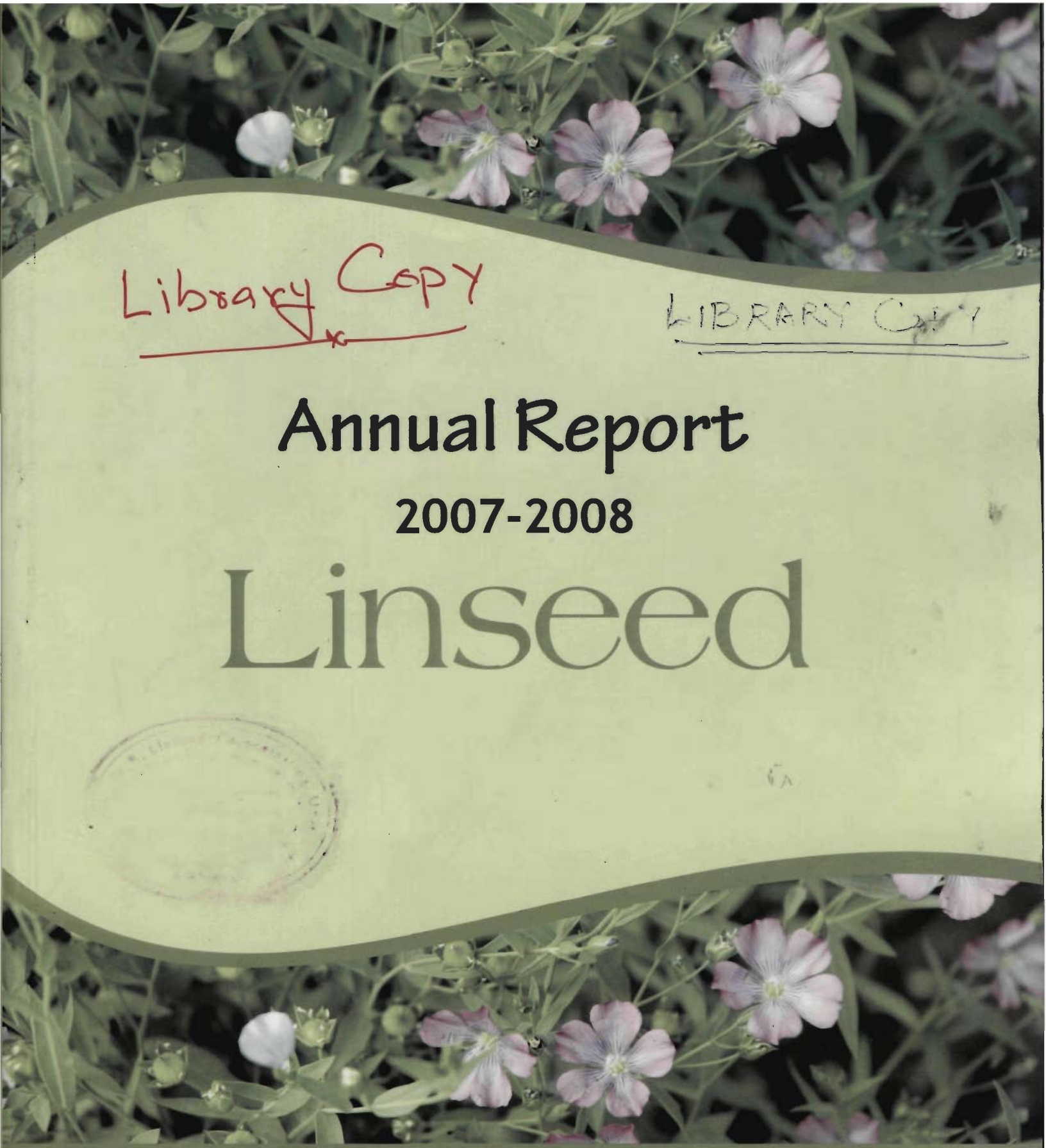


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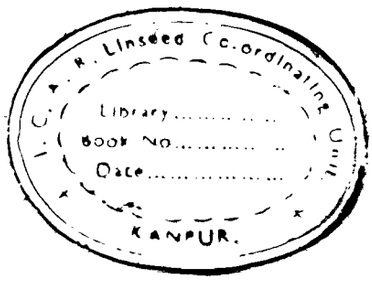
Linseed

All India Coordinated Research Project on Linseed
PROJECT COORDINATING UNIT (LINSEED)
C.S.A.U.A. & T. Campus, Kanpur - 208 002

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(R.L. SRIVASTAVA)
PROJECT COORDINATOR
(LINSEED)

Kanpur
August, 2008

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EXECUTIVE SUMMARY

The salient research achievements, attained during X Plan period (2002-07) under AICRP on linseed in respect of high yielding disease resistant varieties and generation of production and protection technologies for different agro-ecological conditions are achieving the assigned targets of the project envisaged in X plan research activities. As many as 12 linseed varieties, namely, Indira Alsi-32, Sharda, Kartika, RL 914, Suyog, Binwa, Deepika, Him Alsi 1, Baner and LC 2063 (all seed types) and Him Alsi-2 and RLU 6 (dual purpose types) were released and notified and six varieties of seed group *i.e.,* NL 142, LMS 9-2K, KL 214, NL 165, RLC 92 and KL 215 were identified.

During X Plan period, locations as well as situation specific remunerative cropping sequence and inter-cropping systems along with fertilizer management were identified. Introduced linseed inter-cropping in high value crop like autumn planted sugarcane. Standardized seeding rate and sowing time for *utera* condition as well as double purpose varieties of linseed. Assessed impact of $ZnSo_4$ and developed location and situation specifc intergrated nutrient management modules under production technology generation. In protection technology, developed IPM module [sowing of treated seed with Topsin M @ 2 g/kg during end of October to early November with recommended agronomic inputs and need based application of Imidacloprid 200 SL (100 ml/ha) for bud fly and mancozeb (0.25%) for Alternaria blight] for the management of insect pest and diseases, which recorded up to Rs. 8800 /ha additional net monetary return.

Under the impact assessment, the annual compound growth rate in linseed productivity was 2.05% as compared to 0.25% for total oilseeds. The growth in productivity is a silver lining and proves that research is in appropriate direction and encouraging too. The productivity was enhanced by 9.17% during X Plan over IX Plan period. If we have a birds eye view, the reduction in area and subsequently production might be not only due to shifting of cropping pattern but owing to the shrinking in cultivable area and farm size due to population explosion, indiscriminate urbanization and socio-economic compulsions.

Particulars	**IX Plan**	**X Plan**	**% age increase/ decrease over IX Plan**
	(1997-98 to 2001-02)	**(2002-03 to 206-07)**	
Area (000 ha)	650	450	(-) 30.77
Production (000 tonnes)	231	177	(-) 23.38
Yield (kg/ha)	360	393	(+) 9.17

India ranks second (21.21%) in linseed growing country of the world after Canada in terms of area and production wise it ranks fourth (8.29%) in the world after Canada (40.51%), China (18.68%) and USA (10.89%). The area in the major linseed growing states have expanded during X Plan period by 289% in Jharkhand, 170% in J & K, 51% Orissa, 33% in Rajasthan, 26% in Maharashtra and 10% in Nagaland, whereas productivity of few states like Bihar (895 kg/ha), Rajasthan (833 kg/ha) and Nagaland (648 kg/ha) are at par to the world average (852 kg/ha) during 2006-07, besides area, production and productivity are in increasing trend during X Plan period in the states of Maharashtra, Orissa and Rajasthan. This indicates that research endeavours are in right direction which needs boost-up through dissemination of the improved technologies to the growers through the strong extension mechanism so that full productivity potential of the varieties could be harnessed in order to uplift the national average as well as farmer's benefits.

In order to make linseed crop more remunerative and generating employment, the value addition properties of linseed with respect to industrial, medicinal and textile, needs to be emphasized and targeted so that quality fibre may be produced in order to reduce the import bills of worth Rs. 35 crores annually, besides development of linseed varieties for edible purpose having low linolenic acid as well as medicinal and nutritional purposes having high linolenic acid. The seed size of linseed and its oil quality is far better than that of flax seed, hence its international acceptability is very high and linseed oil have been exported for worth Rs. 53 crores during 2006-07 by different countries like Malaysia, U.K. Japan, Itali, Netherland, Singapore, Indonesia, Russia, etc. The major emphasis have been targeted during XI Plan period so that research acievements could be able to save the valuable foreign exchange which will be beneficial to the farming community being more economically viable alternative owing to income from the fibre and value-added products as bonus. The export and import values are given here under :

Export			**Import (2006-07)**	
Product	**Year**	**Value (Rs. in Crores)**	**Products**	**Value (Rs. in Crores)**
Linseed oil	2005-06	30.91	Linseed oil & its products	14.29
	2006-07	53.02	Flax Fibre	35.00
	Increase over 2005-06	**71.57%**	**Total**	**49.29**

The cultivation of linseed under input starved condition, *utera* system of cropping and major linseed growing areas under dry land/moisture stress situations are the major impediments for the low productivity at national level (375-400 kg/ha). Present national average productivity can be increased by 2-3 fold with the adoption of improved varieties alongwith recommended production and protection technologies. A sound and viable transfer of technology process is highly needed to achieve a vast unexploited yield reserviour available in improved linseed varieties. Double purpose linseed varieties (seed and fibre producing) can compete well in terms of net returns with any *rabi* crop.

SEASON AND CROP CONDITION

The overall climatic conditions were not favourable for linseed cultivation in all the major linseed growing areas of central, peninsular and southern regions of the country. Receipt of the rains in September/October facilitated the timely planting of rainfed and *utera* experiments alongwith retention of soil moisture for a long time helped the crop for their establishment at early growth stages at most of the locations except Kangra in Zone-I; Berhampore, Jhanjharpur, Patna in Zone-II; Kota, Tikamgarh, Jabalpur in Zone-III, and Jagdalpur in Zone-IV. Regular rainy days were observed during the crop growth period (November to February) only at few locations *viz.,* Palampur, Kangra, Kanke, Dholi and Berhampore. Maximum rainfall (781 mm) was recorded by Palampur followed by Jashipur (721 mm), Raipur (419 mm), Nagpur (389 mm) and Sabour (387 mm) during September to April months. No precipitation was received during the vegetative phase as well as reproductive phase (Nov. to March) in Zone-III and IV, which cause serious moisture stress in rainfed and *utera* crops and abrupt temperature rise during the months of March onwards, ultimately reduced considerably the productivity of the crop, in general, and experimental yield in particular. This dry spell also effected the quality of the seed due to which, in general, oil content was also reduced. In general, diseases and insect-pest pressure was moderate because of dry spell during the whole of the winter. Bud fly infestation was observed higher in central, peninsular and southern regions of the country.

DEVELOPMENT OF VARIETY

The notable research achievements during the period under report (2007-08) include the release of three linseed varieties *viz.,* Pratap Alsi-1, Deepika and LC-2063 by CVRC and identification of three varieties *i.e.,* RLC-92, NL-165 and KL-215 under the varietal development programme of the project. A brief account of the aforesaid released and identified varieties are given under :

Varieites	Average yield (kg/ha)	Oil content (%)	Recommended areas
Pratap Alsi-1 (RLU-6)	1997 (S) 834 (F)	41.08	Kota Command area of Rajasthan
Deepika (RLC-78)	1272 (I)	41.39	Partially irrigated as well as *utera* situation of Chhattisgarh
LC 2063	1430 (I)	37.40	Irrigated areas of Punjab State
RLC-92	1084 (I)	37.27	Maharashtra, Chhattisgarh, Orissa, Karnataka & Andhra Pradesh
NL-165	1622 (I)	40.27	Bundelkhand of UP, Madhya Pradesh & Rajasthan
KL-215	428 (U)	36.93	HP, Punjab, Haryana, J&K and Uttrakhand

PROGRESS AND FINDINGS

During 2007-08, linseed experiment pertaining to the disciplines of Plant Breeding (12), Agronomy (11), Plant Pathology (9), Entomology (6) and Biochemistry (8) were assigned to as many as 51 locations (14 AICRP linseed centres including PC & GM Unit and 37 voluntary/testing centres). In Frontline Demonstrations, 700 demonstrations were allotted to 35 locations. In all 94 per cent execution of the assigned experiments were achieved due to concerted efforts of the Project Coordinating Unit (Linseed) and full cooperation of the scientists of AICRP linseed and voluntary/testing centres except a few exceptions.

BREEDING

1. GENETIC RESOURCES MANAGEMENT

1.1 Germplasm Management at P.C. & G.M. Unit, Kanpur

- Rejuvenated and maintained 2807 accessions consisted of 2572 seed, 204 double purpose and 31 flax types.
- One hundered fifty accessions maintained as active germplasm.
- Fifty one yellow seed accessions characterized for 15 economic and oil quality descriptors and their documentation is under process.
- Two hundred sixty eight local land races (LLR) collected from NEH and other states were characterized for 25 descriptors and documentation is under process for publishing 3rd catalogue in series.
- Thirty eight exotic germplasm were evaluated for 11 agronomic and 10 morphological traits and their documentation is under process.
- Four wild species received from the NBPGR out of which *Linum austriacum* behaves like perennial in nature.
- Diane (EC 607789) a spring type exotic variety procured from UK during Oct. 2007 was evaluated.
- Six hundred nine accessions conserved for long term storage at NBPGR.
- Two hundred sixty eight LLR's were conserved at NBPGR during 2005.
- Forty five linseed released and notified varieties conserved at NBPGR during 2005 and 2006.
- Supplied 200 accessions for hot spot screening against diseases & bud fly.
- Supplied 100 accessions for hot spot screening against moisture stress.
- Supplied 100 accessions for hot spot screening against saline/alkaline soils.
- Thirty eight exotic accessions supplied to AICRP linseed centres for evaluation.
- Two hundred eleven accession have been supplied to different agencies as per demand for research work.

1.2 Generation of breeding materials and their testing

- Twenty fresh single crosses for flax type with quality fibre, 4 three-Way crosses for earliness, yield with multiple resistance and 3 interespecific crosses involving wild spp. (*L. angustifolium* and *L. bienne*) were attempted.
- Two interspecific crosses were selfed for selecting genotypes having multiple resistance.
- Twenty four crosses and 19 F_2s were advanced at Wellington and their F_2 and F_3 seeds procured.
- Twenty four F_2s, 19 F_3s and 153 F_7s progenies were studied and accordingly 259 SPS and 153 bulk progeny selections were made.

- A trial comprising 21 genotypes including 3 checks were evaluated for seed yield and desirable traits for screening better genotypes and out of them three entries *i.e.,* PCL 42-1, PCL 40 and PCL 27-2 were found promising based on yield and disease and pest reactions.

1.3. Development of variety for edible purpose :

- Five low linolenic acid lines (0-3%) *viz.,* TL 11, TL 26, TL 27, TL 37 and TL 43 were studied for morphological traits and SPS were selected.
- Six basic populations (P_1, P_2, F_1, F_2, BC_1 and BC_2) of six crosses made between the five diverse parents *i.e.,* TL 11, TL 27, TL 37, EC 3183 and ACC No. 2251, were evaluated in RBD with three replications to work out the genetics of fatty acid compositions.
- TBA test indicated variations within Parent's P_1, F_1s and BC_1s of the cross TL 11 × EC 3183 for linolenic acid.
- Fourty SPS were selected from 5 F_3 populations having yield and quality components.

1.4 Molecular characterisation of linseed varieties :

Phenotypically distinct ten linseed varieties *i.e.,* T 397, Neelum, Shekhar, Garima, Padmini, Parvati, Sharda, Sweta, Shikha and Gaurav were characterized at molecular level with Random Amplified Polymorphic DNA's (RAPD) marker. Twenty primers were applied for all the 10 linseed varieties. The present study have proven that all these varieties are genetically different to each other. RAPD variation patterns of the 10 linseed cultivars observed with primers 2, 5, 7, 9, 17 and 19. (Fig. 1)

1.5 Screening of Germplasm for Biotic/Abiotic Stresses Resistance :

Under regular screening programme, every year different sets of 400 accessions screened at AICRP linseed centres (hot spots) for tolerance/resistance against diseases and insect-pest, moisture stress and saline/alkaline soils and desirable accessions are regularly utilized in different breeding programmes.

- A new set of 200 germplasm lines are screened every year at all the 10 hot spot AICRP linseed centres for identification of the tolerant/resistant germplams lines against all the four diseases and linseeed buf fly for utilizing them further in different breeding programme.
- Every year, 100 accessions screened at Lucknow, Kumarganj (Faizabad), Daleepnagar (Kanpur) and Dholi research stations under saline/alkaline soils. The promisiong accessions obtained were further evaluated in yield evaluation trial to judge their superiority for potential and tolerance to stress.
- One hundred accessions were tested at 6 hot spot centres under moisture stress situations. The shorted out promising accessions recommended for hybridization to develop early maturing potential varieties for zones III & IV.

2. Maintenance and Utilization of Germplam at AICRP (Linseed) Centres :

AICRP linseed centres *viz.,* Raipur (1345), Kanke (190), Nagpur (203), Hoshangabad (209), Mauranipur (1300), Kanpur (232) and Jashipur (292) evaluated and maintained as active germplam for breeding purposes at respective centres. Some of the centres like Palampur, Sagar, Patna, Faizabad, Kota, and Raichur did not reported the status of germplam.

3. Generation of Breeding Materials and Selection in Segregating Populations at AICRP (Linseed) Centres :

- A total of 329 fresh crosses were made for seed yield and its components, earliness, resistance to Alternaria, linseed bud fly, multiple resistance, edible grade of oil and flax type with quality fibre.
- Two hundred fifty nine F_1s were raised for F_2 seeds.

- About 2834 segregating progenies were studied in F_2 (375), F_3 (451), F_4 (800), F_5 (487), F_6 (171), F_7 (530), F_8 (9) BC_1F_6 (4) and BC_2F_6 (2) generations.
- About 8244 promising and desirable single plant selections from F_2 (999), F_3 (959), F_4 (1596), F_5 (776), F_6 (511), F_7 (504), BC_1F_6 (25) and BC_2F_6 (40) generations were made.
- About 389 progenies were bulked in F_2 (8), F_4 (38), F_5 (66), F_6 (79), F_7 (170), F_7 (2), and F_9 (6) and BC_1F_6 (20) generations for yield evaluation.

4. Advancement of generation in off season nursery :

- During summer 2007, 13 F_1s were advanced at Kukumseri (L&S) and 24 F_1s and 19 F_2s at NOSN, IARI, Wellington (TN).

5. Evaluation of advanced breeding lines developed at AICRP linseed centres :

As many as 24 station trials comprising 352 advanced breeding lines excluding checks were evaluated during 2007-08 on different aspects at 12 AICRP linseed centres including P.C. Unit and out of these following promising lines were shorted out :

Centre	Trial / Situations	Entries tested	Promising Entries	Potential yield (kg/ha)
Palampur	ST (Flax)	18	70102, 70111, 70119 (Seed yield)	813-889
			70113, 70107, 70119 (Fibre yiled)	495-597
	ST-II	39	Himalini (check), KL-219, KL-241, KL-245	816-1049
Kanpur	PVT-I	15	LCK 8007, LCK 8008, LCK 8012, Sweta (Ch)	1173-1767
	PVT-II	15	LCK 8029, LCK 8023, LCK 8022, Sheela (ch)	1216-1566
Faizabad	ST (R)	12	NDL 2006-2 NDL 2006-8, NDL 2005-25, Shekhar (ch)	800-1360
	ST (I)	12	NDL 2006-10, T 397 (ch)	1650-1800
Kanke	SVT (I)	08	BAU 08-07, BAU 05-07, BAU 04-07, Shekhar (ch)	1250-1734
Mauranipur	PVT (R)	08	LMS 2007-04, LMS P-4, LMS 2007-03, Padmini (ch)	773-960
	PVT (I)	13	LMS 6-12 A, LMS P-01, LMS 7-07, T 397 (ch)	1273-1633
Sagar	SVT (R)	08	0123, 0221, 0210	833-1050
	SVT (I)	12	0115, 0017, 0106-1	1229-1281
Hoshangabad	SVT (I)	08	0708, 0703, 0707, Local check	1750-2083
Kota	RST (I)	22	RL 27010, RL 27005, RL 27011, Meera (ch)	1780-2274
	RST (DP	22	RL 27107, RL 26000, RL 26006, RLU-6 (ch)	2000-2281
Nagpur	PVT (R)	25	Padmini (ch), NL 283, NL 266, NL 273	1070-1123
	MVT (R)	13	NL 260, NL 264, NL 261, Kiran (ch)	286-904
Raipur	PVT (R)	22	T 397 (ch), R 4132, R 4139	1044-1711
	PVT (I)	22	R 4140, R 4135, R 4137, R 552 (ch)	1200-1689
	SVT (R)	08	T 397 (ch), R 4120, R 4116, R 2126	644-1081
	SVT (I)	08	T 397 (ch), R 2126, R 4116	859-1089
	SVT (U)	08	R 4122, R 4123, Padmini (ch)	090-138
Jashipur	PYT (I)	06	V_1K_1 99-44, V_1K_2 99-48, V_1K_2 99-90, Padmini (ch)	585-756
	PYT (II)	09	OL 98-7-3, OL 98-15-2, OL 98-7-4, Sharda (ch)	1227-1653
P.C. Unit	PVT (I)	19	PCL 42-1, PCL 40, Parvati (ch), PCL 27-2	1375-2203
Total	**24**	**352**	**70 promising entries selected**	

6. Promising entries in multi-locational varietals trials :

In multi-locations coordinated varietal evaluation trials, 88 entries alongwith checks were tested in different trials *i.e.,* IVT (R), IVT (I), IVT (U), IVT (DP), AVT (R), AVT (I), AVT (U), AVT (DP) and EEMT (R) in different zones and locations. On the basis of their superiority in seed, oil, fibre yields (10% or above) to the best check, the following promising entries were shorted out for further promotion/ release :

Trial	Zone	Entries tested	Promising lines	
			Seed yield	Oil yield
I Seed Varieties :				
IVT (R)	I	13	NDL 2005-34	
	IV	13	RLC 117, NL 260	
IVT (I)	III	15	RLC 116	RLC 116, PKDL 71
	IV	15	NL 260	NL 260
AVT (R)	IV (Ist)	05	LMS 149-4	LMS 149-4
AVT (I)	IV (IInd)	05	LC 2279-4	LC 2279-4
	IV (Ist)	04	-	RLC 115
EEMT	III (Ist)	08	RLC 116, PKDL 73, SLS 73	SLS-73, RLC 116, PKDL 73
	III (IInd)	04	JLT 215	-
	III (IIIrd)	05	SLS 67	SLS 67
	IV (Ist)	08	OLC 99-57	OLC 99-57
II Double Purpose Varieties :				
IVT (DP)	I	10	NDL 2005-26, PKDL 72 (Seed yield)	RL 26016, PKDL 72
	II	10	LMS 23-6, LCK 7002, LCP 147, RL 26016 (Seed yield)	LMS 23-6, LCK 7002
			LCK 7002, LCP 147 (Fibre yield)	
	III	10	KL 232 (Fibre yield)	
AVT (DP)	I (IInd)	04	LCK 5021 (Seed yield)	LCK 5021
	II (Ist)	04	LCK 6028 (Seed yield)	PKDL 62
	II (IInd)	03	-	LCK 5021

7. Promising entries in special trials

Breeding lines, varieties and germplasm lines were tested in four special trials *viz.,* evaluation of linseed nursery under saline / alkaline soils (LNSA), screening of germplam under abiotic stress *i.e.,* (a) under rainfed/dry land situation (SGR) and (b) under saline/alkaline (SGSA) at AICRP linseed centres. The following entries/lines were found promising with regards to seed yield, days to maturity and other desirable traits like tolerance to abiotic stress as compared to the respective checks and these identified lines could be utilized in genetic enhancement programme in the system.

1. LNSA	Ist year (Seed yield)	:	NDL 2005-29 (771 kg/ha)*, EC 99007 (769 kg/ha)*, GS 436 (738 kg/ha)*, FR 3 (684 kg/ha), NDL 2005-26 (659 kg/ha), check Hira (639 kg/ha)
	(Oil yield)	:	NDL 2005-29 (274 kg/ha)*, EC 99007 (272 kg/ha)*, GS 436 (252 kg/ha)*, FR 3 (237 kg/ha), Flax 16 (227 kg/ha), NDL 2005-26 (224 kg/ha) and Check Hira (222 kg/ha)
	IInd year (Seed yield)	:	EC 41525 (658 kg/ha), EC 41537 (647 kg/ha) and Check - Hira (639 kg/ha)
	Oil yield	:	EC 41537 (241 kg/ha), EC 41525 (231 kg/ha), EC 41573 (228 kg/ha) and Check Hira (222 kg/ha)
2. SGR	Seed yield	:	CI 2006, CI 1904, CI 2053 and CI 1954
	Days to maturity	:	CI 2067 (106 days); CI 1958, CI 2230, CI 2199, CF-white (107 days); CI 2073, CI 2200, CF 481, Canyart, CR-55×RR-9, CI 2005, CI 2010, CI 1901, EC 519A, CI 1978, CP-white, CI 2053 (108 days) and checks = JLS-9 (109 days) and NL 97 and T 397 (110 days)
3. SGSA		:	Jaishi 1-3, JRF-4, NDL 2005-23

8. Breeder Seed Production

As against the DAC indent of 49.11 q breeder seed of 25 linseed improved varieties, the centres could produce 78.74 q breeder seed which was about 60 per cent higher over the indented quantity.

AGRONOMY

Effect of zinc with and without FYM in linseed based crop sequence

- Pooling of three years data reveals that application of zinc through zinc sulphate @ 25 kg/ha in black gram in black gram-linseed crop sequence would be advantageous to record significantly higher linseed equivalent yield and net monetary return at Kanke, whereas addition of FYM in *kharif* season would be more advantageous over zinc application only.

Intercropping studies of linseed with autumn planted sugarcane

- Intercropping of linseed (sub-crop) variety Garima at Dholi and Parvati at IISR, Lucknow with autumn planted sugarcane in 1:3 row ratio were recorded higher net monetary return than sole crop of sugarcane.

Studies on moisture conservation practices for linseed under rainfed situation

- Pooled analysis data of Nagpur proved that moisture conservation practices namely; soil mulching at 30 DAS as well as after first rain shower and hand weeding with no removal of weeded plants from the field, were observed to increase seed yield and net monetary return with significant margin over no mulching.
- Rainfed crops of linseed produced significantly higher seed yield and net monetary return at Raipur and Kanpur when soil moisture was conserved through any means but 10 t/ha FYM as mulch superseded to all with significant margin at Mauranipur.

Studies on sowing time in relation to newly released linseed varieties for double cropping system

- On the basis of pooled analysis it was observed that sowing of linseed variety of Garima after rice under irrigated condition of Faizabad gave higher seed yield and NMR than Shubhra, Shekhar and T397 even under delayed sowing after third week of November.
- Kartika and JLS 9 at Raipur and Kartika and JLT-26 at Powarkheda were observed best varieties for sowing under double crop system after soybean.
- It was observed beneficial to sow linseed after soybean during November rather than last week of October at Raipur, whereas Kartika, Kiran, JLT 26 and J23 were observed superior when sown during last week of October to November, second week of November, whole November and last week of November, respectively, under Powarkheda conditions.

Intercropping studies in seed drill sown *rabi* crops in association with linseed

- Pooled analysis of the results reveals that intercropping of linseed with wheat in 2:2 and 4:4 row ratios at Kanpur and 4:4 row ratio at Palampur were observed superior to sole cropping wheat with regard to LEY and NMR.
- On the basis of pooled analysis, it is concloded that gram + linseed intercropping system could gave higher LEY and NMR than sole gram irrespective of row ratio at Kanpur condition.
- Gram + linseed intercropping system in 6:4 and 4:4 row ratio gave higher LEY and NMR than sole gram at Nagpur during the year.
- Intercropping of linseed with wheat and gram both were observed profitable than sole cropping of gram and wheat at Powarkheda condition.

Studies on bio-efficacy of new herbicides for weed management in irrigated linseed

- On the basis of pooled analysis, clodinafop @ 60 g/ha or clodinafop 80 g + 2, 4-D @ 0.5 kg at Palampur, clodinafop 80 g + 2, 4-D @ 0.5 kg at Faizabad, as well as Powarkheda and clodinafop 80 g/ha at Kanpur were observed better alternative of hand weeding twice.
- Isoproturon 1 kg/ha either with or without 2, 4-D @ 0.5 kg/ha at Raipur and Mauranipur centre were observed alternative of hand weeding twice. However, clodinafop 60 g/ha also gave similar results to hand weeding twice at Raipur.

Studies on the response of newly identified EEMT entries to seed rate and fertilizer application

- A seed rate of 30 kg/ha and 100% RDF were observed optimum for SLS 67 in zone-III.

Studies on the response of AVT (I) 2nd year entries to fertilizer application and sowing schedule

- 100% RDF was observed optimum dose for SLS 61 and NDL 2004-05 at Mauranipur as well as Powarkheda, and for NDL 2004-05, LC 2279-4 and PKDL 52 at Raipur and Nagpur.
- SLS 61 during November and NDL 2004-05 during second week of November gave higher yield at Powarkheda, whereas both the entries SLS 61 and NDL 2004-05 were observed superior when sown during last week of October to second week of November at Mauranipur.

- NDL 2004-05, LC 2279-4 and PKDL 52 entries of zone IV recorded significantly higher NMR when sown during second week to last week of November at Raipur and last week of October to second week of November at Nagpur.

Studies on the response of AVT (DP) entries to fertilizer application and sowing schedule

- LMS 95-4 and LC 5021 have given higher seed yield when sown during last week of November and with the application of 100% RDF (50:40:20 kg NPK/ha) at Palampur condition.
- A fertilizer dose of 100% RDF was observed optimum for LCK 5021 in zone II.
- LCK 5021 gave higher seed and fibre yield when sown during last week of October over November sowings at Kanpur and first week of December over latter sowings at Patna.

PATHOLOGY

The disease pressure was relatively low during crop season. Incidence of four major diseases *viz.,* wilt, Alternaria bligh, powdery mildew, rust as well as Phanerogamic parasite *cuscuta* were observed at Nagpur and Sclerotium stem rot from Kanpur (P.C. Unit). Wilt, Alternaria blight and powdery mildew were reported from all locations. The highest incidence of wilt was recorded at Raipur (10-40%) followed by Kanke (20-25%) from normal fields. However 100% incidence was reported from Kanpur and Kangra followed by Faizabad (90%) from wilt sick plots. The maximum severity of Alternaria blight was recorded at Faizabad (75.5 to 85.5%) followed by Kanpur P.C. Unit (30-65%), Raipur (5-60%) and Jashipur (55%) and at other centres, it was in the range of 5-30 per cent. Powdery mildew was recorded at all locations. It was in most severe form at Faizabad (85%) followed by Palampur (80%), Mauranipur (75%) P.C. Unit Kanpur (55-65%). Rust was recorded at Kangra (100%), Palampur (25%), Kanke (10-15 %) P.C. Unit, Kanpur (10%) and Jashipur (0.5-1%). The first appearance of rust was recorded between Ist week of March to last week of April. Besides above four major diseases Sclerotium stem rot (25-30%) was recorded at P.C. Unit Kanpur and *cuscuta* was reported from Nagpur (50-60%).

Screening of germplasm against diseases under natural condition :

Two hundred germplasm were screened under natural condition against major diseases and pest at their respective hot spot along with resistant and susceptible checks. The promising genetic resources for respective diseases and pest have been listed below :

Wilt (03 location) :

Resistant at all locations - EC 397760

Resistant at more than half (2) locations - LCK 9436, RLC 59

Alternaria blight (04 locations) :

Resistant at three locations - KFS 11, LCK 9414, RL 56-6-2, RL 903

Powdery mildew (03 locations) :

Resistant at two locations - RLC 47, SLS 8, SLS 21, RSJ 7, LCK 9414, KL 43, A 21-2-2, Kiran, NP (RR) 38, Linum gramdiflora, NP (RR) 76, NP (RR) 465, FRW 1, KYS-1, RSJ-2, KFS 11, 4/35-1/1-4, 4/47-2/1-2, RSJ 3, RSJ 5, RSJ 6, Sumerpur local, W/17-1, 4/47, T71, ICAR-3, Kiran, EC 399086

(Rust (2 locations)

Disease free (o) or Resistant at all locations - LCK 9436, LMH 91-24, NL 24, RL 906, RL 967, RLC 29, RLC 47, EC 397760, BSL 10, 4/35-1/1-4, T 71, ICAR 3, GLC 36, A-21-2-2

Uniform disease nursery Trial (UDN)

Entries of all breeding Trials (IVT and AVT) were screened at multilocations against major diseases under natural field conditions (UDN natural) and the entries of Advance breeding Trials (AVT) and the elite cultures of previous year were screened under artificial condition (UDNA-I and UDNA-II), entries found resistant against respective diseases given below.

(A) UDN (Natural)

Wilt	:	Resistant on more than half locations - BAU-06-17, BAU-2K-20 KL 248, KL-222, LCK-6028, LMS-23-6, LCP 147, PKDL-65, RLC 112, RLC-116, RLC 121, SLS-66, Baner, LC 54, Nagarkot, Padmini, Parvati, Shekhar, T 397 and Kiran.
Alternaria blight	:	None entries found resistant.
Powdery mildew	:	Entries resistant more than half location (07) PAU-6-17, KL 219, JLT 215, LCK 6028, LCP-147, LMS-149-4, NL 119, NL 260, PKDL 52, PKDL 62, PKDL 65, RLC 112, RLC-114, RLC 116, RLC 121, SLS 66, SLS 68, J-23, Meera, Nagarkot, NL-97, J-23, Meera, Nagarkot, NL-97, Sheela, Kiran.
Rust	:	Resistant at Both locations JLT-204, LC 2279-4, LCK-5021, LCP 147, LMS 95-4, LMS 149-4, NL 260, PKDL 71, RLC 112, Parvati, Shekhar.

(B) UDN Artificial (UDNA)

Wilt	:	Entries resistant at all locations : PKDL 52, R 552
Alternaria blight	:	Moderately resistant at more than half locations (04) BAU 2K-20, LC 2289-4, NDL 2004-5, PKDL 62, Meera, Surabhi
Powdery mildew	:	Resistant more tnan half locatinos (04) JLT 204, PKDL 52, PKDL 62, PKDL 65, Meera, Surabhi, Kiran
Rust	:	Resistant at both locations : BAU 2K-20, LCK 5021, PKDL 62, PKDL 65, J 23, Surabhi.
Multiple resistant line	:	PKDL 62 and Surabhi

UDN (Elite lines) :

Wilt	:	Resistant at all locations : H 22
Alternaria blight	:	Resistant at more than half location : Ayogi, H 34, Polf 22, Polf 19
Powdery mildew	:	Resistant at more than half location : KL 1, LCK 911, LCK 9406, S 91-5, S 91-6, Polf 29, LH 1
Rust	:	Resistant at more than half locations : S 91-38, DPL 19, KL 1, LC 2023 LCK 9320, PAU 9906, ES 44, JRF 3.

- **Integrated disease management in linseed**

  A combination of seed treatment with Topsin-M (2 g/kg seed) followed by 2 sprays of Indofil- M45 (0.25%) was most effective followed by recommended prectices and seed treatment with trichoderma viridi 4 g/kg seed + 2 sprays of Indofil-M but all were at par.

- **Chemical control** - On the basis of 3 years experimentations companion (carbandazim 12% wp and Mencozeb 63% wp) was found most effective in managing the Alternaria blight an enhancing the grain yield.

- **IDSN** - Following entries of PVT Trials from different centre found promising / Resistant.

Wilt	:	LCK 8013, LCK 8015
Alternaria blight	:	Nil
Powdery mildew	:	RL 26024, RL 27018, RL 27028, RL 27017, RL 27025, LCK 8012, LCK 8014
Rust	:	RL 26008, RL 26016, RL 26024, RL 27022, RL 27019, RL 27023, LCK 8008, LCK 8019, LCK 8025, NL 210

ENTOMOLOGY

Based on different experiemnts conducted at multi-locations, following inferences were drawn :

- Bud fly *(Dasyneura lini)* was noticed as key pest at Faizabad, Raipur and Nagpur locations, while leaf miner at Faizabad and thrips at Raipur as well as Nagpur appeared as major biotic constraints.
- Maximum bud fly infestation being 79.1% was noticed at Nagpur followed by 49.6, 47.8, 40.3, 23.6 and 19.3% bud infestation observed at Rewa, Raipur, kanpur, Kota and Faizabad, respectively.
- Linseed genotypes viz., IC-15888, JRF-5, LCK-5021, NDL-2004-05 and RLC-106 were found promising against bud fly at multi-locations.
- Economic injury level of bud fly was estimated to be 11% bud infestatino for Raipur and Nagpur locations.
- Cultivation of linseed under improved package of practices and two fortnightly applications of insecticide (imidacloprid 200 SL @ 100 ml/ha or monocrotophos 36 SL @ 0.04%) and botanical or vice-versa provided lower bud fly infestations with higher seed yield under rain fed/irrigated condition at Kanpur, Raipur and Nagpur.

- Two fortnightly application of neem seed extract (5%), NSKE (5%) and azadirachtin 300 ppm (0.5%) provided minimum bud fly infestation with higher yields at Kanpur, Raipur and Nagpur locations, respectively.
- Intercropping of linseed with gram (6:4) found suitable combination at Kanpur and Nagpur, while wheat + linseed (6:4) at Raipur was better over other combinations for lowering the bud fly infestation.

BIOCHEMISTRY

- Sowing of linseed in second week of Nov. was found suitable for maximum oil content at Faizabad.
- Intercropping of gram or linseed was proved better than wheat for higher oil content in linseed. Among row ratios, 2 : 2 row ratio was found more favourable for higher oil content.
- Herbicides reduced the oil content over no use of herbicides, though, combination of 2, 4-D with isoproturon or clodinafop increased the oil content over without 2, 4-D herbicide. Herbicides also reduced the linolenic acid as well as iodine value of linseed oil.
- Sowing of seed @ 30 kg/ha and 50% RDF were found suitable for higher oil content.
- The lines Chitarpur, CI-2055 and CP-white were performed consistantly better oil content, among germplasm sown under rainfed situation, at Sagar, Jashipur and Nagpur.
- Out of germplasm grown under salinity the entries viz., Kanpur 2/1, IPS-42, KP-8, ILS-264 were recorded more than 35% oil.
- None entry of IVT showed low in linelenic acid through spot test.
- Among entries of AVT, SLS-61 contained maximum linolenic acid (62.3%).
- Lower temprature and higher humidity were found suitable for higher oil content, linolenic acid and iodine value.

Summary of oil content in different breeding trials

Trial	Zones	Range of Oil %
IVT (R)	All Zones	35.51 (PCL-1-06) - 41.56 (Padmini)
IVT (I)	All Zones	35.49 (BAU 06-5) - 41.73 (SLS-72)
IVT (DP)	All Zones	36.94 (KL-232) - 39.43 (Meera)
IVT (U)	All Zones	34.60 (R-552) - 39.85 (LMS-P-5)
AVT (R)	Zone III	36.61 (R-552) - 39.91 (LMS-149-4)
	Zone IV	35.40 (R-552) - 40.68 (Padmini)
AVT (I)	Zone III	35.58 (NDL-2004-05) - 40.22 (JLT-204)
	Zone IV	35.99 (LC-2279-4) - 37.96 (NDL-2004-05)
AVT (DP)	Zone I	35.73 (Nagarkot) - 37.25 (LCK-5021)
	Zone II	38.17 (LCK-6028) - 40.12 (PKDL-62)
AVT (U)	Zone I	37.64 (T-397) - 41.64 (Surabhi)
EEMT	Zone III	36.72 (RLC-116) - 41.34 (SLS-73)
	Zone IV	36.66 (RLC-116) - 39.83 (NL-97)
SGSA	Zone II	33.58 (EC-41706) - 37.26 (EC-41537)

FRONT LINE DEMONSTRATION

- A total of 535 front line demonstrations were conducted out of 700 assigned but results of 507 FLDs were reported to P.C. Unit.
- The improved technologies of whole package demonstration increased the yield of linseed by 114.61%, 78.10% and 182.26% over local practice under irrigated, rainfed and *utera* situations, which fetched an additional income of Rs. 12834/ha, Rs. 6839/ha and Rs. 7482/ha, respectively.
- The intercropping system (I.T.) brought an increase in linseed equivalent yield by 71.40% under irrigated situation and 78.5% under rainfed situation which attributed an additional income of Rs. 8605/ha and Rs. 9750/ha over farmers' practices, respectively.
- The newly developed varieties of irrigated, rainfed and *utera* situations out yielded by 40.28%, 77.75% and 497.08% and recorded Rs. 11816/ha, Rs. 7263/ha and Rs. 7660/ha additional income over old varieties, respectively.
- The linseed crop responded well towards agronomic inputs like fertilizer application, vermi-composting, water management and weed management which increased the linseed yield by 95.68%, 91.70%, 465.7% and 44.41% over farmers' practices and fetched an additional income of Rs. 10178/ha, Rs. 6065/ha, Rs,. 4464/ha and Rs. 6451/ha, respectively.
- The insect-pest and disease management in linseed brought an increase in seed yield by 77.00% over no management and fetched an additional income of Rs. 6742/ha.

On over all mean basis, the front line demonstration conducted under different agro-climatic conditions envisaged the distinct superiority of improved technologies over local one in all the zone. These technologies should be transferred among the linseed growers through proper and accurate extension mechanism.

PERFORMANCE OF CENTRES

Staff positions of AICRP (Linseed) centres and number of trials allotted, data received discipline wise alongwith response percentage are given in Annexure I and II, respectively. The overall performance of most of the centres is satisfactory except a few centres like Palampur, Raichur and Kanke where the status of the seed yield was comparatively poor owing to unfavourable climate as well as poor plant stands. The performance of the generation of breeding materials and their testing are very poor at almost all the centres which needs to be strengthen further as per the assigned activities during XI plan. A few voluntary centres did not conduct the trials allotted.

MONITORING OF CENTRES

Thirteen multi disciplinary monitoring teams were constituted with the Scientists from Project Coordinating Unit (Linseed), Kanpur and AICRP (Linseed) centres and the monitoring teams visited and monitored the execution of trials, FLD's, breeder & nucleus seed production programmes and their performance, etc. The Project Coordinator also monitored some of the centres alone or alongwith some of the teams consitituted. The details of visits are presented in Appendices I. A detailed technical programme, 2007-08 and guidelines for easy implementation of the programme and its monitoring was brought out soon after the Group Meeting held at MPUA&T, Udaipur (Rajasthan) and distributed to all the voluntary/cooperating centres/Scientists. On the basis of the monitoring report, conclusions have been drawn with respect to the entries which are showing off type plants with regards to plant stature, days to flowering, flower colour, maturity periods, etc., so that such entries may not be promoted further in next stage of testing.

1. SEASON AND CROP CONDITION

The technical programme of AICRP on linseed for the year 2007-08 was approved during Annual Group Meeting of Linseed and Safflower held at Maharana Pratap University of Agric. & Technology, Udaipur (Raj.) during August 23-25, 2007. This technical programme includes experiments in the disciplines of Plant Breeding, Agronomy, Plant Pathology, Entomology and Agricultural Biochemistry. Besides, 700 front line demonstrations were also allocated at different locations of the country. These programmes were allotted at 50 locations spread over four distinct agro-climatic regions of linseed, namely; Northern-Western plain Region (Zone I), Indo-Gangetic Alluvial Region including NEH Region (Zone II), Central Region (Zone III) and Peninsular as well as Southern Region (Zone IV), covering 17 states of the country. Barring a few, all the centres have executed their assigned programme as per technical action plan. The monthly (centre-wise) meteorological information recorded in the terms of number of rainy days, total rainfall (mm), average maximum as well as average minimum temperature (^{0}C) and average relative humidity (RH%) are given in Table 1.

Zone I

Palampur and Kangra centres of this zone reported the information on meteorological indices (Table 1). The soil of the experimental site of Palampur was either clay or silty loam whereas it was clay at Kangra. Palampur centre received a total rainfall of 781.5 mm in 49 rainy days during September to May, whereas Kangra centre received a total rainfall of 237 mm in 21 days during December to April. Out of the rainfall received during Sep. to May at Palampur and October to April at Kangra, the contribution of rainfall recorded during September to Novermber was found to be 31.99% at Palampur and nil at Kangra. Occurrence of heavy rains during September and October at Palampur helped in timely sowing of rainfed and *utera* crops at this location but Kangra centre required pre-sowing irrigation for timely sowing of experiments being void of rainfall during October and November. Both the centres received sufficient rains during December and February which fulfilled the irrigation requirement of the crop like linseed. January was observed coolest month of the year at both the locations. Temperature increased gradually thereafter. Variation in maximum and minimum temperature was observed less at both the centres. Prolonged winter and higher relative humidity increased the growing period of crop of this zone as compared to other zones. However, the growing period of the linseed crop was observed more at Palampur than Kangra.

Zone II

The meteorological information were received from Kanpur, Kanke, Dholi, Berhampore, Sabour, Jhanjharpur, and Patna. The soil texture of the experimental site was observed sandy loam at Kanpur, Dholi and Berhampore; loam at Kanke and Patna, whereas it was silty loam at Jhanjharpur. Among the locations of this zone, Sabour centre received maximum rainfall (386.7 mm) during September 2007 to April 2008 followed by Dholi (312.1 mm), whereas it was lowest at Kanpur (37.5 mm). Berhampore, Jhanjharpur and Patna reported the meteobological informations for the months November to April but it was from October to April for Kanke. Most of the Centres could not receive rain water during December which required irrigation at vegetative phase for the exposure of vigor of the varieties. All the centres of this zone except Patna received either low or no rain water during February which forced the experimenter as well as farmers to irrigate their irrigated experiments/crop at reproductive stage too. The first month of the year *i.e.,* January was observed as coolest one in this zone too. The atmospheric temperature showed gradual inecrease from January onwards and reached at peak during April for this years' *rabi* crop. Among this zone, the atmospheric temperature of Kanpur was observed highest irrespective of month. The atmosphere of Dholi centre was observed more humid than other centres of this zone.

Table 1 Soil type and monthly Weather records at Experimental sites during crop period 2007-08

Sl. No.	Zone / Centre	Soil type	Weather Parameters	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Apr.	May	Total
Zone-1													
1.	Plampur	Clay/Silty loam	No. of rainy days	13	1	0.0	4	9	6	2	5	9	49
			Total rainfall (mm)	247.6	2.4	0.0	38.6	136.5	98.5	15.4	62.4	180.1	781.5
			Max. mean temp. (^{0}C)	26.3	23.4	21.1	16.9	13.5	15.6	24.9	24.1	29.2	-
			Min. Mean Temp. (^{0}C)	17.8	12.2	9.3	5.6	4.2	5.4	12.3	13.4	17.4	-
			RH (%) Max.	85	67	72	66	71	67	46	47	51	-
			RH (%) Min.	75	45	46	49	62	56	26	31	47	-
2.	Kangra	Clay	No. of rainy days	-	-	-	2	6	7	-	6	-	21
			Total rainfall (mm)	-	-	-	198	86.3	72.6	-	58.3	-	237
			Max. mean temp. (^{0}C)	-	28.60	24.75	22.03	18.90	20.26	21.21	30.6	-	-
			Min. mean temp (^{0}C)	-	13.50	9.90	4.58	1.88	5.86	9.36	13.02	-	-
			RH (%) Max.	-	66.00	69.75	75.25	73.75	78.00	91.60	81.00	-	-
			RH (%) Min	-	42.20	35.75	51.00	43.25	46.67	60.60	36.00	-	-
Zone-II													
1.	Kanpur	Sandy Loam	No. of rainy days	3	-	-	-	-	-	-	2	-	5
			Total rainfall (mm)	23.6	0.0	0.0	3.00	0.0	1.6	0.0	9.4	-	37.5
			Max. Mean temp. (^{0}C)	33.3	33.3	28.9	23.6	21.9	23.8	32.8	38.1	-	-
			Min. Mean temp. (^{0}C)	25.2	18.0	13.1	8.6	7.4	9.0	16.5	20.0	-	-
			Av. RH (%)	73.5	58.6	66.5	66.1	59.5	57.7	52.2	35.9	-	-
2.	Kanke	Loam	No. of rainy days	-	1	0	0	2	1	2	0	-	6
			Total rain fall (mm)	-	11.6	0.8	0	11.0	11.2	14.0	0	-	48.6
			Max. Mean temp. (^{0}C)	-	28.8	25.6	23.2	22.9	23.7	31.4	34.5	-	-
			Min. mean temp. (^{0}C)	-	15.9	11.8	6.3	7.5	7.7	14.0	17.7	-	-
			RH (%) Max.	-	88	87	86	88	89	88	84	-	-
			RH (%) Min.	-	53	60	52	53	48	37	34	-	-
3.	Dholi	Sandy loam	No. of rainy days	16	4	1	Nil	1	1	Nil	2	-	25
			Total rainfall (mm)	201.7	59.6	16.0	Nil	11.0	2.8	Nil	21.0	-	312.1
			Max. mean temp. (^{0}C)	31.6	30. 8	28.7	23.7	22.1	22.15	29.0	35.44	-	-
			Min. mean temp. (^{0}C)	25.8	23.0	17.7	10.1	9.8	9.9	15.7	19.7	-	-
			RH (%) Max.	92.12	94.0	96.4	96.6	95.8	93.0	93.0	84.7	-	-
			RH (%) Min.	76.5	67.4	58.6	57.2	58.5	54.0	56.6	41.2	-	-
4.	Berhampore	Sandy loam	No. of rainy days	-	-	-	-	-	-	-	-	-	-
			Total rainfall (mm)	-	-	1.8	0.0	7.8	3.90	11.60	37.2	-	62.3
			Max. mean temp. (^{0}C)	-	-	29.3	25.4	24.1	24.1	31.7	35.0	-	-
			Min. mean temp. (^{0}C)	-	-	20.2	13.6	12.3	13.4	20	23.6	-	-
			RH (%) Max.	-	-	86.5	87.6	89.8	88.8	83.2	86.8	-	-
			RH (%) Min.	-	-	57.8	46	50.8	48.3	44.6	50.5	-	-
5.	Sabour	NR	No. of rainy days	15	2	-	-	4	2	1	2	-	26
			Total rainfall (mm)	251	74.5	-	-	46.7	0.4	0.6	13.5	-	386.7
			Max. mean temp. (^{0}C)	32	31.1	27.6	22.8	21.4	24.5	32.5	34.2	-	-
			Min. mean temp. (^{0}C)	25.9	22.1	15.3	8.5	8.6	10.9	17.1	18.8	-	-
			RH (%) Max.	90.5	90.4	93.5	97	94.8	92	84.2	81.5	-	-
			RH (%) Min.	80.0	63.8	54	51.8	56.2	51.8	45	38	-	-
6.	Jhanjharpur	Silty loam	No. of rainy days	-	-	1	-	1	1	-	3	-	6
			Total rainfall (mm)	-	-	18.5	-	14	1.5	-	4.5	-	38.5
			Max. mean temp. (^{0}C)	-	-	28	29.8	21.5	22.8	30.1	36.0	-	-
			Min. mean temp. (^{0}C)	-	-	17.6	20.0	10.2	10.5	17.3	21.5	-	-
			RH (%) Max.	-	-	91	89	88	86	87	77.6	-	-
			RH (%) Min.	-	-	65	49	50	48	45	31.6	-	-

Sl. No.	Zone / Centre	Soil type	Weather Parameters	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Apr.	May	Total
7.	Patna	Clay	No. of rainy days	-	-	-	-	2	3	-	5	-	10
			Total rainfall (mm)	-	-	-	-	31.8	9.8	-	25.6	-	67.2
			Max. mean temp. (^{0}C)	-	-	28	23.6	22.1	24.2	30.5	35.2	-	-
			Min. mean temp. (^{0}C)	-	-	17.8	12	11.9	13	18.7	22.5	-	-
			RH (%) Max.	-	-	83.3	84.8	81.8	76.3	70.8	68	-	-
			RH (%) Min.	-	-	50.3	54.3	53	51.3	43.8	32.7	-	-
1.	Sagar	M. Black	No. of rainy days	-	-	-	-	-	-	-	-	-	-
			Total rainfall (mm)	13	00	0.2	1.6	00	00	1.8	0.7	-	17.3
			Max. mean temp. (^{0}C)	31.2	33.4	30.8	26.1	25.0	29.1	35.4	36.6	-	-
			Min. mean temp (^{0}C)	22.4	18.6	16.2	12.5	10.9	13.1	20.9	21.4	-	-
			R.H. (Mor)	86.5	50.2	50.5	55.0	49.8	37.3	36.5	38.5	-	-
			RH (Eve.)	76.0	37.4	34.0	47.8	34.2	22.0	23.0	21.5	-	-
2.	Mauranipur	Parwa/Mar	No. of rainy days	3	00	00	00	00	00	00	00	-	3
			Total rainfall (mm)	64	00	00	00	00	00	00	00	-	64
3.	Powarkheda	Vertisol	No. of rainy days	12	0	0	-	-	-	-	-	-	12
			Total rainfall (mm)	161.8	2.2	0	-	-	-	-	-	-	164
			Max. mean temp. (^{0}C)	31.1	31.7	30.1	26.5	-	-	-	-	-	-
			Min. mean temp. (^{0}C)	24.4	19.1	15.4	11.8	-	-	-	-	-	-
			RH (%) Max.	94.7	80.5	74.56	85	-	-	-	-	-	-
			RH (%) Min.	72.5	52.6	60.9	72.2	-	-	-	-	-	-
4.	Kota	Heavyclay	No. of rainy days	-	0	0	1	0	0	0	0	-	1
			Total rainfall (mm)	-	0	1.2	7.4	2.2	1.6	6.8	1.4	-	20.6
			Max. mean temp. (^{0}C)	-	34.32	31.0	24.3	22.1	22.87	34.7	40.3	-	-
			Min. mean temp. (^{0}C)	-	15.35	11.96	7.7	5.1	3.7	14.3	20.54	-	-
			RH (%)	-	61	65.4	76.3	77.2	73	57.1	29.93	-	-
5.	Tikamgarh	NR	No. of rainy days	-	-	00	00	00	00	00	-	-	-
			Total rainfall (mm)	-	-	00	00	00	00	00	-	-	-
			Max. mean temp. (^{0}C)	-	-	30.7	26.8	24.7	26.5	35.0	-	-	-
			Min. mean temp. (^{0}C)	-	-	12.13	9.73	8.4	8.7	17.9	-	-	-
			RH (%)	-	-	58	59.8	56	48	35.4	-	-	-
6.	Jabalpur	NR	No. of rainy days	-	-	0	1	0	1	0	00	-	2
			Total rainfall (mm)	-	00	00	6.0	2.6	4.4	1.4	00	-	14.4
			Max. mean temp. (^{0}C)	-	25.5	28.9	25	23.9	27.1	34.4	38.55	-	-
			Min. mean temp. (^{0}C)	-	16.4	10.2	6.8	7.4	7.6	16.5	18.50	-	-
7.	Durgapura	NR	No. of rainy days	13	3	1	0	-	-	-	-	-	17
			Total rainfall (mm)	185	40.4	11.0	0	-	-	-	-	-	236.4
			Max. mean temp. (^{0}C)	30.9	31.9	33.6	35.5	-	-	-	-	-	-
			Min. mean temp. (^{0}C)	21.4	19.7	16.2	18.6	-	-	-	-	-	-
			RH (%)	92	89	83	85	-	-	-	-	-	-

Sl. No.	Zone / Centre	Soil type	Weather Parameters	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Apr.	May	Total
Zone-IV													
1.	Nagpur	Black cotton	No. of rainy days	18	1	2	00	00	00	-	-	-	21
			Total rainfall (mm)	296.7	13.4	78.7	00	00	00	-	-	-	388.8
			Max. mean temp. (^{0}C)	31.96	32.86	30.83	29.18	29.13	29.78	-	-	-	-
			Min. mean temp. (^{0}C)	23.94	18.78	16.28	13.08	12.65	14.32	-	-	-	-
			R.H. (Mor.) %	84.00	67.75	66.25	62.8	57.75	42.00	-	-		
			R.H. (Eve.) %	68.20	48.25	39.75	36.2	32.75	22.80	-	-		
2.	Raipur	Vertisol	No. of rainy days	18	1	2	00	00	00	2	1	-	24
			Total rainfall (mm)	296.7	13.4	78.7	00	00	00	24.8	5.2	-	418.8
			Max. mean temp. (^{0}C)	31.96	32.88	30.83	29.18	29.13	29.45	34.9	39.7	-	-
			Min. mean temp. (^{0}C)	23.94	18.78	16.28	13.08	12.65	14.45	19.9	19.4	-	
			RH (%)	84	68	66	63	58	44	52.9	35.4	-	
3.	Jashipur	Red lateritic/Sandy loam	No. of rainy days	23	1	3	0	3	1	3	2	-	36
			Total rainfall (mm)	400	32.6	84	Nil	78	12.4	11.0	102.8	-	720.8
			Max. mean temp. (^{0}C)	28.6	28.2	28.6	23.7	24.5	25.6	33.3	36.4	-	-
			Min. mean temp. (^{0}C)	24.7	21.2	18.1	13.6	14.0	15.2	21.4	24.5	-	-
4.	Bilaspur	NR	No. of rainy days	-	1	0	0	1	2	2	-	-	6
			Total rainfall (mm)	-	12.0	0	0	1.4	14.6	12.6	-	-	40.6
			Max. mean temp. (^{0}C)	-	31	28.9	27.5	27.2	28.56	35.0	-	-	-
			Min. mean temp. (^{0}C)	-	19.12	13.0	11.5	11.48	12.0	19.0	-	-	-
			RH (%) Max.	-	90.9	91.4	91.0	90.0	84.9	72.6	-	-	
			RH (%) Min.	-	48.4	35.3	37.2	40.9	42.8	29.9	-	-	
5.	Jagdalpur	NR	No. of rainy days	-	-	0.0	0	0	-	NR	-	-	
			Total rainfall (mm)	-	-	0.0	0	0	1.9	105.4	-	-	107.3
			Max. mean temp. (^{0}C)	-	-	28.15	28.2	28.0	29.9	32.3	-	-	-
			Min. mean temp. (^{0}C)	-	-	18.4	9.3	9.3	11.9	16.7	-	-	-
			RH (%) Max.	-	-	92.3	92.0	92.0	89.8	75.3	-	-	-
			RH (%) Min.	-	-	44.8	41.0	41.2	36.3	29.3	-	-	-
6.	Badnapur	NR	No. of rainy days	11	2	00	00	00	00	00	-	-	13
			Total rainfall (mm)	237	9	00	00	00	00	00	-	-	246
7.	Bijapur (KNT)	NR	No. of rainy days	12	2	1	0.0	-	-	-	-	-	15
			Total rainfall (mm)	148.1	36.2	5.9	0.0	-	23.0	-	-	-	213.2
			Max. mean temp. (^{0}C)	29.9	31.6	30.3	30	-	-	-	-	-	
			Min. mean temp. (^{0}C)	21.3	19.4	14.0	12.9	-	-	-	-	-	-
			RH (%) Max.	92.8	83.6	79.8	80.7	-	-	-	-	-	-
			RH (%) Min.	67.8	48	40.0	39.5	-	-	-	-	-	-

NR : Not reported, RH : Relative humidity

Zone III

Sagar, Mauranipur, Powarkheda, Kota, Tikamgarh, Jabalpur and Durgapura centres of this zone have reported the information on meteorogical indices (Table 1). The Powarkheda and Durgapura centres could not report the meteorological indices for whole crop season, hence not worth presenting. Mauranipur center could not receive even a single drop of rain water and thus there was dought in this area. Kota and Jabalpur centres received some rains during *rabi* season which helped in completing the life cycle of rainfed experiments. The irrigated experiments needed irrigation at vegetative and reporductive phases of the crop for proper vigour and development. The first month of the year, *i.e.* January was observed coolest month. Kota centre was observed most humid centre of this region.

Zone IV

Nagpur, Raipur, Jashipur, Bilaspur, Jagdalpur and Badnapur centres of this zone reported the information on meteorological indices. Jashipur centre received maximum rainfall (720.8 mm) during September to April followed by Raipur (418.8 mm), Nagpur (388.8 mm), Badnapur (246.00 mm), Jagdalpur (107.3 mm) and Bilaspur (40.6 mm). The contribution of rainfall received during September and October was maximum at all the locations and was observed to be 79.76%, 74.04%, 60.00%, 29.55% and 100% at Nagpur, Raipur, Jashipur, Bilaspur and Badnapur, respectively. However, Jagdalpur centre could receive rain only during March and April. The heavy rain pour during September and October helped in timely sowing of rainfed and *utera* crops in this region. Experiments conducted at Badnapur, Bilaspur needed life saving irrigations for the conductance of experiments. Jagdalpur centre required pre-sowing irrigation for sowing the experiment because this centre could not receive rain up to January. All the centres of this zone required irrigations at vegetative and reproductive phases of the crop because the rainfall pattern of this zone was not in a position to fulfill the water requirement of the crop. All the centres of this zone except Jashipur recorded lowest minimum temperature during January. Raipur centre was observed most humid centre of this zone during the crop season.

The disease pressure was relatively low during crop season. Wilt, Alternaria blight and Powdery mildew were reported from all locations. Incidence of four major diseases, *viz.* wilt, Alternaria blight, Powdery mildew, Rust as well as Phanerogamic parasite *cuscuta* were observed at Nagpur and sclerotium stem rot from Kanpur (P.C. Unit). The highest incidence of wilt was recorded at Raipur (10-40%) follwed by Kanke (20-25%) from normal fields. However, incidence of wilt in wilt-sick plot was reported 100% from Kanpur and Kangra followed by Faizabad (90%). The maximum severity of Alternaria blight was recorded at Faizabad (75.5 to 85.5%) followed by Kanpur P.C. Unit (30-65%), Raipur (5-60%) and Jashipur (55%) and at other centres, it was in the range of 5-30 per cent. Powdery mildew was recorded at all locations. It was in most severe form at Faizabad (85%) followed by Palampur (80%), Mauranipur (75%), P.C. Unit Kanpur (55-65%) whereas its intensity at Kangra was only 10 per cent. Incidence of rust was recorded at Kangra (100%), Palampur (25%), Kanke (10-15%), P.C. Unit Kanpur (10%) and Jashipur (0.5-1%). The first appearance of rust was recorded between first week of March to last week of April. Besides above four major diseases, Sclerotium stem rot (25-30%) was recorded at P.C. Unit Kanpur and *Cuscuta* was reported from Nagpur (50-60%).

Maximum bud fly infestation being 79.1% was noticed at Nagpur followed by 49.6, 47.8, 40.3, 23.6 and 19.3% bud infestation observed at Rewa, Raipur, Kanpur, Kota and Faizabad, respectively.

2. BREEDING

2.1 Collection, conservation and evaluation of germplasm

The Project Coordinating and Germplasm Management Unit, AICRP on linseed centres and some voluntary centres were actively involved in collection, conservation, evaluation, characterization and utilization of germplasm for evolving suitable genotypes having specific and / or general adaptation to different agro-climatic regions of the country.

2.1.1 Genetic resource management and generation of breeding materials at P.C. Unit

Germplasm Management Unit (GMU), an integral part of the Project Coordinating Unit is located at Chandra Shekhar Azad University of Agriculture & Technology, Kanpur as National Active Germplams Site of NBPGR and charged with the responsibilities of collection, evaluation, characterization, documentation, distribution and information retrieval of germplasm to different end users. It has strengthened and enriched the genetic wealth by introduction of exotic materials and wild species from abroad through NBPGR and indegenous collections through exploration within country. The unit is located in Indo-Gangetic belt of Uttar Pradesh at Kanpur ($25^0$28' N, 28', Lat.; $79^0$33' 'E' Longt.) with an altitude of 126 meters above sea level. The soil is sandy loam and rainfall ranges from 800-1000 mm. Major precipitation is received from South-West monsoon during the months of June to September.

A total of 2,807 germplasm are being maintained at GMU, Kanpur, Due to shrinkage in land and labour facilities, only 1922 accessions were sown on 27.11.2007 for their maintenance and rejuvenation of seed viability at Crop Research Farm, Nawabganj of CSA University of Agriculture & Technology. The evaluation trial was conducted in augmented block design with four checks *viz;* T-397, Kiran, Neelum and Gaurav replicated in randomized fashion of each block. Two sets of single plant were selected from each accession and harvested separately for maintaining their genetic purity. Besides this, three wild spp *viz; L. grandiflorum, L. angustifolium* and *L. bienne* procurred from Russia under germplasm exchange activities were also rejuvenated. *L. austriacum* seems to be perennial in nature as it could not flower. Diane (EC 607789), a spring type exotic variety procurred from UK through NBPGR during October, 2007 was also evaluated. A set of 150 accessions comprising strains and varieties were also maintained as working germplasm representing wide variablity for important quantitative and qualitative traits as well as host-plant resistance against major biotic and abiotic stresses and their seeds were rejuvenated.

Under generation of breeding materials, 20 single crosses, 04 three way crosses and 03 interspecific crosses invloving wild spp. *Linum angustifolium* (EC 541194) and *Linum bienne* (EC 541196) were attempted with an objective to develop flax type varieties with quality fibre and high yielding multiple resistant seed type varieties. Two F_1^s of interspecific cross were also grown and harvested in bulk after assuring their genetic purity.

Besides this, 190 progeny rows of 24 F_2^S and 119 progeny rows of 19 F_3^S were evaluated and 156 and 103 single plants were selected, respectively for earliness, yield, diseases and pest resistance. Two rows each of 153 F_7^S were grown, evaluated and harvested in bulk. A preliminary varietal trial of 21 entries including three checks (T 397, Padmini and Parvati) was conducted in RBD with three replications. Three entries *i.e.,* PCL 42-1, PCL 40 and PCL 27-2 were found promising based on seed yield data and diseases and pest reactions.

2.1.2 Development of edible purpose variety

Five low linolenic acid lines *i.e.,* TL 11, TL 26, TL 27, TL 37 and TL 43 were grown, studied for their morphological traits and single plants from each line were selected.

Six basic populations (P_1, P_2, F_1, F_2, BC_1 and BC_2) of six selected crosses *viz.,* TL 11 × EC 3183, TL 11 × Acc. No. 2251, TL 27 × EC 3183, TL 27 × Acc. No. 2251, TL 37 × EC 3183 and TL 37 × Acc. No. 2251 were evaluated in RBD with three replications to work out the genetics of fatty acid compositions.

Preliminary screening done through TBA test indicated variation within parent (P_1), F_1^S and BC_1^S of cross TL 11 × EC 3183 for linolenic acid. For remaining crosses, though no variation was observed but we could not find any single plant having low content of linolenic acid. Besides this, $5F_3$ populations were also studied and 40 single plant were selected.

2.1.3 Molecular characterization of linseed varieties through random amplified polymorphic DNA (RAPD)

Molecular characterization was performed with RAPD markers among ten phenotypically distinct varieties *viz;* T 397, Neelum, Shekhar, Garima, Padmini, Parvati, Sharda, Sweta, Shikha and Gaurav recommended for different agro-ecological situations. All the 20 primers were highly reproducible and generated 111 bands with 63.06% polymorphism. The number of amplification product per primer ranged from 2 (SBSB-04) to 9 (SBSB-01) with an average number of 5.55 bands per primer. Two primers (SBSB-06 and SBSB-14) could not generate any polymorphic band whereas, seven primers produced 100 per cent polymorphism. Eleven primers produced genotype specific bands that would be helpful in their identification. Genetic relationship was established based on Jaccard's similarity coefficient which ranged from 0.67 to 0.94. UPGMA cluster analysis generated dendogram with three clusters at 83% similarity coefficient. Cluster I and II comprised of three and six genotypes, respectively whereas, cluster II was having only Neelum. The most distant pairs of linseed varieties were Neelum and Parvati followed by Neelum and Padmini and Neelum and Shekhar. These parents can be utilized in future breeding programme to get promising recombinants. The present study has proved that linseed varieties reported to be similar in morphology are generically different.

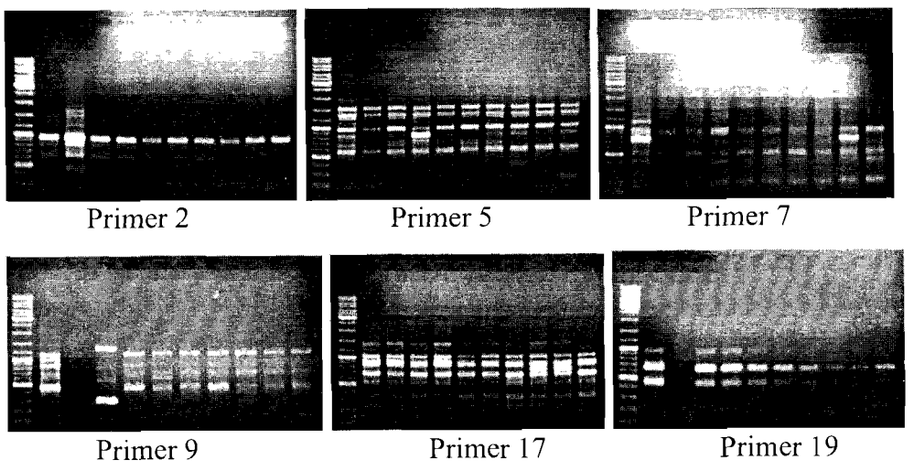


Fig. 1 RAPD variation patterns of the 10 linseed cultivars observed with primers 2, 5, 7, 9, 17 and 19. (Lane 1 = M; Lane 2 = T 397; Lane 3 = Neelum; Lane 4 = Shekhar; Lane 5 = Garima; Lane 6 = Padmini; Lane 7 = Parvati; Lane 8 = Sharda; Lane 9 = Sweta; Lane 10 = Shikha; Lane 11 = Gaurav)

2.1.4 Screening of germplasm against diseases and pest under natural condition

Two hundred germplasm were screened under natural condition against major diseases and pest at their respective hot spots along with resistant and susceptible checks. The identified promising genetic resources for respective diseases and pest have been listed below :

Wilt (03 location) :

Resistant at all locations : EC 397760

Resistant at more than half (2) locations : LCK 9436, RLC 59

Alternaria blight (04 locations) :

Resistant at three locations : KFS11, LCK 9414, RL 56-6-2, RL 903

Powdery mildew (03 locations) :

Resistant at more than two locations : RLC 47, SLS 8, SLS 21, RSJ 7, LCK 9414, KL 43, A 21-2-2, Kiran, NP (RR) 38, *Linum grandiflora*, NP (RR) 76, NP (RR) 465, FRW1, KYS-1, RSJ-2, KFS11, 4/35-1/1-4, 4/47-2/1-2, RSJ3, RSJ5, RSJ 6, Sumerpur local, W/17-1, 4/47, T71, ICAR-3, Kiran, EC 399086

Rust (2 locations)

Disease free (0) or resistant at all locations : LCK 9436, LMH 91-24, NL 24, RL 906, RL 967, RLC 29, RLC 47, EC 397760, BSL 10, 4/35-1/1-4, T 71, ICAR 3, GLC 36, A-21-2-2

Bud fly (02 locations) :

Resistant / moderately resistant : None

2.1.5 Screening of germplasm under rainfed condition

Linseed, a crop of rainfed ecology is mainly cultivated on marginal and sub-marginal lands. Hence, screeining of germplasm under moisture stress situation is mandatory in order to develop variety tolerant for this abiotic stress. A set of 100 germplasm along with three checks *viz;* NL 97, JLS 9 and T 397 were evaluated in augmented block design at seven locations (Kanke, Sagar, Raipur, Jashipur, Nagpur, Raichur and Latur). All the centres reported data on seed yield and other ancillary traits. The results have been discussed and presented in Expt. No. 11.

2.1.6 Screening of germplasm under saline/alkaline condition

One hundred germplasm were screened against soil salinity/alkalinity along with three checks (Hira, Mukta and T 397) in augmented block design at Daleepnagar, Faizabad, Lucknow and Dholi. Compiled results have been discussed and presented in Expt. No. 12. Three genotypes *i.e.* Jaishi-1-3, JRF 4 and NDL 2005-23 were found promising across locations against soil alkalinity.

2.1.7 Documentation

Characterization of 38 exotic germplasm in respect of morpho-agronomic and floral traits like colour, shape and size of flower, petal aestivation and colours of venation, anther, filament and style have been completed for final documentation.

2.1.8 Conservation

At germplasm management unit (GMU) there is no storage facility. Only active collections through seasonal rejuvenation are being maintained here. However, seed of all the germplasm available in GMU have been deposited at national repository facility of NBPGR for long term conservation.

2.1.9 Seed supply

Seeds of following germplasm/genetic stocks / released varieties were supplied to different agencies based on their indent received during *rabi* 2007-08.

Sl. No.	Number of germplasm	Indenter	Purpose
1.	200 (Sl. No. 2101-2300)	AICRP (Linseed) centre	Screening against diseases and pest
2.	100 (Sl. No. 514-618)	- do -	Screening against moisture stress
3.	100 (Sl. No. 1170-1262)	Daleepnagar, Faizabad and Lucknow	Screening against soil alkalinity/salinity.
4.	10	Head, Germplasm Exchange Division NBPGR, New Delhi	Research work
5.	05	Principal RMP (PG) College, Gurukul Narsan, Hardwar	Research work
6.	05	Niti Pathak Research Scholar, Deptt of Botany, Delhi University, New Delhi	Thesis work
7.	05	Devesh Kumar Brahma Nand Degree College Rath, Hamirpur (UP)	Thesis work
8.	50	Ram Veer Singh Research Scholar Deptt. of Biochemistry C.S.A. Univ. of Agric. & Tech., Kanpur	Thesis work
9.	50	Dr. Pawan Kumar Sr. Scientist (Oil seeds) ARI, Patna	Research work
10.	50	Ms. Leena Shakya Research Scholar Jamia Hamdard, New Delhi	Thesis work
11.	09	Head, Deptt. of Plant Pathology GBPUA&T, Pantnagar	Research work
12.	14	Project Incharge AICRP (Linseed) Centre Sagar (MP)	Research work
13.	10	Rajendra Singh Research Scholar Deptt. of Soil Science C.S.A.U.A. & T., Kanpur	Thesis work
14.	01 (Shekhar)	Dr. Arbind Kumar Director, NRCR&M Bharatpur (Rajasthan)	Research Work
15.	01 (Parvati)	Dr. Ashok Kumar Bhopal	
16.	01 (Padmini)	Dr. Munish Gangawar Deptt. of Agro Forestry C.S.A.U.A. & T, Kanpur	Rsearch Work

2.1.10 Maintenance and evaluation of germplasm at AICRP (Linseed) centres

Sl. No.	Centre	No. of accessions	Remarks / Salient features
1.	Palampur	Not Reported	
2.	Kanpur	232	Maintenance
3.	Faizabad	Not Reported	
4.	Patna	Not Reported	
5.	Kanke	190 (158 IC + 32 EC)	Maintenance
6.	Mauranipur	1300	Resistant to powdery mildew-240
			Resistant to bud fly - 16
7.	Sagar	Not Reported	
8.	Hoshangabad	209	Earliness-BAU 286, LCK 94118, TLP1, RLC1, R1903, R1871, RLC81, JLS 67, Indira Alsi 32, PKDL 21
			High oil content - Indira Alsi 32, Kartika, Sharda, PKDL 41
			Seed yield - Kiran, Shekhar, Padmini, Meera, BAU 470, RLC 49, LCK 88061, LCK 8922, Pipariya local, JL 23, KL 168, CL 24111, CL 94113, CL 9404, CW 9289, LCK 8606, RL 44-4-3, PKDL 41, PKDL 43.
			Res. to wilt - RLC 94, RLC 106, PKDL 43, LMS 193-03
			Res. to Alternaria blight - PKDL 41, RL 2206, RL 24106, PKDL 43
			Res. to powdery mildew-PKDL 43, RLC 94, RLC 106
			Tolerant to drought - PKDL 21
9.	Kota	Not Reported	
10.	Nagpur	203 (165 IC + 38 EC)	Maintenance
11.	Raipur	1345	Maintenacne
12.	Jashipur	292	Maintenance
13.	Raichur	Not Reported	

2.2 Activities assigned to AICRP (Linseed) centres during XI plan (2007-2012)

Sl. No.	Name of Scheme / Project / Programe	Target	Assigned centre	Linkage
1.	Genetic enhancement for seed yield, quality traits and resistance against biotic and abiotic stresses.	• Exploration and procurement of germplasm.	P.C. UInit	NBPGR
			P.C. Unit & Kanpur	
		• To identify the germplasm for quality traits *i.e.,* high oil content (>46%), low linolenic acid (<8%) and high linolenic acid (>56%)		
		• To evaluate germplasm and breeding materials against major biotic (AB & BF) and abiotic stresses (drought & salinity) and tailor the plant type suitable for *utera* situation.	P.C. Unit, Raipur, Nagpur, Jashipur, Kanke, Raichur	CSSRI, CRIDA
		• To diversify the wild gene pool and their characterization.	P.C. Unit	NBPGR

Sl. No.	Name of Scheme / Project / Programe	Target	Assigned centre	Linkage
2.	Breeding for high yielding varieties for different cropping and agro-ecological situations.	• To develop new varieties with following yield potential -		
		Rainfed : 1100-1300 kg/ha	Raipur, Nagpur, Jashipur, Raichur, Mauranipur, Sagar & Shillongini	
		Irrigated (Speed type) : 1700-1900 kg/ha	Kanpur, Palampur, Kota, Faizabad, Patna and Kanke	
		Utera (moisture stress) : 500-70 kg/ha	Raipur, Nagpur, Jashipur, Kanke, Patna and Shillongini	
		Utera (Assured moisture) : 700-900 kg/ha	Palampur	
3.	Development of short duration varieties for central and penisular regions.	To develop short duration varieties less than 105 days for central and peninsular regions.	Raipur, Raichur, Jashipur, Mauranipur, Nagpur & Sagar	
4.	Development of resistant varieties against major diseases and linseed bud fly.	• To study the inheritance of major diseases and linseed bud fly.	Rust-Kangra & Kanke Bud fly - Nagpur, Mauranipur	NCL NBRI, AFRC
		• To study the races/biotypes in wilt complex, rust, powdery mildew and Alternaria blight.	Wilt - Kanpur & Raipur AB - P.C. Unit, Faizabad PM-Raipur, Nagpur & Mauranipur	NCL NBRI
		• To extend the crossing programme to cross-incompatible species using biotechnological technique (embryo rescue, etc.)	P.C. Unit	
5.	Development of integrated pest management modules for diseases and insect-pest.	Confirmation of available modules for the management of Alternaria blight and bud fly.	P.C. Unit, Raipur, Nagpur, Faizabad, Kanpur, Kanke	PDBC, NCIPM
6.	Development of integrated crop management modules for realizing potential yield and reducing cost of cultivation in different cropping systems.	• To refine INM modules involving chemicals and organic fertilizer under irrigated situations.	P.C. Unit, Kanpur, Faizabad, Kanke, Hoshangabad, Sagar, Raipur, Shilongini, Palampur & Patna	PDCSR, CRIDA
		• INM on a systems approach for economizing fertilizer use, increasing nutrient use efficiency and for achieving sustainable production of linseed.	-do-	-do-

Sl. No.	Name of Scheme / Project / Programe	Target	Assigned centre	Linkage
7.	Development of flax purpose linseed varieties.	• To develop flax varieties with quality fibre. • To estimate the fibre quality of developed DP & Flax purpose varieties. • To refine fibre quality parameters as per the norms fixed by Textile Industries. • To popularize the fibre scutching machine. • Interface between research institutes and textile industries.	Kanpur, Kota, Palampur, Patna -do- -do- -do- P.C. Unit	NIRJAFT, CRIJAF, JST & CIRCOT State Dep. of Agric, DOD NIRJAFT, CRIJAF, JST & CIRCOT
8.	Development of edible purpose linseed varieties.	• To modify the fatty acid compositions through chemical mutagenesis and biotechnological tools. • To explore the possibility of genetic transformation using the genes from secondary and tertiary gene pool.	P.C. Unit	NBPGR, CFTRI, NCL, BARC, CDC, Canada & CSIR, Australia
9.	Standardization of retting processes to ascertain the fibre quality parameters.	To standardize the microbial and dew retting techniques for ascertaining fibre quality parameters.	Palampur	NIRJAFT, CRIJAF
10.	Development of suitable alternative technology for *utera* cultivation.	• To refine the existing production technology. • To popularize the *zero-till-ferti-seed-drill* sowing method to ensure plant population.	Raipur, Nagpur, Kanke, Faizabad, Patna, Palampur and Shillongini --do--	CIAE, PDCSR --do--
11.	Refinement and promotion of intercropping linseed with autumn planted sugarcane.	To expand linseed cultivation in newer areas i.e., widely spaced crop.	P.C. Unit, Patna	IISR, KIAAR, PRDF
12.	Value addition and product diversification for medicinal, industrial and textile purpose.	• Exploration of Omega-6 and Omega-3 fatty acids at commercial level. • Industrial use of linseed oil by increasing linolenic acid besides, its medicinal values for human health. • Exploitation of flax fibre at industrial and textile levels for quality papers and cloths and other domestic items.	P.C. Unit, Nagpur -do- Kanpur, Kota & Palampur	CFTRI, IRSHA, BIAF, IRIL, JST, RISHRA, CIPHET Canada, Australia
13.	Impact of agronomic inputs on oil content and its quality.	To access the nutritional and environmental impact on oil & oil quality parameters.	P.C. Unit and all AICRP Centres	

The breeding work undertaken under hybridization (Table 2.2.1), generation advancement (Table 2.2.2) and evaluation of segregating generations (Table 2.2.3) have been presented here in tabular form as per mandates assigned to the centres.

Table 2.2.1 Generation of breeding materials

Centre	Crosses made	Major objectives	Donors/Varieties used
Palampur	21		Him Alsi - 1, Binwa, Turkey, TL-11, TL 26, TL 43, Janki, KL 43, KL 243, Gaurav, Nagarkot, Surbhi, Him Alsi-2
	10 TWC		- do -
Kanpur	17	Resistance against Alternaria blight in both seed and dual purpose linseed	H23, H25, JRF4, Sheela, Parvati, Garima, Shubhra, Shikha, Shekhar
Faizaba	03	Seed yield, oil content, diseases and pest resistance	Padmini, T 397, NDL 2004-05, PKDL 62
Patna	Not Reported		
Kanke	11	Earliness, seed yield, diseases and pest resistance	Padmini, PKDL 41, LMS 153-03, SLS 66, R552, RLC 100, Shekhar, Sweta
Mauranipur	05	Earliness, seed yield, oil content, fibre yield and resistance against bud fly	SLS 66, RLC 106, JLS9, LMS 153-03, LMS 95-4, KL1, Neela
Sagar	14	Earliness, seed yield, oil content and resistance against bud fly	RLC 48, Laxmi 27, Padmini, Mukta, SPS 23-10, Neela, R2, Shubhra, Bengal 64, SLS 61, SLS 66, JLS 9, Suyog.
Hoshangabad	40	Earliness, fibre quality, bold seed size, diseases and pest resistance	Kiran, RLC 32, Omega 1, Padmini, RLC 1, Ayogi, RLC 76, Sweta, KL 168, Laxmi 27, Moore, JLS 9, ES 554, Shubhra
Kota	20		
Nagpur	100		
Raipur	40	Earliness, seed yield with multiple resistance against diseases and pest	
Jashipur	28	Earliness, seed yield, resistance against wilt and Alternaria blight	OL1-3, OL4-1, OL2-3, OL2-4, OL3-2, OL22-1, *OL18-4, OLC10*, Padmini, Kiran, Sharda
Raichur	Not Reported		
PC Unit	20	Flax type with quality fibre	Polf 19, JRF 4, EC 322680, H36, Punjab flax
	04 TWC	Earliness, yield with multiple resistance	EC 541194 (*L. angustifolium*), EC 541196 (*L. bienne*), EC 1465, Parvati
	03 IC	-do-	EC 541194, EC 541196, EC 607789, EC 1465

NB : TWC-Three way cross, IC-Interspecific cross.

Table 2.2.2 Advancement of F_1 generation at AICRP centre

Centre	No. of F_1S	Major objectives	Donors/Varieties used
Palampur	23	Not Reported	
Kanpur	08	Resistance against Alternaria blight	H 11, H 17, H 18, Polf 23, Polf 29, Polf 34, JRF 3, JRF 4, Sheela, Rashmi
Faizabad	04	Seed yield, oil content, resistance against wilt and Alternaria blight	Polf 19, Padmini. T397. J23. PKDL 62, NDL 2004-05
	40	Genetic studies	
Patna	Not Reported		
Kanke	Not Reported		
Mauranipur	05	Earliness, yield, diseases and pest resistance	CI 1843, LMS 33-2K, LMS 621, EC 4117, LMS 109-2K, Neelum, Padmini
Sagar	Not Reported		
Hoshangabad	35 05 BCF_1	Earliness, fibre quality, bold seed size, diseases and pest resistance	Meera, Omega 1, JLS 9, RLC 76, Surbhi, Kiran, Laxmi 27, Padmini, Parvati, Shekhar, R 552, Neelum, TLP 1, RLC 1, PKDL 21, Garima, R 1871
Kota	40	Not Reported	
Nagpur	34	Not Reported	
Raipur	68	Earliness, seed yield with multiple resistance against diseases and pest	
Jashipur	Not Reported		
Raichur	Not Reported		
PC Unit	02	Multiple resistance	*L. angustifolium* (EC 541194), *L. bienne* (EC 541196), Parvati

Table 2.2.3 Generation advancement and handling of segregating generations at AICRP centres

Centre	Gen.	Crosses/Progeny rows studied	No. of selections		Major objectives
			SPS	Row Bulk	
Palampur	F_2	45	-	-	
	F_4	-/479	-	-	
	F_5	-/56	-	-	-
Kanpur	F_3	17/225	220	-	AB resistance in seed and DP varieties
	F_4	10/176	190	-	Seed yield and AB resistance
	F_5	18/383	425	37	Seed yield, AB and bud fly resistance
	F_6	5/68	61	-	Seed yield and disease resistance in both seed and DP varieties
Faizabad	BC_1F_6	04	25	20	Seed yield, oil content, resistance against wilt and Alternaria blight
	BC_2F_6	02	40	-	-do-
	F_6	15	20	-	-do-

Centre	Gen.	Crosses/Progeny rows studied	No. of selections		Major objectives
			SPS	Row Bulk	
Kanke	F_2	29	145	-	-
	F_3	09	50	-	-
	F_4	14	80	-	-
	F_7	04	20	-	-
	F_8	08	-	-	-
Mauranipur	F_2	05	309	-	Earliness, seed and oil yield with multiple resistance
	F_3	03	116	-	-do-
	F_4	05	122	-	-do-
	F_5	07	-	-	-do-
	F_6	09	50	32	-do-
Sagar	F_2	07	195	08	Earliness, yield, resistance against Alternaria blight and bud fly
	F_4	14	200	38	-do-
	F_5	13	80	29	-do-
	F_6	07	-	34	-do-
Hoshangabad	F_2	15	198	-	Earliness, seed and fibre yield, bold seed size, diseases and pest resistance
	F_3	12	144	-	-do-
	F_4	19	240	-	-do-
	F_5	06	80	-	-do-
	F_6	13	-	13	-do-
	F_7	12	-	17	-do-
	F_8	01	-	02	-do-
	F_9	05	-	06	-do-
Kota	F_2		26	-	-
	F_3		32	-	-
	F_4		35	-	-
	F_5		20	-	-
	F_6		40	-	-
Nagpur	F_2	04	40	-	-
	F_3	17	294	-	-
	F_4	20	250	-	-
	F_5	21	55	-	-
	F_6	29	340	-	-
	F_7	42	454	-	-

Centre	Gen.	Crosses/Progeny rows studied	No. of selections		Major objectives
			SPS	Row Bulk	
Raipur	F_2	56	-	-	Earliness, seed yield with multiple resistance
	F_3	30	-	-	-do-
	F_4	63	-	-	-do-
	F_5	77	-	-	-do-
	F_6	25	-	-	-do-
	F_7	10	-	-	-do-
Jashipur	F_5	06	60	-	Earliness, seed yield, resistance against wilt, AB and bud fly
	F_7	03	30	-	-do-
Raichur	Not Reported				
PC Unit	F_2	24/190	156	-	Low linolenic acid content
	F_3	19/119	103	-	Earliness, yield and resistant to bud fly and AB
	F_7	153/306	-	153	-do-

NB : DP-Dual purpose, AB-Alternaria blight

2.3 Advancement of generation in off-season nursery

Thirteen F1s were advanced during off season nursery at Regional Research Station, Kukumseri (Lahul & Spiti), Himachal Pradesh.

Twenty four F1s along with nineteen second generation breeding materials were successfully grown for generation advancement during summer 2007 at IARI Regional Station, Wellington (TN) and desirable plant progenies were selected.

2.4 Station trials / Advance breeding lines

During *rabi* 2007-08, twenty four station trials consisting 352 strains excluding checks were conducted in RBD with three replications at twelve AICRP (Linseed) centres including PC Unit. The identified promising strains along with their potential yield are hereby, tabulated as follows :

Centre	Stage of testing	No. of strains	Promising strains	Potential yield (kg/ha)
Palampur	Station trial-I (Flax)	18	70102, 70111, 70119 70113, 70107, 70119	813-889 SY 495-597 FY
	Station trial-II	39	Himalini (C), KL 219, KL 241, KL 245	816-1049
Kanpur	Preliminary varietal trial-I	15	LCK 8007, LCK 8008 LCK 8012, Sweta (C)	1173-1767
	Preliminary varietal trial-II	*15*	*LCK 8029, LCK 8023* LCK 8022, Sheela (C)	*1216-1566*

Centre	Stage of testing	No. of strains	Promising strains	Potential yield (kg/ha)
Faizabad	Station trial (R)	12	NDL 2006-2, NDL 2006-8, NDL 2005-25, Shekhar (C)	800-1360
	Station trial (I)		NDL 2006-10, T397 (C)	1650-1800
Kanke	Station varietal trial (I)	08	BAU-08-07, BAU 05-07, BAU-04-07, Shekhar (C)	1250-1734
Mauranipur	Preliminary varietal trial (R)	08	LMS 2007-04, LMS P-4 LMS 2007-03, Padmini (C)	773-960
	Preliminary varietal trial (I)	13	LMS 6-12A, LMS P-1, LMS 7-7, T 397 (C)	1273-1633
Sagar	Station varietal trial (R)	08	0123, 0221, 0210	833-1050
	Station varietal trial (I)	12	0115, 0017, 0106-1	1229-1281
Hoshangabad	Station varietal trial (I)	08	0708, 0703, 0707, Local check	1750-2083
Kota	Rajasthan state trial (I)	22	RL 27010, RL 27005 RL 27011, Meera (C)	1780-2274
	Rajasthan state trial (DP)	22	RL 27107, RL 26000 RL 26006, RLU 6 (C)	2000-2281
Nagpur	Preliminary varietal trial (R)	25	Padmini (C), NL 283, NL 266, NL 273	1070-1123
	Multilocation varietal trial (R)	13	NL 260, NL 264 NL 261, Kiran (C)	686-904
Raipur	Preliminary varietal trial (R)	22	T 397 (C), R 4132, R4139	1044-1711
	Preliminary varietal trial (I)	22	R 4140, R 4135, R 4137 R 552 (C)	1200-1689
	State varietal trial (R)	08	T 397 (C), R 4120, R 4116, R 2126	644-1081
	State varietal trial (I)	08	T 397 (C), R 2126, R 4116	859-1089
	State varietal trial (U)	08	R 4122, R 4123, Padmini (C)	90-138
Jashipur	Preliminary yield trial-I	06	$V_1K_1$99-44, V_1K_2 99-48, V_1K_2 99-90, Padmini (C)	585-756
	Preliminary yield trial-II	09	OL98-7-3, OL98-15-2, OL 98-7-4, Sharda (C)	1227-1653
PC Unit	Preliminary varietal trial (I)	19	PCL 42-1, PCL 40, Parvati (C), PCL 27-2	1375-2203
Total	24	352	55	

NB : R - Rainfed, I-Irrigated, U-Utera, C-Check, SY-Seed yield, FY-Fibre yield.

2.5 Coordinated experiments on varietal evaluation

Following multi-location trials comprising seed as well as double purpose group of linseed were conducted during *rabi* 2007-08. As per the technical programme approved in the Annual Group Meeting held at Maharana Pratap University of Agriculture & Technology, Udaipur (Rajasthan) on August 23-25, 2005, the trial-wise test entries, their assigned locations and conductance are given as follows :

Trial	Number of test entries and zones	Number of locations			Vitiated	Remark
		Assigned	Conducted	Not conducted		
A. Seed type						
1. Initial varietial trial						
(i) Rainfed	10 (All zones)	31	30	1 (Larnoo)	2	Kanpur, Rewa
(ii) Irrigated	13 (All zones)	25	25	-	-	-
(iii) Utera	06 (All Zones)	13	13		2	Kanke, Madhubani
2. Advanced varietal trial						
(i) Rainfed	01 (Zone-III)	6	6		1	Rewa
	02 (Zone-IV)	10	10		-	
(ii) Irrigated	04 (Zone-III)	7	7		-	
	05 (Zone-IV)	4	4		-	
(iii) Utera	02 (Zone-I Assured moisture)	3	3		-	
B. Double Purpose Type						
3. Initial varietal trial	07 (Zones-I, II & III)	14	14	-	-	
4. Advanced varietal trial	02 (Zone-I)	5	4	1 (Larnoo)	-	
	03 (Zone-II)	6	6	-		
C. Special Trial						
5. Extra early maturing trial	08 (Zone-III)	3	3	-		
	07 (Zone-IV)	6	6	-		
6. Screening nursery trial under saline/alkaline soils	16 (Zone-II)	3	3	-		
7. Screening of germplasm under rainfed situtions	100 (Zones-II, III & IV)	7	7	-		
8. Screenign of germplasm under saline/ alkaline condition	100 (Zone-II)	4	4	-		
Total	**286**	**147**	**145**	**2**	**5**	**98.64% Conductance**

Zone-wise distribution of states representing their testing locations

Zone	States included
I	Jammu & Kashmir, Himachal Pradesh, Punjab and Uttarakhand
II	U.P. (excluding Bundelkhand), Bihar, West Bengal, Assam and Jharkhand
III	Bundelkhand of U.P., Madhya Pradesh and Rajasthan
IV	Maharashtra, Karnataka, Chhatishgarh and Orissa

During rabi 2007-08, location/situation-wise proposed trials along with their date of sowing have been presented in Table 2.5.1. Perusal of the table clearly revealed in general that sowing of the trials were delayed by a week at most of the locations except few across zones. At some of the locations like Berhampore, Patna and Dholi, sowing of experiments was done in the month of December which is indeed very late.

All the centres have conducted their assigned experiments except Larnoo. In this way, conductance of trials have been far more satisfactory (98.64 per cent). All the voluntary centres have conducted their assigned experiments in all the zones and reported the data except Khudwani.

In order to improve as well as to sustain the quality of experimentation following standards have been fixed for the consideration of trials. If the results of a trial deviates from those standards, then it is not considered for the calculations of means or promotion of entries. During the period under report, out of 147 experiments, 02 were not conducted whereas, 05 trials were vitiated one each at Kanpur, Kanke and Madhubani and two at Rewa.

Standards for data consideration

For improving the experimental quality, following statistical standards have been decided for the acceptance of the results :

Category	Situation	Minimum GM yield (kg/ha)	Maximum CV%
(A) Seed purpose	Rainfed	300	25
	Irrigated	600	15
	Utera	200	-
(B) Double purpose	Seed	500	15
	Fibre	400	-

Accordingly, seed yield data of five and seven trials were not considered for the calculation of zonal mean due to low GM and high CV, respectively. Fibre yield of both IVT and AVT from Palampur and Ludhiana was also rejected because of low GM.

Table 2.5.1 Sowing dates of coordinated varietal and special trials conducted at different AICRP/ voluntary centres during 2007-08

Centre	Initial Varietal Trial				Advanced Varietal Trial				Special Trial			
	R	I	U	DP	R	I	U	DP	SGR	SLNSA	EEMT	SGNA
Zone-I												
Ludhiana		Nov. 10		Nov. 10				Nov. 10				
Palampur	*Oct. 12*	*Oct. 17*	*Oct. 23*	*Oct. 16*			*Oct. 23*	*Oct. 16*				
Kangra			Nov. 20				Nov. 20					
Malan			Nov. 19				Nov. 19					
Khudwani	-							-				
Kaul	Nov. 13	Nov. 13		Nov. 13				Nov. 13				
Lurnoo								-				
Zone-II												
Kanke	Nov. 24	Nov. 11		Nov. 15				Nov. 13	Nov. 13			
Kanpur	Nov. 18	Nov. 18		Nov. 18				Nov. 18				
Faizabad	Nov. 29	Oct. 30		Nov. 29				Nov. 28		Oct. 30		Oct. 29
Masodha		Nov. 28										
Shillongini	Nov. 23											
Berhampore	Dec. 03	Dec. 03		Dec. 03				Dec. 03				
Madhubani												
Varanasi	Nov. 06	Nov. 20										
Mainpuri		Nov. 12		Nov. 12								
Sabour	Nov. 07											
Patna	Dec. 14	Nov. 27	Nov. 15	Dec. 04				[illegible]				
Dholi		Dec. 05		Dec. 05				Dec. 05				
Jhunjharpur			Nov. 05									
Daleepnagar										Dec. 12		Dec. 12
Lucknow										Nov. 13		
Gossaigoon												
Nagina			Nov. 05									
Jharnapani	Oct. 10	Oct. 15										
Gorakhpur							Oct. 26					
Ujhani		Oct. 30		Nov. 02								
Zone-III												
Kota	Oct. 14	Nov. 20		Nov. 20	Oct. 14	Nov. 20						
Mauranipur	Nov. 07	Nov. 07		Nov. 14	Nov. 07	Nov. 12					Nov. 07	
Sagar	Nov. 04	Nov. 03		-	Nov. 04	Nov. 03			Nov. 04		Nov. 04	
Hoshangabad		Nov. 26		Nov. 26		Nov. 27					Nov. 23	
Waraseoni			Oct. 29									

Centre	Initial Varietal Trial				Advanced Varietal Trial				Special Trial			
	R	I	U	DP	R	I	U	DP	SGR	SLNSA	EEMT	SGNA
Tikamgarh		Nov. 17			Nov. 16	Nov. 16						
Rewa	Oct. 14				Oct. 15							
Jabalpur		Nov. 17				Nov. 17						
Durgapura	Oct. 31				Oct. 30							
Udaipur		Nov. 18				Nov. 18						
Zone-IV												
Raipur	Nov. 02	Nov. 23	Oct. 18		Nov. 08	Nov. 23			Nov. 03		Nov. 02	
Raichur	Oct. 23	Oct. 23			Oct. 24	Oct. 24					Oct. 26	
Nagpur	Nov. 07	Nov. 08	Nov. 06		Nov. 08	Nov. 12					Nov. 06	
Jashipur	Nov. 20		Dec. 12		Nov. 20	Nov. 28			Nov. 21		Nov. 20	
Solapur	Oct. 10				Oct. 10							
Bilaspur	Nov. 21				Nov. 21						Nov. 21	
Badnapur	Oct. 23				Oct. 24							
Latur	Nov. 10				Nov. 09				Nov. 08			
Jagdalpur	Nov. 29				Nov. 29						Nov. 29	
Somnathpur												
Bijapur	Oct. 22	Oct. 22										

2.5.1 Initial Varietal Trial (Rainfed)

This trial comprising thirteen entries including checks were constituted for its execution in all the four agroclimatic zones. Three zonal checks were Sheela (Zone I), Shekhar (Zone II) and R 552 (Zone III & IV). T397 and Padmini were incorporated as national and additional check, respectively across zones. The trial was conducted in RBD with three replications at all the thirty one locations following recommended package of practices. In order to maintain transparency in experimentation, all the entries were coded as given below along with their pedigree and sponsoring centres :

S.No.	Entry	Code	Pedigree	Source
1.	PCL-1-06	070101	Nagarkot × Neela × Nagarkot	P.C. Unit, Kanpur
2.	LCK-7034	070102	T-397 × ES-44	Kanpur
3.	NL-260	070103	R-552 × RLC-6	Nagpur
4.	PKDL-74	070104	ES-554 × RLC-32	Hoshangabad
5.	NDL-2005-34	070105	LM-46-3 × T-397	Faizabad
6.	LMS-P-3	070106	CI-1890 × LMS-3-97	Mauranipur
7.	BAU-06-8	070107	Pusa-3 × Jeevan	Kanke
8.	SLS-71	070108	LMH-62 × EC-1411	Sagar
9.	KL-219	070109	L-1321 × Flake 1	Palampur
10.	Padmini (AC)	070110	(EC-14628 × EC-77959) × (DPL-20 × Neelum)	Mauranipur
11.	RLC-117	070111	LCK-88062 × T-397	Raipur
12.	Sheela (ZC-I)/	070112	Gaurav × Janki	Kanpur
	Shekhar (ZC-II)/	070112	Laxmi-27 × EC-138′	Kanpur
	R-552 (ZC-III & IV)	070112	No. 55 × R 67	Raipur
13.	T-397 (NC)	070113	T-491 × T-1193-2	P.C. Unit, Kanpur

The distribution of allocated locations was four in Zone I, five in Zone III and eleven each in Zones II & IV. All the designated centres conducted the trial except Larnoo and reported the data except Khudwani from Zone I ; Kanpur from Zone II and Rewa from Zone III. Data on seed yield and its related traits have been presented in Table 2.5.1.1 to 2.5.1.9. Kaul recorded highest general mean (1839 kg/ha) for seed yield. Varietal differences in respect to seed yield were found highly significant. Seed yield of Somnathpur was not entertained for the calculation of zonal mean due to high CV. The results obtained on various aspects have been elucidated as follows :

Zone I

Per se performance of entries revealed that NDL 2005-34 was the highest yielder (1332 kg/ha) followed by BAU-06-8 (1249 kg/ha), SLS 71 (1229 kg/ha) and KL 219 (1228 kg/ha). T397 was the best check with mean seed yield of 1204 kg/ha. In oil yield, three entries SLS 71, BAU-06-8 and LMS-P-3 yielded more than the best check Padmini (466 kg/ha). Non-significant differences among the entries was noticed for plant stand at Kaul only. Usually maturity duration is enhanced in this zone and varies from 173 to 179 days. Based on mean test weight value, five test entries *viz;* LCK 7034, NL 260, LMSP-3, BAU-06-8 and SLS71 were categorised as bold seeded genotypes.

Zone II

Perusal of results presented in Table 2.5.1.1 revealed that none of the test entry could perform better than the best check T397 in terms of seed yield (1257 kg/ha) as well as oil yield (469 kg/ha). Extremely poor plant populations were maintained at Sabour. In principle, differences among genotypes for plant stand should be non-significant. In this trial, significant differences were observed at almost all the reporting centres except Shillongini. A wide variations in respect of flowering (17 days) and maturity durations (19 days) were observed in this zone. Additional check Padmini was found earliest in maturity. Average number of seeds per capsule was ten in NDL 2005-34. None of the test entry may be placed under bold seeded category.

Zone III

Based on zonal mean yield data, it may be inferred that two test entries NL 260 and NDL 2005-34 could establish marginal superiority over best check T397 (1201 kg/ha) whereas, performance of PKDL 74 and RLC 117 was at par to T397. In case of oil yield, none of the test entry could establish more than 10 per cent superiority over best check Padmini (452 kg/ha). Sagar reported high plant populations in comparision to Kota and Mauranipur. Almost all the entries were of medium maturity duration with least variation. Data on ancilliary characters like number of capsules per plant, number of seeds per capsule and 1000-seed weight were in support of seed yield.

Zone IV

Mean seed yield data recorded in this zone reflected the superiority of test entries RLC 117 and NL 260 over best check Padmini (833 kg/ha). In oil yield, performance of test entry RLC 117 and best check Padmini was at par. Non-significant differences among entries for plant stand was observed at Raipur and Raichur centres. Test entry PKDL 74 was earliest (103 days) in maturity. Mean test weight data revealed that none of the test entry was bold seeded in size.

Incidence of rust recorded at Palampur, Kanke and Jharnapani revealed that KL 219 was the only test entry showing moderately resistant reaction at two locations. RL 117 and NDL 2005-34 were scored as resistant to Alternaria blight whereas, NL 260 and BAU-06-8 were found resistant to powdery mildew. Wilt incidence recorded at Palampur, Kanke and Jashipur centres showed resistant nature of KL 219, RLC 117 and Padmini across locations. Bud fly infestation recorded at five locations exhibited resistant nature of RLC 117 whereas, NDL 2005-34 was found moderately resistant to this key pest.

Comparative performance of promising entries

Zone I	Zone II	Zone III	Zone IV
		Seed yield (kg/ha)	
NDL 2005-34 (1332)*	None	NL 260 (1265)	RLC 117 (955)*
BAU-06-8 (1249)	**T 397 (1257) NC**	NDL 2005-34 (1224)	NL 260 (919)*
SLS 71 (1229)		RLC 117 (1203)	**Padmini (833) AC**
KL 219 (1228)		PKDL 74 (1202)	
LCK 7034 (1214)		**T 397 (1201) NC**	
T 397 (1204) NC			
		Oil yield (kg/ha)	
SLS 71 (486)	None		RLC 117 (352)
BAU-06-8 (482)	**T 397 (469) NC**	NL 260 (461)	**Padmini (342) AC**
LMS-P-3 (478)		SLS 71 (458)	
Padmini (466) AC		PKDL-74 (456)	
		NDL 2005-34 (455)	
		Padmini (452) AC	

* Entries exceeding the best check by 10 per cent or more. Values in parentheses indicate seed or oil yield

Table 2.5.1.1 Initial Varietal Trial (Rainfed) : Seed yield (kg/ha)

Sl. No.	Entry	Z-I		Zonal Mean	Z-II							Zonal Mean
		Palampur	Kaul		Kanke	Faizabad	Shillongini	Berhampore	Varanasi	Sabour	Patna	Jharnapani	
1.	PCL-1-06	483	1813	1148	683	1193	1064	728	1611	1444	842	1116	1085
2.	LCK-7034	489	1938	1214	889	550	1120	606	1389	1361	729	789	929
3.	NL-260	384	1479	932	667	600	1065	517	1389	1000	1303	873	927
4.	PKDL-74	508	1688	1098	739	222	1056	589	1333	1139	497	922	812
5.	NDL-2005-34	413	2250	1332	817	833	1287	828	1611	1361	831	1282	1106
6.	LMS-P-3	527	1854	1191	778	417	1167	772	1278	1333	949	833	941
7.	BAU-06-8	559	1938	1249	678	433	1398	394	1833	861	794	767	895
8.	SLS-71	470	1988	1229	917	583	1130	711	1444	1083	1258	778	988
9.	KL-219	851	1604	1228	711	472	1278	606	1444	1083	631	851	885
10.	RLC-117	394	1895	1145	878	667	879	606	1833	1361	1219	773	1027
11.	Padmini (AC)	451	1792	1122	806	472	1176	733	1500	833	1228	1000	969
12.	Sheela (ZC-I)/	565	1688	1127	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II)/	-	-	-	722	443	1621	378	1722	1222	947	1000	1007
	R-552 (ZC-III & IV)	-	-	-	-	-	-	-	-	-	-	-	-
13.	T-397 (NC)	429	1979	1204	761	1300	1037	1250	1778	1667	1175	1089	1257
	Local							911					
	G.M.	502	1839		773	630	1175	688	1551	1212	954	929	
	SE (m) ±	21.51	58.10		35.76	37.37	88.84	52.34	84.75	126.14	108.39	95.94	
	CD	85.09**	229.82**		141.45**	147.80**	351.42**	205.69**	335.22**	498.96**	428.76**	280.04*	
	CV%	7.43	5.47		8.02	10.28	13.09	13.18	9.46	18.03	19.68	17.89	

Table 2.5.1.1 Contd.....

Sl. No.	Entry	Z-III				Zonal Mean	Z-IV											Zonal Mean
		Kota	Sagar	Maurani pur	Durga pura		Nagpur	Jashipur	Raipur	Raichur	Solapur	Bilaspur	Jagdal pur	Badna pur	Latur	Somnath pur*	Bijapur	
1.	PCL-1-06	1288	1347	656	1406	1174	540	-	598	249	501	633	904	647	658	-	547	586
2.	LCK-7034	1280	1333	606	1261	1120	675	258	528	731	781	800	958	692	1474	156	678	758
3.	NL-260	1391	1694	706	1267	1265	1463	-	708	705	781	750	568	732	1681	367	886	919
4.	PKDL-74	1214	1333	850	1411	1202	665	408	592	576	721	800	706	735	1641	503	1242	809
5.	NDL-2005-34	1288	1222	822	1564	1224	823	900	525	406	606	633	852	513	922	219	850	703
6.	LMS-P-3	1329	917	417	1078	935	550	661	612	492	742	733	746	650	1478	308	1081	775
7.	BAU-06-8	1251	1056	183	1142	908	394	1069	522	140	476	767	1054	351	678	-	278	573
8.	SLS-71	1391	1417	722	1089	1155	876	564	747	439	622	910	578	832	1404	403	825	780
9.	KL-219	1021	1417	567	1506	1128	553	975	523	259	384	717	765	348	944	161	492	596
10.	RLC-117	1008	1361	972	1472	1203	1266	789	723	404	790	810	1131	874	1716	361	1050	955
11.	Padmini (AC)	1107	1278	900	867	1038	1159	1256	736	334	615	757	854	741	1164	461	714	833
12.	Sheela (ZC-I)/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II)/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	R-552 (ZC-III & IV)	984	1333	811	817	986	1141	511	623	469	784	733	444	837	1405	328	944	789
13.	T-397 (NC)	1193	1444	894	1272	1201	958	944	827	408	656	650	709	782	1156	303	881	797
	Local				1450		437	-	-	582	649	-	-	-	-			
	G.M.	1211	1319	700	1257		821	758	636	442	651	746	790	672	1255	324	805	
	SE (m) ±	87.38	72.93	38.42	78.0		51.01	54.80	58.24	25.84	48.59	41.77	32.82	37.78	76.63	83.55	59.23	
	CD	255.06*	288.50**	151.95**	306.55**		200.49**	220.48**	230.38**	101.56**	190.95**	165.21**	129.81**	149.44**	303.10**	NS	234.28**	
	CV%	12.50	9.57	9.50	10.75		10.76	12.52	15.87	10.12	12.93	9.70	7.20	9.74	10.57	44.60	12.74	

* Seed yield data was not considered due to high CV

Table 2.5.1.2 Initial Varietal Trial (Rainfed) : Plant stand (000/ha)

Sl. No.	Entry	Z-I		Zonal Mean	Z-II							Zonal Mean
		Palampur	Kaul		Kanke	Faizabad	Shillongini	Berhampore	Varanasi	Sabour	Patna	Jharnapani	
1.	PCL-1-06	1003	987	995	1397	1000	561	617	1124	376	1434	423	867
2.	LCK-7034	1114	1000	1057	1210	1272	595	683	1022	211	1333	363	836
3.	NL-260	1255	920	1088	1130	1580	574	672	1080	236	1340	373	873
4.	PKDL-74	2203	960	1582	1307	1272	507	656	1151	212	1110	370	355
5.	NDL-2005-34	1340	907	1124	1393	1662	569	644	1156	357	1101	590	934
6.	LMS-P-3	1621	1027	1324	1500	1099	628	600	1280	261	1081	440	861
7.	BAU-06-8	989	880	935	1103	1258	667	633	1160	150	1102	487	820
8.	SLS-71	1217	947	1082	1423	1074	622	667	1129	147	1183	510	844
9.	KL-219	1394	987	1191	1157	1379	633	669	1258	242	1089	627	882
10.	RLC-117	1389	893	1141	1517	1019	511	617	1258	210	1386	337	707
11.	Padmini (AC)	1105	880	993	1090	1182	589	661	1245	178	1101	507	819
12.	Sheela (ZC-I)/	1145	867	1006	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II)/	-	-	-	1220	786	678	672	1009	164	1153	453	767
	R-552 (ZC-III & IV)	-	-	-	-	-	-	-	-	-	-	-	-
13.	T-397 (NC)	1207	948	1078	1380	1439	575	661	1209	206	1353	483	913
	Local							639					
	G.M.	1306	939		1294	1232	593	649	1160	227	1213	459	
	SE (m) ±	38.39	46.85		43.11	22.97	39.74	16.11	50.98	26.22	73.58	18.07	
	CD	153.04**	NS		170.52**	90.84**	NS	46.84*	148.8*	103.71**	291.04**	71.46**	
	CV%	5.13	8.64		5.77	3.23	11.61	4.3	7.61	20.02	10.51	6.82	

Sl. No.	Entry	Z-III			Zonal Mean	Z-IV						Zonal Mean
		Kota	Sagar	Maurani pur		Nagpur	Jashipur	Raipur	Raichur	Jagdalpur	Bijapur	
1.	PCL-1-06	325	1518	569	804	782	-	633	791	919	679	760
2.	LCK-7034	370	1129	559	686	830	483	559	731	756	834	699
3.	NL-260	426	875	578	626	1040	-	607	764	736	843	798
4.	PKDL-74	401	1149	577	709	787	657	554	748	923	783	742
5.	NDL-2005-34	387	1110	577	691	893	743	478	715	746	1028	767
6.	LMS-P-3	420	958	314	564	730	620	633	776	904	681	724
7.	BAU-06-8	387	957	303	549	713	827	562	768	874	1161	818
8.	SLS-71	451	952	589	664	890	610	695	768	869	1025	810
9.	KL-219	436	917	581	645	730	793	572	783	909	978	794
10.	RLC-117	453	991	584	676	1097	583	669	806	573	699	738
11.	Padmini (AC)	370	844	574	596	984	830	669	765	844	716	801
12.	Sheela (ZC-I)/	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II)/	-	-	-	-	-	-	-	-	-	-	-
	R-552 (ZC-III & IV)	428	985	578	664	920	617	652	748	756	1036	788
13.	T-397 (NC)	370	1252	582	735	817	707	510	776	968	1029	801
	Local					827	-	-	802	-	-	
	G.M.	402	1049	536		860	679	600	767	829	884	
	SE (m) ±	35.72	57.23	8.38		61.66	51.03	71.55	21.9	23.86	11.15	
	CD	NS	226.38**	33.13**		242.32**	205.31**	NS	NS	94.38**	44.12**	
	CV%	15.4	9.45	2.71		12.42	13.02	20.67	4.94	4.99	2.19	

Table 2.5.1.3 Initial Varietal Trial (Rainfed) : Days to flowering

Sl. No.	Entry	Z-I		Zonal Mean	Z-II							Zonal Mean
		Palampur	Kaul		Kanke	Faizabad	Berhampore	Varanasi	Sabour	Patna	Jharnapani	
1.	PCL-1-06	154	102	128	88	90	66	94	89	82	92	86
2.	LCK-7034	145	101	123	79	83	64	72	73	78	96	78
3.	NL-260	143	93	118	69	74	70	67	68	72	86	72
4.	PKDL-74	152	100	126	78	92	70	71	73	80	92	79
5.	NDL-2005-34	147	101	124	80	76	68	76	74	80	83	78
6.	LMS-P-3	144	97	121	74	78	68	68	70	75	73	72
7.	BAU-06-8	151	103	127	85	91	62	92	90	82	93	85
8.	SLS-71	144	95	120	70	71	56	59	62	70	79	67
9.	KL-219	150	100	125	86	85	62	88	77	82	96	82
10.	RLC-117	144	97	121	78	89	64	70	74	81	82	77
11.	Padmini (AC)	145	98	122	72	77	64	64	67	73	70	70
12.	Sheela (ZC-I)/	148	104	126	-	-	-	-	-	-	-	-
	Shekhar (ZC-II)/	-	-	-	76	88	58	74	73	76	83	75
	R-552 (ZC-III & IV)	-	-	-	74	-	-	-	-	-	-	-
13.	T-397 (NC)	144	99	122	-	73	62	73	60	71	73	69
	Local						60					

Sl. No.	Entry	Z-III				Zonal Mean	Z-IV											Zonal Mean
		Kota	Sagar	Maura nipur	Durga pura		Nag pur	Jashi pur	Rai pur	Rai chur	Sola pur	Bilas pur	Jagdal pur	Badna pur	Latur	Somna thpur	Bija pur	
1.	PCL-1-06	42	58	75	52	57	51	-	72	82	55	64	61	64	64	-	71	66
2.	LCK-7034	63	55	64	56	60	70	64	58	55	55	58	56	56	53	48	62	58
3.	NL-260	58	53	59	53	56	56	-	54	52	54	45	51	52	49	46	58	52
4.	PKDL-74	60	54	62	54	58	59	59	52	53	65	47	52	52	49	46	56	54
5.	NDL-2005-34	55	56	68	55	59	64	62	57	56	63	48	56	59	54	49	72	58
6.	LMS-P-3	58	55	61	58	58	60	61	56	52	62	52	59	56	50	46	58	56
7.	BAU-06-8	60	60	73	52	61	74	76	81	67	60	64	65	60	62	-	70	68
8.	SLS-71	45	48	55	54	51	58	58	45	47	61	65	55	43	41	40	57	52
9.	KL-219	50	52	70	56	57	72	70	66	59	65	54	54	61	53	37	70	60
10.	RLC-117	55	55	64	55	57	58	63	85	53	60	50	52	57	52	42	55	57
11.	Padmini (AC)	58	50	60	53	55	58	58	83	48	61	47	54	49	47	39	56	55
12.	Sheela (ZC-I)/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II)/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	R-552 (ZC-III & IV)	45	52	61	54	53	57	64	89	50	67	52	51	52	48	38	59	57
13.	T-397 (NC)	60	55	60	52	57	59	60	89	51	55	50	60	52	47	39	59	56
	Local				59		60			57	52							

Table 2.5.1.4 Initial Varietal Trial (Rainfed) : Days to maturity

Sl. No.	Entry	Z-I		Zonal Mean	Z-II								Zonal Mean
		Palampur	Kaul		Kanke	Faizabad	Shillongini	Berhampore	Varanasi	Sabour	Patna	Jharnapani	
1.	PCL-1-06	208	138	173	121	133	123	120	148	140	113	146	131
2.	LCK-7034	217	135	176	120	131	123	120	146	133	113	146	129
3.	NL-260	220	136	178	115	123	123	125	139	132	112	144	127
4.	PKDL-74	216	133	175	119	152	122	122	142	132	114	146	131
5.	NDL-2005-34	216	139	178	122	161	122	120	146	132	113	146	133
6.	LMS-P-3	220	132	176	116	125	123	126	140	132	110	144	127
7.	BAU-06-8	218	138	178	114	133	124	122	149	140	114	145	130
8.	SLS-71	221	136	179	119	125	124	120	143	132	110	146	127
9.	KL-219	218	138	178	113	135	125	125	150	141	116	146	131
10.	RLC-117	222	132	177	120	133	123	129	144	134	110	146	130
11.	Padmini (AC)	220	129	175	117	124	123	129	143	133	111	146	114
12.	Sheela (ZC-I)/	214	140	177	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II)/	-	-	-	115	137	124	123	147	134	113	146	130
	R-552 (ZC-III & IV)	-	-	-	-	-	-	-	-	-	-	-	-
13.	T-397 (NC)	217	133	175	112	155	122	126	146	128	110	129	129
	Local							124					

Sl. No.	Entry	Z-III				Zonal Mean	Z-IV											Zonal Mean
		Kota	Sagar	Maura nipur	Durga pura		Nag pur	Jashi pur	Rai pur	Raic hur	Sola pur	Bilas pur	Jagdal pur	Badna pur	Latur	Somna thpur	Bija pur	
1.	PCL-1-06	120	116	125	120	120	123	-	133	113	90	111	116	129	107	-	108	114
2.	LCK-7034	125	118	125	122	123	120	114	118	114	90	100	115	118	94	104	101	108
3.	NL-260	130	113	119	124	122	121	-	117	112	91	108	110	105	88	101	97	105
4.	PKDL-74	125	118	121	121	121	125	106	94	115	100	107	100	105	86	99	91	103
5.	NDL-2005-34	130	119	124	126	125	121	108	119	116	95	104	110	110	96	99	105	108
6.	LMS-P-3	120	116	123	120	120	123	110	121	114	102	107	115	108	85	103	92	107
7.	BAU-06-8	135	120	126	118	125	126	114	141	114	100	100	119	124	109	-	113	116
8.	SLS-71	125	116	119	125	121	122	110	107	114	110	109	115	103	85	98	92	106
9.	KL-219	130	117	127	122	124	121	114	127	115	114	100	107	129	103	98	96	111
10.	RLC-117	120	116	124	127	122	121	113	146	113	91	107	112	109	88	102	92	109
11.	Padmini (AC)	130	112	119	119	120	121	110	143	113	90	104	109	104	88	99	93	107
12.	Sheela (ZC-I)/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II)/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	R-552 (ZC-III & IV)	125	116	122	125	122	123	112	120	111	100	105	108	105	88	99	99	106
13.	T-397 (NC)	130	116	119	124	122	121	112	120	112	96	107	120	105	92	101	100	108
	Local				128		120			116	100		-	-	-		-	

Table 2.5.1.5 Initial Varietal Trial (Rainfed) : Number of capsules per plant

Sl. No.	Entry	Z-I	Z-II							Zonal Mean
		Palampur	Kanke	Faizabad	Shillongini	Berhampore	Varanasi	Sabour	Patna	Jharnapani	
1.	PCL-1-06	50	19	35	57	36	83	60	54	92	55
2.	LCK-7034	38	16	24	52	39	72	70	87	85	56
3.	NL-260	33	15	18	54	44	75	61	74	86	53
4.	PKDL-74	34	15	15	52	38	73	61	86	98	55
5.	NDL-2005-34	30	17	15	66	50	83	77	85	150	68
6.	LMS-P-3	46	15	22	59	48	82	50	90	125	61
7.	BAU-06-8	37	16	24	59	39	96	78	57	115	61
8.	SLS-71	34	15	16	64	41	82	80	83	126	63
9.	KL-219	45	21	18	58	38	76	83	51	142	61
10.	RLC-117	41	16	18	61	39	76	88	67	142	63
11.	Padmini (AC)	36	18	22	54	34	74	74	77	145	62
12.	Sheela (ZC-I)/	43	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II)/	-	16	16	59	38	77	69	55	132	58
	R-552 (ZC-III & IV)	-	-	-	-	-	-	-	-	-	-
13.	T-397 (NC)	33	17	19	67	53	82	108	60	115	65
	Local					48					

Sl. No.	Entry	Z-III			Zonal Mean	Z-IV										Zonal Mean
		Sagar	Maurani pur	Durga pura		Nag pur	Jashi pur	Rai pur	Rai chur	Sola pur	Jagdal pur	Badna pur	Latur	Somnath pur	Bija pur	
1.	PCL-1-06	111	36	42	63	21	-	14	28	33	43	38	21	-	32	29
2.	LCK-7034	78	29	40	49	33	80	14	26	48	44	35	34	12	38	36
3.	NL-260	124	32	38	65	58	-	11	32	46	44	35	40	20	36	36
4.	PKDL-74	131	34	36	67	32	46	17	38	44	29	45	44	19	50	36
5.	NDL-2005-34	115	51	44	70	40	87	11	36	46	53	41	28	16	41	40
6.	LMS-P-3	119	33	48	67	22	64	11	39	50	34	50	37	27	38	37
7.	BAU-06-8	110	22	37	56	31	65	09	21	30	40	34	24	-	22	31
8.	SLS-71	105	30	38	58	33	123	19	39	48	38	46	63	13	42	46
9.	KL-219	104	34	32	57	34	105	16	33	21	53	40	42	13	38	40
10.	RLC-117	84	52	30	55	53	78	19	34	53	71	43	31	19	43	44
11.	Padmini (AC)	117	50	42	70	41	83	18	26	42	51	47	50	13	43	41
12.	Sheela (ZC-I)/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II)/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	R-552 (ZC-III & IV)	101	60	28	63	40	81	17	47	35	38	50	27	15	42	39
13.	T-397 (NC)	81	64	36	60	39	52	28	40	45	49	51	30	18	52	40
	Local	-	-	38	-	25			37	52	-					

Table 2.5.1.6 Initial Varietal Trial (Rainfed) : Number of seeds per capsule

Sl. No.	Entry	Z-I	Z-II							Zonal Mean
		Kaul	Kanke	Faizabad	Shillongini	Berhampore	Sabour	Patna	Jharnapani	
1.	PCL-1-06	9	8	8	8	8	10	9	8	8
2.	LCK-7034	6	8	7	8	7	10	9	10	8
3.	NL-260	7	8	7	8	5	10	8	11	8
4.	PKDL-74	8	9	9	8	6	8	8	8	8
5.	NDL-2005-34	8	8	8	8	8	10	9	16	10
6.	LMS-P-3	7	9	8	8	7	9	9	12	9
7.	BAU-06-8	8	7	8	8	7	8	9	10	8
8.	SLS-71	7	9	10	8	6	9	8	10	9
9.	KL-219	7	8	9	8	7	10	8	8	8
10.	RLC-117	7	9	8	8	6	9	8	11	8
11.	Padmini (AC)	8	8	8	8	7	8	8	12	8
12.	Sheela (ZC-I)/	7	-	-	-	-	-	-	-	-
	Shekhar (ZC-II)/	-	9	7	8	6	8	8	12	8
	R-552 (ZC-III & IV)	-	-	-	-	-	-	-	-	-
13.	T-397 (NC)	7	9	8	8	7	9	9	14	9
	Local		-			6				

Sl. No.	Entry	Z-III			Zonal Mean	Z-IV									Zonal Mean
		Sagar	Maura nipur	Durga pura		Nagpur	Jashipur	Raipur	Solapur	Jagdalpur	Badnapur	Latur	Somna thpur	Bijapur	
1.	PCL-1-06	7	9	8	8	8	-	8	9	6	7	8	-	7	8
2.	LCK-7034	6	8	7	7	7	9	8	8	7	7	9	7	8	8
3.	NL-260	8	8	7	8	9	-	7	8	7	7	8	7	9	8
4.	PKDL-74	8	9	8	8	9	8	8	8	8	7	8	7	11	8
5.	NDL-2005-34	7	8	9	8	8	9	8	8	8	7	7	10	7	8
6.	LMS-P-3	7	7	6	7	8	8	6	8	8	7	7	8	9	8
7.	BAU-06-8	8	8	7	8	9	8	8	8	7	8	8	-	9	7
8.	SLS-71	7	9	7	8	8	8	8	8	8	7	8	7	8	8
9.	KL-219	8	8	9	8	8	8	9	7	8	7	7	7	8	8
10.	RLC-117	8	9	8	8	9	8	8	7	7	6	8	7	11	8
11.	Padmini (AC)	6	8	6	7	7	8	7	8	8	6	8	6	8	7
12.	Sheela (ZC-I)/	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II)/	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	R-552 (ZC-III & IV)	6	7	6	6	8	8	8	7	7	6	8	7	10	8
13.	T-397 (NC)	7	9	7	8	8	9	9	8	7	7	9	7	11	8
	Local			8		8			9	-					

Table 2.5.1.7 Initial Varietal Trial (Rainfed) : 1000-seeds weight (g)

Sl. No.	Entry	Z-I		Zonal Mean	Z-II								Zonal Mean
		Palampur	Kaul		Kanke	Faizabad	Shillongini	Berhampore	Varanasi	Sabour	Patna	Jharnapani	
1.	PCL-1-06	5.6	6.2	5.9	5.2	6.9	4.5	5.6	5.8	4.8	5.0	6.2	4.8
2.	LCK-7034	10.3	11.2	10.8	7.2	6.9	4.2	5.4	7.2	9.6	7.4	6.3	6.8
3.	NL-260	10.0	9.2	9.6	7.0	7.3	8.1	6.1	6.4	8.8	7.1	6.3	7.1
4.	PKDL-74	7.5	7.1	7.3	5.4	7.0	5.4	5.1	7.0	6.0	6.0	6.6	6.1
5.	NDL-2005-34	6.6	5.9	6.3	5.0	7.3	4.9	5.4	6.4	5.2	4.6	7.5	5.8
6.	LMS-P-3	8.5	8.1	8.3	5.6	8.3	5.9	6.2	7.0	6.8	5.7	6.3	6.5
7.	BAU-06-8	10.5	9.1	9.8	6.4	7.3	6.0	5.2	7.8	8.4	6.9	6.7	6.8
8.	SLS-71	11.3	9.5	10.4	6.1	6.9	8.6	6.1	6.8	5.6	7.4	6.9	6.8
9.	KL-219	7.9	7.7	7.8	5.4	7.3	5.0	6.0	5.2	8.0	5.5	7.1	6.2
10.	RLC-117	7.5	7.9	7.7	5.0	7.3	5.1	5.8	6.8	5.6	5.5	7.2	6.2
11.	Padmini (AC)	10.4	5.4	7.9	5.2	6.9	7.4	6.1	6.8	8.0	6.6	7.2	6.8
12.	Sheela (ZC-I)/	9.0	8.3	8.7	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II)/	-	-	-	6.0	6.9	7.3	5.6	6.8	8.8	6.6	7.0	6.9
	R-552 (ZC-III & IV)	-	-	-	-	-	-	-	-	-	-	-	-
13.	T-397 (NC)	6.9	8.1	8.5	5.1	7.0	4.6	5.7	6.4	7.2	4.7	7.0	6.0
	Local							5.6					

Sl. No.	Entry	Z-III				Zonal Mean	Z-IV										Zonal Mean
		Kota	Sagar	Maura nipur	Durga pura		Nag pur	Jashi pur	Raipur	Raichur	Sola pur	Bilaspur	Jagdal pur	Badna pur	Latur	Bijapur	
1.	PCL-1-06	6.0	7.0	4.9	7.3	6.8	4.8	-	4.9	9.4	3.6	7.0	5.6	4.7	4.2	4.4	5.4
2.	LCK-7034	8.0	10.0	7.2	7.2	8.1	6.8	7.8	7.9	10.0	6.8	5.5	6.0	7.1	7.3	7.0	7.2
3.	NL-260	5.7	9.0	6.8	6.8	7.1	8.4	-	7.2	9.3	4.9	7.1	6.4	7.0	7.4	6.8	7.2
4.	PKDL-74	6.9	7.0	5.3	7.6	6.7	6.4	5.9	5.3	9.5	4.4	7.4	6.1	5.1	5.4	5.3	5.6
5.	NDL-2005-34	5.9	7.0	5.1	6.2	6.1	5.2	5.1	4.5	9.4	3.8	6.3	5.2	3.9	4.8	4.3	5.3
6.	LMS-P-3	8.0	9.0	5.8	7.5	7.6	7.4	6.5	5.8	9.4	5.0	5.7	4.9	5.8	6.0	5.6	6.2
7.	BAU-06-8	6.4	9.0	5.7	7.1	7.1	8.2	7.3	6.7	8.2	5.6	5.9	5.7	6.2	6.0	6.2	6.6
8.	SLS-71	7.0	9.0	6.6	6.3	7.2	7.0	7.9	6.6	9.2	5.7	5.1	6.7	6.8	7.1	5.8	6.8
9.	KL-219	7.1	8.0	5.1	7.5	6.9	6.1	5.7	5.4	9.5	4.4	6.2	5.8	5.3	5.0	4.8	5.8
10.	RLC-117	5.9	7.0	6.2	7.5	6.7	6.6	6.7	5.7	9.3	4.4	6.3	6.0	5.5	5.4	6.1	6.2
11.	Padmini (AC)	6.3	9.0	6.8	6.3	7.1	8.4	8.3	6.3	8.9	5.5	6.7	6.4	5.4	6.3	5.9	6.8
12.	Sheela (ZC-I)/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II)/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	R-552 (ZC-III & IV)	6.2	9.0	6.4	7.9	7.4	9.0	7.1	5.9	9.2	5.5	5.9	6.0	6.5	6.3	5.8	6.7
13.	T-397 (NC)	5.9	7.0	5.6	7.2	6.4	5.4	5.0	4.7	9.4	4.5	6.0	6.0	4.6	4.6	4.1	5.4
	Local				7.8		7.8			9.3	6.2						

Table 2.5.1.8 Initial Varietal Trial (Rainfed) : Reaction to diseases and pest

Sl. No.	Entry	Rust			Alternaria blight					Powdery mildew				Wilt			Bud fly				
		Palampur	Kanke	Jharnapani	Kanke	Faizabad	Varanasi	Nagpur	Jashipur	Palampur	Kanke	Maurapur	Nagpur	Palampur	Kanke	Jashipur	Faizabad	Varanasi	Patna	Maurapur	Nagpur
1.	PCL-1-06	F	R	MS	MS	MS	R	R	-	MR	R	F	MR	HS	R	-	R	MS	MS	MR	MS
2.	LCK-7034	F	MS	R	MS	MS	R	MS	MR	MR	MR	F	MS	R	MR	S	MR	MS	MR	MR	MS
3.	NL-260	F	MR	MS	MS	MS	MS	R	-	R	R	F	R	MS	MR	-	MR	MS	MR	MR	R
4.	PKDL-74	F	MR	MS	R	R	MS	R	S	R	MR	F	MR	R	R	MR	R	HS	S	MR	MS
5.	NDL-2005-34	F	R	MS	MR	R	R	R	MS	HS	MS	F	S	MS	R	R	MR	R	R	MR	MR
6.	LMS-P-3	F	R	S	MR	R	HS	MR	MR	R	MR	F	MR	R	R	MS	MR	HS	MS	MR	MS
7.	BAU-06-8	F	MR	MS	MS	MS	R	R	MR	R	R	F	MR	R	MR	R	MR	R	MS	MS	S
8.	SLS-71	F	MS	MS	MR	R	MS	MR	MR	MR	R	F	S	R	MR	MS	R	MS	R	MS	MS
9.	KL-219	F	MR	MR	MR	MS	MS	MR	MR	R	MR	R	S	R	R	R	MR	MS	MS	MR	S
10.	RLC-117	F	MS	MS	R	R	R	MR	MS	MR	MR	F	MR	R	R	R	R	R	R	MR	MR
11.	Padmini (AC)	F	R	MS	R	MS	MS	MR	MR	R	R	F	MR	R	R	R	R	MS	R	MR	MR
12.	Sheela (ZC-I)/	F	-	-	-	-	-	-	-	R	-	-	-	MS	-	-	-	-	-	-	-
	Shekhar (ZC-II)/	-	MR	MR	R	MS	R	-	-	-	MR	-	-	-	MR	-	R	MS	MS	-	-
	R-552 (ZC-III & IV)	-	-	-	-	-	-	MR	MR	-	-	MS	MR	-	-	MS	-	-	-	MR	MR
13.	T-397 (NC)	F	MR	MS	MR	R	R	MS	S	HS	MR	R	MR	R	MR	R	MR	MS	R	MR	S
	Local	-	-	-	-	-	-	MS	-	-	-	-	R	-	-	-	-	-	-	-	MS

Table 2.5.1.9 Initial Varietal Trial (Rainfed) : Oil content (%) and oil yield (kg/ha)

Sl.No.	Entry	Oil content (%)				Oil yield (kg/ha)			
		Zone I	Zone II	Zone III	Zone IV	Zone I	Zone II	Zone III	Zone IV
1.	PCL-1-06	35.09	35.84	36.40	35.07	403	389	427	206
2.	LCK-7034	38.34	37.75	39.18	38.25	465	351	439	290
3.	NL-260	36.06	37.33	36.46	36.67	336	346	461	337
4.	PKDL-74	38.78	39.02	37.90	38.57	426	317	456	312
5.	NDL-2005-34	-	36.26	37.18	35.83	-	401	455	252
6.	LMS-P-3	40.11	40.06	41.24	38.84	478	377	386	301
7.	BAU-06-8	38.63	36.34	37.68	36.17	482	325	342	207
8.	SLS-71	39.58	39.75	39.66	38.90	486	393	458	303
9.	KL-219	37.48	36.94	36.89	35.84	460	327	416	214
10.	RLC-117	35.75	36.81	37.03	36.85	409	378	445	352
11.	Padmini (AC)	41.51	41.79	43.51	41.01	466	405	452	342
12.	Sheela (ZC-I)/	37.22	38.74	35.59	35.81	419	-	-	-
	Shekhar (ZC-II)/						390	-	-
	R-552 (ZC-III & IV)						-	351	283
13.	T-397 (NC)	35.60	37.34	37.47	36.33	429	469	450	290

2.5.2 Initial Varietal Trial (Irrigated)

This initial evaluation trial comprising fifteen entries including two checks was constituted for its evaluation at twenty five locations. Zonal checks were LC54 (Zone I), Shekhar (Zone II) and Suyog (Zone III & IV) whereas, T397 was included as national check across all the four zones. The experiment was conducted in RBD with three replications under irrigated condition following recommended agronomic practices. Pedigree, sources of origin along with code of all the entries have been presented in tabular form as follows :

Sl.No.	Entry	Code	Pedigree	Source
1.	LCP-146	070201	Belley × Acc. No. 2251-1	Ludhiana
2.	PCL-12-3-06	070202	Nagarkot × JRF-5	P.C. Unit, Kanpur
3.	PKDL-71	070203	ES-554 × RLC-32	Hoshangabad
4.	LCK-7035	070204	Shubhra × Neela	Kanpur
5.	BAU-06-5	070205	BAU-1008 × Jeevan	Kanke
6.	NDL-2005-24	070206	LMH-66-3 × Shubhra	Faizabad
7.	LMS-63-6	070207	RLC-(U)-2 × LMS-1-57	Mauranipur
8.	RL-26018	070208	RL-914 × Kiran	Kota
9.	KL-248	070209	Selection from KL-178	Palampur
10.	NL-260	070210	R-552 × RLC-6	Nagpur
11.	SLS-72	070211	Laxmi-27 × JLS-9	Sagar
12.	LBR-6	070212	LW-28-15	Berhampore
13.	RLC-116	070213	Kiran × Chambal	Raipur
14.	LC-54 (ZC-1) /	070214	K2 × Kangra local	Gurdaspur
	Shekhar (ZC-II)/	070214	Laxmi-27 × EC-1387	Kanpur
	Suyog (ZC-III & IV)	070214	(Kiran × KL 168) × Kiran	Sagar
15.	T-397 (NC)	070215	T-491 × T-1193-2	P.C. Unit, Kanpur

The break-up of allocated locations were three (Palampur, Kaul and Ludhiana) in Zone I ; eleven (Kanke, Kanpur, Faizabad, Mainpuri, Patna, Berhampore, Masodha, Dholi, Ujhani, Jharnapani and Varanasi) in Zone II; seven (Kota, Mauranipur, Sagar, Hoshangabad, Tikamgarh, Jabalpur and Udaipur) in Zone III and four (Nagpur, Raipur, Raichur and Bijapur) in Zone IV. All the designated centres conducted the trial nicely and reported the data on seed yield and ancillary characters presented in Table 2.5.2.1 to 2.5.2.9. Highest general mean for seed yield (2646 kg/ha) was recorded at Tikamgarh centre. Significant differences among genotypes for seed yield was observed at all the twenty five locations. Seed yield data of Faizabad, Masodha and Raichur was not considered for the computation of zonal mean due to high CV and low GM, respectively whereas, both parameters were found responsible for the rejection of seed yield data of Raipur centre. The results obtained on various aspects are being discussed here as under-

Zone I

Perusal of zonal mean value of seed yield reflected inability on the part of test entries to surpass the seed yield of the best check T397 (1760 kg/ha) whereas, in oil yield SLS 72 could supersede the best check T 397 (639 kg/ha). Plant populations were above optimum at all the three locations with significant differences among genotypes. Days to flowering and maturity duration in this zone is usually more and varied in the range of 109 to 121 and 163 to 171 days, respectively. Data on ancillary traits like number of capsules per plant, number seeds per capsule and 1000-seeds weight were in support of seed yield data. Test entries LCK 7035, RL 26018 and NL 260 appear to be bold seeded in size.

Zone II

In this zone too, none of the test entries could supersede the seed yield of the best check T397 (1457 kg/ha). However, two test entries (SLS 72 and LMS 63-6) could perform better than the best check T 397 (540 kg/ha) in terms of oil yield. Though the plant stands were adequate but significant differences among the genotypes

were observed at almost all the locations except Manipuri, Dholi and Ujhani. With regard to maturity duration, KL 248 appears to be late in comparison to other entries. Environmental conditions of this zone seem to be congenial as almost all the entries recorded more number of capsules per plant in comparison to other zones. Data on other ancillary traits were found in support of seed yield.

Zone III

Based on zonal mean, it may be inferred that test entry RLC 116 recorded highest seed yield (1836 kg/ha) with yield superiority of 14.46 per cent over the best check Suyog (1604 kg/ha) followed by BAU-06-5, PKDL-71 and LCK 7035. For oil yield, five test entries *viz;* RLC 116, PKDL 71, SLS 72, LCK 7035 and LMS 63-6 were found promising as they recorded more yield than the best check Suyog (617 kg/ha). Very high plant populations were maintained at Tikamgarh centre. Non-significant difference among the entries for plant stand was observed only at Kota centre. Least variation in respect of maturity duration (125-129 days) was noticed. Mean test weight data suggested the bold seeded nature of test entries, LCK 7035, RL 26018 and NL 260.

Zone IV

Perusal of *per se* performance of entries evaluated in this zone indicated that test entry NL 260 registered highest yield (1397 kg/ha) followed by the best check T 397 (1255 kg/ha). In case of oil yield, two test entries NL 260 and SLS 72 were found to out-yield the best check T 397 (458 kg/ha). Poor plant stand was noted at Raipur while non-significant difference among entries was observed at Raichur centre only. Test entry NL 260 was earliest (112 days), whereas PCL 12-3-06 was late in maturity (120 days). RL 26018 along with LMS 63-6 were placed under bold seeded category based on mean 1000-seeds wt. Data on other ancillary traits like number of capsules per plant and numbers of seeds per capsule were found in support of seed yield.

Incidence of rust recorded at four locations revealed low intensity of infestation at Palampur and Ujhani. Test entry LBR 6 was found resistant to rust disease at remaining two locations. Alternaria blight incidence recorded at eight locations revealed lot of variation in disease score. RLC 116 was found moderately resistant to Alternaria blight. Four test entries *viz;* LCP 146, LCK 7035, KL 248 and NL 260 were observed to show resistance against powdery mildew across the locations. With regard to wilt and bud fly infestation, most of the test entries were resistant and moderately resistant, respectively.

Comparative performance of promising entries

Zone I	Zone II	Zone III	Zone IV
		Seed yield (kg/ha)	
None	None	RLC 116 (1836)*	NL 260 (1397)*
T 397 (1760) NC	**T 397 (1457) NC**	BAU-06-5 (1671)	**T 397 (1255) NC**
		PKDL 71 (1660)	
		LCK 7035 (1648)	
		Suyog (1604) ZC	
		Oil yield (kg/ha)	
SLS 72 (660)	SLS 72 (591)	RLC 116 (698)*	NL 260 (516)*
T 397 (639) NC	LMS 63-6 (573)	PKDL 71 (686)*	SLS 72 (487)
	T 397 (540) NC	SLS 72 (651)	**T 397 (458) NC**
		LCK 7035 (636)	
		LMS 63-6 (621)	
		Suyog (617) ZC	

* Entries showing 10 per cent or more superiority over best check. Values in parentheses indicate seed or oil yield

Table 2.5.2.1 Initial Varietal Trial (Irrigated) : Seed yield (kg/ha)

Sl. No.	Entry	Z-I			Zonal Mean	Z-II											Zonal Mean
		Palampur	Kaul	Ludhiana		Kanke	Kanpur	Faizabad*	Mainpuri	Patna	Berhampore	Masodha*	Dholi	Ujhani	Jharnapani	Varanasi	
1.	LCP-146	633	2181	1641	1485	822	778	694	933	2506	728	1279	903	1003	1067	1500	1138
2.	PCL-12-3-06	519	2054	1478	1350	667	1056	1250	1315	1896	933	2006	1306	1836	1578	1444	1337
3.	PKDL-71	607	2158	1752	1506	1017	1056	500	1405	1870	839	806	736	336	1067	1722	1116
4.	LCK-7035	556	1938	1588	1361	1567	1083	694	1440	1963	839	1167	1097	1033	1222	1722	1330
5.	BAU-06-5	622	2021	1618	1420	1500	1083	694	1340	1561	883	1100	1167	1392	1600	1889	1379
6.	NDL-2005-24	556	1625	1766	1316	917	1250	694	1530	1531	833	1222	722	1358	856	1944	1216
7.	LMS-63-6	744	2083	1722	1516	1278	1483	833	1225	2624	1139	1417	1208	1239	1089	1778	1451
8.	RL-26018	741	2354	1699	1598	1122	1417	333	1388	2683	1083	277	1139	1117	1067	1667	1409
9.	KL-248	937	2396	1522	1618	1039	639	583	1155	1625	839	862	667	775	1622	1056	1035
10.	NL-260	807	2354	1515	1559	817	1317	833	1230	2640	772	1360	861	1158	1111	1778	1298
11.	SLS-72	748	2279	1892	1640	1472	1350	1000	1325	1774	1072	1667	1139	1239	1267	1833	1386
12.	LBR-6	744	2333	1906	1661	1300	1139	1033	1570	1849	1133	1222	764	1714	1311	1778	1395
13.	RLC-116	719	2483	1803	1668	1333	1294	750	1530	1721	806	1222	625	1283	1822	1722	1348
14.	LC-54 (ZC-I) /	889	2250	1796	1645	-	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II) /	-	-	-	-	1361	1317	667	1375	2596	778	1000	681	969	1089	1611	1309
	Suyog (ZC-III & IV)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.	T-397 (NC)	659	2604	2017	1760	1489	1394	1167	1340	1618	1261	1817	1250	1764	1333	1667	1457
	Local	-	-	-		-	1100	-	-	-	1200	-	-	-	-	-	
	GM	699	2208	1714		1180	1172	782	1340	2030	946	1228	951	1214	1273	1674	
	SE (m) ±	22.26	81.38	63.15		48.53	55.73	92.79	56.13	128.96	70.62	146.94	35.24	65.74	71.27	107.21	
	CD	86.97**	317.98**	246.75**		189.62**	216.75**	362.56**	219.31**	503.91**	274.63**	574.15**	137.71**	256.88**	278.48**	418.91**	
	CV %	5.52	6.38	6.38		7.12	8.23	20.56	7.25	11.0	12.93	20.72	6.42	9.38	9.69	11.09	

* Seed yield data was not considered due to high CV

Table 2.5.2.1 Contd.....

Sl. No.	Entry	Z-III							Zonal Mean	Z-IV				Zonal Mean
		Kota	Mauranipur	Sagar	Hoshangabad	Tikamgarh	Jabalpur	Udaipur		Nagpur	Raipur*	Raichur*	Bijapur	
1.	LCP-146	1790	1022	972	667	2489	1944	550	1348	619	300	489	814	717
2.	PCL-12-3-06	2016	1156	1431	681	2311	2118	625	1477	825	533	632	1156	991
3.	PKDL-71	2008	1317	1250	1472	2833	2130	608	1660	361	161	866	1217	789
4.	LCK-7035	2098	1500	1069	1389	2544	2269	667	1648	880	333	593	1311	1096
5.	BAU-06-5	2230	1294	1206	1278	2833	2095	758	1671	765	572	549	983	874
6.	NDL-2005-24	2037	1589	1028	944	2467	2419	642	1589	651	356	552	1161	906
7.	LMS-63-6	1815	1278	1042	1750	2689	1771	700	1578	414	550	429	1447	931
8.	RL-26018	2371	661	958	1306	2800	1991	658	1535	560	339	424	1414	987
9.	KL-248	1860	1317	1361	667	2522	1817	475	1431	550	472	97	744	647
10.	NL-260	1440	1278	*944*	*1528*	*2467*	*2269*	*808*	*1533*	*1251*	*333*	*814*	*1542*	*1397*
11.	SLS-72	1724	1522	833	1722	2711	1887	608	1572	978	261	674	1408	1193
12.	LBR-6	1576	1583	833	972	2500	1655	608	1390	1086	639	587	1128	1107
13.	RLC-116	1848	1256	1306	1806	2933	2894	808	1836	940	739	460	1564	1252
14.	LC-54 (ZC-I) /	-	-	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II) /	-	-	-	-	-	-	-	-	-	-	-	-	-
	Suyog (ZC-III & IV)	1761	1150	1194	1528	2889	1956	750	1604	957	856	631	1208	1083
15.	T-397 (NC)	2008	1633	778	944	2578	2465	792	1600	945	1283	384	1564	1255
	Local	-	1283	-	1889	2767	2546	-		576	-	574	-	-
	GM	1906	1302	1080	1284	2646	2139	671		772	515	547	1244	
	SE (m) ±	110.78	50.59	79.25	73.23	115.53	67.92	55.68		59.98	54.59	29.22	41.43	
	CD	432.87**	196.75**	309.67**	284.81**	333.64*	264.16**	217.55**		233.27**	213.29**	113.64	161.90**	
	CV %	10.07	6.73	12.71	9.88	7.56	5.50	14.38		13.45	18.35	9.25	5.77	

* Seed yield data was not considered for computation of zonal mean

Table 2.5.2.2 Initial Varietal Trial (Irrigated) : Plant stand (000/ha)

Sl. No.	Entry	Z-I			Zonal Mean	Z-II											Zonal Mean
		Palam pur	Kaul	Ludhi ana		Kanke	Kanpur	Faizabad	Main puri	Patna	Berham pore	Masodha	Dholi	Ujhani	Jharna pani	Varanasi	
1.	LCP-146	2243	840	1574	1552	887	827	519	870	1087	911	701	1024	1025	443	1209	864
2.	PCL-12-3-06	2891	960	1803	1885	1270	903	1103	804	1408	917	1442	998	1036	523	1213	1056
3.	PKDL-71	1927	960	1573	1487	1380	1019	511	796	1084	928	683	1019	986	360	1085	896
4.	LCK-7035	2327	813	1646	1595	1260	870	911	859	1117	900	1094	1021	1003	357	1027	947
5.	BAU-06-5	2470	827	1524	1607	1150	834	864	845	1083	922	1083	1014	1011	513	1222	958
6.	NDL-2005-24	2367	787	1572	1575	1287	1058	1261	802	1484	944	1671	1060	1011	343	1151	1097
7.	LMS-63-6	2113	867	1227	1402	1253	1094	1028	820	1124	983	1611	1009	1022	320	1231	1045
8.	RL-26018	1833	813	1224	1290	743	971	572	907	1083	961	733	998	1016	370	1067	856
9.	KL-248	2229	787	1229	1415	843	797	681	770	1113	906	846	978	986	417	956	836
10.	NL-260	2321	933	1660	1638	1013	755	1192	708	1094	1000	1428	968	1044	373	1049	966
11.	SLS-72	1948	1040	1695	1561	1247	1006	1051	784	1050	944	1331	966	1022	410	1111	993
12.	LBR-6	2020	787	1499	1435	1220	902	1089	832	1109	956	1456	1007	1004	427	1080	1007
13.	RLC-116	2039	720	1618	1459	1403	929	1222	837	1239	1006	1361	1029	997	563	1071	1060
14.	LC-54 (ZC-I) /	2258	827	1501	1529	-	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II) /	-	-	-	-	1173	889	1208	781	1044	956	1422	1018	1008	383	1191	1007
	Suyog (ZC-III & IV)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.	T-397 (NC)	2377	840	1830	1682	1473	963	1333	781	1066	956	1927	1016	1027	510	1169	1111
	Local						821	-	-	-	1011	-	-	-	-	-	
	GM	2224	853	1545		1174	915	970	813	1146	950	1253	1008	1013	421	1122	
	SE (m) ±	49.39	43.26	65.23		45.98	58.88	41.89	37.47	18.45	19.38	52.76	20.3	12.45	12.46	46.97	
	CD	192.98**	169.05**	254.89**		179.66**	228.97	163.7**	NS	72.08**	75.36**	206.15**	NS	NS	48.68**	183.52**	
	CV %	3.85	8.78	7.31		6.79	11.15	7.48	7.98	2.79	3.53	7.3	3.49	2.13	5.13	7.25	

Table 2.5.2.2 Contd.....

Sl. No.	Entry	Z-III					Zonal Mean	Z-IV				Zonal Mean
		Kota	Mauranipur	Sagar	Hoshangabad	Tikamgarh		Nagpur	Raipur	Raichur	Bijapur	
1.	LCP-146	562	597	535	320	1417	686	723	116	784	429	513
2.	PCL-12-3-06	484	602	1506	1043	2754	1278	870	589	753	444	664
3.	PKDL-71	625	494	1053	983	4021	1435	683	237	772	418	528
4.	LCK-7035	562	592	1281	900	2432	1153	917	32	774	439	541
5.	BAU-06-5	641	587	1395	717	3414	1351	974	103	801	423	575
6.	NDL-2005-24	600	572	1566	883	3064	1337	770	171	795	419	496
7.	LMS-63-6	676	591	1252	793	2657	1194	686	397	776	454	578
8.	RL-26018	571	574	709	797	3387	1208	910	223	761	422	579
9.	KL-248	502	567	681	430	2292	892	720	62	735	443	490
10.	NL-260	577	568	1009	880	3271	1261	1043	159	776	434	603
11.	SLS-72	540	552	1350	1077	3659	1196	911	247	791	431	595
12.	LBR-6	565	578	1075	853	3060	1226	987	423	782	419	653
13.	RLC-116	503	586	1235	1043	3706	1415	904	270	748	421	586
14.	LC-54 (ZC-I) /	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II) /	-	-	-	-	-	-	-	-	-	-	-
	Suyog (ZC-III & IV)	581	592	1329	740	3947	1438	807	294	791	450	586
15.	T-397 (NC)	541	584	1427	628	2938	1224	890	750	834	454	732
	Local	-	574	-	1050	4019		780	-	796	-	
	GM	569	576	1160	821	3127		849	272	779	433	
	SE (m) ±	46.41	9.61	65.96	119.37	316.53		50.02	94.55	22.48	4.03	
	CD	NS	37.39**	257.74**	464.25**	1231.02**		194.54**	369.43**	NS	15.76**	
	CV %	14.14	2.89	9.85	25.18	17.53		10.21	60.3	5.0	1.61	

Table 2.5.2.3 Initial Varietal Trial (Irrigated) : Days to flowering

Sl. No.	Entry	Z-I			Zonal Mean	Z-II											Zonal Mean
		Palampur	Kaul	Ludhiana		Kanke	Kanpur	Faizabad	Mainpuri	Patna	Berhampore	Masodha	Dholi	Ujhani	Jharnapani	Varanasi	
1.	LCP-146	148	104	110	121	80	80	80	79	84	68	88	76	98	102	89	84
2.	PCL-12-3-06	138	104	107	116	83	80	80	76	88	70	90	75	99	100	91	85
3.	PKDL-71	152	103	108	121	78	77	80	75	84	72	90	72	102	102	87	84
4.	LCK-7035	140	101	98	113	61	70	72	80	72	68	81	69	95	101	79	77
5.	BAU-06-5	150	100	107	119	71	84	73	77	82	75	85	71	100	98	89	82
6.	NDL-2005-24	134	100	98	111	70	78	72	76	84	72	82	64	95	95	88	80
7.	LMS-63-6	139	92	102	111	72	72	68	78	70	74	81	70	96	94	85	78
8.	RL-26018	147	93	101	114	73	78	75	76	77	76	86	72	101	96	89	82
9.	KL-248	146	105	105	119	81	80	80	84	86	74	90	74	113	100	97	87
10.	NL-260	134	91	103	109	71	63	72	77	70	68	76	63	88	101	99	77
11.	SLS-72	135	100	101	112	68	67	70	82	71	62	80	75	95	98	82	77
12.	LBR-6	141	100	99	113	64	69	70	84	83	68	79	67	95	98	90	79
13.	RLC-116	138	102	108	116	80	73	75	83	84	70	78	74	97	97	95	82
14.	LC-54 (ZC-I) /	148	100	111	116	-	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II) /	-	-	-	-	68	79	74	84	79	72	84	69	111	99	95	83
	Suyog (ZC-III & IV)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.	T-397 (NC)	133	95	99	109	74	71	71	81	76	74	78	67	95	100	95	80
	Local	-	-	-	-	-	76	-	-	-	70	-	-	-	-	-	-

Table 2.5.2.3 Contd.....

Sl. No.	Entry	Z-III							Zonal Mean	Z-IV				Zonal Mean
		Kota	Mauranipur	Sagar	Hoshangabad	Tikamgarh	Jabalpur	Udaipur		Nagpur	Raipur	Raichur	Bijapur	
1.	LCP-146	72	69	61	60	86	66	79	70	71	63	64	70	67
2.	PCL-12-3-06	85	79	61	65	91	82	81	78	57	63	64	77	65
3.	PKDL-71	70	66	59	57	77	66	79	68	70	58	54	61	61
4.	LCK-7035	82	58	54	54	69	61	62	63	59	54	51	56	55
5.	BAU-06-5	84	77	60	63	77	69	72	72	62	66	56	72	64
6.	NDL-2005-24	75	59	53	58	69	64	65	63	63	57	54	60	59
7.	LMS-63-6	70	66	55	54	69	61	62	62	63	48	50	58	55
8.	RL-26018	68	64	60	56	77	63	67	65	60	60	55	70	61
9.	KL-248	72	71	63	60	89	77	72	72	62	68	63	75	67
10.	NL-260	70	74	53	56	65	58	62	63	56	53	53	57	55
11.	SLS-72	68	64	52	52	69	59	66	61	56	47	50	57	53
12.	LBR-6	73	63	55	57	69	62	64	63	57	56	54	62	57
13.	*RLC-116*	65	60	52	57	69	65	66	62	57	54	53	58	56
14.	LC-54 (ZC-I) /	-	-	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II) /	-	-	-	-	-	-	-	-	-	-	-	-	-
	Suyog (ZC-III & IV)	65	57	51	54	65	60	66	60	57	54	53	59	56
15.	T-397 (NC)	67	63	51	56	69	60	66	62	59	53	54	61	57
	Local	-	53	-	56	65	58	-	-	58	-	55	-	-

Table 2.5.2.4 Initial Varietal Trial (Irrigated) : Days to maturity

Sl. No.	Entry	Z-I			Zonal Mean	Z-II											Zonal Mean
		Palampur	Kaul	Ludhiana		Kanke	Kanpur	Faizabad	Mainpuri	Patna	Berhampore	Masodha	Dholi	Ujhani	Jharnapani	Varanasi	
1.	LCP-146	211	140	152	168	122	136	140	137	126	125	148	130	136	162	143	137
2.	PCL-12-3-06	207	138	144	163	119	136	132	133	121	130	135	130	139	160	141	134
3.	PKDL-71	211	140	150	167	115	139	140	135	122	129	150	124	137	162	142	136
4.	LCK-7035	213	139	148	167	111	132	116	137	123	123	125	124	133	161	141	130
5.	BAU-06-5	214	138	146	166	118	136	120	132	119	132	128	125	137	165	139	132
6.	NDL-2005-24	207	138	143	163	116	134	120	133	121	130	126	116	134	164	140	130
7.	LMS-63-6	214	138	149	167	115	131	119	138	122	128	125	118	136	162	142	131
8.	RL-26018	212	138	146	165	117	136	142	140	124	128	151	128	139	163	140	137
9.	KL-248	213	139	148	167	124	137	140	139	126	125	154	130	140	164	137	138
10.	NL-260	216	139	157	171	114	131	127	129	119	127	131	120	133	165	139	130
11.	SLS-72	215	139	145	166	113	132	120	133	121	122	124	128	132	168	133	130
12.	LBR-6	210	140	143	164	112	131	120	130	117	127	125	124	132	162	162	131
13.	RLC-116	215	140	148	168	120	132	119	138	122	125	125	130	136	163	143	132
14.	LC-54 (ZC-I) /	214	139	150	168	-	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II) /	-	-	-	-	115	132	120	139	125	125	129	122	140	164	138	133
	Suyog (ZC-III & IV)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.	T-397 (NC)	213	138	143	165	117	132	120	131	116	128	125	111	136	165	135	129
	Local	-	-	-	-	-	136	-	-	-	130	-	-	-	-	-	-

Table 2.5.2.4 Contd.....

Sl. No.	Entry	Z-III							Zonal Mean	Z-IV				Zonal Mean
		Kota	Mauranipur	Sagar	Hoshangabad	Tikamgarh	Jabalpur	Udaipur		Nagpur	Raipur	Raichur	Bijapur	
1.	LCP-146	135	132	120	132	125	127	125	128	124	118	115	112	117
2.	PCL-12-3-06	140	133	123	130	126	121	127	129	127	119	116	118	120
3.	PKDL-71	130	130	119	132	126	125	123	126	129	115	112	101	114
4.	LCK-7035	130	131	121	129	127	118	124	126	127	110	111	114	116
5.	BAU-06-5	135	133	120	132	130	117	128	128	130	122	114	103	117
6.	NDL-2005-24	130	127	119	129	130	118	125	125	123	113	122	99	114
7.	LMS-63-6	138	129	119	132	127	117	130	127	127	105	118	104	114
8.	RL-26018	135	130	117	129	126	119	129	126	128	117	118	106	117
9.	KL-248	137	134	118	127	129	123	130	128	128	125	117	95	116
10.	NL-260	139	130	120	132	127	117	128	128	127	109	117	96	112
11.	SLS-72	132	128	119	130	126	117	129	126	126	104	119	103	113
12.	LBR-6	140	126	121	127	126	117	127	126	123	112	116	103	114
13.	RLC-116	131	135	122	131	130	119	127	128	129	112	121	105	117
14.	LC-54 (ZC-I) /	-	-	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II) /	-	-	-	-	-	-	-	-	-	-	-	-	-
	Suyog (ZC-III & IV)	130	133	119	132	129	120	123	127	127	111	122	107	117
15.	T-397 (NC)	130	129	121	128	127	117	125	125	125	109	122	109	116
	Local	-	132	-	132	127	117	-	127	124	-	119	-	-

Table 2.5.2.5 Initial Varietal Trial (Irrigated) : Number of capsules per plant

Sl. No.	Entry	Z-I		Zonal Mean	Z-II								Zonal Mean
		Palampur	Ludhiana		Kanke	Faizabad	Patna	Berhampore	Masodha	Dholi	Jharnapani	Varanasi	
1.	LCP-146	21	64	43	21	19	163	49	84	108	202	97	93
2.	PCL-12-3-06	16	39	28	18	13	146	54	26	66	208	82	77
3.	PKDL-71	20	41	31	19	21	131	56	56	59	85	95	65
4.	LCK-7035	15	45	30	20	24	125	54	31	57	92	70	59
5.	BAU-06-5	26	41	34	18	26	100	57	21	36	210	93	70
6.	NDL-2005-24	21	41	31	16	36	87	69	30	38	110	103	61
7.	LMS-63-6	17	49	33	18	30	114	58	24	76	112	110	68
8.	RL-26018	21	47	34	21	21	160	52	31	64	115	91	69
9.	KL-248	31	69	50	23	35	144	52	39	68	215	103	85
10.	NL-260	20	42	31	16	20	132	42	31	82	150	102	72
11.	SLS-72	23	56	40	21	19	131	42	41	64	160	104	73
12.	LBR-6	20	48	34	19	20	131	54	38	74	145	117	75
13.	RLC-116	21	52	37	18	17	103	57	44	56	220	116	79
14.	LC-54 (ZC-I) /	29	58	44	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II) /	-	-	-	15	28	173	64	47	74	150	109	83
	Suyog (ZC-III & IV)	-	-	-	-	-	-	-	-	-	-	-	-
15.	T-397 (NC)	19	48	34	22	40	145	58	53	93	201	126	92
	Local	-	-	-	-	-	-	56	-	-	-	-	-

Table 2.5.2.5 Contd.....

Sl. No.	Entry	Z-III						Zonal Mean	Z-IV				Zonal Mean
		Mauranipur	Sagar	Hoshangabad	Tikamgarh	Jabalpur	Udaipur		Nagpur	Raipur	Raichur	Bijapur	
1.	LCP-146	61	166	71	63	75	43	80	64	51	31	36	46
2.	PCL-12-3-06	65	110	40	48	69	48	63	28	33	27	41	32
3.	PKDL-71	41	116	40	50	66	64	63	26	37	25	37	31
4.	LCK-7035	59	106	50	55	68	53	65	57	37	26	45	41
5.	BAU-06-5	49	77	57	54	90	52	63	29	49	26	42	37
6.	NDL-2005-24	40	72	48	47	73	33	52	28	43	33	56	40
7.	LMS-63-6	42	96	47	51	71	77	64	29	49	27	54	40
8.	RL-26018	28	116	43	51	77	48	61	27	44	30	50	38
9.	KL-248	76	156	51	63	75	55	79	59	34	10	39	36
10.	NL-260	42	102	52	59	74	52	64	56	37	32	46	43
11.	SLS-72	57	109	40	66	73	47	65	40	28	25	47	35
12.	LBR-6	64	78	63	66	84	48	67	44	47	18	53	41
13.	RLC-116	70	111	62	63	72	51	61	25	51	17	50	36
14.	LC-54 (ZC-I) /	-	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II) /	-	-	-	-	-	-	-	-	-	-	-	-
	Suyog (ZC-III & IV)	43	100	68	60	71	55	66	42	33	28	47	38
15.	T-397 (NC)	49	91	50	55	70	62	63	30	47	20	49	37
	Local	46	-	71	66	58	-	60	26	-	27	-	-

Table 2.5.2.6 Initial Varietal Trial (Irrigated) : Number of seeds per capsule

Sl. No.	Entry	Z-I			Zonal Mean	Z-II							Zonal Mean
		Palampur	Kaul	Ludhiana		Kanke	Faizabad	Patna	Berhampore	Masodha	Dholi	Jharnapani	
1.	LCP-146	8	7	7	8	8	8	9	8	8	8	10	8
2.	PCL-12-3-06	7	9	9	8	8	7	9	8	7	7	12	8
3.	PKDL-71	7	8	9	8	9	9	8	8	8	8	8	8
4.	LCK-7035	7	7	6	7	8	8	8	8	9	8	10	8
5.	BAU-06-5	8	8	8	8	10	9	10	8	8	8	10	9
6.	NDL-2005-24	8	6	8	7	8	8	8	8	8	8	11	8
7.	LMS-63-6	7	7	7	7	8	8	8	8	6	8	12	8
8.	RL-26018	7	7	8	7	9	8	8	8	6	7	10	8
9.	KL-248	8	8	10	9	8	8	9	9	8	7	8	8
10.	NL-260	8	7	6	7	9	9	8	8	8	7	6	8
11.	SLS-72	7	7	6	7	8	7	7	9	7	7	10	8
12.	LBR-6	8	7	9	8	9	7	9	8	9	7	12	9
13.	RLC-116	7	8	8	8	8	9	8	8	8	8	16	9
14.	LC-54 (ZC-I) /	8	6	8	7	-	-	-	-	-	-	-	-
	Shekhar (ZC-II) /	-	-	-	-	8	8	8	10	8	8	8	8
	Suyog (ZC-III & IV)	-	-	-	-	-	-	-	-	-	-	-	-
15.	T-397 (NC)	7	8	8	8	8	8	9	8	9	7	12	9
	Local	-	-	-		-	-	-	9	-	-	-	

Table 2.5.2.6 Contd.....

Sl. No.	Entry	Z-III				Zonal Mean	Z-IV			Zonal Mean
		Mauranipur	Sagar	Hoshangabad	Tikamgarh		Nagpur	Raipur	Bijapur	
1.	LCP-146	7	7	8	9	8	9	8	8	8
2.	PCL-12-3-06	9	8	7	9	8	6	8	9	8
3.	PKDL-71	9	7	8	9	8	6	6	9	7
4.	LCK-7035	8	7	7	8	8	8	6	8	7
5.	BAU-06-5	8	7	7	9	8	7	7	8	7
6.	NDL-2005-24	9	6	8	9	8	8	8	9	8
7.	LMS-63-6	7	7	7	10	8	8	6	10	8
8.	RL-26018	6	7	6	9	7	7	7	10	8
9.	KL-248	6	8	8	9	8	8	8	9	8
10.	NL-260	8	6	7	9	8	9	7	9	8
11.	SLS-72	9	7	6	9	8	8	5	12	8
12.	LBR-6	9	6	9	9	8	8	8	8	8
13.	RLC-116	8	7	7	9	8	8	7	9	8
14.	LC-54 (ZC-I) /	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II) /	-	-	-	-	-	-	-	-	-
	Suyog (ZC-III & IV)	7	7	9	8	8	8	6	9	8
15.	T-397 (NC)	9	7	8	9	8	8	7	10	8
	Local	7	-	7	9		8	-	-	

Table 2.5.2.7 Initial Varietal Trial (Irrigated) : 1000-seeds weight (g)

Sl. No.	Entry	Z-I			Zonal Mean	Z-II								Zonal Mean
		Palam pur	Kaul	Ludhi ana		Kanke	Faiza bad	Patna	Berham pore	Maso dha	Dholi	Jharna pani	Vara nasi	
1.	LCP-146	7.6	7.9	6.9	7.5	5.1	7.5	6.6	6.1	7.5	5.8	6.1	5.8	6.3
2.	PCL-12-3-06	7.3	8.0	5.9	7.1	5.0	7.4	5.4	7.1	7.3	4.6	6.5	4.4	6.0
3.	PKDL-71	6.9	5.7	5.9	6.2	5.4	8.0	6.1	5.9	8.0	5.4	6.6	5.6	6.4
4.	LCK-7035	7.4	10.5	7.9	8.6	6.7	7.0	8.5	6.0	7.2	6.0	6.2	9.0	7.1
5.	BAU-06-5	7.9	7.8	7.9	7.9	6.2	8.1	6.8	5.6	8.2	5.6	6.8	6.2	6.7
6.	NDL-2005-24	7.3	9.2	7.8	8.1	5.0	7.1	6.2	6.1	7.0	4.4	6.1	5.6	5.9
7.	LMS-63-6	7.5	8.4	5.0	7.0	7.0	7.0	9.7	5.8	7.2	7.2	6.2	8.2	7.3
8.	RL-26018	7.5	13.3	10.0	10.3	7.4	6.7	10.2	5.8	6.8	8.4	6.3	9.2	7.6
9.	KL-248	7.7	6.2	6.6	6.8	5.2	6.4	6.5	5.8	6.4	5.6	6.2	5.0	5.9
10.	NL-260	7.8	11.2	8.8	9.3	5.4	7.8	9.0	6.2	7.8	6.6	6.5	7.4	7.1
11.	SLS-72	7.3	9.4	7.7	8.1	6.4	6.4	8.5	6.2	6.4	5.2	6.6	6.6	6.5
12.	LBR-6	8.0	7.2	5.9	7.0	7.1	6.3	5.1	7.2	6.4	4.8	6.5	4.4	6.3
13.	RLC-116	6.8	7.7	6.1	6.9	6.6	7.2	6.0	6.3	7.2	5.2	6.5	5.6	6.3
14.	LC-54 (ZC-I) /	7.7	10.8	6.7	8.4	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II) /	-	-	-	-	7.2	7.1	8.4	6.9	7.0	6.6	6.5	7.8	7.2
	Suyog (ZC-III & IV)	-	-	-	-	-	-	-	-	-	-	-	-	-
15.	T-397 (NC)	7.5	7.5	6.6	7.2	6.0	7.0	6.6	6.9	6.5	4.4	7.1	5.0	6.2
	Local	-	-	-		-	-	-	6.4	-	-	-	-	

Table 2.5.2.7 Contd.....

Sl. No.	Entry	Z-III					Zonal Mean	Z-IV				Zonal Mean
		Kota	Mauranipur	Sagar	Hoshangabad	Tikamgarh		Nagpur	Raipur	Raichur	Bijapur	
1.	LCP-146	6.6	7.2	7.0	5.8	6.2	6.6	6.0	5.8	9.5	5.4	6.7
2.	PCL-12-3-06	5.2	5.1	6.0	3.8	4.6	4.9	4.4	4.4	9.5	4.7	5.8
3.	PKDL-71	5.8	5.7	6.0	5.5	5.9	5.8	6.0	4.9	9.0	5.3	6.3
4.	LCK-7035	8.0	8.8	8.0	7.9	10.3	8.6	8.0	6.3	9.2	6.6	7.5
5.	BAU-06-5	7.1	6.8	8.0	6.5	6.7	7.0	7.4	6.2	9.3	6.1	7.0
6.	NDL-2005-24	6.4	5.3	8.0	6.0	5.9	6.3	5.2	5.1	9.4	4.5	6.1
7.	LMS-63-6	9.4	5.2	7.0	8.5	7.6	7.5	9.6	9.0	9.3	6.6	8.6
8.	RL-26018	10.5	9.4	9.0	9.8	10.0	9.7	9.8	8.1	8.9	7.4	8.6
9.	KL-248	6.7	6.6	8.0	5.7	5.5	6.5	6.0	4.9	8.9	5.2	6.0
10.	NL-260	9.2	6.7	9.0	8.6	8.4	8.4	7.8	7.1	9.4	6.8	7.8
11.	SLS-72	8.1	5.9	7.0	8.2	8.5	7.5	8.0	6.4	9.4	5.4	7.3
12.	LBR-6	5.8	5.2	5.0	5.0	5.1	4.2	5.4	5.1	8.8	4.2	5.9
13.	RLC-116	7.4	9.6	6.0	4.8	5.5	6.7	6.0	5.3	9.2	5.2	6.4
14.	LC-54 (ZC-I) /	-	-	-	-	-	-	-	-	-	-	-
	Shekhar (ZC-II) /	-	-	-	-	-	-	-	-	-	-	-
	Suyog (ZC-III & IV)	9.0	7.8	8.0	7.5	8.3	8.1	4.4	7.0	9.2	6.7	6.8
15.	T-397 (NC)	8.5	6.2	8.0	5.6	5.5	6.8	4.2	5.1	9.3	4.3	5.7
	Local	-	9.7	-	5.5	6.4	-	7.8	-	9.2	-	-

Table 2.5.2.8 Initial Varietal Trial (Irrigated) : Oil content (%) and oil yield (kg/ha)

Sl. No.	Entry	Oil content (%)				Oil yield (kg/ha)			
		Zone I	Zone II	Zone III	Zone IV	Zone I	Zone II	Zone III	Zone IV
1.	LCP-146	35.74	36.90	36.56	36.50	531	420	493	262
2.	PCL-12-3-06	36.57	36.96	36.82	36.29	494	494	544	360
3.	PKDL-71	39.27	40.91	41.34	37.74	591	457	686	298
4.	LCK-7035	37.97	37.77	38.57	36.91	517	502	636	405
5.	BAU-06-5	35.22	35.45	36.08	34.84	500	489	603	305
6.	NDL-2005-24	35.21	36.64	36.81	36.36	463	446	585	329
7.	LMS-63-6	37.96	39.52	39.38	39.13	575	573	621	364
8.	RL-26018	36.74	37.41	36.52	35.13	587	527	561	347
9.	KL-248	37.98	37.90	39.01	35.95	615	392	558	233
10.	NL-260	35.97	36.60	37.28	36.94	561	475	572	516
11.	SLS-72	40.26	42.65	41.43	40.83	660	591	651	487
12.	LBR-6	37.06	37.15	36.83	36.66	616	518	512	406
13.	RLC-116	36.14	36.67	38.03	36.04	603	494	698	451
14.	LC-54 (ZC-I) /	35.97	-	-	-	592	-	-	-
	Shekhar (ZC-II) /	-	36.68	-	-	-	480	-	-
	Suyog (ZC-III & IV)	-	-	38.47	36.68	-	-	617	397
15.	T-397 (NC)	36.29	37.09	37.44	36.52	639	540	599	458

Table 2.5.2.9 Initial Varietal Trial (Irrigated) : Reaction to diseases and pest

Sl. No.	Entry	Rust				Alternaria blight								Powdery mildew					Bud fly					Wilt		
		Palam pur	Kanke	Ujhani	Jharnapani	Kanke	Kanpur	Faizabad	Masodha	Dholi	Ujhani	Varanasi	Nagpur	Palam pur	Kanke	Ujhani	Maurapur	Nagpur	Faizabad	Patna	Masodha	Varanasi	Maurapur	Nagpur	Palam pur	Kanke
1.	LCP-146	F	R	MR	MR	MR	R	MR	MR	MR	S	MS	R	F	R	R	MR	R	MR	MR	MR	MS	MS	MR	R	MR
2.	PCL-12-3-06	F	MR	F	MR	R	R	MR	MR	MS	R	MS	R	R	MR	F	MR	R	MR	R	R	MS	MR	MS	MR	MS
3.	PKDL-71	F	R	R	MS	R	R	MR	MR	MS	H	R	R	F	MS	MR	MR	R	MR	R	MR	R	MS	S	R	R
4.	LCK-7035	F	MR	F	MS	MR	MR	MR	MR	MR	MR	MS	MS	F	R	F	R	R	MR	R	MR	MS	MR	MS	R	R
5.	BAU-06-5	F	MS	F	MS	MR	R	MS	MS	MS	MR	R	MR	F	MR	F	R	R	MR	R	MR	R	MS	MS	R	MR
6.	NDL-2005-24	F	R	F	MR	MR	R	MS	MS	MR	R	R	MR	S	MS	F	R	MS	MR	R	MR	R	MS	MS	MR	MS
7.	LMS-63-6	F	R	R	MS	MR	MR	MR	MR	MS	MR	R	MS	F	R	F	R	MS	R	R	MR	R	MS	MS	R	MR
8.	RL-26018	F	MR	F	MS	R	MR	S	S	MS	MR	MS	MR	MS	MR	F	R	S	MR	R	MR	MS	MR	HS	R	R
9.	KL-248	F	R	MR	MR	MR	R	MR	MR	MS	H	HS	MR	R	R	F	R	MR	MR	R	MR	MS	MS	MS	R	R
10.	NL-260	F	MR	F	MS	MS	MS	MS	MS	MS	MS	R	R	R	MR	F	R	R	MR	MS	R	R	MS	R	MR	MS
11.	SLS-72	F	R	F	MS	R	MR	MS	MS	MS	MS	R	MS	F	MR	F	MS	R	MR	R	MR	R	MR	MR	R	R
12.	LBR-6	F	R	F	R	MR	R	S	S	MR	R	R	R	HS	R	F	MS	R	MR	R	MR	R	MS	MR	R	R
13.	RLC-116	F	MR	F	MS	R	R	MR	MR	MR	MR	R	MR	F	R	F	R	R	MR	R	MR	R	MR	MR	R	R
14.	LC-54 (ZC-I)/	F	-	-	-	-	-	-	-	-	-	-	-	S	-	-	-	-	-	-	-	-	-	-	R	-
	Shekhar (ZC-II)/	-	MR	F	MS	R	MS	MS	MS	MR	MR	MS	-	-	R	F	-	-	MR	MR	MR	MS	-	-	-	MR
	Suyog (ZC-III & IV)	-	-	-	-	-	-	-	-	-	-	-	MR	-	-	-	R	R	-	-	-	-	MR	MS	-	-
15.	T-397 (NC)	F	MR	F	MS	MR	R	S	S	MS	R	MS	MR	HS	R	F	MS	R	MR	R	MR	MS	MS	MS	R	MR
	Local	-	-	-	-	-	MS	-	-	-	-	-	MS	-	-	-	R	R	-	-	-	-	MR	S	-	-

2.5.3 Initial Varietal Trial (Double Purpose)

The trial was constituted for the performance evaluation of seven test entries vis-a-vis three checks *viz;* Nagarkot for Zone I ; Meera and Parvati for Zones II and III. The experiment was conducted in RBD with three replications across zones following recommended agronomic practices of dual purpose linseed. The test entries and checks were coded as per details enumerated below along their pedigree and sponsoring centres :

Sl.No.	Entry	Code	Pedigree	Source
1.	LCK-7002	070301	T-397 × Nagarkot	Kanpur
2.	NDL-2005-26	070302	EC-14-2 × Shubhra	Faizabad
3.	PKDL-72	070303	Kiran × RL-906	Hoshangabad
4.	LCP-147	070304	Belley × Acc. No. 2251-2	Ludhiana
5.	RL-26016	070305	RL-914 × NL-93	Kota
6.	LMS-23-6	070306	T-397 × LMS-1-57	Mauranipur
7.	KL-232	070307	Polf-38 × Janki	Palampur
8.	Nagarkot (ZC-I)	070308	New River × LC-216	Palampur
9.	Meera (ZC-II & III)	070309	(RL-75-6-2 × RL-29-8) × LCK 8528	Kota
10.	Parvati (ZC-II & III)	070310	EC-41628 / EC-77959 // DPL-20/ Neelum /// EC-216/Hira // BR-1/NP-440	Mauranipur

The trial was allotted to three centres each in Zone I and III whereas, there were eight centres in Zone II. All the assigned centres conducted the trial and recorded observations on seed yield and other ancillary traits which have been documented in Table 2.5.3.1 to 2.5.3.12. Significant varietal differences were observed for seed yield at almost all the locations except Patna and Hoshangabad. Fibre yield data of Palampur and Ludhiana was not entertained for the computation of zonal mean because of low GM *i.e.,* less than 400 kg/ha recorded at the centres. The results obtained have been narrated zone-wise as follows:

Zone I

Based on zonal mean value, it may be inferred that five test entries *i.e.,* NDL 2005-26, PKDL 72, LCP 147, RL 26016 and LCK 7002 were superior to the zonal check Nagarkot (1454 kg/ha) in terms of seed yield. Fibre yield data of this zone was not considered due to the reason cited above. In oil yield too, above mentioned test entries were found better than Nagarkot (520 kg/ha). Kaul recorded lesser plant stand in comparision to Palampur and Ludhiana. Most of the test entries recorded higher straw yield than Nagarkot (905 kg/ha) except LMS 23-6.

As usual, prolonged maturity period was observed in this zone. Palampur centre reported extremely low technical plant height as none of the entry could attain 50 cm height. PKDL 72 and RL 26016 recorded more than 9.0 g 1000-seeds weight.

Zone II

Considering *per se* performance of test entries at eight locations, it may be summarized that four test entries *viz;* LMS 23-6, LCK 7002, LCP 147 and RL 26016 registered more than 10 per cent superiority in seed yield over the check Parvati (1079 kg/ha). But in fibre yield, only two test entries LCK 7002 and LCP 147 could establish superiority over the check Parvati (949 kg/ha). Almost all the test entries except KL 232 recorded more oil yield than zonal check Parvati (420 kg/ha). Plant stand was adequate but in most of the cases significant differences were observed.

Least variation in maturity period was observed in this zone (132-136 days). All the entries recorded more than 50 cm technical plant height in contrary to Zone I suggesting congenial environment for the better expression of dual purpose linseed. Data on other ancillary characters were in support of seed and fibre yield data.

Zone III

Mean yield data of this zone revealed marginal superiority of test entries RL 26016 and LCK 7002 over the check Parvati (1513 kg/ha) in terms of seed yield whereas, in case of fibre yield KL 232 out-yielded the zonal check Parvati by margin of 23.09 per cent followed by RL 26016 and LMS 23-6. Test entry LMS 23-6 could establish numerical advantage in oil yield over Parvati (602 kg/ha). Hoshangabad recorded high plant stand with significant differences. LMS-23-6 was adjudged to be earliest in maturity whereas, KL 232 took maximum days (137). Only two test entries LCK 7002 and KL 232 could record more than 50 cm technical plant height. Data on other ancillary characters were found in support of seed and fibre yield.

With regard to observations recorded on major diseases and pest at different locations, it may be suggested that low disease pressure exists at Palampur for rust and at Ujhani for rust and powdery mildew. LMS 23-6 was the only test entry rated as resistant to powdery mildew at three locations. Incidence of Alternaria blight recorded at five centres showed lack of consistency in disease score. KL 232 can be rated as resistant to Alternaria blight. Wilt incidence recorded at Palampur and Kanke shows that NDL 2005-26 was susceptible at both locations. Bud fly infestation recorded at Faizabad, Patna and Mauranipur centres revealed that almost all the entries were moderately resistant to this pest.

Comparative performance of promising entries

Character	Zone I	Zone II	Zone III
Seed yield (kg/ha)	NDL 2005-26 (1601)*	LMS 23-6 (1249)*	RL 26016 (1553)
	PKDL 72 (1599)*	LCK 7002 (1241)*	LCK 7002 (1520)
	LCP 147 (1569)	LCP 147 (1228)*	
	RL 26016 (1563)	RL 26016 (1220)*	LMS 23-6 (1514)
	LCK 7002 (1479)	NDL 2005-26 (1155)	**Parvati (1513) ZC**
	Nagarkot (1454) ZC	PKDL 72 (1138)	
		Parvati (1079) ZC	
Fibre yield (kg/ha)	-	LCK 7002 (1140)*	KL 232 (1359)*
		LCP 147 (1061)*	RL 26016 (1177)
		Parvati (949) ZC	LMS 23-6 (1167)
			Parvati (1104) ZC
Oil yield (kg/ha)	RL 26016 (572)*	LMS 23-6 (490)*	LMS 23-6 (605)
	PKDL 72 (571)*	LCK 7002 (482)*	**Parvati (602) ZC**
	LCK 7002 (555)	LCP 147 (461)	
	LCP 147 (549)	RL 26016 (457)	
	NDL 2005-26 (544)	NDL 2005-26 (432)	
	Nagarkot (520) ZC	PKDL 72 (427)	
		Parvati (420) ZC	

* Entries exceeding the best check by 10 per cent or more. Values in parentheses indicate seed, fibre or oil yield

Table 2.5.3.1 Initial Varietal Trial (Double purpose) : Seed yield (kg/ha)

Sl. No.	Entry	Zone-I			Zonal Mean	Zone-II								Zonal Mean	Zone-III			Zonal Mean
		Palampur	Kaul	Ludhiana		Kanke	Kanpur	Faizabad	Mainpuri	Berham pore	Patna	Dholi	Ujhani		Kota	Mauranipur	Hoshanga bad	
1.	LCK-7002	631	2438	1367	1479	956	1198	1433	1350	1211	1807	1083	886	1241	1968	1370	1222	1520
2.	NDL-2005-26	642	2325	1837	1601	706	964	1700	622	950	1559	1236	1506	1155	2006	922	1417	1448
3.	PKDL-72	833	2108	1856	1599	917	1219	1333	1340	983	1424	819	1069	1138	1937	714	1111	1254
4.	LCP-147	903	2438	1367	1569	750	833	1533	1330	1183	1892	1167	1139	1228	1678	1344	1417	1480
5.	RL-26016	674	2113	1903	1563	989	1255	1472	1045	1072	1893	1000	1031	1220	2776	911	1472	1553
6.	LMS-23-6	708	1771	1595	1358	722	1094	1917	1230	1183	1744	944	1161	1249	1786	1313	1444	1514
7.	KL-232	938	1567	1247	1251	1083	677	1306	1178	1050	1579	1014	708	1074	1686	1156	1361	1401
8.	Nagarkot (ZC-I)	854	2229	1279	1454	-	-	-	-	-	-	-	-	-	-	-	-	-
9.	Meera (ZC-II & III)	-	-	-	-	878	1333	1000	1040	1028	1747	639	678	1043	1740	938	1639	1439
10.	Parvati (ZC-II & III)	-	-	-	-	889	1094	1250	1262	1217	-	764	1074	1079	1613	1344	1583	1513
	Local	-	-	-	-	-	1161	-	-	-	-	-	-	-	-	-	-	-
	GM	775	2123	1556		877	1083	1438	1155	1098	1706	963	1028		1854	1112	1407	
	SE (m) ±	27.56	69.94	59.63		39.86	64.30	91.89	98.36	48.0	118.28	55.56	62.6		107.81	38.68	103.47	
	CD	116.05**	294.46**	251.03**		164.67**	261.71**	379.59**	406.33**	198.29**	NS	229.49**	258.59**		323.23*	159.79**	NS	
	CV %	6.16	5.70	6.64		7.88	10.29	11.07	14.75	7.58	12.01	9.99	10.55		10.07	6.02	12.73	

Table 2.5.3.2 Initial Varietal Trial (Double purpose) : Plant stand (000/ha)

Sl. No.	Entry	Zone-I			Zonal Mean	Zone-II								Zonal Mean	Zone-III			Zonal Mean
		Palampur	Kaul	Ludhiana		Kanke	Kanpur	Faizabad	Mainpuri	Berhampore	Patna	Dholi	Ujhani		Kota	Mauranipur	Hoshangabad	
1.	LCK-7002	2110	833	1737	1560	1603	1083	1950	861	1017	1800	1278	994	1323	590	571	1763	975
2.	NDL-2005-26	1736	950	1799	1495	1540	918	2550	774	1006	1497	1303	1012	1325	641	577	1407	875
3.	PKDL-72	2093	850	2259	1734	1553	1032	1844	902	1006	1327	1302	989	1244	603	567	1243	804
4.	LCP-147	2153	917	1742	1604	1570	1060	2239	885	994	1400	1289	1004	1305	439	557	1273	756
5.	RL-26016	2393	1000	1604	1666	1317	706	1411	749	1100	1577	1254	975	1136	652	553	1297	834
6.	LMS-23-6	2015	900	1630	1515	1277	1012	1944	824	1033	1207	1283	1003	1198	586	569	1137	764
7.	KL-232	2577	850	1992	1806	1360	1139	1933	863	978	1617	1288	900	1260	566	562	1353	827
8.	Nagarkot (ZC-I)	2469	900	1599	1656	-	-	-	-	-	-	-	-	-	-	-	-	-
9.	Meera (ZC-II & III)	-	-	-	-	1333	924	1706	881	1006	1353	1302	972	1185	586	570	973	710
10.	Parvati (ZC-II & III)	-	-	-	-	1370	1080	1561	920	1028	-	1295	1012	1181	623	536	677	612
	Local	-	-	-	-	-	1064	-	-	-	-	-	-	-	-	-	-	-
	GM	2193	900	1795	-	1436	1002	1904	851	1019	1472	1288	985	-	587	562	1236	-
	SE (m) ±	29.78	34.79	114.06	-	36.67	73.76	133.62	45.13	27.82	106.44	21.24	21.26	-	51.06	9.7	42.63	-
	CD	125.39**	NS	345.99*	-	151.49**	219.16*	551.98**	NS	NS	322.88*	NS	63.74*	-	NS	NS	176.08**	-
	CV %	2.35	6.7	11.0	-	4.42	12.75	12.15	9.18	4.73	12.52	2.86	3.74	-	15.06	2.99	5.97	-

Table 2.5.3.3 Initial Varietal Trial (Double purpose) : Straw yield (kg/ha)

Sl. No.	Entry	Zone-I		Zonal Mean	Zone-II						Zonal Mean	Zone-III		Zonal Mean
		Palam pur	Ludhi ana		Kanke	Kan pur	Faiza bad	Berham pore	Patna	Dholi		Maurani pur	Hoshan gabad	
1.	LCK-7002	1372	1009	1191	2628	5260	5206	4528	5653	4167	4574	2219	2556	2388
2.	NDL-2005-26	1247	758	1003	1739	5052	6861	4000	5453	2583	4281	1911	1778	1845
3.	PKDL-72	1326	734	1030	2194	4479	6111	4361	4950	3361	4243	1339	1861	1600
4.	LCP-147	1288	831	1060	1611	4323	7806	4361	5340	4056	4583	3125	2389	2757
5.	RL-26016	1486	691	1089	2206	4063	5139	3778	4978	4667	4139	1891	2000	1946
6.	*LMS-23-6*	*1188*	*524*	*856*	*1833*	*4740*	*6056*	*4278*	*5343*	*2917*	*4195*	*2328*	*1528*	*1928*
7.	KL-232	1212	752	982	2583	5521	6806	3944	6173	4944	4995	3036	2639	2838
8.	Nagarkot (ZC-I)	1260	549	905	-	-	-	-	-	-	-	-	-	-
9.	Meera (ZC-II & III)	-	-	-	2206	5313	5806	3417	5453	2778	4162	2292	2806	2549
10.	Parvati (ZC-II & III)	-	-	-	2028	4635	5778	3583	-	4083	4021	2750	2917	2834
	Local				-	5521	-							
	GM	1297	731		2114	4891	6107	4028	5418	3728		2321	2275	
	SE (m) ±	28.24	60.2		90.69	164.88	165.97	152.35	358.84	228.96		73.77	112.21	
	CD	118.88**	253.44**		374.64**	671.09**	685.59**	629.35**	NS	945.83**		304.75**	463.55**	
	CV %	3.77	14.26		7.43	5.84	4.71	6.55	11.47	10.64		5.5	8.54	

Table 2.5.3.4 Initial Varietal Trial (Double purpose) : Fibre yield (kg/ha)

Sl. No.	Entry	Zone-I		Zonal Mean	Zone-II				Zonal Mean	Zone-III
		Palampur*	Ludhiana*		Faizabad	Mainpuri	Patna	Dholi		Mauranipur
1.	LCK-7002	**276**	204		1861	937	774	986	1140	661
2.	NDL-2005-26	**251**	152		1917	415	644	542	880	953
3.	PKDL-72	**270**	147		1528	892	457	639	879	656
4.	LCP-147	**260**	166		1889	783	737	833	1061	938
5.	RL-26016	**285**	138		1394	637	727	889	912	1177
6.	LMS-23-6	**235**	99		1250	858	468	569	786	1167
7.	KL-232	**239**	150		1428	693	605	1069	949	1359
8.	Nagarkot (ZC-I)	**249**	143		-	-	-	-	-	-
9.	Meera (ZC-II & III)	-	-		1267	635	594	583	770	948
10.	Parvati (ZC-II & III)	-	-		1194	820	-	833	949	1104
	Local									
	GM	**258**	150		1525	741	626	772		996
	SE (m) ±	**7.08**	13.77		36.53	58.78	41.99	38.42		37.76
	CD	29.81**	57.98**		150.90**	242.83**	176.78**	158.72**		156.0**
	CV %	4.75	15.90		4.15	13.14	11.62	8.62		6.57

* Fibre yield data was not considered due to low GM

Table 2.5.3.5 Initial Varietal Trial (Double purpose) : Days to flowering

Sl. No.	Entry	Zone-I			Zonal Mean	Zone-II								Zonal Mean	Zone-III			Zonal Mean
		Palampur	Kaul	Ludhiana		Kanke	Kanpur	Faizabad	Mainpuri	Berhampore	Patna	Dholi	Ujhani		Kota	Mauranipur	Hoshangabad	
1.	LCK-7002	149	102	111	121	83	82	89	96	65	77	74	108	84	74	74	64	71
2.	NDL-2005-26	145	100	99	115	78	81	82	87	67	-	71	97	80	70	73	58	67
3.	PKDL-72	147	95	99	114	79	77	75	97	62	76	71	98	79	70	63	56	63
4.	LCP-147	153	102	110	122	83	82	90	96	65	83	78	98	84	85	77	62	75
5.	RL-26016	144	99	97	113	74	77	79	97	67	76	71	98	80	70	63	58	64
6.	LMS-23-6	147	95	100	114	80	77	81	91	67	76	66	98	80	70	61	56	62
7.	KL-232	148	101	110	120	81	77	65	97	65	83	76	110	82	86	68	65	73
8.	Nagarkot (ZC-I)	146	103	111	120	-	-	-	-	-	-	-	-	-	-	-	-	-
9.	Meera (ZC-II & III)	-	-	-	-	85	84	91	95	62	80	72	110	85	70	62	57	63
10.	Parvati (ZC-II & III)	-	-	-	-	82	85	91	98	65	79	76	110	86	80	66	63	70
	Local						79	-										

Table 2.5.3.6 Initial Varietal Trial (Double purpose) : Days to maturity

Sl. No.	Entry	Zone-I		Zonal Mean	Zone-II								Zonal Mean	Zone-III			Zonal Mean
		Palampur	Ludhiana		Kanke	Kanpur	Faizabad	Mainpuri	Berhampore	Patna	Dholi	Ujhani		Kota	Mauranipur	Hoshangabad	
1.	LCK-7002	214	151	183	127	138	137	150	130	122	130	148	135	135	132	136	134
2.	NDL-2005-26	211	141	176	120	139	125	143	132	-	123	143	132	140	132	132	135
3.	PKDL-72	215	146	181	125	138	135	147	129	113	124	143	132	140	131	133	135
4.	LCP-147	217	147	182	128	139	138	150	132	123	131	143	136	132	132	136	133
5.	RL-26016	214	145	180	121	138	145	149	135	117	124	144	134	130	133	137	133
6.	LMS-23-6	213	144	179	126	132	132	143	137	121	121	147	133	130	129	137	132
7.	KL-232	212	151	182	128	132	144	151	130	124	132	150	136	135	132	143	137
8.	Nagarkot (ZC-I)	217	151	184	-	-	-	-	-	-	-	-	-	-	-	-	-
9.	Meera (ZC-II & III)	-	-	-	130	138	142	148	132	124	124	148	136	138	128	140	135
10.	Parvati (ZC-II & III)	-	-	-	126	138	140	149	135	124	125	148	136	139	128	142	136
	Local					138	-	-	-								

Table 2.5.3.7 Initial Varietal Trial (Double purpose) : Technical plant height (cm)

Sl. No.	Entry	Zone-I		Zonal Mean	Zone-II							Zonal Mean	Zone-III		Zonal Mean
		Palam pur	Ludhi ana		Kanke	Kan pur	Faiza bad	Main puri	Berha mpore	Patna	Dholi		Maura nipur	Hosha ngabad	
1.	LCK-7002	41	63	52	42	56	68	75	68	52	84	64	52	57	55
2.	NDL-2005-26	22	56	39	34	50	58	70	61	-	63	56	41	41	41
3.	PKDL-72	25	57	41	29	35	55	70	75	39	71	53	37	36	37
4.	LCP-147	33	65	49	41	42	60	86	72	54	77	62	50	42	46
5.	RL-26016	31	52	42	37	41	62	68	69	39	68	55	50	37	44
6.	LMS-23-6	26	52	39	36	38	47	67	72	41	61	52	48	30	39
7.	KL-232	35	60	48	53	65	56	90	76	67	79	69	62	40	51
8.	Nagarkot (ZC-I)	39	51	45	-	-	-	-	-	-	-	-	-	-	-
9.	Meera (ZC-II & III)	-	-	-	44	50	62	87	78	58	77	65	61	52	57
10.	Parvati (ZC-II & III)	-	-	-	44	50	64	84	63	64	80	64	58	60	59
	Local	-	-	-	-	56	-	-	-	-	-	-	-	-	-

Table 2.5.3.8 Initial Varietal Trial (Double purpose) : Number of capsules per plant

Sl. No.	Entry	Zone-I		Zonal Mean	Zone-II					Zonal Mean	Zone-III		Zonal Mean
		Palampur	Ludhiana		Kanke	Faizabad	Berhampore	Patna	Dholi		Mauranipur	Hoshangabad	
1.	LCK-7002	27	41	34	23	44	52	88	57	53	78	64	71
2.	NDL-2005-26	26	38	32	22	63	48	-	64	49	72	51	62
3.	PKDL-72	30	47	39	22	47	39	84	40	46	29	45	37
4.	LCP-147	35	48	42	21	60	39	97	40	51	76	53	65
5.	RL-26016	26	47	37	20	53	47	88	68	55	38	54	46
6.	LMS-23-6	24	69	47	21	27	51	92	60	50	62	68	65
7.	KL-232	35	44	40	23	33	45	116	34	50	58	69	64
8.	Nagarkot (ZC-I)	36	54	45	-	-	-	-	-	-	-	-	-
9.	Meera (ZC-II & III)	-	-		22	28	52	71	31	41	47	60	54
10.	Parvati (ZC-II & III)	-	-		37	37	48	71	40	47	52	68	60

Table 2.5.3.9 Initial Varietal Trial (Double purpose) : Number of seeds per capsule

Sl. No.	Entry	Zone-I			Zonal Mean	Zone-II					Zonal Mean	Zone-III		Zonal Mean
		Palampur	Kaul	Ludhiana		Kanke	Faizabad	Berham pore	Patna	Dholi		Mauranipur	Hoshangabad	
1.	LCK-7002	8	8	8	8	9	8	8	8	7	8	8	7	8
2.	NDL-2005-26	7	8	8	8	9	9	9	-	8	9	7	8	8
3.	PKDL-72	6	8	6	7	8	8	9	7	8	8	9	7	8
4.	LCP-147	7	7	8	7	9	9	6	8	7	8	9	8	9
5.	RL-26016	8	8	7	8	8	5	8	9	8	8	8	7	8
6.	LMS-23-6	7	8	8	8	9	7	8	7	7	8	8	10	9
7.	KL-232	8	8	7	8	8	8	8	8	7	8	8	8	8
8.	Nagarkot (ZC-I)	8	7	8	8	-	-	-	-	-	-	-	-	-
9.	Meera (ZC-II & III)	-	-	-	-	9	7	8	7	7	8	8	7	8
10.	Parvati (ZC-II & III)	-	-	-	-	8	8	8	8	8	8	8	8	8

Table 2.5.3.10 Initial Varietal Trial (Double purpose) : 1000-seeds weight (g)

Sl. No.	Entry	Zone-I			Zonal Mean	Zone-II					Zonal Mean	Zone-III			Zonal Mean
		Palam pur	Kaul	Ludhiana		Kanke	Faiza bad	Berham pore	Patna	Dholi		Kota	Maura nipur	Hoshan gabad	
1.	LCK-7002	7.0	6.8	6.4	6.7	6.0	7.1	6.8	6.6	6.8	6.7	6.7	6.6	6.9	6.7
2.	NDL-2005-26	5.5	7.9	6.4	6.6	6.4	7.1	7.2	-	8.2	7.2	6.4	5.4	8.2	6.7
3.	PKDL-72	10.2	8.9	8.6	9.2	8.0	6.3	6.1	7.8	6.0	6.8	6.0	6.7	5.7	6.1
4.	LCP-147	7.2	8.4	6.0	7.2	5.2	7.0	6.5	5.7	5.8	6.0	8.4	5.6	6.7	6.9
5.	RL-26016	11.2	7.8	9.6	9.5	8.2	7.1	6.6	8.6	7.8	7.7	11.7	8.2	10.3	10.1
6.	LMS-23-6	8.2	6.3	7.6	7.4	6.1	6.8	6.7	7.0	6.4	6.6	6.2	6.8	6.4	6.5
7.	KL-232	7.0	7.9	6.2	7.1	6.4	7.3	7.2	5.8	5.6	6.5	5.4	5.6	6.7	5.9
8.	Nagarkot (ZC-I)	7.8	8.4	6.8	7.7	-	-	-	-	-	-	-	-	-	-
9.	Meera (ZC-II & III)	-	-	-	-	7.4	6.9	6.8	7.2	6.8	7.0	7.8	6.9	8.0	7.6
10.	Parvati (ZC-II & III)	-	-	-	-	7.2	7.0	6.9	7.4	6.0	6.9	8.9	7.4	7.3	7.9

Table 2.5.3.11 Initial Varietal Trial (Double purpose) : Reaction to diseases and pest

Sl. No.	Entry	Rust			Powdery mildew				Alternaria blight					Bud fly			Wilt	
		Palam pur	Kan ke	Ujh ani	Palam pur	Kan ke	Ujha ni	Maura nipur	Kan ke	Kan pur	Faiza bad	Dholi	Ujha ni	Faiza bad	Patna	Maura nipur	Palam pur	Kan ke
1.	LCK-7002	F	R	MS	R	R	F	MR	MS	MR	MR	MR	R	R	MR	MR	MR	MR
2.	NDL-2005-26	F	MR	F	MS	MR	F	S	R	MR	MS	MS	R	R	-	MR	S	MS
3.	PKDL-72	F	MR	F	MR	MR	F	R	MR	R	MR	MS	R	MR	MR	MR	R	MR
4.	LCP-147	F	MR	F	F	MS	F	R	R	MR	MR	MS	R	MR	MS	MR	R	MS
5.	RL-26016	F	R	F	MS	MR	F	MR	MR	R	MS	MR	R	R	MR	MR	R	R
6.	LMS-23-6	F	R	F	R	R	F	R	MR	R	MS	MS	R	R	MR	MR	R	MS
7.	KL-232	F	MR	R	F	MS	F	R	R	R	MR	MR	R	R	MR	MS	R	MR
8.	Nagarkot (ZC-I)	F	-	-	F	-	-	-	-	-	-	-	-	-	-	-	R	-
9.	Meera (ZC-II & III)	-	R	F	-	R	F	R	MR	R	MR	MR	R	R	MR	S	-	R
10.	Parvati (ZC-II & III)	-	MR	MR	-	MR	MR	R	MR	MR	R	MS	R	MR	R	MS	-	MR
	Local								-	R	-			-				

Table 2.5.3.12 Initial Varietal Trial (Double purpose) : Oil content (%) and oil yield (kg/ha)

Sl. No.	Entry	Oil content (%)			Oil yield (kg/ha)		
		Zone I	Zone II	Zone III	Zone I	Zone II	Zone III
1.	LCK-7002	37.52	38.85	39.53	555	482	601
2.	NDL-2005-26	33.98	37.37	37.93	544	432	549
3.	PKDL-72	35.72	37.55	38.54	571	427	483
4.	LCP-147	34.97	37.58	38.73	549	461	573
5.	RL-26016	36.59	37.49	38.00	572	457	590
6.	LMS-23-6	37.92	39.27	39.97	515	490	605
7.	KL-232	34.61	37.09	36.58	433	398	512
8.	Nagarkot (ZC-I)	35.79	-	-	520	-	-
9.	Meera (ZC-II & III)	-	39.37	39.56		411	569
10.	Parvati (ZC-II & III)	-	38.96	39.79		420	602

2.5.4 Initial Varietal Trial (Utera)

This trial consisting of six test entries was constituted for its execution under assured moisture and moisture stress conditions prevailing in zones I and II, III, IV, respectively. Zonal checks were Baner and Surbhi under assured moisture; R552 under moisture stress whereas, T397 was included as national check in both conditions. The trial was laid out in RBD with three replications following recommended agronomic practices. Test entry BAU-06-17 was evaluated under assured moisture situation only due to insufficient quantity of seed supplied by concerned breeder. All the entries were coded as per details outlined below along with their pedigree and sponsoring centers :

S.No.	Entry	Code	Pedigree	Source
1.	T-397 (NC)	070401	T-491 × T-1193-2	P.C. Unit, Kanpur
2.	Surbhi (ZC-I) /	070402	LC-216 × LC-185	Palampur
	R-552 (ZC-II, III & IV)	070402	No. 55 × R-67	Raipur
3.	NL-119	070403	J-23-10 × AKL-60	Nagpur
4.	PKDL-75	070404	KL-168 × LCK-1909	Hoshangabad
5.	BAU-06-17	070405	SLS-11 × R-552	Kanke
6.	NDL-2005-34	070406	LM-46-3 × T-397	Faizabad
7.	RLC-121	070407	(LCK-9313 × ACC. 926) × TLP-1	Raipur
8.	LMSP-5	070408	J-23 × Neela	Mauranipur
9.	Baner (ZC-I)	070409	EC-21741 × LC-216	Palampur

All the assigned centres conducted the trial successfully and reported the data except Kanke and Madhubani. The trial was vitiated at Kanke and Madhubani. Data recorded on seed yield and other ancillary traits have been presented in Table 2.5.4.1 to 2.5.4.9. Seed yield data of Nagpur centre was not considered due to low GM *i.e.,* less than 200 kg/ha. Highly significant differences were observed among the genotypes for seed yield at majority of the testing locations except Kangra and Malan. The results received under different situations are discussed here as under

Assured moisture condition

Perusal of seed yield data presented in Table 2.5.4.1 revealed that none of the test entry could surpass the seed yield of the best check Surbhi (460 kg/ha). Similar trend was observed for oil yield. Satisfactory plant stand was maintained at all the three locations *i.e.,* Palampur, Kangra and Malan. Test entry NDL 2005-34 was earliest in maturity (177 days) whereas, PKDL 75, BAU-06-17 and LMS-5 recorded more than 8.0 g 1000-seeds weight. Data on other ancillary traits were found in agreement with seed yield.

Observations on rust, powdery mildew and wilt infestation recorded in this region indicated low disease presure of rust and powdery mildew at Palampur. Test entry NDL 2005-34 was scored as resistant to rust and moderately resistant to powdery mildew and wilt diseases.

Moisture stress condition

Based on mean seed yield data of seven locations, it may be concluded that national check T 397 is still one of the best and widely adapted varieties under moisture stress utera situation too as none of the test entry could out-yield it. For oil yield too, none were found better than T 397 (248 kg/ha). Highest general mean for seed yield (833 kg/ha) was recorded at Patna along with plant population. Extremely poor plant stands were reported from Jhanjharpur and Raipur centres.

An interesting result with respect to maturity duration was observed under different moisture regime. Test entry NDL 2005-34 reported to be earliest under assured moisture took maximum days (127) to complete its growth and development under moisture stress situation. Seed size was also adversely affected under moisture stress situation.

Test entry RLC 121 alongwith national check T397 were scored resistant to Alternaria blight both at Gorakhpur and Jashipur whereas, NDL 2005-34 and Surbhi were found to be susceptible against Alternaria blight at Jashipur centre. Bud fly infestation recorded at Patna exhibited moderately resistant nature of NL 119, PKDL 75 and T 397, whereas other entries were found moderately susceptible to this key pest.

Comparative performance of promising entries

Character	Under assured moisture	Under moisture stress
Seed yield (kg/ha)	None	None
	Surbhi (460) ZC	**T397 (686) NC**
Oil yield (kg/ha)	None	None
	Surbhi (190) ZC	**T 397 (248) NC**

Table 2.5.4.1 Initial Varietal Trial (Utera) : Seed yield (kg/ha)

Sl. No.	Entry	Assured moisture situation			Mean	Moisture stress situation								Mean
		Zone I				Zone II				Zone III	Zone IV			
		Palam pur	Kan gra	Malan		Jhanjh arpur	Ujhani	Patna	PRDF Gorakhpur	Waras eoni	Nagpur*	Rai pur	Jashi pur	
1.	NL-119	275	273	567	372	272	700	810	73	357	117	226	167	378
2.	PKDL-75	208	210	389	269	209	417	955	130	311	217	396	322	391
3.	BAU-06-17	149	244	600	331	–	–	–	–	–	–	–	–	–
4.	NDL-2005-34	325	254	561	380	305	833	851	733	369	267	547	-	606
5.	RLC-121	289	273	533	365	323	698	727	1040	545	333	297	462	585
6.	LMS-P-5	217	197	594	336	251	623	957	767	343	217	337	487	538
7.	Baner (ZC-I)	331	286	678	432	–	–	–	–	–	–	–	–	–
8.	Surbhi (ZC-I)/	454	292	633	460	–	–	–	–	–	–	–	–	–
	R-552 (ZC-II, III & IV)	–	–	–	–	195	512	538	18	284	35	520	–	345
9.	T-397 (NC)	278	222	567	356	341	819	992	1233	348	83	563	505	686
	Local								417					
	G.M.	281	250	569		271	657	833	551	366	181	417	388	
	SE (m) ±	10.74	23.36	67.97		19.54	30.78	74.53	83.31	23.69	29.9	39.11	48.97	
	CD	44.35**	NS	NS		84.4**	132.94**	229.68*	350.74**	102.34**	92	168.49**	232.35**	
	CV%	6.63	16.18	20.69		12.49	8.11	15.5	26.17	11.22	28.65	16.23	21.84	

* Seed yield data was not considered due to poor GM

Table 2.5.4.2 Initial Varietal Trial (Utera) : Plant stand (000/ha)

Sl. No.	Entry	Assured moisture situation			Mean	Moisture stress situation							Mean
		Zone I				Zone II				Zone III	Zone IV		
		Palam pur	Kangra	Malan		Jhanjh arpur	Ujhani	Patna	PRDF Gorakhpur	Wara seoni	Rai pur	Jashi pur	
1.	NL-119	1280	1549	1633	1487	183	480	4721	787	1626	221	447	1209
2.	PKDL-75	1333	1373	1538	1415	116	283	3827	747	931	134	517	936
3.	BAU-06-17	913	1236	1320	1156	-	-	-	-	-	-	-	1421
4.	NDL-2005-34	1451	1078	1813	1447	190	607	4896	725	2000	110	-	1357
5.	RLC-121	1013	1587	1420	1340	203	500	5245	790	2127	131	503	1014
6.	LMSP-5	924	1601	1204	1243	152	443	4005	573	1293	127	507	
7.	Baner (ZC-I)	949	1811	1849	1536	-	-	-	-	-	-	-	
8.	Surbhi (ZC-I)/	1867	1688	1700	1752	-	-	-	-	-	-	-	
	R-552 (Z-II, III & IV)	-	-	-	-	109	313	3785	810	1349	87	-	1076
9.	T-397 (NC)	1675	1155	1380	1403	217	643	3790	811	1334	153	523	1067
							-	-	755	-			
	GM	1267	1453	1540		167	467	4324	750	1523	138	499	
	SE (m) ±	61.21	47.31	23.72		12.41	31.01	205.44	46.75	65.84	12.28	40.23	
	CD	252.87**	195.44**	98.0**		53.62**	133.98**	887.57**	NS	284.44**	53.05**	NS	
	CV%	8.37	5.64	2.67		12.86	11.5	8.23	10.8	7.49	15.46	13.95	

Table 2.5.4.3 Initial Varietal Trial (Utera) : Days to flowering

Sl. No.	Entry	Assured moisture situation			Mean	Moisture stress situation								Mean
		Zone I				Zone II				Zone III	Zone IV			
		Palampur	Kangra	Malan		Jhanjharpur	Ujhani	Patna	PRDF Gorakhpur	Waraseoni	Nagpur	Raipur	Jashipur	
1.	NL-119	137	121	108	122	81	91	81	95	61	62	52	70	74
2.	PKDL-75	138	119	110	122	83	88	87	99	64	72	56	72	78
3.	BAU-06-17	134	114	110	119	-	-	-	-	-	-	-	-	-
4.	NDL-2005-34	144	114	108	122	87	91	93	101	68	78	69	-	84
5.	RLC-121	140	119	108	122	85	89	79	94	60	65	74	69	77
6.	LMSP-5	133	118	111	121	86	92	72	93	62	58	62	61	73
7.	Baner (ZC-I)	146	123	110	126	-	-	-	-	-	-	-	-	-
8.	Surbhi (ZC-I)/	136	117	108	120	-	-	-	-	-	-	-	-	-
	R-552 (ZC-II, III & IV)	--	-	-	-	88	90	81	93	65	70	62	-	78
9.	T-397 (NC)	131	117	110	119	90	88	79	92	64	69	63	67	77
	Local								96					

Table 2.5.4.4 Initial Varietal Trial (Utera) : Days to maturity

Sl. No.	Entry	Assured moisture situation			Mean	Moisture stress situation							Mean
		Zone I				Zone II			Zone III	Zone IV			
		Palampur	Kangra	Malan		Jhanjharpur	Patna	PRDF Gorakhpur	Waraseoni	Nagpur	Raipur	Jashipur	
1.	NL-119	214	159	170	181	126	119	132	117	110	119	105	118
2.	PKDL-75	213	161	171	182	126	129	137	125	117	123	108	124
3.	BAU-06-17	215	157	172	181	-	-	-	-	-	-	-	-
4.	NDL-2005-34	214	148	170	177	124	128	138	129	122	123	-	127
5.	RLC-121	211	163	171	182	127	127	134	126	109	120	104	121
6.	LMSP-5	213	163	172	183	123	125	131	139	102	122	104	121
7.	Baner (ZC-I)	213	162	171	182	-	-	-	-	-	-	-	-
8.	Surbhi (ZC-I)/	213	160	172	182	-	-	-	-	-	-	-	-
	R-552 (ZC-II, III & IV)	-	-	-	-	127	122	130	123	114	118	-	122
9.	T-397 (NC)	213	155	171	180	130	118	129	120	114	119	103	119
	Local							133					

Table 2.5.4.5 Initial Varietal Trial (Utera) : Number of capsules per plant

Sl. No.	Entry	Assured moisture situation			Mean	Moisture stress situation							Mean
		Zone I				Zone II			Zone III	Zone IV			
		Palampur	Kangra	Malan		Jhanjharpur	Patna	PRDF Gorakhpur	Waraseoni	Nagpur	Raipur	Jashipur	
1.	NL-119	9	15	11	12	08	16	07	14	18	6	11	11
2.	PKDL-75	7	12	12	10	11	10	08	13	18	6	12	11
3.	BAU-06-17	6	8	9	8	-	-	-	-	-	-	-	-
4.	NDL-2005-34	6	8	14	9	12	11	09	15	17	4	-	11
5.	RLC-121	6	14	12	11	15	12	12	18	20	6	13	14
6.	LMSP-5	6	11	11	9	13	11	09	13	19	6	10	12
7.	Baner (ZC-I)	7	15	13	12	-	-	-	-	-	-	-	-
8.	Surbhi (ZC-I)/	8	17	11	12	-	-	-	-	-	-	-	-
	R-552 (ZC-II, III & IV)	-	-	-	-	09	10	05	11	17	4	-	9
9.	T-397 (NC)	7	7	11	8	19	10	20	13	16	7	11	14
	Local					-		08					

Table 2.5.4.6 Initial Varietal Trial (Utera) : Number of seeds per capsule

Sl. No.	Entry	Assured moisture situation			Mean	Moisture stress situation						Mean
		Zone I				Zone II			Zone III	Zone IV		
		Palampur	Kangra	Malan		Jhanjharpur	Patna	PRDF Gorakhpur	Waraseoni	Raipur	Jashipur	
1.	NL-119	7	9	8	8	5	7	4	7	8	9	7
2.	PKDL-75	7	7	7	7	4	5	5	6	6	8	6
3.	BAU-06-17	7	8	7	7	-	-	-	-	-	-	-
4.	NDL-2005-34	8	8	9	8	4	6	6	7	8	-	6
5.	RLC-121	8	9	8	8	5	7	7	8	8	8	7
6.	LMSP-5	7	7	7	7	4	5	6	6	7	7	6
7.	Baner (ZC-I)	8	9	7	8	-	-	-	-	-	-	-
8.	Surbhi (ZC-I)/	8	9	8	8	-	-	-	-	-	-	-
	R-552 (ZC-II, III & IV)	-	-	-	-	5	5	2	6	6	-	5
9.	T-397 (NC)	8	9	8	8	6	7	8	7	8	9	8
	Local	-	-	-	-	-	-	5	-	-	-	-

Table 2.5.4.7 Initial Varietal Trial (Utera) : 1000-seeds weight (g)

Sl. No.	Entry	Assured moisture situation			Mean	Moisture stress situation						Mean
		Zone I				Zone II			Zone III	Zone IV		
		Palampur	Kangra	Malan		Jhanjharpur	Patna	PRDF Gorakhpur	Waraseoni	Raipur	Jashipur	
1.	NL-119	7.1	6.8	7.2	7.0	4.1	5.6	4.4	4.2	5.2	-	4.8
2.	PKDL-75	10.3	9.0	11.1	10.1	3.9	8.3	4.6	4.0	-	5.5	5.3
3.	BAU-06-17	9.1	7.8	10.0	9.0	-	-	-	-	6.5	7.1	6.8
4.	NDL-2005-34	6.8	4.8	9.4	7.0	4.1	5.3	5.6	4.1	4.6	-	4.7
5.	RLC-121	6.8	7.2	7.6	7.2	4.2	6.3	5.8	4.4	6.2	-	5.4
6.	LMSP-5	9.2	7.0	9.1	8.4	3.9	8.1	5.6	4.1	7.2	5.9	5.8
7.	Baner (ZC-I)	6.0	6.3	7.4	6.6	-	-	-	-	-	-	-
8.	Surbhi (ZC-I)/	6.7	5.6	7.3	6.5	-	-	-	-	-	-	-
	R-552 (ZC-II, III & IV)	-	-	-	-	4.0	6.0	4.3	4.0	6.1	-	4.9
9.	T-397 (NC)	6.6	5.2	6.7	6.2	4.4	5.2	6.8	4.1	4.3	5.0	5.0
	Local	-	-	-	-	-	-	4.7	-	-	-	-

Table 2.5.4.8 Initial Varietal Trial (Utera) : Reaction to diseases and pest

Sl. No.	Entry	Rust			Powdery mildew		Wilt			Alternaria blight		Bud fly
		Palampur	Kangra	Malan	Palampur	Malan	Palampur	Kangra	Jashipur	Gorakhpur	Jashipur	Patna
1.	NL-119	F	MR	R	F	F	R	R	F	MS	MS	MR
2.	PKDL-75	F	F	F	F	F	R	MR	F	MS	R	MR
3.	BAU-06-17	F	MR	R	F	F	MS	MS	-	-	-	-
4.	NDL-2005-34	F	R	R	F	MR	R	R	-	R	S	MS
5.	RLC-121	F	F	F	F	F	R	R	F	MR	R	MS
6.	LMSP-5	F	F	F	F	F	R	R	F	R	R	MS
7.	Baner (ZC-I)	F	F	F	F	R	R	R	-	-	-	-
8.	Surbhi (ZC-I)/	F	R	F	F	F	R	R	-	-	S	-
	R-552 (ZC-II, III & IV)	-	-	-	-	-	-	-	-	HS	-	MS
9.	T-397 (NC)	R	S	MR	R	MR	R	R	F	R	R	MR
	Local	-	-	-	-	-	-	-	-	MS	-	-

Table 2.5.4.9 Initial Varietal Trial (Utera) : Oil content (%) and oil yield (kg/ha)

Sl. No.	Entry	Oil content (%)					Oil yield (kg/ha)	
		Under assured moisture	Under moisture stress				Assured moisture	Moisture stress
		Zone I	Zone II	Zone III	Zone IV	Mean (Z-II, III & IV)	Zone I	Zones -II, III & IV
1.	NL-119	39.25	36.92	35.05	38.68	36.88	146	139
2.	PKDL-75	38.65	30.01	35.58	39.31	34.97	104	137
3.	BAU-06-17	37.79	-	-	39.33	39.33	125	-
4.	NDL-2005-34	37.55	35.91	-	34.64	35.28	143	214
5.	RLC-121	39.79	38.33	37.32	-	37.83	145	221
6.	LMS-P-5	39.95	39.18	41.06	39.99	40.08	134	216
7.	Baner (ZC)	36.90	-	-	-	-	159	-
8.	Surbhi (ZC-I)/	41.34	-	-	-	-	190	-
	R-552 (ZC-II, III & IV)	-	35.20	33.71	34.89	34.60	-	119
9.	T-397	37.52	34.54	37.44	36.47	36.15	134	248

2.5.5 Advanced Varietal Trial (Rainfed)

This trial comprising one and two test entries of first year testing in Zone III and IV, respectively was conducted with an objective to develop high yielding linseed varieties for rainfed cultivation. The checks *i.e.,* R552, Padmini and T397 were common in both zones. The experiment was laid out in RBD with five replications at six locations in zone III and with four replications at ten locations in zone IV. All the entries including checks were coded as per details enumerated below along with their pedigree and sources :

S.No.	Entry	Code	Pedigree	Source
			Zone-III	
			1st Year Testing	
1.	T-397 (NC)	070501	T-491/T-1193-2	P.C. Unit, Kanpur
2.	Padmini (AC)	070502	EC-41628 / EC-77959//DPL-20/Neelum	Mauranipur
3.	R-552 (ZC)	070503	No. 55/R-67	Raipur
4.	LMS-149-4	070504	KL-178 / Hira	Mauranipur
			Zone-IV	
			1st Year Testing	
1.	R-552 (ZC)	070505	No. 55/R-67	Raipur
2.	Padmini (AC)	070506	EC-41628/EC-77959//DPL-20/Neelum	Mauranipur
3.	T-397 (NC)	070507	T-491/T-1193-2	P.C. Unit, Kanpur
4.	SLS-68	070508	Kiran / KL-168 / Kiran	Sagar
5.	LMS-149-4	070509	KL-178 / Hira	Mauranipur

All the allotted centres of the zones III and IV conducted the trial successfully except Rewa. Data recorded on seed yield and other ancillary characters have been presented in Table 2.5.5.1 to 2.5.5.9. Seed yield data of Somnathpur was not considered for the computation of zonal mean due to high CV (30.55%). Non-significant varietal differences for seed yield was observed at Kota, Solapur and Bilaspur. Zone-wise results have been discussed as follows :

Zone III

Per se performance of the entries indicated that the test entry LMS 149-4 could not surpass the seed yield of the best check T397 (1436 kg/ha). Similar result was observed in case of oil yield also.

Tikamgarh reported high plant population whereas, least plant count was observed at Kota. Maturity duration of all the entries was almost similar as it varied from 117-120 days. Data on ancillary traits were in support of seed yield.

Alternaria blight incidence recorded at Kota shows that all the entries were moderately resistant. At Mauranipur all the entries were reported moderately resistant to bud fly and free from powdery mildew incidence except T397 which was moderately susceptible.

Zone IV

Based on zonal mean yield data, it may be inferred that test entry LMS 149-4 recorded highest seed yield (852 kg/ha) with yield superiority of 12.25 per cent over the best check T397 (759 kg/ha). It also recorded more than 10 per cent superiority over the best check Padmini in case of oil yield. Out of ten, only five centres

reported data on plant stand. Raipur maintained lowest plant population with significant differences among the genotypes. Non-significant differences among entries for plant stand was observed at Nagpur, Jashipur and Raichur. Test entry SLS 68 was earliest in maturity (107 days). Almost all the entries recorded less than 8.0 g 1000-seeds weight. Data on other ancillary traits were in support of seed yield data.

Diseases and pest incidence recorded at Nagpur, and Jashipur centres of this zone revealed that almost all the entries were moderately resistant to Alternaria blight, powdery mildew, wilt and bud fly except Padmini and T 397 which were rated moderate to highly susceptible against wilt disease.

Comparative performance of promising entries

Character	Zone III	Zone IV
Seed yield (Kg/ha)	None	LMS 149-4 (852)*
	T397 (1436) NC	**T397 (759) NC**
Oil yield (kg/ha)	None	LMS 149-4 (334)*
	T 397 (540) NC	**Padmini (296) AC**

* Entries possessing 10 per cent or more superiority over best check. Values in parentheses indicate seed or oil yield

Table 2.5.5.1 Advanced Varietal Trial (Rainfed) : Zone-III (1st Year Testing)

Sl. No.	Entry	Seed yield (kg/ha)					Zonal Mean	Plant stand (000/ha)				Zonal Mean
		Kota	Sagar	Mauranipur	Tikamgarh	Durgapura		Kota	Sagar	Mauranipur	Tikamgarh	
1.	LMS-149-4	772	700	1022	1700	1325	1104	320	1065	586	2250	1055
2.	R-552 (ZC)	983	1130	938	1668	1815	1307	311	984	587	2878	1190
3.	Padmini (AC)	1004	1010	970	1880	1300	1233	391	1002	586	2136	1029
4.	T-397 (NC)	997	1320	1166	1700	1997	1436	336	1580	588	2371	1219
	Local	-	-	-	1848	1793	-				3264	
	G.M.	939	1040	1024	1759	1646		340	1158	587	2580	
	SE (m) ±	67.94	36.80	21.78	46.58	**58.52**		24.13	38.65	4.52	200.57	
	CD at 5%	NS	158.99**	94.08**	139.64*	241.75**		NS	166.98**	NS	828.52**	
	CV%	16.18	7.91	4.76	5.92	7.95		15.89	7.47	1.72	17.38	

Table 2.5.5.2 Advanced Varietal Trial (Rainfed) : Zone-III (1st Year Testing)

Sl. No.	Entry	Days to flowering					Zonal Meal	Days to maturity					Zonal Man
		Kota	Sagar	Mauranipur	Tikamgarh	Durgapura		Kota	Sagar	Mauranipur	Tikamgarh	Durgapura	
1.	LMS-149-4	58	50	51	62	59	56	120	113	116	110	126	117
2.	R-552 (ZC)	48	51	61	62	56	56	125	112	123	112	129	120
3.	Padmini (AC)	40	53	55	64	58	54	122	114	121	110	128	119
4.	T-397 (NC)	42	53	58	56	60	54	120	116	121	112	132	120
	Local				62	64					113	130	

Table 2.5.5.3 Advanced Varietal Trial (Rainfed) : Zone-III (1st Year Testing)

Sl. No.	Entry	No. of capsules/plant				Zonal Meal	No. of seeds/capsule				Zonal Man
		Sagar	Mauranipur	Tikamgarh	Durgapura		Sagar	Mauranipur	Tikamgarh	Durgapura	
1.	LMS-149-4	80	54	39	45	55	6	9	9	8	8
2.	R-552 (ZC)	140	68	42	46	74	7	**8**	9	7	8
3.	Padmini (AC)	116	74	35	42	67	7	**6**	9	8	8
4.	T-397 (NC)	73	65	42	51	58	8	**9**	9	9	9
	Local				43	**49**				9	9	

Table 2.5.5.4 : Advanced Varietal Trial (Rainfed) : Zone-III (1st Year Testing)

Sl. No.	Entry	1000-seeds wt (g)					Zonal Mean	Reaction to diseases		Bud fly	Oil content (%)	Oil yield (kg/ha)
								A.B.	P.M.			
		Kota	Sagar	Mauranipur	Tikamgarh	Durgapura		Kota	Mauranipur	Mauranipur		
1.	LMS-149-4	8.0	7.0	7.0	6.9	6.8	7.1	MR	F	MR	39.91	441
2.	R-552 (ZC)	5.5	11.0	6.8	7.1	7.6	7.6	MR	F	MR	36.61	478
3.	Padmini (AC)	8.0	10.0	8.6	7.5	8.4	8.5	MR	F	MR	42.34	522
4.	T-397 (NC)	7.5	7.0	5.8	4.9	8.1	6.7	MR	MS	MR	37.63	540
	Local				6.4	7.9					-	-

NB : AB = Alternaria blight, PM = Powdery mildew

Table 2.5.5.5 Advanced Varietal Trial (Rainfed) : Zone-IV (1st Year Testing)

Sl. No.	Entry	Seed yield (kg/ha)										Zonal Mean	Plant stand (000/ha)					Zonal Mean
		Nag pur	Jashi pur	Rai pur	Rai chur	Sola pur	Bilas pur	Jagdal pur	Latur	Somnath pur*	Badna pur		Nag pur	Jashi pur	Rai pur	Rai chur	Jagdal pur	
1.	LMS-149-4	1218	1033	476	599	651	900	1163	1201	352	429	852	820	780	498	583	859	708
2.	SLS-68	892	568	366	369	806	917	627	824	342	539	656	810	653	392	566	681	620
3.	R-552 (ZC)	975	-	180	574	519	930	748	860	323	671	682	852	-	181	550	886	617
4.	Padmini (AC)	895	508	447	493	833	1017	849	898	382	614	728	740	553	368	573	879	623
5.	T-397 (NC)	796	910	714	556	697	767	1156	622	342	610	759	780	753	763	571	830	739
	Local	750	-	-	333	625	-	-	-	-	-		820	-	-	528	-	
	G.M.	921	754	436	487	689	906	909	881	348	572		804	684	441	562	827	
	SE (m) ±	51.30	39.32	37.2	22.97	87.52	58.14	13.59	5473	61.37	17.73		33.18	65.26	59.28	14.44	32.17	
	CD	213.79**	180.72**	160.74**	95.73**	NS	NS	64.48**	236.46**	NS	76.59**		NS	NS	256.12**	NS	104.93*	
	CV%	11.14	10.42	17.05	9.43	22.01	11.11	2.59	12.43	30.55	6.19		8.25	19.07	26.92	5.14	6.74	

* Seed yield data was not considered due to high CV

Table 2.5.5.6 Advanced Varietal Trial (Rainfed) : Zone-IV (1st Year Testing)

Sl. No.	Entry	Days to flowering										Zonal Mean	Days to maturity										Zonal Mean
		Nag pur	Jashi pur	Rai pur	Rai chur	Sola pur	Bilas pur	Jagdal pur	Latur	Somnath pur	Badna pur		Nag pur	Jashi pur	Rai pur	Rai chur	Sola pur	Bilas pur	Jagdal pur	Latur	Somnath pur	Badna pur	
1.	LMS-149-4	55	58	48	52	53	45	41	43	39	45	48	124	111	110	115	118	109	106	87	100	106	109
2.	SLS-68	53	59	48	58	56	44	43	46	39	51	50	123	112	111	119	116	100	99	87	98	106	107
3.	R-552 (ZC)	58	-	57	54	55	56	51	47	41	51	52	126	-	118	115	114	114	115	89	104	106	111
4.	Padmini (AC)	55	61	47	52	53	47	39	44	39	48	49	123	111	111	114	115	101	112	86	99	104	108
5.	T-397 (NC)	55	59	57	59	57	44	47	46	37	55	52	121	109	117	114	116	100	109	88	99	110	108
	Local	55	-	-	70	58	-	-	-	-	-	61	124	-	-	119	112	-	-	-	-	-	118

Table 2.5.5.7 Advanced Varietal Trial (Rainfed) : Zone-IV (1st Year Testing)

Sl. No.	Entry	No. of capsules/plant									Zonal Mean	No. of seeds/capsule								Zonal Mean
		Nag pur	Jashi pur	Rai pur	Rai chur	Sola pur	Jagdal pur	Latur	Somnath pur	Badna pur		Nag pur	Jashi pur	Rai pur	Sola pur	Jagdal pur	Latur	Somnath pur	Badna pur	
1.	LMS-149-4	58	66	19	33	24	29	38	13	57	37	8	8	8	7	7	9	6	7	8
2.	SLS-68	43	88	27	28	27	35	25	24	50	39	8	8	8	6	6	8	7	7	7
3.	R-552 (ZC)	52	-	34	32	21	45	31	23	65	38	8	-	7	5	6	9	7	7	7
4.	Padmini (AC)	44	81	40	37	30	35	45	27	54	44	7	8	7	6	7	8	7	7	7
5.	T-397 (NC)	30	73	26	33	20	35	23	26	57	36	8	9	9	7	6	9	14	7	9
	Local	31			34	37	-	-	-	-	34	7								

Table 2.5.5.8 Advanced Varietal Trial (Rainfed) : Zone-IV (1st Year Testing)

Sl. No.	Entry	1000-seeds wt (g)									Zonal Mean	Reaction to diseases and pest				
												Alternaria blight		P.M.	Bud fly	Wilt
		Nagpur	Jashipur	Raipur	Raichur	Solapur	Bilaspur	Jagdalpur	Latur	Badnapur		Nagpur	Jashipur	Nagpur	Nagpur	Jashipur
1.	LMS-149-4	7.8	8.9	6.4	9.3	5.0	7.4	5.8	6.9	6.7	7.1	MR	R	MR	MR	MR
2.	SLS-68	8.6	8.2	6.2	9.2	4.4	7.4	5.1	7.0	7.1	7.0	MR	MR	MR	MR	MR
3.	R-552 (ZC)	7.2	-	6.1	9.2	3.8	7.2	5.8	6.1	7.5	6.6	MR	-	MR	MR	-
4.	Padmini (AC)	7.4	8.5	6.0	9.2	3.9	6.5	5.5	6.2	6.6	6.6	MS	MR	MR	MR	MS
5.	T-397 (NC)	6.2	5.4	4.5	9.0	3.7	6.0	5.6	4.6	5.6	5.7	MR	MR	MR	MR	HS
	Local	7.8	-	-	9.2	6.0	-	-	-	-	7.7	MS	-	MR	MS	-

Table 2.5.5.9 Advanced Varietal Trial (Rainfed) : Zone-IV (1st Year Testing)

Sl. No.	Entry	Oil content (%)	Oil yield (kg/ha)
1.	LMS-149-4	39.15	334
2.	SLS-68	36.98	243
3.	R-552 (ZC)	35.40	241
4.	Padmini (AC)	40.68	296
5.	T-397 (NC)	36.03	273

2.5.6 Advanced Varietal Trial (Irrigated)

This trial comprising six and seven entries including checks was planned for its execution in zones III & IV, respectively. There were two test entries for each year of testing in zone III whereas, in zone IV two and three test entries were included as first and second years of testing, respectively. J23 was the zonal and T397 was national checks for both the zones. The trial was conducted in RBD with four replications following recommended agronomic practices. All the entries were coded as given below along with their pedigree and sponsoring centres :

Sl. No.	Entry	Code	Pedigree	Source
			Zone-III	
			First Year Testing	
1.	RLC-115	070601	NL-93 × LCK-9312	Raipur
2.	JLT-204	070602	Mutant of JLT-27	Tikamgarh
			Second Year Testing	
3.	NDL-2004-05	070603	Garima × RL-993	Faizabad
4.	SLS-61	070604	(SLS-5 × TLP-1) × LMS-16-3	Sagar
5.	J-23 (ZC)	070605	EC-9832 × Hira	Jabalpur
6.	T-397 (NC)	070606	T-491 × T-1193-2	P.C. Unit Kanpur
			Zone-IV	
			First Year Testing	
1.	RLC-115	070607	NL-93 × LCK-9312	Raipur
2.	JLT-204	070608	Mutant of JLT-27	Tikamgarh
			Second Year Testing	
3.	T-397 (NC)	070609	T-491 × T-1193-2	P.C. Unit Kanpur
4.	J-23 (ZC)	070610	EC-9832 × Hira	Jabalpur
5.	LC-2279-4	070611	1509 × LC-54	Ludhiana
6.	NDL-2004-05	070612	Garimax RL-993	Faizabad
7.	PKDL-52	070613	J-23 × RLC-1	Hoshangabad

All the assigned centres conducted the trial and reported the data on seed yield and ancillary traits (Table 2.5.6.1 to 2.5.6.7). Seed yield data of Hoshangabad, Raipur and Raichur was not considered for the computation of zonal mean either due to high CV or low GM. Varietal differences were highly significant for seed yield at all the testing locations. Jabalpur reported maximum GM (2523 kg/ha) for seed yield. Varietal performances are discussed here as under following sub-heads :

Zone III

Persual of *per se* performance across locations revealed that none of the test entry could surpass the seed yield of the best check J 23 (1768 kg/ha) in both years of testing. Similar results were observed in oil yield also. All the entries were of medium maturity group (125-128 days) and possess eight seeds per capsule. Kota centre reported moderately resistant reactions against Alternaria blight for all the entries. At Mauranipur most of the test entries were either resistant or moderately resistant to powdery mildew and bud fly, respectively.

Zone IV

Test entry LC 2279-4 recorded highest seed yield with yield advantage of 12.65 per cent over the best check T-397 (1447 kg/ha) followed by RLC 115 (1534 kg/ha) and PKDL 52 (1533 kg/ha). In case of oil yield, LC 2279-4 along with RLC 115 registered more than 10 per cent superiority over the best check T 397 (552 kg/ha). In general, plant stands were poor in comparision to zone III. Raipur centre reported extremely low plant population followed by Raichur. All the entries took about 111-115 days to complete their growth and maturity. JLT 204 can be categorised as bold seeded entry as it recorded more than 8.0 g 1000-seeds weight.

Observations on Alternaria blight recorded at Nagpur and Jashipur indicated the resistant behaviour of JLT 204. Test entries RLC 115 and JLT 204 were found susceptible against powdery mildew and bud fly whereas, LC 2279-4 and PKDL 52 were moderately resistant. All the entries were scored free from wilt at Jashipur.

Comparative performance of promising entries

Character	Zone III	Zone IV
	Ist Year Testing	
Seed yield (kg/ha)	None	RLC 115 (1534)
	J23 (1768) ZC	**T 397 (1447) NC**
	IInd Year Testing	
	None	LC 2279-4 (1630)*
	J 23 (1768) ZC	PKDL 52 (1533)
		T 397 (1447) NC
	Ist Year Testing	
Oil yield (kg/ha)	None	RLC 115 (579) *
	J 23 (682) ZC	**T 397 (522) NC**
	IInd Year Testing	
	None	LC 2279-4 (587)*
	J 23 (682) ZC	PKDL 52 (556)
		T 397 (522) NC

* Entries showing 10 per cent or more superiority over best check. Values in parentheses indicate seed or oil yield

Table 2.5.6.1 Advanced Varietal Trial (Irrigated) : Zone-III

Sl. No.	Entry	Seed yield (kg/ha)							Zonal Mean	Plant stand (000/ha)					Zonal Mean
		Kota	Maura nipur	Hoshan gabad*	Sagar	Tikam garh	Jabal pur	Udai pur		Kota	Maur anipur	Hoshan gabad	Sagar	Tikam garh	
						First Year Testing									
1.	RLC-115	2428	1093	1263	975	2355	2319	613	1631	392	586	1010	891	2931	1162
2.	JLT-204	1798	1120	1350	831	2310	2931	844	1639	402	583	943	808	2930	1133
						Second Year Testing									
3.	NDL-2004-05	2074	1353	650	669	2160	1688	619	1427	365	589	505	511	2169	828
4.	SLS-61	2093	1060	1225	1163	2395	2338	700	1625	400	583	1035	985	2659	1132
5.	J-23 (ZC)	2187	1085	1263	1088	2320	3181	744	1768	391	577	1105	1046	2967	1217
6.	T-397 (NC)	1778	1305	813	750	2195	2681	856	1594	401	586	1180	1258	2826	1250
	Local					2260	-	-						2854	
	G.M.	2060	1169	1094	913	2285	2523	729		392	584	963	916	2762	
	SE (m) ±	103.56	23.78	89.63	50.67	51.86	60.42	48.98		23.89	3.77	97.02	89.96	188.39	
	CD	431.62**	99.11**	373.54**	211.19**	154.10*	251.83**	204.15**		NS	NS	404.37**	374.94**	NS	
	CV%	10.06	4.07	16.39	11.11	4.54	4.79	13.44		12.19	1.29	20.15	19.63	13.64	

* Seed yield data was not considered due to high CV

Table 2.5.6.2 Advanced Varietal Trial (Irrigated) : Zone-III

Sl. No.	Entry	Days to flowering							Zonal Mean	Days to maturity							Zonal Mean	Reaction to diseases and pest		
																		AB	PM	Bud fly
		Kota	Maura nipur	Hoshan gabad	Sagar	Tikam garh	Jabal pur	Udai pur		Kota	Maura nipur	Hoshan gabad	Sagar	Tikam garh	Jabal pur	Udai pur		Kota	Maura nipur	Maura nipur
									FIRST YEAR TESTING											
1.	RLC-115	62	55	53	52	64	58	64	58	135	127	131	117	121	118	126	125	MR	R	MR
2.	JLT-204	62	56	53	54	66	60	62	59	132	129	133	118	123	120	133	127	MR	R	MR
									SECOND YEAR TESTING											
3.	NDL-2004-05	77	65	58	59	83	74	72	70	130	129	125	118	127	127	124	126	MR	MR	MR
4.	SLS-61	60	53	50	47	65	59	64	57	134	132	136	117	125	120	129	128	MR	R	MR
5.	J-23 (ZC)	67	56	57	54	78	63	65	63	135	125	131	121	125	117	127	126	MR	R	MS
6.	T-397 (NC)	64	62	55	49	70	65	64	61	130	131	125	119	125	118	128	125	MR	MS	MS
	Local					70								127						

NB : AB - Alternaria blight, PM - Powdery mildew

Table 2.5.6.3 Advanced Varietal Trial (Irrigated) : Zone-III

Sl. No.	Entry	No. of capsules/plant						Zonal Mean	No. of seeds/capsule				Zonal Mean	1000-seeds wt (g)					Zonal Mean
		Maura nipur	Hoshan gabad	Sagar	Tikam garh	Jabal pur	Udai pur		Maura nipur	Hoshan gabad	Sagar	Tikam garh		Kota	Maura nipur	Hoshan gabad	Sagar	Tikam garh	
								FIRST YEAR TESTING											
1.	RLC-115	53	49	118	40	50	30	57	7	8	7	9	8	6.1	7.5	7.5	6.0	7.9	7.0
2.	JLT-204	40	54	143	37	48	21	57	7	9	7	9	8	9.5	9.0	8.9	9.0	8.7	7.3
								SECOND YEAR TESTING											
3.	NDL-2004-05	51	58	141	44	104	55	76	9	7	7	9	8	5.8	5.7	5.5	6.0	4.9	5.6
4.	SLS-61	38	65	132	48	49	37	62	8	8	6	9	8	5.1	7.4	8.8	8.0	6.5	7.2
5.	J-23 (ZC)	36	44	108	47	59	41	56	8	8	7	9	8	8.0	7.4	7.6	8.0	7.4	7.7
6.	T-397 (NC)	41	39	91	45	48	39	51	8	9	4	9	7	5.5	7.1	5.1	6.0	5.4	5.8

Table 2.5.6.4 Advanced Varietal Trial (Irrigated) : Zone III

Sl. No.	Entry	Oil content (%)	Oil yield (kg/ha)
		FIRST YEAR TESTING	
1.	RLC-115	39.08	637
2.	JLT-204	40.22	659
		SECOND YEAR TESTING	
3.	NDL-2004-05	35.58	508
4.	SLS-61	38.55	626
5.	J-23 (ZC)	38.59	682
6.	T-397 (NC)	37.50	598

Table 2.5.6.5 Advanced Varietal Trial (Irrigated) : Zone-IV

Sl. No.	Entry	Seed yield (kg/ha)				Zonal Mean	Plant stand (000/ha)				Zonal Mean	Days to flowering				Zonal Mean
		Nagpur	Raipur*	Raichur*	Jashipur		Nagpur	Raipur	Raichur	Jashipur		Nagpur	Raipur	Raichur	Jashipur	
							FIRST YEAR TESTING									
1.	RLC-115	839	315	511	2228	1534	842	129	537	703	553	59	51	49	55	54
2.	JLT-204	444	450	414	1870	1157	688	281	557	713	560	65	50	55	56	57
							SECOND YEAR TESTING									
3.	LC-2279-4	1148	610	633	2111	1630	858	381	554	758	638	66	57	58	65	62
4.	NDL-2004-05	883	223	436	1004	944	813	126	541	628	527	66	60	66	69	65
5.	PKDL-52	1004	273	327	2061	1533	830	-	502	775	702	62	52	52	59	56
6.	J-23 (ZC)	695	240	734	1909	1302	695	137	590	735	539	62	56	54	59	58
7.	T-397 (NC)	841	1028	502	2052	1447	841	504	570	715	658	60	54	54	58	57
	Local	720		600			833	-	530	-		59	-	61	-	
	G.M.	822	448	520	1891		803	260	548	718						
	SE (m) ±	45.31	34.75	22.73	84.51		53.76	17.65	15.81	26.43						
	CD	181.41**	141.44**	91.01**	343.98**		NS	73.55**	46.51*	78.53*						
	CV%	11.03	15.51	8.75	8.94		13.40	13.6	5.77	7.36						

* Seed yield data was not considered due to high CV and / or poor GM

Table 2.5.6.6 Advanced Varietal Trial (Irrigated) : Zone-IV

Sl. No.	Entry	Days to maturity				Zonal Mean	No. of capsules/plant				Zonal Mean	No. of seeds/capsule				Zonal Mean	1000-seeds wt (g)				Zonal Mean
		Nagpur	Raipur	Raichur	Jashipur		Nagpur	Raipur	Raichur	Jashipur		Nagpur	Raipur	Jashipur			Nagpur	Raipur	Raichur	Jashipur	
									FIRST YEAR TESTING												
1.	RLC-115	124	107	115	102	112	13	38	26	50	32	7	7	9	8	8.2	6.7	9.2	7.5	7.9	
2.	JLT-204	126	106	112	102	112	10	18	32	65	31	8	6	9	8	9.2	8.2	9.1	8.5	8.8	
									SECOND YEAR TESTING												
3.	LC-2279-4	123	115	114	107	115	58	32	25	92	52	8	7	9	8	8.0	6.2	9.4	5.9	7.4	
4.	NDL-2004-05	120	117	110	111	115	40	26	32	99	49	7	7	9	8	6.8	7.1	10.1	6.9	7.7	
5.	PKDL-52	121	108	115	101	111	45	25	41	50	40	8	7	9	8	7.0	5.4	9.2	6.4	7.0	
6.	J-23 (ZC)	123	112	114	101	113	11	39	25	50	31	8	7	9	8	8.4	6.9	10.0	8.1	8.4	
7.	T-397 (NC)	120	111	114	103	112	44	29	30	87	48	8	8	9	8	4.8	5.0	9.4	5.1	6.1	
	Local	124	-	115			19		34			7	-	-	-	7.8	-	8.9	-	-	

Table 2.5.6.7 Advanced Varietal Trial (Irrigated) : Zone-IV

Sl. No.	Entry	Oil content (%)	Oil yield (kg/ha)	Reaction to diseases and pest				
				Alternaria blight		P.M.	Bud fly	Wilt
				Nagpur	Jashipur	Nagpur	Nagpur	Jashipur
			FIRST YEAR TESTING					
1.	RLC-115	37.75	579	MR	MS	HS	S	F
2.	JLT-204	37.87	438	R	MR	S	HS	F
			SECOND YEAR TESTING					
3.	LC 2279-4	35.99	587	MR	MS	MR	MR	F
4.	NDL 2004-05	37.96	358	MS	R	MR	MS	F
5.	PKDL-52	36.24	556	MR	MS	MR	MR	F
6.	J-23 (ZC)	37.48	488	MS	S	MS	S	F
7.	T-397 (NC)	36.06	522	MR	MS	MR	MR	F
	Local	-	-	MR	-	MR	S	-

2.5.7 Advanced Varietal Trial (Double purpose)

The trial was conducted in zone I as IInd year testing and in zone II both as 1st and 2nd year testing with four and five entries including checks, respectively. Zonal checks were Nagarkot (Zone I) and Meera and Parvati (Zone II). The experiment was conducted in RBD with five replications in zone I and four replications in zone II under irrigated and well managed condition. All the test entries, checks and filler were coded as given below along with their pedigree and sources of origin :

Sl. No.	Entry	Code	Pedigree	Source
			Zone-I	
			2nd Year Testing	
1.	Nagarkot (ZC)	070701	New River × LC-216	Palampur
2.	Filler (Rashmi)	070702	Gaurav × Janki	Kanpur
3.	LMS-95-4	070703	RL-904 × LCK-88312	Mauranipur
4.	LCK-5021	070704	Garima × LCK-88062	Kanpur
			Zone-II	
			1st Year Testing	
1.	LCK-6028	070705	LCK-88062 × Neela	Kanpur
2.	PKDL-62	070706	Kiran × ACC. No. 801	Hoshangabad
			2nd Year Testing	
3.	LCK-5021	070707	Garima × LCK-88062	Kanpur
4.	Meera (ZC)	070708	(RL-75-6-2 × RL-29-8) × LCK-8528	Kota
5.	Parvati (ZC)	070709	EC-41628/EC-77959//DPL-20/Neelum /// EC-216/Hira // BR-1/NP-440	Mauranipur

All the assigned centers conducted the trial nicely except Larnoo and reported the data except Khudwani which have been presented in Table 2.5.7.1 to 2.5.7.7. Seed yield data of Palampur and fibre yield data of Palampur and Ludhiana were not considered for the computation of zonal mean due to low GM. Likewise, seed yield data of Patna was not considered because of high CV. Significant varietal differences for seed and fibre yield were observed at all the testing locations. Highest general mean for seed and fibre yield was recorded at Kanke and Faizabad, respectively. Performance of entries in their respective zones have been narrated as below :

Zone I

Perusal of yield data presented in Table 2.5.8.1 clearly revealed the superiority of 2nd year test entries LCK 5021 and LMS 95-4 over the zonal check Nagarkot (1292 kg/ha). LCK 5021 out-yielded Nagarkot by a margin of 19.89 and 24.89 per cent whereas, another test entry LMS 95-4 registered the superiority of 4.72 and 8.23 per cent in terms of seed and oil yield, respectively. Fibre yield data of this zone was not considered due to low GM recorded at both reporting centres. Sufficient plant populations were maintained at all the

locations in all the entries except poor germination of Rashmi at Kaul and Palampur. Reduced technical plant height and/or stunted growth was noticed in all the entries at Palampur. All the entries appear to be of same maturity duration. Test entry LMS 95-4 can be categorized in to bold seeded group as it recorded more than 8.0 g 1000-seeds weight.

Disease reactions recorded at Palampur centre revealed low pressure for foliar diseases as all the tested entries were found free from rust and powdery mildew. LCK 5021 was scored as moderately susceptible against wilt.

Zone II

Based on zonal mean data, it may be inferred that all the three test entries were better than the best check Parvati in terms of seed as well as oil yield whereas, in case of fibre yield only two test entries LCK 5021 and LCK 6028 could establish marginal superiority over best zonal check Parvati (923 kg/ha). Dense population density was reported from Patna. Maturity duration varied from 131-133 days which is about five days earlier than the previous year. Meera recorded highest technical plant height (65 cm) followed by another check Parvati (62 cm). Ancillary traits were found in support of seed and fibre yield data.

Incidence recorded on major diseases and pest revealed that LCK 5021 was resistant to Alternaria blight and powdery mildew and moderately resistant to rust, wilt and bud fly. LMS 95-4 exhibited moderately susceptible reactions against Alternaria blight across locations.

Comparative performance of promising entries

Zone and year of testing	Seed yield (kg/ha)	Fibre yield (kg/ha)	Oil yield (kg/ha)
I, 2nd year	LCK 5021 (1549)*	-	LCK 5021 (577)*
	LMS 95-4 (1353)		LMS 95-4 (500)
	Nagarkot (1292) ZC		**Nagarkot (462) ZC**
II, 1st year	LCK 6028 (1266)*	LCK 6028 (931)	PKDL 62 (492)*
	PKDL 62 (1226)		LCK 6028 (483)
II, 2nd year	LCK 5021 (1241)	LCK 5021 (963)	LCK 5021 (496)*
	Parvati (1151) ZC	**Parvati (923) ZC**	**Parvati (445) ZC**

* Entries showing 10 per cent or more superiority over best check. Values in parentheses indicate seed, fibre or oil yield

Table 2.5.7.1 Advanced Varietal Trial (Double purpose) : Zone-I (Second Year Testing)

Sl. No.	Entry	Seed yield (kg/ha)			Zonal Mean	Plant stand (000/ha)			Zonal Mean	Straw yield (kg/ha)		Zonal Mean
		Palampur*	Kaul	Ludhiana		Palampur	Kaul	Ludhiana		Palampur	Ludhiana	
1.	LCK-5021	521	1475	1623	1549	1698	1070	2330	1699	1227	910	1069
2.	LMS-95-4	544	1487	1218	1353	2057	1260	1931	1749	872	834	853
3.	Rashmi (Filler)	161	642	1091	867	148	160	2193	834	198	818	508
4.	Nagarkot (ZC-I)	563	1547	1036	1292	2223	1027	2367	1872	956	924	940
	G.M.	447	1288	1242		1532	879	2205		813	872	
	SE (m) ±	15.92	49.23	38.13		42.67	78.29	105.52		26.67	33.2	
	CD	73.16**	212.69**	164.75**		196.11**	338.24**	325.17*		122.6**	NS	
	CV%	7.12	8.55	6.87		5.57	19.91	10.7		6.56	8.52	

* Seed yield data was not considered due to low GM

Table 2.5.7.2 Advanced Varietal Trial (Double purpose) : Zone-I (Second Year Testing)

Sl. No.	Entry	Fibre yield (kg/ha)		Zonal Mean	Days to flowering			Zonal Mean	Days to maturity			Zonal Mean	Technical plant height (cm)		Zonal Mean
		Palampur*	Ludhiana*		Palampur	Kaul	Ludhiana		Palampur	Kaul	Luchiana		Palampur	Ludhiana	
1.	LCK-5021	245	180	-	152	98	105	118	217	139	147	168	28	55	42
2.	LMS-95-4	174	167	-	153	101	104	119	215	141	146	167	36	65	51
3.	Rashmi (Filler)	40	164	-	153	99	108	120	218	139	151	169	26	59	43
4.	Nagarkot (ZC-I)	182	187	-	147	98	109	118	217	138	149	168	32	63	48
	G.M.	160	175												
	SE (m) ±	7.86	6.91												
	CD	36.15**	NS												
	CV%	9.81	8.86												

*Fibre yield data was not considered due to low GM

Table 2.5.7.3 Advanced Varietal Trial (Double purpose) : Zone-I (Second Year Testing)

Sl. No.	Entry	No. of capsules/ plant		Zonal Mean	No. of seeds/ capsule			Zonal Mean	1000-seeds wt (g)			Zonal Mean	Reaction to diseases			Oil content (%)	Oil yield (kg/ha)
													Palampur				
		Palampur	Ludhiana		Palampur	Kaul	Ludhiana		Palampur	Kaul	Ludhiana		Wilt	PM	Rust		
1.	LCK-5021	28	47	38	8	8	7	8	8.7	6.6	7.1	7.5	MS	F	F	37.25	577
2.	LMS-95-4	31	42	37	8	7	8	8	8.9	9.7	7.6	8.7	R	F	F	36.98	500
3.	Rashmi (Filler)	29	42	36	7	7	8	7	6.9	6.9	6.9	6.9	R	F	F	36.05	313
4.	Nagarkot (ZC-I)	41	41	41	7	9	7	8	6.6	6.7	5.8	6.4	R	F	F	35.73	462

Table 2.5.7.4 Advanced Varietal Trial (Double purpose) : Zone-II

Sl. No.	Entry	Seed yield (kg/ha)						Zonal Mean	Plant stand (000/ha)						Zonal Mean	Straw yield (kg/ha)						Zonal Mean
		Kanke	Kan pur	Faiza bad	Berham pore	Dholi	Patna*		Kanke	Kan pur	Faiza bad	Berham pore	Dholi	Patna		Kanke	Kan pur	Faiza bad	Berham pore	Dholi	Patna	
											First Year Testing											
1.	LCK-6028	1971	1204	1404	962	787	1881	1266	1610	1358	957	837	1248	2127	1356	3257	4183	3942	2500	3474	6188	3924
2.	PKDL-62	2055	1108	1298	938	733	1658	1226	1643	1362	1417	849	1235	1915	1404	3317	4736	4022	2284	3131	3600	3515
											Second Year Testing											
3.	LCK-5021	1899	1298	1154	947	907	1608	1241	1545	1341	1378	945	1250	1962	1404	3077	4327	4904	2212	3714	4125	3727
4.	Meera (ZC)	1923	1214	981	743	781	1426	1128	1625	1406	1365	952	1230	2136	1452	3221	4663	4054	1971	3990	5225	3854
5.	Parvati (ZC)	1779	1257	1234	822	661	1495	1151	1693	1401	1372	974	1226	2122	1465	3089	4111	4343	2344	3822	5460	3862
	G.M.	1925	1216	1214	882	774	1614		1623	1374	1298	911	1238	2052		3192	4404	4253	2262	3626	4919	
	SE (m) ±	49.27	31.82	49.6	43.31	29.54	130.12		29.5	38.92	28.09	16.59	14.2	46.07		77.86	104.14	81.56	64.5	163.66	51.5	
	CD	151.82*	98.05*	235.32**	133.47*	127.64**	NS		90.9*	NS	133.29**	71.68**	NS	141.97*		NS	449.92**	386.99**	278.68**	504.34*	222.52**	
	CV%	5.12	5.23	7.08	9.82	7.63	16.13		3.64	5.67	3.75	3.64	2.29	4.49		4.88	4.13	3.32	5.7	9.03	2.09	

*Seed yield data was not considered due to high CV

Table 2.5.7.5 Advanced Varietal Trial (Double purpose) : Zone-II

Sl. No.	Entry	Fibre yield (kg/ha)			Zonal Mean	Days to flowering						Zonal Mean	Days to maturity						Zonal Mean
		Faizabad	Dholi	Patna		Kanke	Kanpur	Faizabad	Berhampore	Dholi	Patna		Kanke	Kanpur	Faizabad	Berhampore	Dholi	Patna	
								First Year Testing											
1.	LCK-6028	1266	727	800	931	78	83	84	65	72	77	77	127	146	144	128	124	117	131
2.	PKDL-62	1314	607	451	791	82	77	82	67	71	74	76	133	138	143	129	126	116	131
								Second Year Testing											
3.	LCK-5021	1378	962	548	963	83	82	81	65	73	79	77	128	138	142	131	125	120	131
4.	Meera (ZC-II)	1138	889	547	858	86	78	85	67	72	80	78	132	140	140	128	124	120	131
5.	Parvati (ZC-II)	1298	962	508	923	84	80	86	70	76	79	79	134	138	140	133	129	121	133
	G.M.	1279	829	571															
	SE (m) ±	21.2	52.55	5.62															
	CD	100.58**	144.41**	24.26**															
	CV%	2.87	8.95	1.97															

Table 2.5.7.6 Advanced Varietal Trial (Double purpose) : Zone-II

Sl. No.	Entry	Technical plant height (cm)						Zonal Mean	No. of capsules/plant					Zonal Mean	No. of seeds/capsule					Zonal Mean
		Kanke	Kanpur	Faizabad	Berhampore	Dholi	Patna		Kanke	Faizabad	Berhampore	Dholi	Patna		Kanke	Faizabad	Berhampore	Dholi	Patna	
	First Year Testing																			
1.	LCK-6028	43	35	57	68	71	53	55	30	48	62	66	67	55	8	6	8	8	8	8
2.	PKDL-62	34	41	48	74	58	44	50	32	29	55	55	84	51	9	7	7	8	8	8
	Second Year Testing																			
3.	LCK-5021	46	30	63	78	77	48	57	30	31	54	65	54	47	9	8	6	9	8	8
4.	Meera (ZC-II)	52	41	69	71	90	66	65	35	28	53	41	48	41	9	8	8	6	7	8
5.	Parvati (ZC-II)	44	37	75	66	84	64	62	33	36	49	78	51	49	8	8	9	7	7	8

Table 2.5.7.7 Advanced Varietal Trial (Double purpose) : Zone-II

Sl. No.	Entry	1000-seeds wt (g)					Zonal Mean	Reaction to diseases and pest								Oil content (%)	Oil yield (kg/ha)
								Alternaria blight			Rust	Wilt	P.M.	Bud fly			
		Kanke	Faizabad	Berhampore	Dholi	Patna		Kanke	Kanpur	Faizabad	Kanke	Kanke	Kanke	Faizabad	Patna		
	First Year Testing																
1.	LCK-6028	8.4	8.0	7.5	6.4	8.1	7.7	MR	MS	MS	R	MR	MR	MR	MR	38.17	483
2.	PKDL-62	6.8	8.8	8.1	7.2	8.4	7.9	MS	MS	MS	R	R	MS	R	MS	40.12	492
	Second Year Testing																
3.	LCK-5021	6.2	9.2	7.9	6.8	7.6	7.5	R	R	MR	MR	MR	R	MR	R	39.95	496
4.	Meera (ZC-II)	7.0	7.5	6.8	6.1	7.2	6.9	MR	MR	S	MR	MR	MR	MR	R	38.83	438
5.	Parvati (ZC-II)	7.6	8.4	7.5	7.2	7.4	7.6	R	R	MR	R	MS	MR	MR	R	38.67	455

2.5.8 Advanced Varietal Trial (Utera)

This trial comprising two test entries, two checks and one filler was constituted as first year testing to evaluate their performance under assured moisture condition. T 397 and Surbhi were the national and zonal check, respectively whereas, Sweta was included as filler. The experiment was conducted in RBD with four replications at three locations. All the entries were coded as enumerated below along with their pedigree and sponsoring centres :

Sl. No.	Entry	Code	Pedigree	Source
			First Year Testing	
			Under assured moisture	
1.	T-397 (NC)	70801	T-491 × T-1193-2	P.C. Unit, Kanpur
2.	Surbhi (ZC)	70802	LC-216 × LC-185	Palampur
3.	PKDL-65	70803	Kiran × R-552	Hoshangabad
4.	RLC-112	70804	Kiran × Chambal	Raipur
5.	Filler (Sweta)	70805	Mukta × T-1206	

The break-up of allocated locations were Palampur, Kangra and Malan locating in Himachal Pradesh. All the centres conducted the trial and the data recorded on seed yield and other ancillary characters have been presented in Table 2.5.8.1 to 2.5.8.4.

Perusal of seed yield data reflected significant varietal differences at all the locations. Mean seed yield data revealed that zonal check Surbhi was the highest yielder (453 kg/ha) followed by test entry PKDL 65 (346 kg/ha). Almost similar trend was observed for oil yield.

Comparatively less plant stand count was noticed at Palampur. National check T 397 was the earliest in maturity (177 days). Seed setting was good as almost all the entries possess 8-9 seeds per capsule.

Disease reactions recorded at Palampur, Malan and Kangra revealed freeness of all the entries from rust and powdery mildew. With regard to wilt incidence Sweta and Surbhi may be rated as resistant genotype.

Comparative performance of promising entries

Character	1st year testing under assured moisture
Seed yield (kg/ha)	None
	Surbhi (453) ZC
Oil yield (kg/ha)	None
	Surbhi (189) ZC

Table 2.5.8.1 Advanced Varietal Trial (Utera) : Assured moisture condition

Sl. No.	Entry	Seed yield (kg/ha)			Zonal Mean	Plant stand (000/ha)			Zonal Mean
		Palampur	Kangra	Malan		Palampur	Kangra	Malan	
1.	Sweta (Filler)	315	269	425	336	1041	1508	1465	1338
2.	RLC-112	300	336	372	336	866	1715	1747	1443
3.	PKDL-65	293	350	394	346	898	1827	1417	1381
4.	Surbhi (Z-I)	456	314	589	453	1908	1613	1656	1726
5.	T-397 (NC)	308	195	431	311	860	1338	1428	1209
	G.M.	335	293	442		1115	1600	1542	
	SE (m) ±	10.43	14.41	44.17		15.25	17.69	22.03	
	CD%	45.04**	62.26**	136.13*		65.87**	76.44**	95.19**	
	CV%	6.23	9.84	19.98		2.74	2.21	2.86	

Table 2.5.8.2 Advanced Varietal Trial (Utera) : Assured moisture condition

Sl. No.	Entry	Days to flowering			Zonal Mean	Days to maturity			Zonal Mean	No. of capsules/plant			Zonal Mean
		Palampur	Kangra	Malan		Palampur	Kangra	Malan		Palampur	Kangra	Malan	
1.	Sweta (Filler)	134	125	115	125	211	162	170	181	9	8	8	8
2.	RLC-112	147	126	114	129	213	166	171	183	8	11	8	10
3.	PKDL-65	140	125	112	126	214	164	170	183	7	16	11	11
4.	Surbhi (Z-I)	141	122	111	125	213	161	171	182	10	9	11	10
5.	T-397 (NC)	133	118	113	121	209	151	171	177	6	7	9	7

Table 2.5.8.3 Advanced Varietal Trial (Utera) : Assured moisture condition

Sl. No.	Entry	No. of seeds/capsule			Zonal Mean	1000-seeds wt (g)			Zonal Mean	Reaction to diseases						
										Rust			Wilt			Powdery mildew
		Palampur	Kangra	Malan		Palampur	Kangra	Malan		Palampur	Kangra	Malan	Palampur	Kangra	Malan	Palampur
1.	Sweta (Filler)	8	9	9	9	8.3	8.1	9.5	8.6	F	F	F	S	R	R	F
2.	RLC-112	8	8	8	8	7.1	6.3	7.2	6.9	F	MR	F	MR	R	F	F
3.	PKDL-65	8	9	9	9	7.5	6.8	8.1	7.5	F	F	F	MR	MR	F	F
4.	Surbhi (Z-I)	8	9	9	9	6.7	5.8	6.9	6.5	F	F	F	R	R	F	F
5.	T-397 (NC)	8	8	8	8	6.5	5.3	6.3	6.0	F	HS	MS	MR	R	MR	F

Table 2.5.8.4 Advanced Varietal Trial (Utera) : Assured moisture condition

Sl. No.	Entry	Oil content (%)	Oil yield (kg/ha)
1.	Sweta (Filler)	41.77	140
2.	RLC-112	37.82	127
3.	PKDL-65	38.97	135
4.	Surbhi (Z-1)	41.64	189
5.	T-397 (NC)	37.64	117

2.5.9 Extra early maturing varietal trial (Rainfed)

This trial was conceptualized in order to breed short duration varieties (less than 110 days) for central and peninsular regions. It comprised of five test entries as first year testing in zones III & IV, one and two test entries as second and third years of testing in zone III and two test entries as second year testing in zone IV. There were three checks *i.e.*, JLS 9, NL 97 and T 397 common in both zones. The experiment was conducted in RBD with three replications. All the entries were coded as enumerated below along with their pedigree and sources of origin :

Sl. No.	Entry	Code	Pedigree	Source
			ZONE-III & IV	
			FIRST YEAR TESTING	
1.	PCL-35-06	070901	RL-993 × EC-1424	P.C. unit, Kanpı
2.	SLS-73	070902	LMH-62 × Laxmi-27	Sagar
3.	PKDL-73	070903	LCK-1909 × Kiran	Hoshangabad
4.	OLC-99-57	070904	Mutant	Jashipur
5.	RLC-116	070705	-	Raipur
6.	JLS-9 (ZC)	070706	(RL-102 × R-7) × J-23	Sagar
7.	NL-97 (ZC)	070707	R-7 × RLC-4	Nagpur
8.	T-397 (NC)	070708	T-491 × T-1193-2	P.C. unit, Kanpur
			ZONE-III	
			SECOND YEAR TESTING	
9.	JLT-215	090909	Mutant of JLT-84-5-1	Tikamgarh
			THIRD YEAR TESTING	
10.	SLS-67	070910	LCK-9610 × LMS-127	Sagar
11.	SLC-66*	070911	Selection from LC-2512	Sagar
			ZONE-IV	
			SECOND YEAR TESTING	
12.	RLC-114	070912	LCK-88062 × T-397	Raipur
13.	JLT-215	070913	Mutant of JLT-84-5-1	Tikamgarh

* Additional testing

Zonewise break-up of locations were Mauranipur, Sagar and Hoshangabad (Zone-III); Nagpur, Raipur, Jagdalpur, Bilaspur, Jashipur and Raichur (Zone-IV). All the assigned centres conducted the trial and reported the data which have been presented in Table 2.5.9.1 to 2.5.9.5. Significant difference for seed yield was observed at all the locations except Bilaspur. Sagar reported highest GM (1394 kg/ha) for seed yield. Performances of entries have been discussed here as follows:

Zone III

Mean seed yield data revealed that almost all the test entries except SLS 66 have recorded more seed yield than the highest yielding check JLS 9 (933 kg/ha) with yield advantage of 4.07 to 28.83 per cent. Almost similar results were observed in case of oil yield. Sagar reported high plant stand in comparision to Mauranipur and Hoshangabad centres. Maturity period in this zone varied from 113-120 days.

Incidence of powdery mildew and bud fly infestation recorded at Mauranipur indicated that test entries OLC 99-57 and RLC 116 were resistant to powdery mildew while the others were free from the disease. Test entries JLT 215 and SLS 66 were found resistant to bud fly.

Zone IV

Based on zonal mean yield data, it may be concluded that four test entries *i.e.* PKDL 73, OLC 99-57, RLC 116 and RLC 114 have exhibited better performance than the best check T 397 (806 kg/ha). For oil yield, five test entries were found promising as they recorded more yield than the best check JLS 9 (300 kg/ha). Most of the centres maintained optimum plant stands except Raipur. All the entries were at par in maturity period which varied from 106 to 111 days. PKDL 73 was the earliest in maturity. In this zone, none of the entry was found in bold seeded group.

Incidence of Alternaria blight recorded at Nagpur and Jashipur revealed lack of homology in disease reaction with only exception of RLC 114 showing moderate resistant reaction at both locations. None of the entry was resistant to powdery mildew and bud fly infestation recorded at Nagpur. Two test entries *i.e.,* PCL 35-06 and OLC 99-57 were found resistant to wilt incidence recorded at Jashipur centre.

Comparative performance of promising entries

Zone and year of testing	Seed yield (kg/ha)	Days to maturity	Oil yield (kg/ha)
III, 1st year	RLC 116 (1202)*	118	SLS 73 (456)*
	PKDL 73 (1115)*	114	RLC 116 (441)*
	SLS 73 (1103)*	114	PKDL 73 (424)*
	OLC 99-57 (1015)	116	OLC 99-57 (388)
	PCL 35-06 (971)	113	**JLS 9 (380) ZC**
	JLS 9 (933) ZC	116	
III, 2nd year	JLT 215 (1028)*	115	JLT 215 (400)
	JLS 9 (933) ZC	116	**JLS 9 (380) ZC**
III, 3rd year	SLS 67 (1088)*	114	SLS 67 (423)*
	JLS 9 (933) ZC	116	JLS 9 (380) ZC
IV, 1st year	OLC 99-57 (902)*	108	OLC 99-57 (346)*
	PKDL 73 (849)	106	PKDL 73 (324)
	RLC 116 (846)	109	SLS 73 (315)
	T 397 (806) NC	109	RLC 116 (310)
			JLS 9 (300) ZC
IV, 2nd year	RLC 114 (870)	110	RLC 114 (320)
	T 397 (806) NC	109	**JLS 9 (300) ZC**

* Entries exceeded the best check by a margin of 10% or more. Figures in parentheses indicate seed or oil yield

Table 2.5.9.1 Special trial on extra early maturing genotypes (Rainfed) : ZONE-III

Sl. No.	Entry	Seed yield (kg/ha)			Zonal Mean	Plant stand (000/ha)			Zonal Mean	Days to flowering			Zonal Mean	Days to maturity			Zonal Mean
		Sagar	Mauranipur	Hoshangabad		Sagar	Mauranipur	Hoshangabad		Sagar	Mauranipur	Hoshangabad		Sagar	Mauranipur	Hoshangabad	
	Frist Year Testing																
1.	PCL-35-06	1321	1072	519	971	1428	572	894	965	55	63	62	60	111	118	110	113
2.	SLS-73	1407	761	1141	1103	1044	578	757	793	48	51	50	50	114	114	114	114
3.	PKDL-73	1728	828	790	1115	1308	574	600	827	49	54	50	51	109	119	115	114
4.	OLC-99-57	1383	772	889	1015	1160	562	769	830	55	57	56	56	112	120	117	116
5.	RLC-116	1506	1111	988	1202	1200	577	760	846	49	57	63	56	114	123	116	118
	Second Year Testing																
6.	JLT-215	1457	739	889	1028	1598	572	810	993	53	50	48	50	115	115	115	115
	Third Year Testing																
7.	SLS-67	1481	772	988	1080	1270	572	857	900	48	49	48	48	111	117	115	114
8.	SLS-66*	-	878	938	908	-	559	674	617	-	55	52	54	-	122	117	120
9.	JLS-9 (ZC)	1185	872	741	933	1130	569	533	744	48	52	52	51	109	123	116	116
10.	NL-97 (ZC)	1185	878	543	869	1383	579	757	906	47	57	61	55	113	124	113	117
11.	T-397 (NC)	1284	750	494	843	1427	561	874	954	51	62	63	59	114	119	111	115
	Local			914				906				52		-	-	114	
	GM	1394	858	819		1295	570	766									
	SE (m) ±	98.21	37.46	63.41		123.0	6.6	91.11									
	CD	291.82*	150.70**	252.79**		NS	NS	NS									
	CV%	12.2	7.56	13.40		16.45	7.56	20.60									

* Additional testing

Table 2.5.9.2 Special trial on extra early maturing genotypes (Rainfed) : Zone-III

Sl. No.	Entry	No. of capsules/plant			Zonal Mean	No. of seeds/capsule			Zonal Mean	1000-seeds wt (g)			Zonal Mean	Reaction to disease and pest		Oil content (%)	Oil yield (kg/ha)
														Mauranipur			
		Sagar	Mauranipur	Hoshangabad		Sagar	Mauranipur	Hoshangabad		Sagar	Mauranipur	Hoshangabad		P.M.	Bud fly		
	FIRST YEAR TESTING																
1.	PCL-35-06	110	87	37	78	7	7	8	7	6.0	6.2	5.3	5.8	F	MR	36.16	351
2.	SLS-73	141	38	49	76	7	7	7	7	9.0	7.8	8.2	8.3	F	MR	41.34	456
3.	PKDL-73	127	43	35	68	7	8	8	8	8.0	7.1	8.2	7.8	F	MR	38.01	424
4.	OLC-99-57	161	26	71	86	7	8	8	8	8.0	6.2	7.0	7.1	R	MR	38.26	388
5.	RLC-116	172	49	55	92	8	9	7	8	7.0	6.5	5.6	6.4	R	MR	36.72	441
	SECOND YEAR TESTING																
6.	JLT-215	189	28	48	88	7	8	8	8	7.0	7.3	7.7	7.3	F	R	38.91	400
	THIRD YEAR TESTING																
7.	SLS-67	173	29	18	73	8	8	6	7	9.0	7.5	7.5	8.0	F	MR	39.14	423
8.	SLS-66*	-	46	59	53	-	8	8	8	-	7.4	8.1	7.8	F	R	40.65	369
9.	JLS-9 (ZC)	148	32	57	79	7	8	7	7	9.0	7.4	7.1	7.8	R	MR	40.72	380
10.	NL-97 (ZC)	228	38	63	110	7	8	8	8	7.0	6.8	6.2	6.7	F	MR	37.83	329
11.	T-397 (NC)	127	29	41	66	7	9	8	8	7.0	5.7	5.2	6.0	F	R	36.92	311
	Local			50				8	-			5.8	-				

* Additional testing

Table 2.5.9.3 Special trial on extra early maturing genotypes (Rainfed) : ZONE-IV

Sl. No.	Entry	Seed yield (kg/ha)						Zonal Mean	Plant stand (000/ha)					Zonal Mean	Days to flowering						Zonal Mean
		Nagpur	Raipur	Raichur	Jashipur	Jagdal pur	Bilas pur		Nagpur	Raipur	Raichur	Jashipur	Jagdalpur		Nag pur	Rai pur	Raichur	Jashi pur	Jagdal pur	Bilas pur	
									FIRST YEAR TESTING												
1.	PCL-35-06	850	537	478	1007	815	1111	800	1050	450	744	710	800	751	64	54	51	61	54	56	57
2.	SLS-73	851	810	533	-	652	1139	797	850	325	726	-	854	689	59	52	48	-	48	47	51
3.	PKDL-73	1240	561	644	736	632	1278	849	920	418	749	677	612	675	63	55	50	61	44	44	53
4.	OLC-99-57	1238	517	804	780	820	1250	902	997	419	735	700	602	691	59	55	49	60	45	44	52
5.	RLC-116	1339	659	678	474	593	1333	846	954	509	749	707	748	733	59	54	51	64	49	48	54
									SECOND YEAR TESTING												
6.	RLC-114	1527	819	544	299	810	1222	870	1067	383	714	487	662	663	59	55	54	63	47	57	56
7.	JLT-215	477	611	382	-	741	1222	687	1060	540	689	-	751	760	61	45	50	-	47	47	50
8.	JLS-9 (ZC)	984	592	550	568	800	1028	754	970	501	745	747	642	721	60	53	48	59	52	49	54
9.	NL-97 (ZC)	842	601	669	217	770	1028	688	1074	529	733	460	951	749	59	51	50	62	58	49	55
10.	T-397 (NC)	1054	644	507	840	760	1028	806	973	548	731	690	474	683	59	55	51	60	48	50	54
	Local	650		513	-	469	-		923	-	730	-	1027		62	-	54	-	-	-	58
	GM	1005	635	573	615	715	1164		985	462	731	647	739				51				
	SE (m) ±	68.65	57.0	13.7	56.4	18.18	76.97		153.73	63.34	13.29	39.37	54.0								
	CD	276.21**	169.36*	55.12**	237.45**	73.15**	NS		NS	NS	NS	165.76**	217.28**								
	CV%	11.83	15.54	4.14	15.88	4.41	11.45		27.02	23.74	3.15	10.54	12.7								

Table 2.5.9.4 Special trial on extra early maturing genotypes (Rainfed) : ZONE-IV

Sl. No.	Entry	Days to maturity						Zonal Mean	No. of capsules/plant					Zonal Mean	No. of seeds/capsule				Zonal Mean
		Nagpur	Raipur	Raichur	Jashipur	Jagdalpur	Bilaspur		Nagpur	Raipur	Raichur	Jashipur	Jagdalpur		Nagpur	Raipur	Jashipur	Jagdalpur	
FIRST YEAR TESTING																			
1.	PCL-35-06	116	97	115	108	109	114	110	40	19	42	55	33	38	8	4	9	6	7
2.	SLS-73	124	103	113	-	108	101	110	39	13	37	-	33	31	8	7	-	7	7
3.	PKDL-73	118	88	113	111	103	100	106	47	8	39	88	34	43	8	8	8	7	8
4.	OLC-99-57	118	112	113	109	93	100	108	49	9	47	49	31	37	8	7	9	7	8
5.	RLC-116	121	97	113	111	103	109	109	57	14	34	70	39	43	8	9	9	7	8
SECOND YEAR TESTING																			
6.	RLC-114	119	99	112	115	100	116	110	60	23	22	66	37	42	8	8	9	7	8
7.	JLT-215	118	97	114	-	102	102	107	33	19	46	-	37	34	7	7	-	8	7
8.	JLS-9 (ZC)	118	88	112	110	108	111	108	38	10	41	59	37	37	7	6	8	7	7
9.	NL-97 (ZC)	117	103	113	110	112	113	111	55	11	41	85	31	45	8	6	8	7	7
10.	T-397 (NC)	117	95	113	108	109	111	109	50	21	28	54	28	36	8	8	9	7	8
	Local	123		115					40		37				8	-	-	-	

Table 2.5.9.5 Special trial on extra early maturing genotypes (Rainfed) : Zone-IV

Sl. No.	Entry	1000-seeds wt (g)						Zonal Mean	Reaction to diseases and pest					Oil content (%)	Oil yield (kg/ha)
									Alternaria blight		P.M.	Bud fly	Wilt		
		Nagpur	Raipur	Raichur	Jashipur	Jagdalpur	Bilaspur		Nagpur	Jashipur	Nagpur	Nagpur	Jashipur		
								FIRST YEAR TESTING							
1.	PCL-35-06	5.2	4.5	9.2	5.3	6.0	7.2	6.2	R	S	MS	MS	R	36.73	294
2.	SLS-73	8.8	7.6	9.0	-	5.5	6.5	7.5	R	-	MS	MR	-	39.56	315
3.	PKDL-73	8.4	7.5	9.3	8.5	6.1	6.0	7.6	R	MS	MR	MR	MR	38.18	324
4.	OLC-99-57	9.0	6.6	9.3	7.9	5.7	7.4	7.7	MR	MS	MR	MR	R	38.36	346
5.	RLC-116	6.6	5.1	9.2	5.5	5.6	7.4	6.6	R	MS	MS	MS	MR	36.66	310
								SECOND YEAR TESTING							
6.	RLC-114	6.4	5.9	8.3	6.2	6.2	7.4	6.7	MR	MR	MR	MR	S	36.83	320
7.	JLT-215	8.8	6.9	10.1	-	5.8	6.7	7.7	MS	-	MS	MS	-	37.41	257
8.	JLS-9 (ZC)	9.4	7.5	9.2	8.6	5.6	6.1	7.7	R	MS	MR	MR	MR	39.83	300
9.	NL-97 (ZC)	7.8	6.0	9.2	6.2	5.8	5.9	6.8	MR	MS	MS	MS	S	38.81	267
10.	T-397 (NC)	4.8	4.5	10.7	5.2	5.2	5.9	6.1	MS	S	MR	MR	R	36.87	297
	Local	7.8		8.5					MS	-	R	S	-		

2.5.10 Screening of linseed nursery under saline / alkaline soils

This trial was formulated in order to evaluate the performance of promising genotypes under saline/alkaline conditions. There were nine genotypes as first year and seven genotypes as second year testing along with three checks *viz;* Mukta, Hira and T 397. The experiment was conducted in RBD with three replications at Daleepnagar (Kanpur), Faizabad and Lucknow. All the entries and checks were coded as enumerated below along with their pedigree and sponsoring centres :

Screening of linseed nursery under saline/alkaline soils

Sl. No.	Entry	Code	Source
		FIRST YEAR TESTING	
1.	FR-3	071001	P.C. Unit, Kanpur
2.	FR-11	071002	P.C. Unit, Kanpur
3.	Flax-16	071003	P.C. Unit, Kanpur
4.	EC-99007	071004	P.C. Unit, Kanpur
5.	EC-98866	071005	P.C. Unit, Kanpur
6.	GS-436	071006	P.C. Unit, Kanpur
7.	NDL-2005-17	071007	Faizabad
8.	NDL-2005-29	071008	Faizabad
9.	NDL-2005-26	071009	Faizabad
		SECOND YEAR TESTING	
10.	EC-41690	071010	P.C. Unit, Kanpur
11.	EC-41706	071011	P.C. Unit, Kanpur
12.	EC-41687	071012	P.C. Unit, Kanpur
13.	EC-41689	071013	P.C. Unit, Kanpur
14.	EC-41537	071014	P.C. Unit, Kanpur
15.	EC-41525	071015	P.C. Unit, Kanpur
16.	EC-41573	071016	P.C. Unit, Kanpur
17.	Mukta (Ch)	071017	P.C. Unit, Kanpur
18.	Hira (Ch)	071018	P.C. Unit, Kanpur
19.	T-397 (Ch)	071019	P.C. Unit, Kanpur

All the assigned centres conducted the trial and reported data on seed yield and ancillary traits which have been presented in Table 2.5.10.1 to 2.5.10.2. The pH and electrical conductivity (EC) of experimental sites were mentioned below :

Location	pH	EC (mmhos/cm)
Daleepnagar	9.20	0.38
Faizabad	9.04	0.61
Lucknow	8.38	0.25

Significant differences among genotypes for seed yield was observed at Faizabad only. Perusal of seed yield data indicated that five genotypes from first year testing (NDL 2005-29, EC 99007, GS 436, FR3 and NDL 2005-26) and two genotypes *i.e.,* EC 41525 and EC 41537 from second year testing could surpass the seed yield of best check Hira (639 kg/ha). In oil yield too, three test entries NDL 2005-29, EC 99007 and GS 436 from first year testing recorded more than 10 per cent superiority over best check Hira (222 kg/ha). Poor plant populations were reported from Daleepnagar due to adverse edaphic factors (pH-9.20). Data on other ancillary traits were found in support of seed yield. EC 41690 recorded more than 8.0 g 1000-seeds weight.

Comparative performance of promising entries

Character	Year of Testing	
	First	**Second**
Seed yield (kg/ha)	NDL 2005-29 (771)*	EC 41525 (658)
	EC 99007 (769)*	EC 41537 (647)
	GS 436 (738)*	**Hira (639) Check**
	FR 3 (684)	
	NDL 2005-26 (659)	
	Hira (639) Check	
Oil yield (kg/ha)	NDL 2005-29 (274)*	EC 41537 (241)
	EC 99007 (272)*	EC 41525 (231)
	GS 436 (252)*	EC 41573 (228)
	FR 3 (237)	**Hira (222) Check**
	Flax 16 (227)	
	NDL 2005-26 (224)	
	Hira (222) Check	

* Entries exceeded the best check by a margin of 10 per cent or more. Values in parentheses indicate seed or oil yield

Table 2.5.10.1 Screening of linseed nursery under saline / alkaline soils

Sl. No.	Entry	Seed yield (kg/ha)			Zonal Mean	Plant stand (000/ha)			Zonal Mean	Oil content (%)	Oil yield (kg/ha)
		Daleepnagar	Faizabad	Lucknow		Daleepnagar	Faizabad	Lucknow			
					FIRST YEAR TESTING						
1.	FR-3	113	988	952	684	306	389	223	306	34.63	237
2.	FR-11	89	679	867	545	41	284	263	196	34.68	189
3.	Flax-16	100	593	1141	611	74	395	280	250	37.11	227
4.	EC-99007	152	963	1193	769	102	426	253	260	35.43	272
5.	EC-98866	156	593	1170	640	116	447	270	278	34.95	224
6.	GS-436	101	988	1126	738	85	574	310	323	34.20	252
7.	NDL-2005-17	69	395	1407	624	60	430	310	267	34.48	215
8.	NDL-2005-29	189	988	1137	771	130	562	303	332	35.57	274
9.	NDL-2005-26	201	494	1281	659	86	601	280	322	34.03	224
					SECOND YEAR TESTING						
10.	EC-41690	126	370	1037	511	123	494	293	303	34.00	174
11.	EC-41706	204	457	1052	571	151	401	313	288	33.58	192
12.	EC-41687	93	370	1078	514	89	430	270	263	35.10	180
13.	EC-41689	109	395	1004	503	80	430	247	252	35.45	178
14.	EC-41537	199	691	1052	647	95	395	267	252	37.26	241
15.	EC-41525	48	988	937	658	181	500	280	320	35.05	231
16.	EC-41573	141	691	1056	629	314	451	317	361	36.22	228
17.	Mukta (Ch)	200	741	963	635	137	377	227	247	34.51	219
18.	Hira (Ch)	181	667	1070	639	130	500	247	292	34.82	222
19.	T-397 (Ch)	230	568	874	557	141	500	257	299	35.18	196
	Local	174	-	-		269	-	-			
	G.M.	144	664	1073		136	452	274			
	SE (m) ±	41.11	38.17	163.53		18.97	9.92	27.0			
	CD	NS	146.79**	NS		72.76	38.14**	NS			
	CV%	49.57	9.96	26.38		24.24	3.8	17.05			

Table 2.5.10.2 Screening of linseed nursery under saline/alkaline soils : Ancillary characters

Sl. No.	Entry	Days to flowering			Zonal Mean	Days to maturity			Zonal Mean	1000-seeds weight (g)		Zonal Mean	No. of capsules/plant			Zonal Mean	No. of seeds/capsule			Zonal Mean
		Daleep nagar	Faiza bad	Luck now		Daleep nagar	Faiza bad	Luck now		Daleep nagar	Faiza bad		Daleep nagar	Faiza bad	Luck now		Daleep nagar	Faiza bad	Luck now	
FIRST YEAR TESTING																				
1.	FR-3	85	72	84	80	125	120	137	127	5.6	7.3	6.5	22	14	264	100	10	8	10	9
2.	FR-11	90	72	74	79	132	119	142	131	4.3	8.2	6.3	13	14	264	97	9	8	9	9
3.	Flax-16	88	70	89	82	129	120	137	129	4.5	7.3	5.9	13	11	331	118	9	8	10	9
4.	EC-99007	96	72	85	84	129	129	136	131	4.5	7.0	5.8	26	14	191	77	9	8	10	9
5.	EC-98866	100	73	77	83	132	128	135	132	3.8	6.2	5.0	14	12	260	95	9	9	10	9
6.	GS-436	87	70	95	84	127	128	140	132	5.9	8.0	7.0	24	15	251	97	10	7	10	9
7.	NDL-2005-17	96	68	85	83	131	128	139	133	5.3	7.5	6.4	9	16	210	78	9	7	10	9
8.	NDL-2005-29	99	72	86	86	136	128	136	133	4.8	7.2	6.0	19	15	306	113	9	8	9	9
9.	NDL-2005-26	92	72	86	83	138	130	137	135	4.3	8.2	6.3	28	13	177	73	9	8	9	9
SECOND YEAR TESTING																				
10.	EC-41690	91	70	83	81	134	129	137	133	9.5	7.6	8.6	15	13	205	78	10	7	9	9
11.	EC-41706	94	69	83	82	150	125	140	138	4.2	7.5	5.9	18	18	232	89	9	8	9	9
12.	EC-41687	86	73	84	81	120	130	140	130	4.9	6.8	5.9	24	13	217	85	9	8	9	9
13.	EC-41689	91	70	86	82	124	118	139	127	4.9	8.2	6.6	18	14	233	88	10	7	9	9
14.	EC-41537	98	71	83	84	134	131	140	135	4.7	8.1	6.4	22	15	185	74	9	8	9	9
15.	EC-41525	94	73	92	86	124	131	144	133	5.0	7.8	6.4	23	14	108	48	9	7	9	8
16.	EC-41573	93	72	74	80	120	129	134	128	4.8	6.8	5.8	21	14	175	70	10	8	9	9
17.	Mukta (Ch)	91	71	73	78	119	126	138	128	5.5	7.1	6.3	44	15	131	63	9	9	9	9
18.	Hira (Ch)	97	72	73	81	124	127	138	130	4.1	7.2	5.6	22	16	173	70	11	9	9	10
19.	T-397 (Ch)	93	73	73	80	126	125	142	131	5.3	6.8	6.1	11	15	207	78	8	8	9	8
20.	Local	89	-	-	89	121	-	-	121	5.7	-	5.7	25	-	-	25	8	-	-	8

2.5.11 Screening of germplasm under rainfed condition

This trial was executed with an objective to identify the better performing genotypes than the existing checks under rainfed situation.

One hundred accessions along with three checks *i.e.,* NL 97, JLS 9 and T 397 were evaluated in augmented block design comprising four blocks at seven locations. All the centres conducted the trial and recorded the data on seed yield, days to flowering days to maturity, number of capsules per plant, plant height and number of seeds per capsule which have been presented in Table 2.5.11.1 to 2.5.11.3.

Latur centre recorded seed yield on plant basis whereas, the remaining six centres *viz;* Kanke, Sagar, Raipur, Jashipur, Nagpur and Raichur reported per plot seed yield. Hence, seed yield data of Latur was not considered for statistical analysis.

For seed yield, significant variances due to unreplicated treatments vs checks was observed at Kanke (Block 2), Raipur (Block 2) and Raichur (Blocks 1, 2, 4) whereas, significant variation due to checks was observed at Jashipur only.

Five, nineteen, twenty three, seven, fifteen and two genotypes were found to out-perform the respective best yielding checks at Kanke, Sagar, Raipur, Jashipur, Nagpur and Raichur, respectively. The top ranking five genotypes selected on the basis of *per se* performance at different locations have been tabulated here as follows:

Five best genotypes for seed yield (kg/ha)

Kanke	Sagar	Raipur	Jashipur	Nagpur	Raichur
CI 2053	CI 1954	EC 511	CI 2231	CI 2204	DAK 105
EC 100	Dhar	CI 2260	CI 2060	EC 519 A	CI 2006
CI 1983	CI 1894	CI 1924	CI 2208	CI 2053	NL 97
EC 421	CI 2006	CI 2006	CI 2206	EC 500	CI 2007
CI 1954	CI 1904	CI 2201	CI 2205	CI 1904	CI 1904

Following top ranking genotypes have shown consistency in their performance across the locations which may be utilized in hybridization programme as well as for yield evaluation :

CI 2006	Sagar, Raipur, and Raichur
CI 1904	Sagar, Nagpur and Raichur
CI 2053	Kanke, Nagpur
CI 1954	Kanke, Sagar

Table 2.5.11.1 Screening of germplasm under rainfed condition : Seed yield (kg/ha)

Sl. No.	Cultures Name	Seed yield (kg/ha)					
		Kanke	Sagar	Raipur	Jashipur	Nagpur	Raichur
		BLOCK-I					
1.	CP-43	675. 93	1271.30	219.44	312.50	833.33	142.59
2.	Cross-4/29	453.70	1660.19	441.67	256.94	644.44	153.70
3.	CI-1928	675.93	1771.30	308.33	-	722.22	187.04
4.	CI-2052	564.81	1549.07	286.11	868.06	633.33	242.59
5.	EC-513 A	398.15	1215.74	386.11	145.83	255.56	320.37
6.	EC-523 B	287.04	1049.07	252.78	534.72	555.56	75.93
7.	EC-522	231.48	1493.52	330.56	-	755.56	142.59
8.	CI-2048	509.26	1826.85	408.33	1368.06	933.33	231.48
9.	EC-500	453.70	1993.52	397.22	90.28	1477.78	253.70
10.	CI-1971	675.93	1215.74	408.33	-	1011.11	264.81
11.	CI-2204	398.15	1326.85	308.33	368.06	1622.22	231.48
12.	CI-15635	453.70	1660.19	319.44	-	911.11	620.37
13.	CI-1983	731.48	1715.74	341.67	-	566.67	264.81
14.	Chitarpur	564.81	1715.74	175.00	-	711.11	353.70
15.	CI-1974	620.37	1660.19	308.33	-	311.11	153.70
16.	CI-1956	287.04	1549.07	530.56	-	377.78	609.26
17.	Dhar	398.15	2326.85	686.11	-	622.22	320.37
18.	Deep Purple Petal	675.93	1715.74	730.56	812.50	855.56	287.04
19.	CI-2006	675.93	2160.19	730.56	-	1044.44	820.37
20.	Detal-1	564.81	1549.07	375.00	-	77.78	198.15
21.	CI-2059	675.93	1826.85	697.22	-	900.00	242.59
22.	EC-531 A	564.81	1604.63	608.33	-	455.56	331.48
23.	CI-2073	453.70	1549.07	308.33	-	444.44	353.70
24.	CI-1894	342.59	2271.30	641.67	-	266.67	142.59
25.	Chitora Sagar	509.26	1715.74	630.56	-	0.00	253.70
		BLOCK-II					
26.	EC-388	527.78	2030.56	741.67	-	692.59	335.19
27.	CI-2203	416.67	641.67	541.67	-	737.04	324.07
28.	CI-2055	305.56	1197.22	586.11	868.06	1003.70	157.41
29.	CI-2200	416.67	86.11	475.00	979.17	448.15	390.74
30.	CI-2231	527.78	419.44	486.11	1868.06	892.59	212.96
31.	CI-2199	416.67	252.78	430.56	-	525.93	112.96
32.	CI-1892	472.22	752.78	552.78	-	659.26	79.63
33.	CI-1998	305.56	752.78	519.44	-	470.37	446.30
34.	CI-1916	361.11	419.44	552.78	-	659.26	57.41

Sl. No.	Cultures Name	Seed yield (kg/ha)					
		Kanke	Sagar	Raipur	Jashipur	Nagpur	Raichur
35.	DUK-101	361.11	197.22	419.44	-	392.59	257.41
36.	DPR-Petal	361.11	530.56	341.67	-	603.70	468.52
37.	EC-429	250.00	586.11	486.11	-	481.48	457.41
38.	CR-M-6XRR-9	194.44	641.67	486.11	-	748.15	57.41
39.	CI-2060	416.67	586.11	508.33	1645.83	825.93	446.30
40.	DAK-102	416.67	752.78	552.78	-	337.04	435.19
41.	CI-2229	361.11	197.22	263.89	-	214.81	379.63
42.	CI-2201	527.78	919.44	708.33	-	625.93	112.96
43.	CI-2205	361.11	697.22	463.89	1368.06	692.59	24.07
44.	EC-481	416.67	197.22	363.89	-	325.93	446.30
45.	CI-1924	416.67	975.00	741.67	-	325.93	-20.37
46.	CI-1984	416.67	1086.11	652.78	-	670.37	168.52
47.	EC-553	250.00	197.22	508.33	-	281.48	-20.37
48.	EC-511	472.22	752.78	830.56	-	570.37	301.85
49.	Canyart	194.44	308.33	619.44	-	670.37	412.96
50.	CI-2260	138.89	252.78	763.89	-	448.15	479.63
		BLOCK-III					
51.	CI-1900	416.67	993.52	619.44	590.28	681.48	709.26
52.	CP-33	472.22	826.85	375.00	-	770.37	275.93
53.	CI-2007	472.22	993.52	241.67	-	759.26	731.48
54.	CR-55XRR-9	194.44	826.85	230.56	645.83	1125.93	475.93
55.	Close Petal	472.22	437.96	86.11	-	181.48	420.37
56.	Dhar local	305.56	1271.30	452.78	-	514.81	520.37
57.	CI-2049	361.11	771.30	419.44	979.17	837.04	353.70
58.	CI-1977	250.00	1104.63	130.56	-	603.70	387.04
59.	CI-1897	416.67	771.30	263.89	-	525.93	253.70
60.	CI-2005	416.67	1326.85	230.56	-	414.81	309.26
61.	CI-2056	527.78	1493.52	263.89	701.39	781.48	442.59
62.	EC-534	472.22	1215.74	508.33	-	459.26	275.93
63.	CI-1900	472.22	1382.41	352.78	-	637.04	309.26
64.	CI-2010	472.22	1215.74	197.22	479.17	1070.37	598.15
65.	Dingoachi	305.56	1326.85	286.11	-	759.26	253.70
66.	EC-100	805.56	937.96	375.00	-	892.59	487.04
67.	CI-1972	638.89	993.52	375.00	-	837.04	587.04
68.	Chhindwara	250.00	1160.19	352.78	-	548.15	320.37
69.	CI-1968	472.22	1215.74	419.44	-	692.59	564.81
70.	CS-9	416.67	882.41	363.89	-	503.70	209.26

Sl. No.	Cultures Name	Seed yield (kg/ha)					
		Kanke	Sagar	Raipur	Jashipur	Nagpur	Raichur
71.	CI-1958	527.78	1326.85	463.89	1090.28	1237.04	620.37
72.	CI-1901	305.56	1104.63	275.00	145.83	959.26	431.48
73.	CI-2067	361.11	1049.07	163.89	-	681.48	287.04
74.	Check	638.89	1049.07	352.78	-	359.26	487.04
75.	CI-1954	694.44	2771.30	441.67	-	781.48	498.15
			BLOCK-IV				
76.	CI-1970	657.41	1093.52	197.22	-	581.48	446.30
77.	EC-519 A	546.30	1315.74	275.00	562.50	1537.04	257.41
78.	EC-421	712.96	1149.07	308.33	-	348.15	357.41
79.	CI-2230	379.63	1260.19	230.56	840.28	948.15	190.74
80.	CI-1978	490.74	1537.96	441.67	-	837.04	379.63
81.	CP-White	268.52	1037.96	352.78	506.94	759.26	312.96
82.	CF-White	435.19	1093.52	219.44	-	537.04	324.07
83.	EC-519 K	657.41	1482.41	319.44	451.39	937.04	357.41
84.	EC-524	379.63	1204.63	608.33	729.17	870.37	201.85
85.	CI-2053	824.07	1815.74	252.78	1340.28	1514.81	568.52
86.	CI-1904	601.85	2149.07	497.22	-	1281.48	712.96
87.	CI-2208	324.07	1704.63	208.33	1562.50	570.37	90.74
88.	EC-12	268.52	2093.52	641.67	-	692.59	268.52
89.	EC-536	324.07	1371.30	308.33	-	437.04	135.19
90.	CI-2063	435.19	1704.63	275.00	1284.72	559.26	201.85
91.	CI-1908	546.30	1926.85	386.11	-	659.26	190.7
92.	CI-2066	546.30	1371.30	208.33	1340.28	692.59	457.41
93.	EC-415	470.74	1871.30	286.11	-	603.70	112.96
94.	CI-2206	268.52	1649.07	286.11	1451.39	614.81	168.52
95.	CI-2057	379.63	1815.74	308.33	-	737.04	690.74
96.	DAK-105	346.30	1593.52	297.22	-	537.04	824.07
97.	EC-533-IS	379.63	1649.07	352.78	-	492.59	557.41
98.	EC-541	490.74	1371.30	286.11	-	414.81	668.52
99.	CI-2236	324.07	1649.07	419.44	1118.06	481.48	257.41
100.	EC-521 M	824.07	1926.85	375.00	-	525.93	257.41
	CHECKS						
	NL-97	611.11	1027.78	397.22	-	922.22	763.89
	JLS-9	569.44	1430.56	344.44	444.44	825.00	591.67
	T-397	680.56	1577.78	450.00	1236.11	830.56	561.11
	GM	620.37	1345.37	397.22	84.28	859.26	638.89
	SE (M) ±	73.35	299.09	44.76	175.22	105.74	81.02
	CD	-	-	-	788.51*	-	-
	C.V.%	23.65	44.46	22.54	41.71	24.61	25.36

	Kanke		Sagar		Raipur		Jashipur		Nagpur		Raichur	
	SE (M) ±	CD 5%	SE (M) ±	CD 5%	SE (M) ±	CD 5%	SE (M) ±	CD 5%	SE (M) ±	CD 5%	SE (M) ±	CD 5%
Unrep. Treats-Same Block	207.46	507.65	845.94	2070.02	126.60	309.80	495.61	1577.03	299.07	731.83	229.17	560.77
Unrep. Treats-Diff. Block	239.55	586.18	976.81	2390.25	146.19	357.73	606.99	1931.45	345.34	845.05	264.62	647.52
Unrep. Treats vs Check	179.66	439.64	732.61	1792.69	109.64	268.30	446.74	1421.51	259.00	633.78	198.46	485.64

Table 2.5.11.2 Screening of germplasm under rainfed condition : Ancillary traits

Sl No.	Cultures Name	No. of capsules / plant						Mean	No. of seeds / capsule						Mean
		Kanke	Sagar	Raipur	Jashipur	Nagpur	Latur		Kanke	Sagar	Raipur	Jashipur	Nagpur	Latur	
						BLOCK-I									
1.	CP-43	20	114	10	22	19	34	37	10	7	8	9	8	7	8
2.	Cross-4/29	10	83	7	24	31	13	28	6	7	6	8	6	8	7
3.	CI-1928	11	41	5	-	30	15	20	9	6	6	-	8	7	7
4.	CI-2052	12	101	26	38	34	15	38	9	8	7	8	9	8	8
5.	EC-513 A	13	79	11	31	49	10	32	8	7	8	10	9	7	8
6.	EC-523 B	10	87	11	69	35	8	37	7	7	6	9	7	5	7
7.	EC-522	13	74	11	-	26	16	28	7	8	5	-	7	8	7
8.	CI-2048	12	73	8	56	30	10	32	9	7	6	9	9	7	8
9.	EC-500	10	43	8	29	28	16	22	10	6	7	9	9	7	8
10.	CI-1971	11	86	6	-	23	11	27	9	5	6	-	7	6	7
11.	CI-2204	17	96	9	58	69	15	44	9	8	4	7	8	8	7
12.	CI-15635	12	50	18	-	18	19	23	10	7	6	-	7	6	7
13.	CI-1983	16	85	15	-	21	9	29	9	8	5	-	7	5	7
14.	Chitarpur	36	84	13	-	27	13	35	9	7	5	-	9	6	7
15.	CI-1974	14	187	12	-	28	14	51	9	8	5	-	6	7	7
16.	CI-1956	33	66	14	-	22	10	29	7	5	8	-	7	7	7
17.	Dhar	10	44	27	-	25	17	25	8	7	8	-	8	7	8
18.	Deep Purple Petal	26	42	12	54	40	14	31	8	7	7	8	7	2	7
19.	CI-2006	15	66	6	-	29	7	25	10	8	4	-	8	6	7
20.	Detal-1	21	65	20	-	19	17	28	11	7	5	-	8	6	7
21.	CI-2059	14	73	21	-	50	8	33	7	8	5	-	7	5	6
22.	EC-531 A	23	77	19	-	34	24	35	8	8	5	-	8	8	7
23.	CI-2073	13	96	25	-	29	29	38	7	7	4	-	8	6	6
24.	CI-1894	14	41	13	-	21	14	21	8	9	4	-	7	5	7
25.	Chitora Sagar	25	64	60	-	33	17	40	7	7	4	-	8	7	7
						BLOCK-II									
26.	EC-388	15	191	13	-	41	16	55	7	8	7	-	8	5	7
27.	CI-2203	16	94	44	-	33	16	41	8	6	8	-	6	5	7
28.	CI-2055	11	59	10	46	26	9	27	9	7	5	6	6	4	6
29.	CI-2200	19	118	15	34	58	21	44	6	7	7	9	6	7	7
30.	CI-2231	24	72	10	64	35	23	38	8	8	7	9	7	5	7
31.	CI-2199	33	84	23	-	28	11	36	10	7	5	-	8	5	7
32.	CI-1892	25	57	8	-	28	16	27	10	7	6	-	6	7	7
33.	CI-1998	10	65	10	-	32	30	29	8	7	5	-	6	8	7
34.	CI-1916	9	85	11	-	21	16	28	9	8	6	-	7	7	7
35.	DUK-101	13	36	5	-	39	8	20	6	6	3	-	7	6	6
36.	DPR-Petal	19	136	14	-	32	14	43	10	8	8	-	7	5	8
37.	EC-429	22	43	6	-	15	18	20	7	7	4	-	7	6	6
38.	CR-M-6XRR-9	27	117	10	-	22	11	37	7	7	9	-	7	6	7
39.	CI-2060	20	76	7	57	27	20	30	9	8	6	10	8	8	8
40.	DAK-102	12	121	9	-	20	21	37	10	7	6	-	6	5	7

Sl No.	Cultures Name	No. of capsules / plant						Mean	No. of seeds / capsule						Mean
		Kanke	Sagar	Raipur	Jashipur	Nagpur	Latur		Kanke	Sagar	Raipur	Jashipur	Nagpur	Latur	
41.	CI-2229	16	60	14	-	21	16	28	7	7	6	-	7	5	6
42.	CI-2201	17	58	18	-	55	17	33	9	8	6	-	7	6	7
43.	CI-2205	22	72	21	45	42	14	36	8	9	6	9	8	9	8
44.	EC-481	10	36	11	41	46	16	27	10	7	6	7	7	6	7
45.	CI-1924	12	99	12	-	39	8	34	9	7	7	-	7	7	7
46.	CI-1984	10	36	6	-	42	14	22	8	8	9	-	9	8	8
47.	EC-553	18	59	9	-	40	10	27	7	8	6	-	8	7	7
48.	EC-511	13	148	33	-	67	14	55	8	8	8	-	8	7	8
49.	Canyart	10	86	37	-	57	18	42	11	6	8	-	7	7	8
50.	CI-2260	18	30	14	-	35	17	23	9	7	4	-	7	9	7
						BLOCK-III									
51.	CI-1900	9	82	5	14	64	32	34	9	7	7	8	9	6	8
52.	CP-33	12	61	4	-	47	8	26	9	9	7	-	9	6	8
53.	CI-2007	10	63	21	-	43	9	29	10	8	6	-	9	7	8
54.	CR-55XRR-9	15	81	21	51	33	13	36	6	7	7	9	7	5	7
55.	Close Petal	17	62	9	-	25	38	30	7	7	7	-	6	6	7
56.	Dhar local	19	82	15	80	48	11	43	9	8	4	9	8	6	7
57.	CI-2049	14	71	3	57	24	22	32	10	8	7	9	8	6	8
58.	CI-1977	12	34	11	-	16	7	16	7	8	5	-	8	6	7
59.	CI-1897	11	32	22	-	30	7	20	7	7	5	-	7	5	6
60.	CI-2005	19	70	5	-	44	8	29	8	7	7	-	6	6	7
61.	CI-2056	11	58	18	21	51	9	28	9	7	7	10	8	6	8
62.	EC-534	21	23	7	-	36	15	20	9	8	6	-	9	6	8
63.	CI-1900	13	49	7	-	25	11	21	10	7	5	-	8	6	7
64.	CI-2010	14	42	7	95	38	14	35	9	7	6	10	8	4	7
65.	Dingoachi	8	26	10	-	19	21	17	6	8	6	-	7	7	7
66.	EC-100	16	20	10	-	39	10	19	8	7	8	-	8	4	7
67.	CI-1972	18	57	7	-	32	12	25	8	8	5	-	7	8	7
68.	Chhindwara	10	40	8	-	35	9	20	7	7	7	-	8	7	7
69.	CI-1968	9	82	9	-	35	17	30	7	7	4	-	7	5	6
70.	CS-9	17	38	14	-	59	14	28	9	8	8	-	7	5	7
71.	CI-1958	13	51	10	55	35	7	29	6	7	6	7	7	5	6
72.	CI-1901	11	44	16	18	30	11	22	10	7	6	9	8	5	8
73.	CI-2067	9	63	11	-	52	15	30	10	7	4	-	8	6	7
74.	Check	21	66	19	-	27	19	30	11	7	8	-	8	6	8
75.	CI-1954	19	145	16	-	24	17	44	9	8	3	-	7	7	7
						BLOCK-IV									
76.	CI-1970	12	28	21	-	30	31	24	8	8	5	-	8	6	7
77.	EC-519 A	10	73	9	38	32	15	30	6	8	6	8	8	6	7
78.	EC-421	21	40	15	-	30	18	25	8	7	3	-	9	6	7
79.	CI-2230	23	29	17	52	34	16	29	10	9	6	9	8	5	8
80.	CI-1978	13	27	18	50	33	13	26	9	8	9	8	9	8	9
81.	CP-White	20	52	12	90	40	19	39	7	9	5	9	8	7	8
82.	CF-White	14	73	15	-	36	26	33	9	7	7	-	9	6	8

Sl No.	Cultures Name	No. of capsules / plant						Mean	No. of seeds / capsule						Mean
		Kanke	Sagar	Raipur	Jashipur	Nagpur	Latur		Kanke	Sagar	Raipur	Jashipur	Nagpur	Latur	
83.	EC-519 K	15	46	8	55	66	27	36	8	8	7	10	9	8	8
84.	EC-524	12	63	24	62	52	25	40	9	8	8	9	9	7	8
85.	CI-2053	11	40	13	50	36	24	29	10	8	7	9	10	7	9
86.	CI-1904	13	52	12	-	44	16	27	8	8	6	-	8	4	7
87.	CI-2208	16	73	7	111	43	20	45	7	8	6	9	9	9	10
88.	EC-12	11	52	10	-	35	20	26	10	8	6	-	9	9	8
89.	EC-536	23	52	22	-	29	16	28	8	7	8	-	8	8	8
90.	CI-2063	12	43	7	34	29	24	25	7	7	7	8	8	6	9
91.	CI-1908	19	30	8	-	21	21	20	8	7	7	-	7	6	7
92.	CI-2066	17	36	7	99	37	19	36	10	7	6	9	9	4	8
93.	EC-415	15	61	12	-	26	18	26	8	8	7	-	8	8	8
94.	CI-2206	8	48	11	88	46	27	38	10	8	8	9	8	8	9
95.	CI-2057	9	45	26	-	13	13	21	10	8	9	-	9	6	8
96.	DAK-105	21	55	10	-	38	17	28	8	7	5	-	8	7	7
97.	EC-533-15	25	65	19	-	51	32	38	6	6	8	-	8	5	7
98.	EC-541	26	46	23	-	28	11	27	7	7	5	-	8	7	7
99.	CI-2236	11	28	8	116	40	19	44	10	8	6	10	9	9	9
100.	EC-521 M	17	78	20	-	44	23	36	9	10	9	-	9	6	9
	CHECKS														
	NL-97	20	82	15	20	33	33	34	9	7	6	8	8	7	8
	JLS-9	15	70	8	47	34	11	31	7	7	6	7	8	5	7
	T-397	18	64	9	38	30	19	30	8	8	5	9	8	7	8

Table 2.5.11.2 Contd.....

Sl. No.	Cultures Name	Days to flowering							Mean	Days to maturity						Mean	Plant height (cm)						Mean
		Kanke	Sagar	Rai pur	Jashi pur	Nag pur	Rai chur	Latur		Kanke	Sagar	Rai pur	Jashi pur	Nag pur	Latur		Kanke	Sagar	Rai pur	Jashi pur	Nag pur	Latur	
										BLOCK-I													
1.	CP-43	70	47	55	63	64	72	48	60	117	114	118	110	124	94	113	41	65	31	50	53	54	49
2.	Cross-4/29	74	56	70	71	64	74	60	67	115	118	131	115	125	101	118	44	72	40	61	57	62	56
3.	CI-1928	74	50	53	64	63	70	54	61	114	119	117	-	125	93	114	34	62	37	-	53	53	48
4.	CI-2052	77	58	68	69	64	79	55	67	119	119	129	114	123	94	116	39	69	37	58	50	53	51
5.	EC-513 A	76	53	58	63	69	77	52	64	117	116	120	101	125	93	112	38	67	34	58	54	38	48
6.	EC-523 B	76	51	57	63	68	76	51	63	120	118	119	113	125	93	115	32	57	28	54	50	50	45
7.	EC-522	77	54	58	64	63	70	53	63	118	120	121	-	122	97	116	34	61	34	-	47	49	45
8.	CI-2048	79	56	54	63	71	75	52	64	117	121	118	113	123	100	115	34	62	33	58	60	48	49
9.	EC-500	76	55	58	64	64	78	52	64	116	117	117	102	124	101	113	37	67	36	55	59	62	53
10.	CI-1971	71	48	53	63	64	71	51	60	115	114	117	-	122	99	113	33	64	31	-	55	45	46
11.	CI-2204	79	49	52	63	67	72	51	62	117	116	116	103	125	92	112	50	74	36	59	60	47	54
12.	CI-15635	68	49	52	64	62	55	46	57	117	115	117	-	125	94	114	45	71	35	-	48	47	49
13.	CI-1983	85	61	66	-	52	76	59	67	121	122	127	-	123	101	119	50	75	52	-	63	54	59
14.	Chitarpur	70	48	53	64	69	68	51	60	117	119	116	-	126	98	115	49	60	33	-	46	43	46
15.	CI-1974	76	50	60	-	79	-	60	65	116	120	122	-	123	101	116	52	80	44	-	55	62	59
16.	CI-1956	78	52	55	-	69	64	54	62	111	122	117	-	124	92	113	39	77	48	-	54	53	54
17.	Dhar	75	56	56	64	65	66	53	62	112	115	119	-	126	93	113	38	68	48	-	50	53	51
18.	Deep Purple Petal	69	46	55	58	66	70	54	60	113	120	118	101	122	92	111	53	61	44	62	55	54	55
19.	CI-2006	77	50	47	64	63	66	50	60	112	117	109	-	123	91	110	44	66	43	-	60	50	53
20.	Detal-I	79	53	66	64	83	73	60	68	113	119	129	-	124	95	116	40	64	44	-	58	56	52
21.	CI-2059	78	51	58	63	69	70	57	64	112	120	119	-	123	94	114	37	68	58	-	50	52	53
22.	EC-531 A	79	57	59	-	70	77	49	65	117	114	120	-	123	94	114	33	60	40	-	48	52	47
23.	CI-2073	67	42	42	64	66	57	42	54	111	117	99	-	125	88	108	45	63	32	-	49	46	47
24.	CI-1874	80	52	61	70	81	79	59	69	122	119	122	-	126	95	117	40	83	48	-	52	58	56
25.	Chitora Sagar	79	53	58	64	69	70	57	64	120	113	122	-	127	100	116	43	66	41	-	49	68	53

Table 2.5.11.2 Contd.....

Sl. No.	Cultures Name	Days to flowering							Mean	Days to maturity						Mean	Plant height (cm)						Mean
		Kanke	Sagar	Rai pur	Jashi pur	Nag pur	Rai chur	Latur		Kanke	Sagar	Rai pur	Jashi pur	Nag pur	Latur		Kanke	Sagar	Rai pur	Jashi pur	Nag pur	Latur	
										BLOCK-II													
26.	EC-388	79	50	58	64	69	77	51	64	113	114	123	-	124	100	115	44	77	36	-	55	61	55
27.	CI-2203	79	57	50	58	68	72	51	62	115	122	114	-	125	94	114	45	65	37	-	50	57	51
28.	CI-2055	81	50	59	68	69	77	56	66	123	119	120	111	123	99	116	47	74	35	65	56	60	56
29.	CI-2200	77	52	53	58	67	66	51	61	111	114	109	103	125	83	108	40	65	35	67	54	51	52
30.	CI-2231	81	53	60	64	68	64	56	64	117	118	117	110	126	94	114	35	59	35	70	58	57	52
31.	CI-2199	70	48	47	64	68	64	43	58	111	117	94	-	125	89	107	48	58	25	-	44	50	45
32.	CI-1892	80	55	64	64	79	80	57	68	118	119	119	-	124	93	115	46	74	34	-	63	56	55
33.	CI-1998	84	56	65	-	80	74	58	70	120	120	121	-	123	94	116	53	88	52	-	64	74	66
34.	CI-1916	83	57	58	69	78	74	56	68	121	121	113	-	124	100	116	38	70	38	-	64	41	50
35.	DUK-101	80	56	57	69	69	70	51	65	121	119	111	-	126	94	114	43	75	41	-	60	68	57
36.	DPR-Petal	78	54	58	69	68	73	54	65	119	120	113	-	127	89	114	44	80	27	-	52	63	53
37.	EC-429	88	54	57	63	69	66	51	64	119	120	109	-	123	90	112	44	65	39	-	50	54	50
38.	CR-M-6XRR-9	78	47	52	64	70	64	48	60	116	113	108	-	124	89	110	35	56	27	-	48	45	42
39.	CI-2060	76	50	51	55	67	69	48	59	117	116	107	110	125	91	111	43	69	32	66	52	54	53
40.	DAK-102	77	48	50	64	70	57	42	58	116	114	104	-	126	88	110	34	61	22	-	47	45	42
41.	CI-2229	79	51	66	64	81	72	56	67	120	118	121	-	125	94	116	43	86	40	-	66	74	62
42.	CI-2201	80	56	58	64	71	77	58	66	118	119	114	-	123	93	113	38	64	40	-	60	53	51
43.	CI-2205	79	57	57	64	70	-	51	63	116	121	111	111	124	92	113	39	66	39	60	59	51	52
44.	EC-481	79	54	53	61	65	55	50	60	115	119	101	106	125	83	108	42	58	28	47	54	52	47
45.	CI-1924	80	52	54	69	72	-	51	63	118	117	102	-	126	95	112	37	69	44	-	59	57	53
46.	CI-1984	81	50	63	-	79	80	54	68	119	115	109	-	123	97	113	35	66	26	-	72	58	51
47.	EC-553	80	54	63	-	79	64	55	66	119	118	109	-	124	93	113	37	66	33	-	49	54	48
48.	EC-511	76	56	55	64	67	64	49	62	114	119	105	-	125	91	111	35	73	47	-	60	54	54
49.	Canyart	75	49	51	64	68	59	44	59	112	116	101	-	123	90	108	32	69	35	-	63	52	50
50.	CI-2260	79	54	56	64	69	61	52	62	118	120	106	-	124	91	112	40	61	25	-	56	57	48

Table 2.5.11.2 Contd.....

Sl. No.	Cultures Name	Days to flowering							Mean	Days to maturity						Mean	Plant height (cm)						Mean
		Kanke	Sagar	Raipur	Jashipur	Nagpur	Raichur	Latur		Kanke	Sagar	Raipur	Jashipur	Nagpur	Latur		Kanke	Sagar	Raipur	Jashipur	Nagpur	Latur	
										BLOCK-III													
51.	CI-1900	77	54	55	62	69	61	54	62	115	119	105	107	122	93	110	32	68	31	53	61	53	50
52.	CP-33	82	56	58	64	69	74	57	66	120	120	104	-	124	93	112	34	60	27	-	50	43	43
53.	CI-2007	74	51	68	64	64	67	58	64	113	118	114	-	125	94	113	30	73	36	-	48	53	48
54.	CR-55×RR-9	74	52	53	63	69	61	49	60	112	112	104	111	123	84	108	31	61	32	52	57	35	46
55.	Close Petal	84	55	58	-	79	72	52	67	118	120	109	-	124	91	112	38	75	39	56	57	51	53
56.	Dhar local	77	54	54	64	69	51	50	61	116	120	105	107	126	89	111	36	66	46	56	56	44	51
57.	CI-2049	83	51	58	69	69	77	55	66	112	116	105	114	127	92	111	32	57	56	56	55	45	50
58.	CI-1977	86	56	67	72	70	77	57	69	117	121	112	-	126	97	115	42	84	22	-	63	61	54
59.	CI-1897	85	52	73	72	80	78	57	71	119	119	91	-	124	99	110	39	84	46	-	65	66	60
60.	CI-2005	78	51	54	-	68	68	49	61	111	118	99	-	125	87	108	31	61	23	-	43	37	39
61.	CI-2056	76	55	58	62	71	77	54	65	112	120	104	109	126	93	111	39	71	33	60	60	51	52
62.	EC-534	85	50	66	72	79	-	62	69	118	117	111	-	125	100	114	40	63	41	-	58	43	49
63.	CI-1900	86	53	63	72	71	-	60	68	113	119	109	-	126	99	113	39	73	30	-	52	49	49
64.	CI-2010	77	50	53	62	66	67	49	61	111	117	103	107	124	83	108	41	61	30	57	55	43	48
65.	Dingoachi	86	56	66	69	69	-	60	68	119	121	111	-	123	94	114	36	68	31	-	56	48	48
66.	EC-100	76	52	58	69	66	72	50	63	116	119	105	-	126	93	112	36	74	36	-	72	62	56
67.	CI-1972	79	51	52	64	69	67	49	52	114	117	104	-	125	85	109	44	73	40	-	60	49	53
68.	Chhindwara	83	54	57	69	69	69	51	65	113	119	104	-	124	90	110	45	58	38	-	62	51	51
69.	CI-1968	84	53	59	69	70	69	49	65	117	118	107	-	123	92	111	42	78	51	-	80	62	63
70.	CS-9	86	51	57	64	70	68	50	64	112	116	104	-	125	89	109	39	65	44	-	64	50	52
71.	CI-1958	74	48	45	55	66	58	41	55	111	114	101	108	125	84	107	38	59	25	52	57	54	48
72.	CI-1901	76	52	56	64	64	67	50	61	116	117	103	100	126	88	108	30	57	54	53	50	39	47
73.	CI-2067	70	45	42	64	64	64	40	56	114	113	97	-	124	83	106	35	59	26	-	58	42	44
74.	Check	85	49	60	69	70	69	52	65	118	116	107	-	125	93	112	40	68	33	-	54	50	49
75.	CI-1954	76	47	44	64	69	69	42	59	116	117	99	-	123	90	109	40	75	27	-	66	45	51

Table 2.5.11.2 Contd.....

Sl. No.	Cultures Name	Days to flowering							Mean	Days to maturity						Mean	Plant height (cm)						Mean
		Kanke	Sagar	Rai pur	Jashi pur	Nag pur	Rai chur	Latur		Kanke	Sagar	Rai pur	Jashi pur	Nag pur	Latur		Kanke	Sagar	Rai pur	Jashi pur	Nag pur	Latur	
										BLOCK-IV													
76.	CI-1970	73	52	65	64	71	-	52	63	117	118	90	-	124	100	110	39	39	34	57	62	50	47
77.	EC-519 A	77	54	52	58	64	69	52	61	112	120	99	101	124	89	108	33	57	35	62	53	47	48
78.	EC-421	82	56	62	68	79	72	55	68	119	122	90	-	125	98	111	27	37	26	-	45	43	36
79.	CI-2230	86	51	58	63	70	77	56	66	114	119	90	104	126	90	107	46	50	30	60	68	56	52
80.	CI-1978	81	53	55	64	64	76	50	63	112	118	91	107	124	94	108	43	57	36	56	67	51	52
81.	CP-White	75	52	52	64	64	66	55	61	111	118	92	110	126	88	108	41	54	30	65	55	42	48
82.	CF-White	71	50	53	64	62	59	49	58	113	117	93	-	125	89	107	46	53	37	-	53	46	47
83.	EC-519 K	73	56	57	63	64	68	50	62	117	121	97	106	123	92	109	47	54	29	62	60	54	51
84.	EC-524	78	50	55	64	69	71	48	62	113	120	95	111	124	91	109	37	49	46	66	58	46	50
85.	CI-2053	71	51	52	56	62	59	50	57	112	117	98	104	125	92	108	33	53	28	57	60	51	47
86.	CI-1904	72	49	52	64	64	61	50	59	113	116	97	-	126	94	109	38	61	34	-	70	45	50
87.	CI-2208	85	53	63	64	79	78	50	67	119	120	106	111	124	98	113	40	62	46	65	61	48	54
88.	EC-12	82	55	66	-	78	78	51	68	117	122	109	-	123	101	114	39	66	41	-	63	46	51
89.	EC-536	84	54	67	-	81	-	60	69	120	121	107	-	124	101	115	42	63	31	-	54	53	49
90.	CI-2063	84	56	58	64	79	76	61	68	115	122	101	113	125	99	113	33	50	42	56	49	51	47
91.	CI-1908	84	53	66	-	79	80	57	70	118	119	109	-	124	100	114	38	46	40	-	57	46	45
92.	CI-2066	77	52	52	63	70	64	78	65	114	119	98	111	123	93	110	30	55	30	62	51	62	48
93.	EC-415	75	54	58	-	66	72	49	62	112	120	100	-	124	93	110	33	56	37	-	53	51	46
94.	CI-2206	86	57	61	69	71	77	49	67	117	121	104	113	125	98	113	36	51	30	59	58	51	48
95.	CI-2057	71	50	52	-	64	64	54	59	113	119	97	-	126	90	109	30	56	38	-	49	47	44
96.	DAK-105	73	54	55	-	64	64	49	60	118	120	97	-	125	92	110	40	58	26	-	51	51	45
97.	EC-533-15	73	51	55	-	64	62	51	59	117	116	99	-	125	94	110	37	67	27	-	51	55	47
98.	EC-541	76	57	57	-	64	54	50	60	115	121	102	-	126	90	111	40	100	19	-	48	50	51
99.	CI-2236	80	56	60	64	71	78	51	66	118	120	105	111	126	97	115	37	62	35	61	47	61	51
100.	EC-521 M	79	49	47	64	65	72	55	62	119	115	92	-	124	99	110	49	66	36	-	64	46	52
	CHECKS																						
	NL-97	74	48	50	61	69	59	50	59	117	115	108	102	122	93	110	51	64	37	55	58	59	44
	JLS-9	72	47	52	60	64	55	49	57	117	114	103	108	124	87	109	36	56	35	53	45	44	45
	T-397	73	50	52	59	69	66	50	60	114	117	105	107	124	92	110	39	59	34	56	51	51	48

2.5.12 Screening of germplasm under saline/alkaline condition

About 6.73 m ha area in India is affected with soil salinity/alkalinity. Hence, this screening trial was formulated in order to identify the genotypes better than the existing checks under saline/alkaline condition. The experiment was conducted on one hundred germplasm and three checks *i.e.,* Hira, Mukta and T-397 at four locations in augmented block design consisting four blocks/ replications.

All the four assigned centres *viz;* Daleepnagar, Faizabad, Lucknow and Dholi conducted the trial successfully and recorded data on seed yield and ancillary traits like days to maturity, number of capsules per plant and number of seeds per capsule which have been documented in Table 2.5.12.1 to 2.5.12.2.

Non-significant variation among the treatments (genotypes) and also among the checks was observed at all the four locations for seed yield, whereas variances due to treatments vs checks was found significant across all the four blocks at Faizabad centre only. Three, four, twenty one and fourteen genotypes registered more seed yield than the best check at Daleepnagar, Faizabad, Lucknow and Dholi, respectively.

The top ranking five genotypes selected on the basis of their *per se* performance at different locations have been enumerated here as under :

Five best genotypes for seed yield (kg/ha)

Daleepnagar	Faizabad	Lucknow	Dholi
Kanpur Local	NDL 2005-23	Jaishi 1-3	HY262
Jaishi 1-3	NDL 2005-29	NDL 2005-23	HY52 × RR9
JRF-4	NDL 2005-34	H49	IC4948
T 397	NDL 2005-22	JRF 4	ICAR4
KP 5	NDL 2005-24	Holden	HYB 603-2

Following common genotypes have been marked as sustainable one across the locations among the aforesaid selected genotypes which may be utilized in crop improvement programme :

Jaishi-1-3	Daleepnagar and Lucknow
JRF-4	Daleepnagar and Lucknow
NDL-2005-23	Faizabad & Lucknow

Table 2.5.12.1 Screening of germplasm under saline / alkaline condition : Seed yield (kg/ha)

Sl. No.	Cultures Name	Seed yield (kg/ha)			
		Daleepnagar	Faizabad	Lucknow	Dholi
		BLOCK-I			
1.	JLT-84-5-1	–129.17	947.22	122.00	56.20
2.	Jashi-21	–154.17	725.00	678.00	50.70
3.	HY-126-2 (IC-4948)	–104.17	691.67	539.00	184.00
4.	ICAR-3	–120.83	580.56	678.00	72.90
5.	KP-13 A	—	447.22	1233.00	67.30
6.	NDL-2005-22	–129.17	1169.44	956.00	56.20
7.	Kanpur 2/1	–129.17	913.89	1233.00	28.40
8.	ICAR-1	–104.17	502.78	1511.00	39.60
9.	KP-10	–112.50	558.33	1456.00	22.90
10.	HYB-603-2	–120.83	169.44	1650.00	167.30
11.	ILS-154	–95.83	502.78	1372.00	139.60
12.	Inslar Local	–70.83	947.22	1789.00	167.30
13.	IC/54	254.17	980.56	678.00	139.60
14.	JBP-Star II	–54.17	669.44	378.00	17.30
15.	K-2 × (R-4/29)	12.50	613.89	539.00	50.70
16.	Hamirpur	–129.17	1002.78	678.00	56.20
17.	HY-262	–37.50	1058.33	400.00	195.10
18.	IPS-42	29.17	891.67	539.00	56.20
19.	Jakauli	–104.17	1002.78	511.00	67.30
20.	HY-52 × RR-9	–137.50	780.56	400.00	189.60
21.	Jaishri-2	–95.83	558.33	1011.00	–13.80
22.	ILS-56	–129.17	669.44	122.00	167.30
23.	NDL-2005-24	–129.17	1113.89	–17.00	34.00
24.	ILS-77	–95.83	558.33	122.00	56.20
25.	H-104-V/7	–112.50	425.00	289.00	50.75
		BLOCK-II			
26.	Jawargi-1-11	65.28	973.15	567.00	95.15
27.	Kota-8	98.61	917.59	1983.00	100.75
28.	ILS-169	223.61	806.48	1150.00	117.35
29.	ICAR-6	90.28	917.39	1150.00	39.55
30.	ILS-150	223.61	750.93	1011.00	45.15
31.	IPI-10	248.61	528.70	1844.00	50.75
32.	ILS-79	98.61	495.37	2122.00	111.85
33.	H-49	115.28	473.15	2400.00	39.55
34.	IC-16380	115.28	695.37	2400.00	—

Sl. No.	Cultures Name	Seed yield (kg/ha)			
		Daleepnagar	Faizabad	Lucknow	Dholi
35.	HY-38	115.28	495.37	2122.00	45.15
36.	Jabalpur local	98.61	450.93	1956.00	72.95
37.	JRF-4	398.61	417.59	2122.00	—
38.	KP-5	265.28	473.15	1956.00	—
39.	Jaishi 1-3	631.94	750.93	2678.00	45.15
40.	ILS-60	173.61	495.37	1844.00	89.55
41.	Jabalpur 1986	156.94	750.93	1011.00	45.15
42.	IPI-6	181.94	806.48	1567.00	39.55
43.	ILS-153	123.61	473.15	1150.00	—
44.	ILS-252	106.94	384.26	1291.00	—
45.	KL-31	156.94	395.37	1289.00	34.05
46.	HY-66	173.61	495.37	1844.00	—
47.	IC-47936	198.61	562.04	1150.00	100.75
48.	NDL 2005-26	148.61	1084.26	1150.00	39.55
49.	ILS-169	156.94	473.15	1011.00	—
50.	Jathari local	—	806.48	1844.00	47.95
		BLOCK-III			
51.	Ireland	—	650.93	1326.00	59.05
52.	H-10416-b	81.94	984.26	493.00	53.45
53.	JLST-1	115.28	984.26	771.00	53.45
54.	IC-16350	98.61	873.15	771.00	70.15
55.	JRF-1	—	984.26	1465.00	—
56.	Jawargi-1-5	48.61	762.04	1188.00	64.65
57.	KL-169	81.94	762.04	1743.00	64.65
58.	ICAR-2	106.94	817.59	1215.00	—
59.	IC-16392	148.61	706.48	1604.00	—
60.	H-660	65.28	484.26	1326.00	75.75
61.	IC-16382	73.61	428.70	1660.00	31.25
62.	ILS-60	123.61	428.70	2021.00	—
63.	NDL-2005-31	40.28	928.70	1743.00	42.35
64.	ICAR-3	81.94	595.37	1604.00	—
65.	KL-37	65.28	428.70	1326.00	147.85
66.	KP-13	56.94	206.48	715.00	—
67.	Kota-2	65.28	373.15	1326.00	—
68.	Hanuman Sagar	65.28	539.81	493.00	75.75
69.	KB-96-10	40.28	484.26	1326.00	—
70.	HY-276	65.28	539.81	1382.00	—
71.	KL-1	56.94	317.59	771.00	—
72.	ICAR-7	156.94	428.70	1604.00	—
73.	H.P.	98.61	428.70	1738.00	78.50
74.	ILS-73	48.61	373.15	826.00	—
75.	K-29	73.61	428.70	1049.00	45.10

Sl. No.	Cultures Name	Seed yield (kg/ha)			
		Daleepnagar	Faizabad	Lucknow	Dholi
		BLOCK-IV			
76.	HY-126-2 (IC-4568)	123.61	984.26	94.00	78.50
77.	HY-397	156.94	928.70	261.00	34.00
78.	HY-614-1	123.61	817.59	427.00	45.10
79.	IC-15888	181.94	539.81	927.00	39.60
80.	IPI-8	156.94	817.59	1705.00	—
81.	I/276	248.61	962.04	1483.00	50.70
82.	IC-59202	140.28	873.15	1761.00	—
83.	JRF-5	140.28	595.37	1705.00	—
84.	Kanpur	690.28	539.81	1761.00	—
85.	NDL-2005-23	181.94	1262.04	2427.00	45.10
86.	ICAR-4	165.28	739.81	1927.00	178.50
87.	Holden	173.61	706.48	2094.00	—
88.	ILS-293	181.94	650.93	1316.00	106.20
89.	KP-8	231.94	484.26	1594.00	128.50
90.	NDL-2005-32	240.28	1039.81	1483.00	61.80
91.	Kanpur local	131.94	317.59	983.00	45.10
92.	NDL 2005-34	173.61	1184.26	594.00	—
93.	ILS-61	173.61	762.04	705.00	—
94.	HY-31	173.61	539.81	1205.00	—
95.	ILS-65	198.61	762.04	1205.00	50.70
96.	Kota-13	231.94	650.93	1038.00	—
97.	ILS-264	140.28	484.26	1038.00	106.20
98.	ICI-14577	156.94	817.59	1038.00	—
99.	Jabalpur-367	156.94	562.04	1205.00	—
100.	NDL-2005-29	123.61	1228.70	1094.00	128.50
	Hira (Check)	160.42	1100.00	749.50	88.88
	Mukta (Check)	62.50	972.22	1048.00	68.03
	T-397 (Check)	289.58	1047.22	1485.50	—
	GM	170.83	1039.81	1094.33	78.45
	SE (m) ±	92.23	82.51	375.05	21.78
	CD	NS	NS	NS	NS
	CV %	107.97	15.87	68.54	55.53

Source	Daleepnagar		Faizabad		Lucknow		Dholi	
	SE (M) ±	CD 5%	SE (M) ±	CD 5%	SE (M) ±	CD 5%	SE (M) ±	CD 5%
Unrep. Treats - Same Block	260.85	638.31	233.38	571.08	1060.80	2595.79	61.61	196.03
Unrep. Treats - Diff. Block	301.21	737.05	269.48	659.42	1224.91	2997.36	75.45	240.09
Unrep Treats vs Check	225.90	552.79	202.11	494.57	918.68	2248.02	55.53	176.70

Table 2.5.12.2 Screening of germplasm under saline / alkaline condition : Ancillary characters

S.No.	Cultures Name	Days to maturity			Mean	No. of capsules/plant				Mean	No. of seeds/capsule			Mean
		Daleep nagar	Faiza bad	Dholi		Daleep nagar	Faiza bad	Luck now	Dholi		Daleep nagar	Faiza bad	Luck now	
						BLOCK-I								
1.	JLT-84-5-1	134	120	118	124	26	24	123	18	48	7	7	7	7
2.	Jashi-21	128	122	122	124	29	27	107	14	44	10	8	6	8
3.	HY-126-2 (IC-4948)	131	126	122	126	39	29	101	27	49	11	8	8	9
4.	ICAR-3	132	127	124	128	129	26	63	12	58	8	9	10	9
5.	KP-13 A	-	126	124	125	-	24	114	27	55	-	9	10	10
6.	NDL-2005-22	130	126	124	127	20	27	98	22	42	9	9	10	9
7.	Kanpur-2/1	127	130	124	127	65	20	171	22	70	9	8	8	8
8.	ICAR-1	125	132	124	127	32	15	150	26	56	9	8	9	9
9.	KP-10	122	126	119	122	45	21	196	7	67	10	7	10	9
10.	HYB-603-2	126	129	124	126	26	18	90	21	39	9	7	10	9
11.	ILS-154	124	128	124	125	24	20	122	22	47	9	8	9	9
12.	Inslar local	128	128	122	126	54	22	270	17	91	9	8	8	8
13.	IC/54	129	126	122	126	36	26	149	24	59	9	8	9	9
14.	JBP-Star II	125	128	118	124	23	16	78	10	32	9	8	8	8
15.	K-2 × (R-4/29)	122	126	120	123	32	22	152	14	55	10	9	5	8
16.	Hamirpur	120	125	127	124	46	25	185	16	68	9	9	7	8
17.	HY-262	121	125	116	121	21	26	70	17	34	9	9	10	9
18.	IPS-42	129	128	120	126	54	20	125	21	55	9	9	9	9
19.	Jakauli	131	127	122	127	60	27	176	18	70	9	8	9	9
20.	HY-52 × RR-9	136	128	124	129	17	20	86	16	35	8	8	10	9
21.	Jaishri-2	134	125	122	127	19	17	97	23	39	9	8	9	9
22.	ILS-56	132	125	122	126	41	18	100	15	44	9	8	8	8
23.	NDL-2005-24	136	124	120	127	17	27	63	12	30	9	9	8	9
24.	ILS-77	133	125	120	126	15	16	73	9	28	10	8	10	9
25.	H-104-V/7	132	126	127	128	18	19	105	16	40	8	8	8	8
						BLOCK-II								
26.	Jawargi-1-11	134	126	124	128	11	20	89	10	33	7	8	8	8
27.	Kota-8	130	125	122	126	11	24	78	16	32	9	9	10	9
28.	ILS-169	126	127	120	124	14	22	83	16	34	10	8	10	9
29.	ICAR-6	129	125	122	125	26	18	237	12	73	10	8	10	9
30.	ILS-150	138	126	120	128	15	15	89	11	33	9	8	10	9
31.	IPI-10	128	125	120	124	24	16	80	16	34	9	8	9	9
32.	ILS-79	134	126	122	127	15	12	148	18	48	9	8	8	8
33.	H-49	130	128	122	127	22	12	120	5	40	9	8	8	8
34.	IC-16380	129	126	-	128	19	17	270	-	102	9	8	9	9

S.No.	Cultures Name	Days to maturity			Mean	No. of capsules/plant				Mean	No. of seeds/capsule			Mean
		Daleep nagar	Faiza bad	Dholi		Daleep nagar	Faiza bad	Luck now	Dholi		Daleep nagar	Faiza bad	Luck now	
35.	HY-38	124	126	122	124	22	10	210	14	64	10	8	8	9
36.	Jabalpur Local	136	128	122	129	15	16	133	19	46	8	8	9	8
37.	JRF-4	132	126	-	129	23	15	165	-	68	10	7	10	9
38.	KP-5	134	126	-	130	43	13	170	-	75	9	8	9	9
39.	Jaishi 1-3	128	124	124	125	25	14	221	18	70	7	7	7	7
40.	ILS-60	120	126	124	123	44	8	133	17	51	9	7	9	8
41.	Jabalpur 1986	134	125	124	128	20	10	138	16	46	8	8	8	8
42.	IPI-6	129	126	124	126	13	15	155	18	50	9	8	6	8
43.	ILS-153	138	123	-	131	21	10	158	-	63	9	7	10	9
44.	ILS-252	124	124	-	124	17	14	117	-	49	8	7	8	8
45.	KL-31	132	126	120	126	18	10	137	17	46	8	8	10	9
46.	HY-66	128	125	-	127	16	11	127	-	51	10	7	10	9
47.	IC-47936	124	124	119	122	20	15	63	15	28	10	7	9	9
48.	NDL-2005-26	128	125	124	126	17	25	185	16	61	8	8	9	8
49.	ILS-169	124	128	-	126	8	12	57	-	26	9	7	10	9
50.	Jathari local	-	124	123	124	-	20	240	23	94	-	7	6	7
						BLOCK-III								
51.	Ireland	-	124	122	123	-	38	93	12	48	-	8	9	9
52.	H-10416-b	133	128	119	127	17	30	55	9	28	8	8	8	8
53.	JLST-1	129	126	122	126	17	24	95	19	39	9	8	11	9
54.	IC-16350	129	126	124	126	13	32	217	14	69	7	8	6	7
55.	JRF-1	-	124	-	124	-	32	115	-	74	-	8	8	8
56.	Jawargi-1-5	128	125	122	125	24	34	135	12	51	7	8	10	8
57.	KL-169	124	123	120	122	20	25	137	13	49	8	7	7	7
58.	ICAR-2	120	126	-	123	17	15	220	-	84	10	7	9	9
59.	IC-16392	139	125	124	129	19	20	151	-	63	9	9	6	8
60.	H-660	133	124	118	125	17	17	50	18	26	9	8	10	9
61.	IC-16382	139	125	124	129	15	15	260	4	74	9	7	10	9
62.	ILS-60	134	124	-	129	15	15	210	-	80	10	7	10	9
63.	NDL-2005-31	136	125	122	128	16	26	177	14	58	10	9	9	9
64.	ICAR-3	130	129	-	130	16	11	119	-	49	11	8	10	10
65.	KL-37	122	126	120	123	13	13	185	14	56	9	8	9	9
66.	KP-13	124	123	-	124	14	8	168	-	63	9	7	10	9
67.	Kota-2	126	125	-	126	8	10	175	-	64	9	7	8	8
68.	Hanuman Sagar	125	126	122	124	10	9	115	22	39	8	9	8	8
69.	KB-96-10	127	125	-	126	13	11	117	-	47	8	7	8	8
70.	HY-276	138	124	-	132	19	17	143	-	60	9	7	9	8

S.No.	Cultures Name	Days to maturity			Mean	No. of capsules/plant				Mean	No. of seeds/capsule			Mean
		Daleep nagar	Faiza bad	Dholi		Daleep nagar	Faiza bad	Luck now	Dholi		Daleep nagar	Faiza bad	Luck now	
71.	KL-1	142	126	-	134	14	23	224	-	57	8	6	9	8
72.	ICAR-7	141	126	-	134	15	17	180	-	71	11	7	9	9
73.	H.P.	132	124	122	126	14	22	155	30	55	10	7	9	9
74.	ILS-73	139	126	122	129	7	15	210	-	77	10	7	6	8
75.	K-29	128	124	122	125	19	17	85	16	34	9	6	10	8
						BLOCK-IV								
76.	HY-126-2 (IC-4568)	132	126	122	127	9	42	70	10	33	10	9	8	9
77.	HY-397	135	126	120	127	11	27	80	13	33	11	8	6	8
78.	HY-614-1	129	125	120	125	19	24	86	13	36	9	8	9	9
79.	IC-15888	130	124	120	125	16	25	92	17	38	8	8	8	8
80.	IPI-8	128	125	-	127	14	26	115	-	52	9	8	10	9
81.	I/276	132	128	120	127	12	59	180	18	67	9	8	9	9
82.	IC-59202	133	124	-	129	21	41	143	-	68	8	8	10	9
83.	JRF-5	128	126	-	127	11	35	160	-	69	9	8	9	9
84.	Kanpur	132	126	-	129	24	18	160	-	67	9	8	8	8
85.	NDL-2005-23	134	125	122	127	10	27	137	12	47	9	9	8	9
86.	ICAR-4	128	124	122	125	7	24	175	16	56	8	8	5	7
87.	Holden	138	126	-	132	15	13	162	-	63	8	7	8	8
88.	ILS-293	131	124	122	126	13	26	121	18	45	8	7	7	7
89.	KP-8	132	126	118	125	13	16	183	11	56	9	9	8	9
90.	NDL-2005-32	134	125	120	126	12	22	178	19	58	8	9	8	8
91.	Kanpur Local	142	124	120	129	7	10	125	28	43	8	7	8	8
92.	NDL-2005-34	140	126	-	133	16	24	122	-	54	8	8	9	8
93.	ILS-61	132	125	-	129	12	10	162	-	61	9	8	7	8
94.	HY-31	136	124	-	130	10	11	124	-	48	8	8	8	8
95.	ILS-65	133	126	124	128	35	9	115	120	70	10	7	6	8
96.	Kota-13	130	128	-	129	30	8	220	-	86	9	8	9	9
97.	ILS-264	131	124	122	126	24	8	160	17	52	9	7	9	8
98.	ICI-14577	142	125	-	134	18	12	170	-	67	8	8	9	8
99.	Jabalpur-367	138	124	-	131	16	11	242	-	90	10	7	9	9
100.	NDL-2005-29	131	126	122	126	11	26	138	17	48	8	8	10	9
	Hira (Check)	130	126	122	126	31	26	55	15	32	9	9	9	9
	Mukta (Check)	126	126	124	125	23	24	131	18	49	9	8	8	8
	T-397 (Check)	132	126	120	126	21	25	132	17	49	9	9	10	9

2.6 Breeder seed production

Breeder seed indent of 49.11 quintals in respect of 25 linseed varieties was received from Deptt. of Agriculture and Cooperation, MOA, GOI, New Delhi. About 79.00 q of breeder seed was produced by different SAUs during 2007-08 which is about 60 per cent higher than the indented quantity. In addition to this, 3.14 q was also produced as an additional quantity making total availability of breeder seed around 81.88 q.

The production was nil in case of Neela whereas, surplus quantity of breeder seed was produced in some var. Padmini, JLS 9 and Kartika. Variety and centre-wise details of breeder seed produced during *rabi* 2007-08 have been given below:

Sl. No.	Variety	DAC indent (q)	Actual production (q)	Name of producing centres/state
1	Nagarkot	0.30	0.48	CSKHPKV, Palampur (HP)
2	Surbhi	0.05	0.04	"
3	Binwa	0.15	0.64	"
4	Baner	0.10	0.74	"
5	Jeevan	0.05	0.06	"
6	Janki	0.05	0.28	"
7	Shekhar	2.80	4.80	CSAUA&T, Kanpur (UP)
8	Neelum	0.20	1.00	"
9	Garima	0.40	3.20	"
10	Laxmi-27	075	0.70	"
11	Padmini	6.85	15.80	"
12	Sheela	3.90	1.70	"
13	Parvati	7.65	5.00	"
14	Shikha	0.35	0.60	"
15	Rashmi	0.15	1.00	"
16	Sharda	0.90	1.20	"
17	Meera	0.90	3.00	MPUA&T, Kota (Raj.)
18	JLS-9	8.40	15.50	JNKVV, Jabalpur (MP)
19	Suyog	0.65	1.00	"
20	JL-23-10	2.00	1.90	"
21	Kiran	0.01	0.10*	IGKV, Raipur (CG)
22	Deepika	1.00	1.40	"
23	Indira Alsi-32	2.00	2.80	"
24	Kartika	9.00	15.80	"
25	Neela	0.50	0.00	P&ORS, Berhampore (WB)
	Total	**49.11**	**78.74**	
Additional production				
1	Him Alsi-1	-	0.44	CSKHPKV, Palampur (HP)
2	Him Alsi-2	-	0.40	"
3	Himani	-	0.30	"
4	NL 97	-	1.00	PDKV, Nagpur (MS)
5	Sweta	-	1.00	CSAUA&T, Kanpur (UP)
	Total	**-**	**3.14**	
	Grand Total	**49.11**	**81.88**	

* Carry over seed

3. AGRONOMY

The technical programme of Agronomy for the year 2007-08 consisted eleven coordinated experiments that were to be conducted under rainfed and irrigated agro-ecosystem at 16 locations spread over four agro-climatic regions of the linseed, *viz.* North-Western region (Zone I), Gangetic Alluvial region including NEH region (Zone II), Central region (Zone III), and Peninsular & Southern region (Zone IV). Sagar Centre has conducted two station trials besides AICRP experiments. The title of AICRP experiments are given below:

1. Effect of zinc with and without FYM in linseed based cropping sequence.
2. Intercropping studies of linseed with autumn planted sugarcane.
3. Studies on moisture conservation practices for linseed under rainfed situation.
4. Studies on sowing time in relation to newly released linseed varieties for double cropping system.
5. Intercropping studies in seed drill sown *rabi* crops in association with linseed.
6. Studies on bio-efficacy of new herbicides for weed management in irrigated linseed.
7. Studies on phosphorus management in double cropping system involving linseed.
8. Studies on integrated nutrient management in double cropping system involving linseed.
9. Studies on the response of EEMT entries of Zone III to seed rate and fertilizer application.
10. Studies on the response of AVT (I) 2nd year entries to fertilizer application and sowing schedule.
11. Studies on the response of AVT (DP) entries to sowing schedule and fertilizer application.

Barring a few, all the centres have conducted their assigned experiments as per approved technical programme. The coordinated experiments that have completed three years of experimentation at one location, have been concluded after pooled analysis of the data. The experiment Nos. 9, 10 and 11 are the regular experiments that were planned with a view to generate agronomic data to fulfil requisite for varietal identification/release by central variety identification/ release committee. The experiment as well as centre-wise results of all the centres for the year and pooled results of some centres are presented below:

3.1 Effect of zinc with and without FYM in linseed based crop sequence

The experiment was allotted to Kanke centre in blackgram-linseed crop sequence. This experiment consisted eight treatments which was laid out in randomized block design with three replications. The main objective of this experiment was to find out the impact of zinc on black gram-linseed crop sequence with and without FYM. This experiment has completed three years of experimentation at this location, hence concluded. The details of the treatments are given below:

1. Zinc to both the crops
2. Zinc to blackgram
3. Zinc to linseed
4. T_1 + FYM
5. T_2 + FYM
6. T_3 + FYM
7. Recommended dose of NPK to both the crops
8. Absolute control *i.e.*, No NPK Zn and FYM

Zinc was applied through zinc sulphate @ 25 kg/ha, while FYM @ 5 t/ha but in *kharif* season only. The results recorded at Kanke centre are reported below:

Kanke (2007-08)

The experiment was conducted on sandy loam textured soil having medium available N, P_2O_5 and K_2O along with Zn 1.35 ppm and sulphur 16.0 kg/ha. The varieties were T_9 for black gram and Sweta for linseed. The experimental crops blackgram and linseed were fertilized @ $N_{20}P_{40}K_0$ and $N_{40}P_{30}K_{20}$ (kg/ha), respectively. T_3 and T_5 with regard to blackgram yield and all the treatments except T_8 with regard to linseed yield recorded significantly higher yields over recommended dose of NPK application to both the crops (T_7). Linseed equivalent yield recorded in T_1 (1510 kg/ha), T_4 (1783 kg/ha), T_5 (1640 kg/ha) and T_6 (1511 kg/ha) were observed significantly superior to T_7 *i.e.* recommended dose of NPK to both the crops (1217 kg/ha). However, the net monetary returns of T_4 (Rs. 23840/ha) and T_5 (Rs. 21437/ha) only could significantly supersede T_7 (Rs. 13392/ha).

Pooled results

Application of zinc during both the season *i.e.*, T_1 (679 kg/ha), addition of FYM in T_1 *i.e.*, T_4 (851 kg/ha) and addition of FYM in T_2 *i.e.*, T_5 (792 kg/ha) were observed to increase black gram yield significantly over recommended dose of NPK to both the crops *i.e.* T_7 (629 kg/ha) whereas all the treatments except T_8 were found to increase linseed yield significantly over T_7 (Table 3.1). Linseed equivalent yield recorded in T_1 (1582 kg/ha), T_2 (1408 kg/ha), T_4 (1903 kg/ha), T_5 (1639 kg/ha) and T_6 (1568 kg/ha) were found significantly higher than T_7 (1246 kg/ha).

Table 3.1 : Effect of zinc with and without FYM in black gram-linseed crop sequence at Kanke

Treatments	Yield (kg/ha) and economic of 2007-2008					Pooled yield (kg/ha) and NMR (Rs/ha)			
	Blackgram	Linseed	LEY	Cost of cultivation (Rs/ha)	NMR (Rs/ha)	Blackgram	Linseed	LEY	NMR
T_1	633	877	1510	20405	17353	679	905	1582	13951
T_2	604	767	1371	19470	14805	613	773	1408	11227
T_3	526	727	1252	19470	11830	557	768	1346	9774
T_4	817	967	1783	20735	23840	851	1022	1903	20457
T_5	814	827	1640	19580	21437	792	821	1639	16288
T_6	611	900	1511	19580	18203	627	919	1568	14502
T_7	594	607	1217	17050	13392	590	629	1246	10108
T_8	454	540	1019	13695	11772	467	521	1007	8379
Mean	**632**	**776**	**1413**	-	**16579**	**647**	**795**	**1462**	**13086**
SE (m)±	37.43	44.31	69.61	-	1740.27	24.12	29.62	38.76	809.98
CD at 5%	114	134	211	-	**5280**	70	86	112	2339
CV%	10.26	11.01	12.65	-	18.18	-	-	-	-
CD year	-	-	-	-	-	NS	NS	NS	2816

Sale price of black gram and linseed for the year 2007-08 : Rs. 25/kg
NMR - Net monetary return; LEY = Linseed equivalent yield.

The net monetary returns fetched in the same treatments *i.e.*, T_1, T_2, T_4, T_5 and T_6 were also significantly higher than T_7. It is also clear from Table 3.1 that addition of FYM irrespective of treatments of Zn application increased the net monetary return numerically. Thus it is concluded that application of Zn through zinc sulphate @ 25 kg/ha in blackgram in blackgram-linseed crop sequence would be advantageous to record higher LEY and NMR whereas addition of FYM in *kharif* would provide more benefit over Zn application.

3.2 Intercropping studies of linseed with autumn planted sugarcane.

This experiment was allotted to RAU (Dholi), Sarkareshwar, M.P.K.V. (Rahuri), Padegaon and Kadegaon but Dholi centre only could conduct the trial. This experiment includes 8 treatments in RBD with 3 replications. The details of the treatments are given below :

T_1 Sugarcane + linseed (1:3) using linseed variety V_1

T_2 T_1 with linseed variety V_2

T_3 Sugarcane + linseed (1:4) using linseed variety V_1

T_4 T_3 with linseed variety V_2

T_5 Sugarcane + linseed: broad casting of linseed variety V_1 @ 45 kg/h

T_6 T_5 with linseed variety V_2 @ 30 kg/ha

T_7 Sole sugarcane

T_8 Sole linseed using variety V_1 @ 45 kg/ha at 20 cm apart

T_9 Sole linseed using variety V_2 @ 30 kg/ha at 25 cm apart

The results of whole system initiated during 2006-07 at Dholi and Lucknow Centres are presented below but results of 2007-2008 will be reported next year.

Dholi

The results of Dholi centre are given in Table 3.2.1.

Table 3.2.1 Impact of autumn planted sugarcane on yield of linseed in sugarcane + linseed intercropping system at Dholi-Pusa. (2006-07)

Sl. No.	Treatment	Linseed yield (2006-07) (kg/ha)	Cane yield (t/ha)	LER	Cost of cultivation (Rs/ha)	GMR (Rs/ha)	NMR (Rs/ha)	B:C Ratio
1.	T_1 S + LR (1:3 RR)	345	68.29	1.42	42626	82017	39391	1.92
2.	T_2 S + LG (1:3 RR)	896	73.61	1.88	42126	98888	56761	2.35
3.	T_3 S + LR (1:4 RR)	292	67.14	1.32	42626	79687	37061	1.87
4.	T_4 S + LG (1:4 RR)	775	70.14	1.70	42126	92663	50537	2.20
5.	T_5 S + LR (B)	271	64.36	1.25	42051	76213	34162	1.81
6.	T_6 S + LG (B)	273	65.98	1.09	41876	78041	36165	1.86
7.	T_7 S (Sole)	-	83.34	1.00	39114	91674	52560	2.34
8.	T_8 LR (Sole)	572	-	1.00	8160	11435	3275	1.40
9.	T_9 LG (Sole)	903	-	1.00	7860	18054	10194	230
	GM	**538**	**70.40**	-	-	-	-	-
	SE (m). ±	27.31	5.30	-	-	-	-	-
	CD at 5%	83	11.56	-	-	-	-	-
	CV %	8.79	9.23	-	-	-	-	-

S=Sugarcane; LR = Linseed Rashmi; LG= Linseed Garima; RR=Row Ratio; B=Broadcast
Market rates: Sugarcane Rs. 1100/t; Linseed Rs. 2000/q.

Sole cropping of linseed vr. Garima (903 kg/ha) yielded significantly higher than sole cropping of linseed using vr. Rashmi (572 kg/ha). Among intercropping patterns, intercropping of linseed variety Garima in autumn planted sugarcane excelled all the treatments significantly but 1:3 row ratio (T_2) was observed superior than 1:4 row ratio (T_4). Intercropping linseed vr. Garima in 1:3 row ratio has not affected sugarcane yield as it was at par to sole crop of sugarcane (Table 3.2). The same treatment fetched highest NMR (Rs. 56761/ha) too which was about 8% higher than sole cropping of sugarcane.

IISR (Lucknow)

Two varieties of linseed V_1 : Parvati and V_2 : Garima were intercropped in autumn planted sugarcane cv. Cosc 92423. Sole cropping of linseed vr. Parvati (1111 kg/ha) yielded numerically higher than sole cropping of Garima (906 kg/ha). Among intercropping systems, the yield of Parvati was numerically higher than Garima in every row ratio (Table 3.2.2). Sugarcane + Linseed (1:3) cv. Parvati produced at par millable cane (112.7 thousand/ha) and cane yield (76.5 t/ha) to sole sugarcane (121.3 thousand/ha and 80.8 t/ha). Sugarcane + linseed (1:3) cv. Garima followed the same very closely. Sugarcane + linseed (1:3) cv. Parvati recorded significantly highest cane equivalent yield (97.5 t/ha) and SEY (10.73 t/ha) along with maximum LER (1.81). The quality parameters were not affected by intercropping of linseed with sugarcane. Thus, linseed vr. Parvati may be intercropped with autumn planted sugarcane in 1:3 row ratio for increased profitability of sugarcane production systems.

Table 3.2.2 Impact of intercropping linseed with autumn planted sugarcane at IISR (Lucknow) 2006-07

Cropping Systems	Germination of cane (%)	Nos. of tillers (000/ha)			NMC (000/ha)	Cane yield (t/ha)	Linseed plant population (000/ha)	Linseed yield (kg/ha)	Cane equivalent yield (t/ha)	°Brix	Pol %	Purity (%)	CCS		SEY (t/ha)	LER
		March	May	July									(%)	(t/ha)		
S + L P (1:3)	41.6	76.9	175.9	167.8	112.7	76.5	493.7	960.7	97.5	18.56	16.08	86.6	11.01	8.43	10.73	1.81
S + L G (1:3)	39.7	71.6	163.8	146.2	104.6	73.7	479.8	776.9	90.7	18.56	16.08	86.6	11.01	8.12	9.98	1.77
S + L P (1:4)	38.8	65.9	146.0	115.9	96.7	64.2	779.4	813.9	81.9	18.61	16.40	88.1	11.33	7.27	9.28	1.53
S + L G (1:4)	40.2	71.6	149.0	106.8	102.3	67.6	673.8	800.6	85.1	18.46	16.26	88.1	11.23	7.59	9.55	1.72
S + L P (B)	38.9	76.7	126.0	102.9	95.6	66.9	794.6	668.7	81.5	18.35	16.26	88.6	11.26	7.53	9.18	1.43
S + L G (B)	38.5	73.9	106.5	101.3	89.7	59.7	659.7	574.6	72.2	18.21	15.83	86.9	10.86	6.48	7.85	1.37
S (Sole)	36.6	179.8	208.7	220.8	121.3	80.8	-	-	80.8	18.11	16.26	89.8	11.33	9.15	9.15	1.00
LP (Sole)	-	-	-	-	-	-	1029.7	1110.6	24.2	-	-	-	-	-	-	1.00
LG (Sole)	-	-	-	-	-	-	824.6	905.7	19.8	-	-	-	-	-	-	1.00
CD (P=0.05)	**NS**	**24.56**	**35.68**	**16.17**	**14.56**	**9.25**	**116.4**	**205.7**	**11.57**	**NS**	**NS**	**3.56**	**NS**	**0.95**	**0.97**	**-**

S= Sugarcane, LP = Linseed Cv. Parvati, LG = Linseed Cv. Garima, SEY = Sugar equivalent yield
Commodity Price :
Sugarcane = Rs. 1100 per tonne LER = Land equivalent ratio
Linseed = Rs. 2400 per q PLER = Partial Land equivalent ratio
*Not included in statistical analysis

3.3 Studies on moisture conservation practices for linseed under rainfed situation

This trial was allotted to Kanke, Sagar, Nagpur, Raipur, Faizabad and Mauranipur. All the centres executed the trial as per approved technical programme. This experiment has completed a consecutive period of three years at Kanke, Sagar and Nagpur, hence, data generated (seed yield and NMR) during the period have been pooled. This trial consisted seven treatments as given below and were laid out in RBD with three replications at all the locations.

T_1 No mulching
T_2 Straw mulching @ 10 t/ha
T_3 Spreading of FYM @ 10 t/ha as mulch
T_4 Incorporation of FYM @ 10 t/ha in the soil
T_5 Soil mulching at 30 DAS
T_6 Soil mulching at 30 DAS and after first rain shower
T_7 Hand weeding but no removal of weeded plants from the field

The centre-wise results of the year for all the locations alongwith pooled results of Kanke, Sagar and Nagpur centres are given here as under :

Kanke (2007-08)

The experiment was sown on sandy loam soil having low available N, medium available P_2O_5 as well as K_2O with pH 6.3. Seed yield and net monetary return recorded in T_2, T_3, T_9 and T_6 were observed significantly higher than T_1 *i.e.* no mulching. The net return per rupee investment recorded in these treatments were also on par with T_1 (Table 3.3.1).

Pooled results

Seed yield and net monetary return observed in different treatments were on par among themselves (Table 3.3.1). It happened mainly because of the fact that these parameters could not exhibit treatment differences during 2004-05 and 2006-07 too.

Table 3.3.1 Impact of moisture conservation practices on rainfed linseed at Kanke

Treatment	2007-08									Pooled	
	Seed yield (kg/ha)	Cost of Cultiv. (Rs/ha)	NMR (Rs/ha)	Net. Return per Re investment (Rs.)	P. height (cm.)	P. branch plant	Cap/plant	Seeds/cap	Test wt. (g)	Seed yield (kg/ha)	NMR (Rs/ha)
T_1	653	5200	11120	2.13	38.6	2.67	24.20	6.0	6.30	486	6027
T_2	**792**	**5540**	**14252**	2.57	39.9	2.60	24.47	7.0	6.10	566	7356
T_3	**736**	**6120**	**12283**	2.00	37.8	2.33	22.33	6.5	6.35	529	6230
T_4	**750**	**6120**	**12630**	2.06	38.9	2.07	26.53	6.9	5.90	542	6511
T_5	**663**	**5540**	**11022**	1.98	38.9	2.40	23.13	6.2	6.00	505	5956
T_6	**722**	**5540**	12516	2.25	38.3	2.73	23.53	6.2	6.25	517	6295
T_7	604	5540	9564	1.72	39.2	2.27	21.67	6.1	6.10	476	5290
G.M.	**703**	-	**11912**	**2.10**	-	-	-	-	-	**517**	**6238**
SE(m)±	10.16	-	254.06	0.05	-	-	-	-	-	18.39	1028
CD at 5%	31	-	783	0.15	-	-	-	-	-	NS	NS
CV%	2.50	-	3.69	3.79	-	-	-	-	-	-	-

Sagar (2007-08)

The experiment was sown on medium black soil on 16 Nov., 2007 and fertilized @ 40:20:20 kg NPK/ha. Seed yield (1235 kg/ha), net monetary return (Rs. 27919/ha) and net return per rupee investment (Rs. 3.06) recorded in T_5 (Soil mulching at 30 DAS) were significantly higher than T_2 and T_3 (Table 3.3.2.). All the treatments of moisture conservation practices were either on par with T_1 (No mulching) or gave lower NMR.

Pooled results

Weighted analysis of seed yield revealed no presence of year x treatment interaction, consequently no inference about overall superiority of any treatment can be established. Weighted analysis of NMR revealed significant year x treatment interaction. Afterward analysis of variance showed non significant differences among themselves (Table 3.3.2). The errors of seed yield and NMR were also found heterogeneous. Hence, it is not possible to establish any conclusion for this experiment.

Table 3.3.2 Impact of moisture conservation practices on rainfed linseed at Sagar

Treatment	2007-08										Pooled	
	Plant Stand (000/ha)	Seed yield (kg/ha)	Cost of Cultiv. (Rs/ha)	NMR (Rs/ha)	Net. Return per Reinvestment (Rs.)	P.L. hight (cm.)	P. branch plant	Cap/ plant	Seeds/ cap	Test wt. (g)	Seed yield (kg/ha)	NMR (Rs/ha)
T_1	1052	1086	8781	23809	2.71	46.6	3.13	135.9	9.0	10.40	765	11610
T_2	1019	915	10131	17329	1.71	49.0	3.23	157.3	8.5	8.67	739	9209
T_3	1169	1086	11131	21459	1.93	56.7	3.40	157.6	9.1	9.63	866	11248
T_4	1004	1138	11131	23029	2.01	52.2	3.07	161.5	7.5	8.97	926	12766
T_5	798	1235	9131	27919	3.06	53.0	3.20	149.5	8.5	8.30	869	13840
T_6	729	1183	9481	26009	2.74	56.4	4.27	190.2	8.1	10.03	893	13844
T_7	913	982	9621	18839	2.06	53.0	3.53	159.2	8.6	9.90	822	11860
G.M.	**955**	**1090**	-	**22770**	**2.33**	-	-	-	-	-	**840**	**12054**
SE(m)±	35.62	54.81	-	1682.93	0.16	-	-	-	-	-	-	12.30
CD at 5%	110	169	-	5187	0.49	-	-	-	-	-	-	**NS**
CV%	6.46	8.71	-	12.95	8.55	-	-	-	-	-	-	-

Nagpur (2007-08)

All the methods of moisture conservation except T_5 *i.e.* Soil mulching at 30 DAS, were observed to increase linseed yield significantly over control but T_4 recorded the highest seed yield (Table 3.3.3). Net monetary return recorded in T_7 *i.e.* Hand weeding and no removal of weeded plants from the field (Rs. 16551/ha) was significantly higher than T_1 (Rs. 11313/ha), T_3 (Rs 9374/ha) and T_4 (Rs. 10300/ha). However, NMR recorded in T_2 to T_6 were on par with T_1. Net monetary return per rupee investment recorded in T_7 (Rs. 2.16) was also the highest. It is also clear from the table 3.3.3 that moisture content of the soil at 30 DAS and harvest were also increased due application of moisture conservation practices.

Pooled results

Seed yield was significantly increased due to application of moisture conservation practices (T_2 to T_7) over control (T_1) but T_6 *i.e.*, soil mulching at 30 DAS and after first rain shower (Rs. 10901/ha) and T_7 i.e. Hand weeding and no removal of weeded plants from the field (Rs. 13408/ha) only were observed to increase NMR with significant margin over T_1 *i.e.* no mulching (Rs. 8552/ha). However, NMR recorded in T_2, T_3, T_4 and T_5 were observed on par with T_1. All the moisture conservation practices brought improvement in moisture content of soil at 60 DAS and at harvest (Table 3.3.4). Net return per rupee investment was recorded maximum in T_7 (Rs. 1.77) followed by T_6 (Rs. 1.44). Thus, it would be profitable to conserve the soil moisture of clayey soil of Nagpur through either soil mulching at 30 DAS and after first rain shower or hand weeding with removal of weeded plants from the field.

Table 3.3.3 Impact of moisture conservation practices on rainfed linseed at Nagpur : 2007-08

Treatment	2007-08								Moisture content (%)			
	Seed yield (Rs/ha)	Cost of Cultiv. (Rs/ha)	NMR (Rs/ha)	Net. Return per Reinvestment (Rs.)	Dl height (cm.)	Cap/ plant	Test wt. (g)	Plant Stand (Rs./ha)	at 30 DAS		at harvest	
									0-30 cm	30-45 cm	0-30 cm	30-45 cm
T_1	552	6375	11313	1.77	69.3	42.6	6.2	743	22.1	23.1	13.2	14.4
T_2	789	11665	13575	1.16	78.1	55.0	6.8	780	24.1	26.0	16.1	17.5
T_3	750	14625	9374	0.64	77.0	56.0	0.05	783	24.1	25.3	15.3	16.3
T_4	814	15740	10300	0.65	74.0	59.0	6.8	830	24.4	25.7	15.4	16.5
T_5	641	7250	13283	1.83	72.7	54.0	6.4	750	23.1	24.1	15.3	15.2
T_6	669	7415	14001	1.88	73.0	54.8	6.4	765	23.6	24.7	14.7	15.6
T_7	757	7665	16551	2.16	78.0	55.0	6.8	780	24.6	25.4	15.6	17.2
SE(m)±	36.7	-	1418	-	-	-	-	-	-	-	-	-
CD at 5%	113	-	4366	-	-	-	-	-	-	-	-	-
CV%	10.4	-	-	-	-	-	-	-	-	-	-	-

Table 3.3.4 Pooled impact of moisture conservation practices on rainfed linseed at Nagpur

Treatment	Seed yield (Rs/ha)	Cost of Cultiv. (Rs/ha)	NMR (Rs/ha)	Net. Return per Re investment (Rs.)	Moisture content %					
					at 60 DAS			at harvest		
					0-30 cm	0-45 cm	Mean	0-30 cm	0-45 cm	Mean
T_1	638	6943	8552	1.24	23.0	23.9	23.4	13.2	14.4	13.8
T_2	862	12236	8810	0.73	25.7	27.0	26.4	16.4	18.1	17.2
T_3	907	14927	6933	0.46	25.0	26.1	25.5	16.5	17.7	17.1
T_4	951	15494	7530	0.48	24.8	26.6	25.7	16.5	18.1	17.2
T_5	741	7388	10586	1.43	24.1	24.7	25.4	15.8	16.8	16.3
T_6	762	7593	10901	1.44	24.2	25.1	24.6	15.9	17.0	16.4
T_7	864	7560	13408	1.77	25.4	27.0	26.2	16.8	18.3	17.5
SE(m)±	29.2	-	697	-	-	-	-	-	-	-
CD at 5%	91	-	2146	-	-	-	-	-	-	-
Market rates			2005-06		2006-07			2007-08		
Seed Rs/q			2060		2150			3200		
FYM Rs/t			750		750			750		
Wheat straw Rs/t			500		500			500		

Raipur (2007-08)

The experiment was sown on vertisol soil having low available nitrogen as well as phosphorus and medium available potassium. Seed yield and net monetary return both were increased significantly due to use of moisture conservation practices (T_2 to T_7) over control (T_1). However, NMR recorded in T_1 and T_7 were at par (Table 3.3.5). Thus it would be profitable to use moisture conservation practices to grow linseed under rainfed condition on vertisol soil of Raipur.

Table 3.3.5 Impact of moisture conservation practices on rainfed linseed at Raipur

Treatment	Plant stand (0000/ha)	Seed yield (kg/ha)	Cost of cultivation (Rs/ha)	GMR (Rs/ha)	Net monetary return (Rs/ha)	Net Return/Rs invested (Rs)	Plant height (cm)	Primary branches/ plant	Capsules/ Plant	Seeds/ capsule	Test Weight (gm)
T_1	131	340	5433	8500	3067	0.56	28.1	1.70	12.6	6.53	6.00
T_2	184	513	7093	12833	5740	0.81	30.1	1.77	18.7	7.60	6.40
T_3	188	517	7593	12917	5324	0.70	29.7	2.27	20.7	7.83	6.40
T_4	194	580	7673	14500	6827	0.89	28.3	2.40	19.5	8.37	6.60
T_5	169	420	5673	10500	4827	0.85	29.5	1.73	19.8	7.63	6.20
T_6	159	417	5673	10417	4744	0.84	30.8	1.93	21.7	7.47	6.30
T_7	145	410	6633	10250	3617	0.55	29.3	1.90	16.8	6.53	6.10
Mean	**167**	**457**	**6539**	**11417**	**4878**	**0.74**	**29.4**	**1.96**	**18.54**	**7.42**	**6.29**
SE(m)±	4.04	23.28	-	582.02	582.02	0.09	0.78	0.12	1.37	0.26	NS
CD at 5%	14.59	65	-	1613	1613	0.25	2.2	0.33	3.81	0.71	-
CV%	15.12	8.83	-	8.83	20.67	20.71	4.62	10.6	12.85	5.95	5.70

Mauranipur (2007-08)

The experiment was sown on Kabar soil having 0.4% organic carbon, 16 kg/ha P_2O_5, 288 kg/ha K_2O and pH 7.8. Seed yield was increased significantly when soil moisture was conserved (T_2 to T_7) over control (T_1). However T_1 and T_7 were on par (Table 3.3.6). The net monetary return recorded in T_3, *i.e.,* spreading of FYM @ 10 t/ha as mulch (Rs. 7915/ha) was significantly higher than T_1 (Rs. 3993/ha) as T_2, T_4, T_5, T_6 and T_7 recorded on par NMR to T_1. Thus it would be advantageous to apply 10 t/ha FYM as mulch in rainfed linseed sown on kabar soil of Mauranipur area.

Table 3.3.6 Impact of moisture conservation practices on rainfed linseed at Mauranipur

Treatment	Plant stand (0000/ha)	Seed yield (kg/ha)	Cost of cultivation (Rs/ha)	NMR (Rs/ha)	Net Return/Rs invested (Rs)	Technical plant height total (cm)	No. of Primary branches/ plant	No. of Capsules/ Plant	No. of Seeds/ capsule	Test Weight (gm)
T_1	766	469	9130	3993	0.43	44.3	3.50	32.3	7.1	6.53
T_2	915	552	10530	4926	0.46	47.3	4.30	35.5	7.4	6.83
T_3	964	688	11330	7915	0.69	51.3	4.96	38.6	8.3	7.13
T_4	940	622	11330	6067	0.53	47.8	4.40	37.6	8.2	6.96
T_5	894	543	9630	5541	0.57	48.1	4.30	36.7	7.5	6.83
T_6	884	549	9630	5723	0.59	46.5	3.86	34.5	7.4	6.73
T_7	874	535	9930	5031	0.50	46.7	3.70	34.2	7.3	6.66
Mean	**891**	**565**		**6000**	**0.54**					
SE(m)±	14.36	23.84		661.74	0.07					
CD at 5%	44	73		2339	NS					
CV%	2.79	7.31		20.47	21.31					

Faizabad (2007-08)

The experiment was sown on sandy loam soil having 124.6 kg/ha N, 16.6 kg/ha P_2O_5, 215.3 kg/ha K_2O, 0.23 EC and pH 8.3. Linseed crop grown under rainfed condition brought significant increase in seed yield

when soil moisture was conserved (T_2 to T_7) as compared to control (T_1) but it was the highest in T_4. However, T_1 and T_5 were on par (Table 3.3.6). Net monetary return was also maximum in T_4 (Rs. 3227/ha) . Net monetary return per rupee investment followed the similar trend as seed yield and NMR.

Table 3.3.7 Impact of moisture conservation practices on rainfed linseed at Faizabad

Treatment	Plant stand (0000/ha)	Seed yield (kg/ha)	Cost of cultivation (Rs/ha)	NMR (Rs/ha)	Net Return/Rs invested (Rs)	Av. Plant height total (cm)	No. of Primary branches/ plant	No. of Capsules/ Plant	No. of Seeds/ capsule	Test Weight (gm)
T_1	585	242	6000	274	0.05	23.0	1.72	17.2	4.5	5.90
T_2	784	389	8500	1572	0.18	25.2	2.30	28.5	4-8	6.40
T_3	724	353	8000	1246	0.16	24.8	2.24	26.8	4.7	6.25
T_4	831	432	8000	3227	0.40	28.6	2.37	31.4	5.0	6.70
T_5	783	288	6870	561	0.08	23.5	1.82	20.2	4.5	6.00
T_6	669	315	7740	815	0.11	24.0	1.92	22.4	4.6	6.06
T_7	701	345	7392	1523	0.21	24.6	2.10	24.8	4.7	6.14
Mean	**725**	**338**	-	-	-	-	-	-	-	-
SE(m)±	36.50	12.52	-	-	-	-	-	-	-	-
CD at 5%	111	38	-	-	-	-	-	-	-	-
CV%	8.72	6.42	-	-	-	-	-	-	-	-

3.4 Studies on sowing time in relation to newly released linseed varieties for double cropping system

This experiment was allotted to Faizabad, Powarkheda and Raipur centre. The Faizabad centre conducted the experiment in rice-linseed crop sequence while remaining two in soybean-linseed. There were twelve treatment combinations that consisted three sowing schedules (main plot) and four varieties (Sub-plot). The centre wise report for the year 2007-08 of all the centres and pooled result of Faizabad centre are being reported here as under.

Faizabad (2007-08)

The experiment was sown on sandy loam soil after the harvest of rice crop. Linseed crop yielded significantly higher when it was sown during third week of November (1328 kg/ha) as compared to last two sowings (Table 3.4.1). Linseed variety Garima (1165 kg/ha) out yielded with significant margin over Shubhra, Shekhar and T397. The net monetary return and net return per rupee investment of these treatments were also the highest. The interaction between sowing schedule and varieties were also significant with regard to seed yield. All the varieties of linseed gave significantly maximum yield in first sowing during third week of November. Whereas, further delay in sowing date reduced the seed yield substantially. Net monetary return and net return per rupee investment also followed the similar trend of seed yield.

Pooled results (2005-06 to 2007-08)

Linseed crop sown during third week of November gave significantly higher seed yield (1377 kg/ha) as compared to last two sowings during last week of November and third week of December (Table 3.4.1). Among the varieties, Garima (1239 kg/ha) superseded to Shubhra, Shekhar and T397 with significant margin.

Sowing of linseed during third week of November gave highest NMR (Rs. 16842/ha) as compared to last two sowings. The net monetary return was also recorded maximum with Garima (Rs. 13806/ha) over Shubhra, Shekhar and T397. The interaction effect was also found significant for seed yield. All the varieties were found to record significantly higher seed yield when sown during third week of November but seed yield of Shekhar recorded during first and second sowings were on par. Linseed variety Garima yielded significantly higher in all the sowings as compared to other varieties. The net monetary return of Garima recorded during all the three sowings were also observed higher over all the remaining varieties during respective sowing schedule. Thus it would be profitable to sow linseed variety Garima after rice during third week of November for higher seed yield and net monetary return. However, it would also be profitable to sow Garima variety rather than Shubhra, Shekhar and T397 under delayed sowing conditions.

Table 3.4.1 Response of newly released varieties to sowing schedule in double crop sequence at Faizabad

Sowing Duration (D)	Varieties (V)				Mean	Sources	SE (M) ±	CD at 5%	CV %
	Garima	Shubhra	Shekhar	T-397					
Seed yield (kg/ha) - 2007-08									
Nov. III week	1527	1250	1423	1111	**1328**	D	39.06	135	6.79
Nov. last week	1292	1027	1150	933	**1100**	V	34.16	57	-
Dec. III week	677	567	600	525	**592**	V with in D	19.72	99	-
Mean	**1165**	**948**	**1058**	**856**	-	D with in V	-	142	-
Cost of Cultivation (Rs./ha) - 2007-08									
Nov. III week	13020	13020	13020	13020	**13020**	D	-	-	-
Nov. last week	13020	13020	13020	13020	**13020**	V	-	-	-
Dec. III week	13020	13020	13020	13020	**13020**	V with in D	-	-	-
Mean	**13020**	**13020**	**13020**	**13020**	-	D with in V	-	-	-
Net monetary-return (Rs./ha) - 2007-08									
Nov. III week	26630	19480	24030	15788	**21482**	D	-	-	-
Nov. last week	20522	13630	16880	11238	**15568**	V	-	-	-
Dec. III week	4530	1722	2580	630	**2366**	V with in D	-	-	-
Mean	**17227**	**1161**	**14497**	**922**		D with in V	-	-	-
Net return/Re investment (Rs) 2007-08									
Nov. III week	2.05	1.50	1.85	1.21	**1.65**	D	-	-	-
Nov. last week	1.58	1.05	1.30	0.86	**1.20**	V	-	-	-
Dec. III week	0.35	0.13	0.20	0.05	**0.18**	V with in D	-	-	-
Mean	**1.33**	**0.89**	**1.12**	**0.71**	-	D with in V	-	-	-
Seed yield (kg/ha) pooled (2005-06 to 2007-08)									
Nov. III week	1585	1306	1438	1181	**1377**	Year	20.93	47	-
Nov. last week	1347	1108	1213	953	**1155**	D	70.27	195	-
Dec. III week	786	655	714	580	**684**	V	16.59	33	-
Mean	**1239**	**1023**	**1122**	**905**	-	V with in D	28.74	57	-
						D with in same or diff. V	86.08	232	-
Net monetary return (Rs/ha) : Mean value (2005-06 to 2007-08)									
Nov. III week	21145	15332	18250	12642	**16842**	-	-	-	-
Nov. last week	16169	13855	13344	7978	**12837**	-	-	-	-
Dec. III week	4104	1429	2582	653	**2192**	-	-	-	-
Mean	**13806**	**10205**	**11392**	**7091**	-	-	-	-	-

Table 3.4.2 Growth and yield characters of linseed varieties as affected by sowing schedule at Faizabad (2007-08)

Treatments	Plant height (cm)	No. of Primary branches	No. of Capsules/pt	No. of Seeds/Cap	Test Weight (g)
D_1V_1	54.8	3.6	58.6	8.24	8.5
D_1V_2	53.2	3.3	50.4	8.05	17.4
D_1V_3	50.8	3.5	54.8	8.11	8.0
D_1V_4	48.6	3.1	46.4	7.93	6.5
D_2V_1	52.6	3.4	47.6	8.06	8.3
D_2V_2	51.4	3.1	43.6	7.92	7.2
D_2V_3	48.2	3.2	46.0	8.01	7.7
D_2V_4	46.4	2.8	41.7	7.80	6.2
D_3V_1	49.4	2.9	33.7	7.86	7.3
D_3V_2	48.6	2.5	29.6	7.73	6.6
D_3V_3	45.4	2.7	32.4	7.80	7.1
D_3V_4	43.8	2.3	27.4	7.69	5.7

Raipur

Seed yield (1004 kg/ha), net monetary return (Rs. 15941/ha) and net return per rupee investment (Rs. 1.74) were significantly higher in sowing during last week of November as compared to earlier two sowings (Table 3.4.3). Seed yield (830 kg/ha), net monetary return (Rs. 11603/ha) and net return per rupee investment (Rs. 1.27) of Kartika were also significantly higher than Kiran and NL-97 but Kartika and JLS-9 were at par. A significant increase in seed yield and net monetary of Kartika, Kiran and NL-97 was observed due to every delay in sowing from last week of October to last week of November. Whereas, JLS-9 yielded maximum when it was sown during November second week and gave significantly maximum NMR. Thus it would be profitable to sow linseed variety Kartika and JLS-9 in soybean linseed crop sequence during November last week and November second week, respectively for higher seed yield and net monetary return.

Powarkheda

Seed yield (1510 kg/ha) was observed significantly higher when linseed crop was sown during second week of November over first sowing during last week of October (1161 kg/ha). Seed yield (1490 kg/ha) was also significantly higher when Kartika was sown as compared to JLS-9 and J-23. Whereas, Kartika and JLT-26 were observed at par (Table 3.4.3). The linseed variety Kartika gave maximum yield when it was sown during last week of October but was on par with last two sowings. The linseed variety JLS-9 produced significantly higher seed when it was sown during second week of November as compared to last two sowings. JLT-26 was found significantly superior when it was sown during second week of November than last week of October but was on par with last sowing. Whereas, J-23 gave significantly higher yield when sown during last week of November over first two sowings. Thus, Kartika and JLT-26 superseded to J-23

and JLS-9 with significant margin. Whereas, it was observed benificial to sow Kartika during last week of October to last week of November; Kiran during second week of November, JLT-26 during the whole November and J-23 during last week of November under irrigated condition of Powarkheda in Soybean-linseed crop sequence.

Table 3.4.3 Impact of sowing time-cum newly released varieties at Raipur and Powarkheda

Sowing duration (D)	Varieties (V)						Mean	Sources	SE (M) ±	CD at 5%	CV%
	Kartika	Kiran	JLS-9	NL-97	JLT-26	J-23					
Plant stand (000/ha) at Raipur											
Oct. last week	125	118	92	99	-	-	108	D	460	16	14.90
Nov. II week	157	143	80	85	-	-	116	V	7.66	22	-
Nov. last week	176	166	130	139	-	-	153	D × V	-	NS	-
Mean	**152**	**142**	**100**	**108**							
Seed yield (kg/ha) at Raipur											
Oct. last week	639	530	586	519	-	-	568	D	29.72	102	15.38
Nov. II week	789	654	956	586	-	-	746	V	26.41	77	-
Nov. last week	1063	1054	840	1059	-	-	1004	D × V	45.75	133	-
Mean	**830**	**746**	**794**	**721**							
Cost of cultivation (Rs/ha) at Raipur											
Oct. last week	9153	9153	9153	9153	-	-	9153	-	-	-	-
Nov. II week	9153	9153	9153	9153	-	-	9153	-	-	-	-
Nov. last week	9153	9153	9153	9153	-	-	9153	-	-	-	-
Mean	**9153**	**9153**	**9153**	**9153**	-	-	-	-	-	-	-
Net Monetary return (Rs/ha) at Raipur											
Oct. last week	6821	4103	5485	3828	-	-	5059	D	724	2570	29.22
Nov. II week	10576	7196	14735	5488	-	-	9499	V	660.91	1918	-
Nov. last week	17413	17194	11839	17316	-	-	15941	D × V	1444	3322	-
Mean	**11603**	**9498**	**10686**	**8878**							
Net return/Re investment (Rs) at Raipur											
Oct. last week	0.75	0.45	0.60	0.42	-	-	0.55	D	0.08	0.28	29.18
Nov. II week	1.16	0.79	1.61	0.60	-	-	1.04	V	0.07	0.21	-
Nov. last week	1.90	1.88	1.29	1.89	-	-	1.74	D × V	0.13	0.36	-
Mean	**1.27**	**1.04**	**1.17**	**0.97**							
Seed yield (kg/ha) at Powarkheda											
Oct. last week	1533	-	1208	-	1194	708	1161	D	34.25	135	8.81
Nov. II week	1458	-	1667	-	1622	1292	1510	V	69.79	120	-
Nov. last week	1479	-	1058	-	1583	1667	1447	V with D	40.29	207	-
Mean	**1490**	-	**1311**	-	**1467**	**1122**		D with in same/ diff. V	-	206	-

Table 3.4.4 Growth, yield attributes and economics of linseed varieties as affected by sowing schedule at Raipur and Powarkheda (2007-08)

Treatments	Raipur						Powarkheda		
	NMR (Rs/ha)	Plant height (cm)	Av. Branches/ plant	Av. cap/ plant	Av. Seeds/ Capsule	Test weight (g)	NMR (Rs/ha)	Cost of cultivation (Rs/ha)	Net return per rupee invest (Rs.)
Sowing Duration									
D_1	5059	42.4	2.6	27.5	7.0	5.76	20019	9500	2.10
D2	9499	46.8	3.3	32.3	7.4	5.73	28998	9500	3.05
D3	15941	50.0	3.5	35.1	7.8	5.64	27395	9500	2.88
CD at 5%	**2570**	**1.48**	**0.209**	**2.83**	**0.17**	-	-	-	-
Varieties									
Kartika	11603	45.3	3.3	36.9	7.8	5.47	28384	9500	2.98
Kiran	9498	46.4	3.1	31.4	7.6	5.54	-	-	-
JLS-9	10686	45.0	3.2	27. 8	7.2	6.41	23933	9500	2.51
NL-97	8878	48.2	3.0	30.5	7.0	5.44	-	-	-
JLT-26	-	-	-	-	-	-	27899	9500	2.93
JL-23	-	-	-	-	-	-	21666	9500	2.28
CD at 5%	**1918**	**1.73**	**NS**	**2.48**	**0.217**	**0.224**	-	-	-

3.5 Intercropping studies in seed drill sown *rabi* crops in association with linseed

This experiment was allotted to Raipur, Nagpur, Powarkheda, Sagar, Palampur and Kanpur (P.C. Unit) with the main objective to find out suitable row ratio for intercropping linseed with major *rabi* crops being sown with the help of seed drill. There were thirteen treatments in this experiment which were laid out in Randomized Block Design with three replications. However, safflower was used as sub-crop inplace of lentil at Powarkheda. Nagpur centre conducted the experiment with wheat and gram. This experiment has completed three years period of experimentation at Sagar, Palampur and Kanpur (P.C. Unit), hence, concluded after pooled analysis. The experiment conducted at Raipur was vitiated because of labour strike that prevailed during 14.2.2008 to 28.3.2008. The centre-wise report of remaining centre is given below :

Nagpur (2007-08)

Intercropping of linseed with gram in 6 : 4 row ratio produced significantly higher LEY (1841 kg/ha) and was on par with Gram + linseed in 4 : 4 row ratio (1634 kg/ha) and sole crop of gram (1550 kg/ha) but net monetary return (Rs. 51317/ha) recorded with Gram + linseed (6 : 4) superseded to all with significant margin (Table 3.5.1). Intercropping of linseed with wheat was not observed advantages because LEY and NMR both were reduced in wheat + linseed association as compared to sole cropping of wheat. Thus,

(1) Gram + linseed intercropping system in 6 : 4 and 4 : 4 row ratios were observed advantageous over sole cropping of gram but it would be more profitable to select gram + linseed (6 : 4) intercropping system.

(2) Intercropping linseed with wheat could not provide higher NMR over sole cropping of wheat.

Table 3.5.1 Impact of different intercropping associations at Nagpur

Treatments	Seed yield (kg/ha)		LEY (kg/ha)	LER	Cost of Cultivation (Rs./ha)	NMR (Rs./ha)	Net ret./ rupee invest. (Rs.)
	Main crop	Sub crop					
T_1 Wheat + Linseed (2:2)	1533	313	841	0.77	7800	19119	2.45
T_2 Wheat + Linseed (4:4)	1871	416	1056	0.98	8000	25830	3.22
T_3 Wheat + Linseed (6:4)	2194	499	1253	1.16	8700	31429	3.60
T_4 Gram + Linseed (2:2)	1336	427	1345	1.07	8100	34980	4.32
T_5 Gram + Linseed (4:4)	1533	580	1634	1.34	8300	44018	5.30
T_6 Gram + Linseed (6:4)	1752	670	1841	1.54	8700	51317	5.88
T_7 Sole Linseed (NL-97)	874	-	874	1.00	7500	20499	2.73
T_8 Sole Wheat (AKW 1071)	3844	-	1321	1.00	8500	33788	3.97
T_9 Sole Gram (Jackya 9218)	2255	-	1550	1.00	9000	40615	4.51
SE (M) ±	-	-	139	0.05	-	2024.4	-
CD at 5%	-	-	416	0.14	-	6066	-

Market rates of the Produce (Rs./kg: 2007-08) : Linseed : Rs. 32.00; Wheat : Rs. 11.00; Gram : Rs. 22.00

Powarkheda (2007-08)

Sole cropping of wheat out yielded significantly higher LEY (2501 kg/ha) over all the sole cropping as well as intercropping systems. Whereas, net monetary returns fetched with wheat + linseed and gram + linseed intercropping systems were higher than sole cropping of the main crops irrespective of row ratios (Table 3.5.2). However, wheat + linseed (6 : 4) among wheat + linseed intercropping systems and gram + linseed (2 : 2) among gram + linseed intercropping systems were observed superior over other systems of that particular crops. Thus, it would be profitable to sow wheat and gram in intercropping system alongwith linseed rather than sole cropping wheat and gram under Powarkheda condition.

Table 3.5.2 Impact of different intercropping associations at Powarkheda

Treatments	Seed yield (kg/ha)		LEY (kg/ha)	LER	Cost of cultivat. (Rs./ha)	NMR (Rs./ha)	Net retu./ Re invest. (Rs.)
	Main crops	Sub crops					
T_1 Wheat + Linseed (2 : 2)	1672	764	1485	1.22	15000	22860	1.52
T_2 Wheat + Linseed (4 : 4)	2656	708	1745	1.59	12000	32490	2.70
T_3 Wheat + Linseed (6 : 4)	2521	750	1837	1.57	13650	33192	2.43
T_4 Gram + Linseed (2 : 2)	1156	1062	2105	1.36	14250	39427	2.76
T_5 Gram + Linseed (4 : 4)	1417	792	2041	2.54	13125	38930	2.96
T_6 Gram + Linseed (6 : 4)	1367	701	1907	2.41	12233	36401	2.97
T_7 Linseed + lentil (2 : 2)	979	625	1415	2.17	13000	23075	1.77
T_8 Linseed + Lentil (4 : 4)	1000	583	1364	2.35	11000	23772	2.16
T_9 Linseed + Lentil (6 : 4)	812	667	1304	1.90	10334	22908	2.21
T_{10} Sole linseed	1468	-	1468	1.00	9000	28435	3.15
T_{11} Sole Wheat	2394	-	2501	1.00	10500	17009	1.61
T_{12} Sole gram	708	-	2092	1.00	13500	33575	2.48
T_{13} Sole Saff.	562	-	1909	1.00	11445	26733	2.33
SE (m) ±	-	-	49.76	-	-	-	-
CD at 5%	-	-	145	-	-	-	-
CV %	-	-	4.84	-	-	-	-

Market prices (Rs./kg: 2007-08) : Linseed : 25.5 Wheat : 11.00 Gram : 22.5 Saff. 20.00

Sagar (2007-08)

It is clear from Table 3.5.3 that Gram + linseed (4:4) intercropping system gave significantly higher LEY (1410 kg/ha) and net monetary return (Rs. 32700/ha) as compared to others. Whereas, wheat + linseed (2 : 2 and 6 : 4), gram + linseed (6 : 4) and sole cropping of wheat (1317 kg/ha) as well as gram (1404 kg/ha) with regard to LEY and wheat + linseed (2 : 2 and 6 : 4), gram + linseed (2 : 2 and 6 : 4), sole wheat as well as gram with regard to NMR were observed on par with gram + linseed (4 : 4).

Pooled results

Sole cropping of wheat gave significantly higher LEY (1507 kg/ha) which was on par with sole gram and all the intercropping systems of wheat and gram with linseed (Table 3.5.3). Whereas, net monetary return (Rs. 27709/ha) fetched in sole gram was observed superior to all but was on par with sole cropping of wheat and all the intercropping systems of wheat + linseed and gram + linseed. However, none of the intercropping system could give higher NMR than sole cropping of main crops. The LER recorded in gram + linseed in 6 : 4 row ratio (1.02) and linseed + lentil in 6 : 4 row ratio were observed only intercropping systems who gave LER higher than one. Thus, Gram + linseed, wheat + linseed and linseed + lentil intercropping system could not establish profitability over sole cropping of gram, wheat and linseed, respectively.

Table 3.5.3 Impact of intercropping associations at Sagar

Treatments	2007-08							Pooled		
	Seed yield (kg/ha)		LEY (kg/ha)	LER	Cost of cultivat. (Rs/ha)	NMR (Rs/ha)	Net retu./ Re invest. (Rs.)	LEY (kg/ha)	NMR (Rs./ha)	LER
	Main crops	Sub crops								
T_1 Wheat + Linseed (2 : 2)	1968	354	1338	0.97	9213	30927	3.36	1273	22431	0.78
T_2 Wheat + Linseed (4 : 4)	1759	334	1213	0.90	9213	27177	2.95	1237	21312	0.79
T_3 Wheat + Linseed (6 : 4)	2111	283	1339	1.20	9338	30822	3.30	1447	23801	1.00
T_4 Gram + Linseed (2 : 2)	1130	523	1252	0.98	9590	30960	3.23	1260	22738	0.85
T_5 Gram + Linseed (4 : 4)	1319	442	1410	1.01	9590	32700	3.41	1264	22183	0.83
T_6 Gram + Linseed (6 : 4)	1237	415	1322	1.16	9813	29847	3.05	1292	23389	1.02
T_7 Linseed + Lentil (2 : 2)	491	692	1183	1.21	8898	26582	2.99	1044	17443	0.99
T_8 Linseed + Lentil (4 : 4)	542	853	1125	1.12	8898	24852	2.79	921	14544	0.96
T_9 Linseed + Lentil (6 : 4)	570	489	1059	1.31	8833	22947	2.60	950	14396	1.13
T_{10} Sole linseed	1021	-	1021	1.00	8699	21921	2.52	1041	17369	1.00
T_{11} Sole wheat	2634	-	1317	1.00	9599	29901	3.11	1507	26911	1.00
T_{12} Sole gram	1914	-	1404	1.00	10261	31846	3.11	1334	27709	1.00
T_{13} Sole lentil	802	-	802	1.00	9161	14909	2.63	622	7107	1.00
SE (m) ±	-	-	50.70	0.04	-	1512.79	0.16	110.39	2394.83	0.06
CD at 5%	-	-	148	0.12	-	4416	0.47	322	6990	0.12
CV %	-	-	7.23	7.18	-	9.58	7.24	-	-	-

Market prices (Rs./kg : 2007-08) : Linseed : 30.00 Wheat : 15.00 Gram : 22.00 Lentil : 30.00 for 2007-08

Palampur (2007-08)

Linseed equivalent yield (1181 kg/ha) and net monetary return (Rs. 12381/ha) of wheat + linseed (6 : 4) were significantly higher but wheat + linseed (4 : 4) with regard to LEY and wheat + linseed (4 : 4) and sole lentil with regard to NMR were observed on par with wheat + linseed (6 : 4).

Pooled results

Linseed equivalent yield (1105 kg/ha) recorded in wheat + linseed (6 : 4) and net monetary return (Rs. 10772/ha) of wheat + linseed (4 : 4) were observed significantly superior to all but these were on par with remaining combinations of wheat + linseed and sole cropping of linseed and wheat (Table 3.5.4). Thus, it would be profitable to grow wheat in intercropping system with linseed particularly in wheat + linseed (4 : 4) system.

Table 3.5.4 Impact of intercropping associations at Palampur

Treatments	2007-08						Pooled	
	Seed yield (kg/ha)		LEY (kg/ha)	Cost of cultivat. (Rs/ha)	NMR (Rs/ha)	Net retu/ Re nvest. (Rs.)	LEY (kg/ha)	NMR (Rs./ha)
	Main crops	Sub crops						
T_1 Wheat + Linseed (2 : 2)	1902	302	985	9240	10467	1.13	984	9629
T_2 Wheat + Linseed (4 : 4)	2129	327	1125	10328	12168	1.18	1097	11561
T_3 Wheat + Linseed (6 : 4)	1965	382	1181	11239	12381	1.10	1105	10772
T_4 Gram + Linseed (2 : 2)	183	191	411	7760	460	0.05	453	1204
T_5 Gram + Linseed (4 : 4)	309	262	669	9420	3953	0.42	592	2125
T_6 Gram + Linseed (6 : 4)	288	320	688	10200	3560	0.35	650	2703
T_7 Linseed + Lentil (2 : 2)	676	87	852	9700	7333	0.76	621	2618
T_8 Linseed + Lentil (4 : 4)	779	88	925	10800	7700	0.72	676	2622
T_9 Linseed + Lentil (6 : 4)	825	129	974	11300	8180	0.73	753	3600
T_{10} Sole linseed (Him Alsi-2)	1065	-	1065	8836	12471	1.41	1040	12363
T_{11} Sole wheat (Surabhi)	2544	-	967	12000	7353	0.61	962	6611
T_{12} Sole gram (Himachal Chana)	426	-	533	8780	1867	0.21	572	2560
T_{13} Sole lentil (Markanday)	289	-	361	8895	(–) 1682	(–) 0.19	365	(–) 1681
SE (m) ±	-	-	31.74	-	634.87	0.07	102.36	2042.51
CD at 5%	-	-	93	-	1853	0.20	299	5962
CV %	-	-	6.66	-	16.58	17.27	-	-

Market prices (Rs./kg : 2007-08) : Linseed : 20.00 Wheat : 7.50 Gram : 25.00 Lentil : 25.00

Kanpur (P.C. Unit): 2007-08

Gram + linseed (6:4) gave significantly higher LEY (2411 kg/ha) and NMR (Rs. 44468/ha) which were on par with sole cropping of gram as well as linseed and intercropping association of gram + linseed in 2:2 and 4:4 row ratio (Table 3.5.6). Intercropping system of wheat + linseed and gram + linseed yielded higher LEY and NMR than main crop but LEY and NMR of linseed + lentil were observed lower than linseed.

Pooled results

Gram + linseed (6:4) intercropping system yielded significantly higher LEY (2193 kg/ha) which was on par with the LEY recorded in wheat + linseed (2:2 and 4:4), gram + linseed (2:2 and 4:4) and sole cropping of gram (Table 3.5.5). The intercropping system of wheat + linseed in 2:2 and 4:4 row ratio and gram + linseed in all the three row ratios gave numerically higher LEY than sole cropping of main crops. The net monetary return of these associations were also observed superior than main crop of that particular combinations, whereas linseed + lentil yielded lower LEY and NMR than sole crop of linseed.

Thus it may be concluded that,

(i) Intercropping of linseed with seed drill sown wheat in 2:2 and 4:4 row ratio would give higher LEY and NMR than sole crop of wheat (main crop).

(ii) Gram + linseed in 2:2, 4:4 and 6:14 row ratios was observed more remunerative than sole crop of gram (main crop).

(iii) Linseed + lentil could not exhibit its superiority over sole crop of linseed (main crop).

Table 3.5.5 Impact of different intercroppings under irrigated situations at Kanpur (P.C. Unit)

Treatments	2007-08							Pooled				
	Seed yield (kg/ha)		LEY (kg/ha)	LER	Cost of cultiva. (Rs/ha)	NMR (Rs/ha)	Net retu./ Re invest. (Rs)	LEY (kg/ha)	LER	Cost of cultiva. (Rs/ha)	NMR (Rs/ha)	Net retu./ Re invest. (Rs)
	Main crops	Sub crops										
T_1 Wheat + Linseed (2:2)	2600	988	1988	0.94	19750	34538	1.75	2126	1.08	17317	31977	1.85
T_2 Wheat + Linseed (4:4)	2517	1038	2006	0.95	19750	34923	1.77	2077	1.06	17317	30780	1.78
T_3 Wheat + Linseed (6:4)	2750	856	1914	0.91	20300	32214	1.59	1848	0.92	17753	25617	1.44
T_4 Gram + Linseed (2:2)	764	1510	2392	1.05	18600	44357	2.38	2133	1.06	15533	31729	2.04
T_5 Gram + Linseed (4:4)	802	1450	2375	1.04	18600	43952	2.36	2172	1.08	15533	32474	2.09
T_6 Gram + Linseed (6:4)	1032	1220	2411	1.05	19250	44468	2.31	2193	1.09	15983	32846	2.06
T_7 Linseed + Lentil (2:2)	1300	530	1919	0.94	16000	34242	2.14	1827	1.03	13733	26166	1.91
T_8 Linseed + Lentil (4:4)	1225	598	1915	0.95	16000	34390	2.15	1832	1.04	13733	26670	1.94
T_9 Linseed + Lentil (6:4)	1400	490	1965	0.95	16800	34780	2.07	1765	0.97	14087	24866	1.77
T_{10} Sole linseed (Shekhar)	2283	-	2283	1.00	1770	41658	2.35	1996	1.00	14600	29344	2.00
T_{11} Sole wheat (PBW 343)	5111	-	1966	1.00	24000	32227	1.34	1987	1.00	20000	29398	1.47
T_{12} Sole gram (Udai)	1990	-	2293	1.00	20000	41608	2.08	2123	1.00	16667	29037	1.74
T_{13} Sole lentil (K75)	1447	-	1670	1.00	15000	29867	1.99	1512	1.00	13333	20673	1.55
SE (m) ±	-	-	72.51	-	-	1855.22	-	56.47	-	-	-	-
CD at 5%	-	-	211	-	-	5484	-	165	-	-	-	-
CV %	-	-	6.03	-	-	9.18	-	-	-	-	-	-

Market prices (Rs/kg: 2007-08): Linseed: 26.00 Wheat: 10.00 Gram: 30.00 Lentil: 30.00, Straw of wheat and pulses: 1.00

3.6 Studies on bio-efficacy of new herbicides for weed management in irrigated linseed

This experiment was allotted to Palampur, Kanpur (P.C. Unit), Faizabad, Powarkheda, Raipur and Mauranipur with the main objective to find out suitable herbicide for weed management in irrigated linseed. This experiment consisted twelve treatments namely ;

T_1 Hand weeding twice at 20-25 and 40-45 DAS

T_2 Isoproturon @ 1.00 kg *a.i.*/ha

T_3 T_2 + 2, 4-D @ 0.5 kg *a.i.*/ha

T_4 Sulfosulfuron @ 10 g *a.i.*/ha

T_5 Sulfosulfuron @ 20 g *a.i.*/ha

T_6 Sulfosulfuron @ 30 g *a.i.*/ha

T_7 Clodinafop @ 60 g *a.i.*/ha

T_8 Clodinafop @ 80 g *a.i.*/ha

T_9 Clodinafop @ 100 g *a.i.*/ha

T_{10} T_7 + 2, 4-D @ 0.5 kg *a.i.*/ha

T_{11} T_8 + 2, 4-D @ 0.5 kg *a.i.*/ ha

T_{12} Weedy check

The experiment was conducted as per technical programme in Randomized Block Design with three replication. Herbicides were applied in standing crop as post emergence application at 30-35 days after sowing (DAS). This experiment has completed three years' period of experimentation at Palampur, Kanpur, (P.C. Unit), Faizabad and Powarkheda, hence, concluded. The centre-wise report is presented below :

Palampur (2007-08)

Seed yield (1365 kg/ha) of T_{11} and net monetary return (Rs. 15600/ha) of T_{10} were significantly higher over all the practices of weed management (Table 3.6.1). However, T_{10} and T_{11} were observed on par with regard to net monetary return. Weed dry weight was also observed minimum in T_{11} (9.33 g/m^2) and T_{10} (9.97 g/m^2). It is also clear from Table 3.6.1 that all the herbicides, except sulfosulfuron @ 20 (T_5) and 30 (T_6) g/ha, brought significant increase in seed yield over hand weeding twice which ultimately increased the net monetary return too. T_5, T_6 and T_{12} recorded loss.

Pooled results

Weed management through clodinafop @ 80 g/ha + 2, 4-D @ 0.50 kg/ha (T_{11}) brought significant increase in seed yield (1587 kg/ha) over all the treatments except T_8 *i.e.*, clodinafop @ 80 g/ha (1393 kg/ha). Net monetary return (Rs. 21270/ha) was also recorded significantly higher in T_{11} but was on par with clodinafop @ 80 g/ha (Rs. 18414/ha), clodinafop @ 100 g/ha (Rs. 17417/ha) and clodinafop 60 g/ha + 2, 4-D@0.5 kg/ha (Rs. 17039/ha). Weed dry weight also observed minimum in T_{11} (10.10 g/m^2) and was at par to T_{10} and T_9. Thus, weed management through herbicide clodinafop @ 60 g/ha could provide higher net monetary return at Palampur condition, however 2, 4-D @ 0.5 kg/ha may also be mixed in the tank alongwith clodinafop 80 g/ha if there is a problem of broad leaf weeds too.

Table 3.6.1 Impact of new herbicides on linseed and weed infestation at Palampur

Treatments	2007-08										Pooled	
	Plant stand (000/ha)	Seed yield (kg/ha)	Weed Dry wt (g/m^2)	Cost of cultivation (Rs/ha)	Net return (Rs/ha)	Plant height (cm)	No. of Cap/pt	No. of seeds/ cap	P. branch/ plant	Seed yield (kg/ha)	Weed dry wt g/m^2	Net monetary return (Rs/ha)
T_1	1120	687	12.70	12526	1214	64.9	40.5	7.6	5.1	1051	16.42	8552
T_2	1136	787	36.60	8650	6697	66.6	42.6	7.7	5.3	859	43.03	8568
T_3	1120	849	33.67	8790	8377	53.2	43.1	7.3	5.6	972	41.57	10838
T_4	1165	679	31.00	9790	3800	57.5	37.7	7.3	5.8	975	31.33	9698
T_5	1166	504	25.70	11300	-1227	52.1	40.2	7.5	6.1	975	27.70	8246
T_6	1212	566	23.50	12740	-1393	58.6	42.9	7.3	5.7	862	24.76	4953
T_7	1238	781	17.30	9295	6322	65.9	44.4	7.3	7.3	1166	17.93	14084
T_8	1310	815	13.63	9580	6713	68.0	46.9	7.3	7.6	1393	14.62	18414
T_9	1259	1099	11.93	9800	12173	69.4	46.3	7.6	7.8	1321	12.79	17417
T_{10}	1248	1250	9.97	9380	15600	69.1	44.7	7.7	7.6	1326	10.80	17039
T_{11}	1297	1365	9.33	9980	15033	72.3	48.2	7.6	7.7	1587	10.10	21270
T_{12}	766	211	288.00	7200	-2987	51.1	25.4	4.1	4.2	450	306.11	1133
Mean	**1170**	**798**	**42.78**	-	**5860**	-	-	-	-	**1078**	**46.43**	**11684**
SE (M) ±	11.09	14.04	1.51	-	70634	-	-	-	-	79.81	2.72	1624.34
CD at 5%	33	41	4.43	-	2071	-	-	-	-	234	7.96	4764
CV%	1.64	3.05	6.13	-	20.88	-	-	-	-	-	-	-

Faizabad (2007-08)

Seed yield (1304 kg/ha) was observed significantly higher in hand weeding twice at 20-25 and 40-45 DAS over all the remaining treatments of chemical weed management (Table 3.6.2). The same treatment fetched the maximum net monetary return (Rs. 20884/ha) too. Among the weedicides, clodinafop @ 80 g/ha + 2, 4-D @ 0.5 kg/ha superseded to all but was on par with T_{10} *i.e.*, clodinafop 60 g/ha + 2, 4-D @ 0.5 kg/ha with regard to seed yield. Net monetary return also followed the similar trend. Weed infestation reflected in the term of weed population and weed dry weight both were lowest in hand weeding followed by clodinafop @ 80 g/ha + 2, 4-D @ 0.5 kg/ha.

Pooled results

Hand weeding twice at 20-25 and 40-45 DAS superseded to all with regard to seed yield (1425 kg/ha) significantly and fetched maximum net monetary returns too (Rs. 17785/ha). Weed dry weight per unit area was also significantly lower in the same treatment (Table 3.6.2). Among the weedicide treatments, clodinafop @ 80 g/ha + 2, 4-D @ 0.5 kg/ha gave significantly higher seed yield (1199 kg/ha) and maximum net monatary returns (Rs. 13846/ha) over all the remaining treatments. However, clodinafop @ 60g/ha + 2, 4-D @ 0.5 kg/ha followed very closely. Thus it may be concluded that clodinafop @ 80 g/ha + 2, 4-D @ 0.5 kg/ha may be used in place of hand weeding twice for weed management in irrigated linseed at Faizabad condition, if there

Table 3.6.2 Impact of new herbicides on linseed crop and weed infestation at Faizabad

Treatments	2007-08														Pooled			
	Plant stand (000/ha)	Seed yield (kg/ha)	40 DAS		at harvest		cost of cultivation (Rs/ha)	Net income (Rs/ha)	Net return per Re-invest (Rs.)	Plant hight (cm)	Pri. branch/ plant	Cap./ plant	Seeds/ cap.	Test weight (g)	Seed yield (kg/ha)	weed dry wt (g/m^2) at harvest	Cost of cultivation (Rs/ha)	NMR (Rs/ha)
			Weed/ m^2	Weed dry wt (g/m^2)	Weeds /m^2	Weed dry wt (g/m^2)												
T_1	1105	1304	24.3	4.03	30.67	10.23	13020	20884	1.60	48.4	5.2	61.3	8.6	8.24	1425	9.00	12168	17785
T_2	778	704	181.3	25.09	171.67	57.20	10795	7509	0.70	41.3	3.7	31.0	7.3	7.40	843	67.36	9902	7768
T_3	861	859	95.0	13.57	85.33	28.43	11045	11289	1.02	43.1	4.1	39.3	7.9	7.82	943	41.34	10152	9826
T_4	820	726	142.7	20.37	133.00	44.33	11205	7671	0.68	40.8	4.1	32.3	7.7	7.67	933	53.00	10345	9048
T_5	796	807	78.3	11.17	68.67	22.90	12015	8967	0.75	40.2	4.0	36.6	7.8	7.76	1017	32.40	11155	9999
T_6	782	785	74.7	10.63	65.00	21.67	12825	7585	0.59	41.0	4.0	34.0	7.8	7.81	1100	24.80	11965	10637
T_7	833	689	208.0	29.57	198.33	66.10	11795	6119	0.52	42.8	4.0	30.6	7.2	7.46	856	72.68	10902	7007
T_8	880	874	92.3	13.20	82.67	27.53	12260	10464	0.85	43.6	4.2	41.6	8.0	7.69	988	35.32	11400	9878
T_9	874	896	81.0	11.53	71.33	23.90	12726	10570	0.83	43.2	4.1	43.3	7.8	7.92	1026	42.48	11844	9591
T_{10}	1007	1067	72.3	10.33	63.67	21.13	12045	15697	1.30	44.1	4.6	48.0	8.1	7.96	1098	28.30	11185	12292
T_{11}	1069	1148	60.7	8.63	51.00	16.97	12085	17363	1.39	45.0	4.9	52.3	8.3	8.15	1199	20.92	11500	13846
T_{12}	753	541	274.7	39.23	265.00	88.33	10120	3946	0.39	37.1	2.9	27.6	6.1	7.32	694	93.66	9268	5206
Mean	**880**	**867**	**115.4**	**16.51**	**107.19**	**35.72**	-	-	-	-	-	-	-	-	**1010**	**43.44**	-	-
SE (M) ±	48.75	41.14	3.86	0.58	3.84	1.28	-	-	-	-	-	-	-	-	53.48	7.00	-	-
CD at 5%	143	120	11	1.70	11.25	3.75	-	-	-	-	-	-	-	-	157	20.54	-	-
CV %	9.6	8.22	5.8	6.07	6.21	6.21	-	-	-	-	-	-	-	-	-	-	-	-

Weeds: *Phalaris minor, C. album, M. indica, A. arvensis* etc.

Powarkheda (2007-08)

Hand weeding (T_1) gave significantly higher seed yield (2370 kg/ha) than all the remaining treatments except T_9 (Clodinafop @ 100 g/ha), T_{10} (Clodinafop @ 60 g/ha + 2, 4-D @ 0.5 kg/ha) and T_{11} (clodinafop @ 80 g/ha + 2, 4D @ 0.5 kg/ha) as T_9, T_{10} and T_{11} were observed on par with T_1 (Table 3.6.3). T_{11} gave maximum net monetary return (Rs. 39212/ha) and T_1 followed it very closely (Rs. 38648/ha). The net return per rupee investment was also higher in T_{11} (Rs. 3.12) and T_1 (Rs. 2.86). T_{11} reduced the weed count and weed dry weight per unit area substantially. The weed control efficiency were also observed maximum in the same treatments.

Pooled results

Seed yield (2211 kg/ha) was significantly increased when weeds were managed through hand weeding twice at 20-25 and 40-45 days after sowing and was on par with T_{11} (2120 kg/ha), T_{10} (2024 kg/ha) and T_3 (2016 kg/ha). Net monetary return (Rs. 32199/ha) was also recorded maximum in hand weeding treatment but T_{11} (Rs. 30201/ha) followed it very closely (Table 3.6.3). Weed dry weight per unit area was also less in the same treatments. Thus, clodinafop @ 80 g/ha + 2, 4-D @ 0.5 kg/ha may be applied at 30-35 day stage of crop for weed management in place of hand weeding twice at 20-25 and 40-45 DAS for higher seed yield and net monetary returns from irrigated linseed.

Table 3.6.3 Impact of new herbicides on linseed crop and weed infestation at Powarkheda

Treatments	2007-08								Pooled		
	Seed yield (kg/ha)	cost of cultivation (Rs./ha)	Net monetary return (Rs./ha)	Net ret. per Re invest. (Rs.)	Weed index (%)	WCE (%)	Weed count per m^2	Weed dry wt. (g/m^2)	Seed yield (kg/ha)	Weed dry wt (g/m^2)	NMR (Rs/ha)
T_1	2370	13500	38648	2.86	-	89.73	16.66	8.00	2211	35.28	32199
T_2	1963	12426	30759	2.47	17.18	64.69	37.00	27.50	1888	45.15	26785
T_3	2000	12564	31435	2.50	15.62	74.96	31.66	19.50	2016	41.11	28881
T_4	1962	12237	30948	2.52	17.18	65.48	32.33	26.88	1633	38.70	22227
T_5	1925	12474	29896	2.39	18.74	58.75	27.66	32.13	1774	35.45	24306
T_6	1574	12711	21919	1.72	33.59	13.02	60.00	67.75	1754	41.70	22960.
T_7	1834	12293	28039	2.28	22.65	28.58	55.00	55.63	1826	42.55	24980
T_8	1963	12370	30795	2.48	17.18	63.64	35.00	28.31	1928	34.75	26678
T_9	2019	12488	31919	2.55	14.84	76.78	22.66	18.08	1961	33.98	27025
T_{10}	2166	12431	35236	2.83	8.59	83.14	18.66	13.13	2024	35.45	28850
T_{11}	2352	12528	39212	3.12	0.78	88.12	15.33	9.25	2110	33.12	30201
T_{12}	1370	12000	18148	1.51	42.18	-	87.66	77.90	1178	71.28	13699
SE (M) ±	123.37	-	-	-	-	-	-	-	80.77	-	-
CD at 5%	361	-	-	-	-	-	-	-	237	-	-
CV%	10.91	-	-	-	-	-	-	-	-	-	-

Major weeds : *Phalaris minor, Calbum, C. rotundus, M. indica* etc.

P.C. Unit, Kanpur (2007-08)

Seed yield (2190 kg/ha) and net monetary return (Rs. 42009/ha) both were recorded significantly higher with clodinafop @ 80 g/ha (T_8) over all the remaining methods of weed management (Table 3.6.4). Though weed

dry weight (18.67 g/m^2) and weed count (45.67/m^2) both were lower in T_6 *i.e.*, Sulfosulfuron @ 30 g/ha but it affected the linseed plants adversely and yielded lowest seed (771 kg/ha). The net return per rupee investment was also observed higher in T_8 (Rs. 2.81).

Pooled results

Application of clodinafop @ 80 g/ha at 30-35 day stage of crop for weed management in irrigated linseed gave significantly higher seed (1787 kg/ha) and net monetary return (Rs. 25881/ha) over all the remaining methods of weed management except hand weeding twice because it was on par with T_8. Though, weed count (41.67/m2) and weed dry weight (21.82 g/m2) both were observed lowest in T_6 *i.e.*, sulfosulfuron @ 30 g/ha but its applicaton reduced the seed yield very much (881 kg/ha). It happened because the application of sulfosulfuron @ 30 g/ha damaged the linseed crop badly. Thus it may be concluded that clodinafop @ 80 g/ha may be applied in irrigated crop of linseed at 30-35 days after sowing for the weed management to record higher seed yield and net monetary returns at Kanpur condition.

Table 3.6.4 Impact of new herbicides on irrigated linseed and weed infestaton at Kanpur (P.C. Unit)

Treatments	2007-08						Pooled				
	Seed yield (kg/ha)	Weed count/m^2	Weed dry wt (g/m^2)	Cost of Cultivation (Rs/ha)	NMR (Rs/ha)	Net ret. per Re invested (Rs.)	Seed yield (kg/ha)	Weed count/m^2	Weed dry wt (g/m^2)	Cost of cultivation (Rs/ha)	NMR (Rs./ha)
T_1	1983	48.33	22.67	17700	33867	1.91	1779	43.00	20.94	14600	24369
T_2	1721	120.00	141.67	13475	31280	2.32	1585	100.89	116.26	12225	22461
T_3	1553	84.00	93.33	13725	26038	1.90	1552	76.89	72.78	12475	20897
T_4	965	73.33	51.67	13885	11196	0.81	1139	64.56	44.57	12635	11519
T_5	791	58.33	26.33	14695	5862	0.40	1015	53.00	30.71	13445	7939
T_6	771	45.67	18.67	15505	4550	0.29	881	41.67	21.82	14255	4412
T_7	1819	81.67	57.33	14475	32819	2.27	1607	92.45	92.26	13225	22097
T_8	2190	71.67	40.33	14940	42009	2.81	1787	67.89	60.41	13692	25881
T_9	2024	58.33	34.33	15406	37218	2.42	1541	48.22	32.25	14159	18489
T_{10}	1424	67.67	46.00	14725	22299	1.51	1481	75.78	75.46	13475	13009
T_{11}	1343	53.33	35.00	15240	19687	1.29	1488	47.89	48.16	13958	17916
T_{12}	814	291.67	206.67	12800	8364	0.65	860	251.89	198.63	11533	6903
SE (M) ±	33.23	5.05	4.34	-	87292	-	122.17	8.86	11.31	-	3345.16
CD at 5%	97	14.79	12.71	-	2557	-	358	25.99	33.17	-	9812
CV%	3.97	9.95	11.66	-	6.59	-	-	-	-	-	-

Major weeds : *Phalaris minor, C. album, C. arvensis* etc.

Raipur (2007-08)

Hand weeding twice increased the seed yield (880 kg/ha) significantly over all the remaining treatments of weed management (Table 3.6.5). Among weedicidal treatments, Isoproturon @ 1 kg/ha + 2, 4-D @ 0.5 kg/ha (T_3) superseded to all except T_7 (Clodinafop @ 60 g/ha) and T_{11} (Clodinafop @ 80 g/ha + 2, 4-D @ 0.5 kg/ha). Net monetary return (Rs. 12090 /ha) was also observed significantly higher in hand weeding treatment over all the remaining treatments except Isoproturon @ 1 kg/ha (Rs. 11670 /ha), Isoproturon @ 1 kg/ha + 2, 4-D @ 0.5 kg/ha (Rs. 11953 /ha) and clodinafop @ 60 g/ha (Rs. 10095 /ha). Weed control efficiency of these treatments was also observed higher. Thus, Isoproturon @ 1 kg/ha either with or without 2, 4-D @ 0.5 kg/ha or clodinafop @ 60 g/ha may be used as post emergence application at 30-35 DAS in place of hand weeding twice for higher seed yield and net monetary returns from irrigated linseed.

Table 3.6.5 Impact of new herbicides on linseed and weed infestation at Raipur : 2007-08

Treatment	Plant stnad (0000/ha)	Seed yield (kg/ha)	Weed population/ m^2 at maturity	Weed dry weight g/m^2	Weed control efficiency (%)	Weed control index	Cost of cultivation (Rs/ha)	GMR (Rs./ha)	Net monetary return (Rs./ha)	Net Return / Rs invested (Rs)	Plant height (cm)	Primary branches/plant	Capsules / Plant	Seeds / capsule	Test Weight (gm)
T_1	195	880	23.53	26.19	76.21	---	9902	21992	12090	1.55	48.00	4.20	42.30	8.40	6.00
T_2	160	789	36.68	36.67	62.92	10.68	8047	19717	11670	1.78	46.20	3.65	36.52	8.10	5.77
T_3	175	805	33.67	38.99	65.97	8.52	8172	20125	11953	1.80	47.52	3.95	37.45	8.30	6.00
T_4	117	594	42.80	47.13	56.73	32.50	8366	14850	6484	1.11	46.20	2.90	30.10	7.10	5.66
T_5	*115*	*545*	*47.33*	*43.49*	*52.15*	*38.06*	*9151*	*13625*	*4474*	*0.82*	*45.10*	*2.65*	*27.10*	7.50	5.55
T_6	110	522	52.73	56.60	46.69	40.68	9942	13050	3108	0.65	46.12	2.55	25.60	7.50	5.65
T_7	150	786	38.47	38.27	61.11	10.79	9530	19625	10095	1.39	47.30	3.40	35.40	7.10	5.95
T_8	120	710	42.56	37.30	56.95	19.31	10179	17750	7571	1.08	47.00	3.10	31.10	7.90	5.85
T_9	122	735	40.52	36.20	59.04	16.47	10828	18375	7547	1.03	45.00	2.80	35.10	7.80	5.60
T_{10}	128	740	48.40	45.80	51.07	15.90	9655	18500	8845	1.25	45.00	2.50	32.10	7.60	5.64
T_{11}	130	755	41.27	43.40	58.28	14.20	10304	18875	8571	1.17	45.30	2.60	25.40	7.65	5.60
T_{12}	132	610	98.93	86.00	---	30.68	7502	15250	7748	1.37	45.00	2.50	28.45	7.50	5.60
Mean	**137.83**	**705.78**	**705.78**	**705.78**	**---**	**---**	**9298.17**	**17644.44**	**8346.28**	**1.25**	**46.15**	**3.07**	**32.22**	**7.70**	**5.74**
SE (M) ±	44.66	22.23	2.86	3.00	---	---	---	726.5	726.50	0.13	4.1	0.33	1.77	0.46	---
CD at 5%	16.11	64.00	7.94	8.32	---	---	---	2014	2014	0.4	NS	0.90	4.90	1.28	NS
CV%	20.25	5.93	10.89	11.63	---	---	---	7.75	16.45	19.13	---	18.41	9.51	10.370	3.29

Weed Flora : *Celosia argentiea, Chenopodium album, Parthanium hysterophorus, Cynodon dactylon, Commelina benghalensis, Alternanthra triandra, Physalis minima and Albution indicum.*

Mauranipur

Seed yield (1479 kg/ha), net monetary return (Rs. 26742/ha) were recorded significantly higher when weeds were managed by hand weeding twice at 20-25 and 40-45 DAS as compared to all (Table 3.6.6). However, net monetary return recorded in T_2 (Isoproturon @ 1 kg/ha) and T_3 (Isoproturon @ 1 kg/ha + 2, 4-D @ 0.5 kg/ha) was found on par with T_1. Thus it may be concluded that Isoproturon @ 1 kg/ha either with or without 2, 4-D @ 0.5 kg/ha as post emergence may be used to manage weeds in irrigated linseed at Mauranipur condition.

Table 3.6.6 Impact of new herbicides on linseed and weed infestation at Mauranipur : 2007-08

Treatment	Plant stand (0000/ ha)	Seed yield (kg/ha)	Weed count/ m^2	Weed dry wt (g/m^2)	NMR (Rs. / ha)	Net return/ Ps/in rest (Rs.)	Plant height (cm)	AV. P branches/ plant	Av. cap/ plant	Av. seeds/ cap.	Test wt (g)
T_1	947	1479	27.00	25.0	26742	1.82	88.8	4.3	52.7	8.3	8.55
T_2	867	1293	56.00	49.3	23934	1.90	84.1	3.9	46.5	7.7	7.82
T_3	891	1309	39.33	32.3	23782	1.84	86.4	4.0	49.8	7.8	8.26
T_4	850	1269	70.33	61.3	22510	1.72	83.1	3.8	45.3	7.5	7.80
T_5	840	1257	76.33	74.0	21327	1.54	82.7	3.7	41.9	7.5	7.76
T_6	818	1243	82.67	74.7	20078	1.36	80.2	3.5	39.5	7.5	7.75
T_7	859	1277	69.00	59.0	22145	1.63	83.2	3.9	45.9	7.6	7.82
T_8	892	1306	43.67	36.7	22279	1.56	85.9	3.9	48.6	7.8	8.19
T_9	845	1267	74.67	64.7	20566	1.36	82.8	3.7	44.4	7.5	7.79
T_{10}	877	1309	48.33	47.0	22762	1.63	84.4	3.9	46.9	7.7	7.85
T_{11}	943	1318	34.00	32.0	22505	1.56	87.7	4.3	51.5	8.2	8.38
T_{12}	760	797	177.67	135.7	12017	1.16	78.6	3.4	39.0	7.4	7.56
Mean	**866**	**1260**	**66.6**	**57.6**	**21721**	**1.59**	-	-	-	-	-
SE (M) ±	24.72	38.53	3.43	5.6	1086.85	0.09	-	-	-	-	-
CD at 5%	72	113	10	16	3183	0.26	-	-	-	-	-
CV%	4.95	5.3	8.91	16.84	8.67	9.55	-	-	-	-	-

3.7 Studies on Phosphorus management in double cropping system involving linseed

This experiment will be started from *kharif* 2008.

3.8 Studies on integrated nutrient managment in double cropping system involving linseed.

This experiment will be started from *kharif* 2008.

3.9 Studies on the response of EEMT entries of Zone III to seed rate and fertilizer application

This experiment was allocated at Sagar and Mauranipur centre with the main objective to evaluate the performance of newly developed entry SLS 67 (A0793) under seeding rates (25, 30, 35 kg/ha) and fertilizer application (50, 100 and 150% RDF). This entry was compared with JLS-9 (A0791) and T397 (A0792). Two separate experiments namely, entries × seed rate and entries × fertilizer application, were laid out in

RBD with factorial arrangement and three replications. The data generated at Sagar and Mauranipur centres for entries × seed rate and entries × fertilizer application are given in Tables 3.9.1 and 3.9.2, respectively. The experiment-wise results of these two centres are reported below ;

Table 3.9.1 Response of EEMT entries to seed rate at Sagar and Mauranipur

Entries (E)	Seed rates (s) (kg/ha)			Mean	Sources	SE (M) ±	CD at 5%	CV %
	25	30	35					
				Plant stand (000/ha) at Sagar				
JLS-9	875	973	1318	1055	E	20.27	61	5.42
T397	1332	1377	1131	1280	S	20.27	61	-
SLS67	753	1195	1152	1033	E × S	35.10	105	-
Mean	**986**	**1182**	**1200**	**1122**	-	-	-	-
				Seed yield (kg/ha) at Sagar				
JLS-9	994	1057	921	991	E	27.53	83	8.56
T397	811	765	768	781	S	27.53	NS	-
SLS 67	1176	1036	1161	1124	E × S	47.69	NS	-
Mean	**994**	**952**	**950**	**965**	-	-	-	-
				Net Monetary Return (Rs/ha) at Sagar				
JLS 9	21122	22892	18732	20915	E	826.64	39	12.30
T397	15642	14152	14142	14645	S	826.64	NS	-
SLS 67	26572	22272	25922	24922	E × S	1431.78	NS	-
Mean	**21112**	**19772**	**19599**	**20161**	-	-	-	-
				Plant stand (000/ha) at Mauranipur				
JLS 9	743	853	908	835	E	18.58	NS	6.54
T397	808	878	951	879	S	18.58	56	-
SLS67	673	885	967	842	E × S	32.18	NS	-
Mean	**741**	**872**	**942**	**852**	-	-	-	-
				Seed yield (kg/ha) at Mauranipur				
JLS 9	675	747	757	726	E	15.16	45	6.34
T397	608	672	679	653	S	15.16	45	-
SLS67	738	781	804	774	E × S	26.25	NS	-
Mean	**674**	**733**	**747**	**718**	-	-	-	-
				Net Monetary return (Rs/ha) at Mauranipur				
JLS 9	6231	8037	8070	7446	E	422.60	1267	17.56
T397	4345	5937	5933	5405	S	422.60	1267	-
SLS67	7994	9007	9433	8811	E × S	731.96	NS	-
Mean	**6190**	**7660**	**7812**	**7221**	-	-	-	-

A0791: JLS9, A0792: T397, A0793: SLS67

Table 3.9.2 Response of EEMT entries to fertilizer application at Sagar and Mauranipur

Entries (E)	Fertilizer levels (F)			Mean	Sources	SE (M) ±	CD at 5%	CV %
	50% RDF	100% RDF	150% RDF					
			Plant stand (000/ha) at Sagar					
JLS-9	983	905	930	939	E	24.57	NS	7.60
T397	1005	961	1044	1003	F	24.57	NS	-
SLS67	962	1021	912	965	E × F	42.55	NS	-
Mean	**983**	**962**	**962**	**969**	-	-	-	-
			Seed yield (kg/ha) at Sagar					
JLS-9	938	1012	1131	1027	E	30.70	92	9.62
T397	744	714	737	732	F	30.70	92	-
SLS 67	967	1161	1213	1114	E × F	53.18	NS	-
Mean	**883**	**962**	**1027**	**957**	-	-	-	-
			Net Monetary Return (Rs/ha) at Sagar					
JLS 9	19870	21601	24672	22048	E	921.43	2763	13.85
T397	14060	12671	12842	13191	F	921.43	NS	-
SLS 67	20760	26061	27122	24648	E × F	1595.96	NS	-
Mean	**18230**	**20111**	**21545**	**19962**	-	-	-	-
			Plant stand (000/ha) at Mauranipur					
JLS 9	886	896	903	895	E	15.48	NS	5.17
T397	874	893	923	897	F	15.48	NS	-
SLS67	893	896	927	905	E × F	26.81	NS	-
Mean	**885**	**895**	**918**	-	-	-	-	-
			Seed yield (kg/ha) at Mauranipur					
JLS 9	635	809	830	758	E	11.55	35	4.49
T397	632	767	828	742	F	11.55	35	-
SLS67	649	872	931	817	E × F	20.01	NS	-
Mean	**639**	**816**	**863**	-	-	-	-	-
			Net Monetary return (Rs/ha) at Mauranipur					
JLS 9	5410	9773	9851	8345	E	322.70	967	11.06
T397	5317	8606	9814	7912	F	322.70	967	-
SLS67	5802	11518	12679	10000	E × F	558.93	NS	-
Mean	**5510**	**9966**	**10782**	-	-	-	-	-

A0791: JLS9, A0792: T397, A0793: SLS67

Entries × Seed rate

Sagar

The experiment was sown on medium black soil and fertilized @ 40 : 20 : 20 kg NPK/ha. A seeding rate of 35 kg/ha produced on par plant stand to 30 kg/ha (Table 3.9.1). Plant stand of T397 was significantly superior to JLS 9 and SLS 67 but JLS9 and SLS 67 were at par. SLS 67 out yielded significantly over T397 and JLS9 and fetched significantly higher NMR (Rs 24922/ha) as compared to JLS 9 and T397. Seeding rate and interaction of entries × seeding rate could not bring treatment effect on seed yield and net monetary returns.

Mauranipur

This experiment was sown on Parwa soil and fertilized @ 50:20:20 kg NPK/ha. Plant stand was increased significantly with every increases of seed rate from 25 kg/ha to 30 kg/ha but there was non-significant difference among the entries (Table 3.9.1). SLS 67 gave significantly higher seed yield (774 kg/ha) and NMR (Rs. 8811/ha) than JLS 9 and T297. The seed yield and NMR both were also recorded higher when sown @ 35 kg/ha seed rate but was on par with 30 kg/ha.

Entries × Fertilizer application

Sagar

The experiment was sown on medium black soil. Pant stand among the varieties and fertilizer application both differed with numerical margin only (Table 3.9.2). SLS 67 gave significantly higher seed yield (1114 kg/ha) and net monetary return (Rs. 24648/ha) as compared to T397. Seed yield (1027 kg/ha) with 150% RDF *i.e.* 60 : 30 : 30 kg NPK/ha and 100% RDF *i.e.* 40 : 20 : 20 kg NPK/ha were observed on par. Whereas, fertilizer application and interaction between entries × fertilizer application could not exhibit treatment effect with regard to net monetary return (Table 3.9.2).

Mauranipur

The experiment was sown on Parwa soil having 0.43% organic carbon, 13.8 kg/ha P_2O_5 and 246 kg/ha K_2O alongwith pH 7.5. Plant stand among the treatments differed only with numerical difference (Table 3.9.2). SLS 67 gave significantly higher seed yield and NMR than JLS 9 and T397. Though, seed yield recorded at 150% RDF was significantly superior to all but NMR recorded at 150% RDF and 100% RDF were at par.

Thus, the results for SLS 67 may be summarized as;

1. A seeding rate of 30 kg/ha was observed optimum at Sagar and Mauranipur.
2. 100% RDF was observed optimum dose for the sowing of SLS 67 at both the locations.

3.10 Studies on the response of AVT (I) 2nd Year entries to fertilizer application and sowing schedule

This trial was allotted to Powarkheda as well as Mauranipur in Zone III and Raipur as well as Nagpur in Zone IV with a view to assess the response of SLS 61 (A07101), NDL 2004-05 (A07102) in Zone III and NDL 2004-05 (A07102), LC2279-4 (A07104), PKDL 52 (A07105) in Zone IV against fertilizer application and sowing schedule. Two separate experiments (entries × fertilizer application and sowing schedule × entries) were laid out for the purpose at all the assigned locations. T 397 (A07103) was taken for the comparison in both the zones. The data of these two experiments are shown in Table 3.10.1 and 3.10.2, respectively.

The centre-wise results are reported here as under;

Entries x fertilizer application

The results of this experiment are given in table 3.10.1.

Table 3.10.1 Response of AVT (I) 2nd year entries to fertilizer application

Entries (E)	Fertilizer application (% RDF)			Mean	Sources	SE (M) ±	CD at 5%	CV%	NMR (Rs/ha) at Powarkheda	
	50	100	150							
Seed yield (kg/ha) at Powarkheda										
SLS 61	588	1500	1417	1168	E	29.28	88	8.24	50% RDF	6639
NDL 2004-05	583	1208	1563	1118	F	29.28	88	-	100% RDF	23052
T397	439	1063	1240	914	E × F	50.72	152	-	150% RDF	24908
Mean	**537**	**1257**	**1406**	-	-	-	-	-	-	
Plant stand (000/ha) at Mauranipur										
SLS 61	872	915	933	907	E	10.29	NS	3.45		
NDL 2004-05	867	925	918	903	F	10.29	31	-		
T397	831	860	932	874	E × F	17.83	NS	-		
Mean	**857**	**900**	**928**	-	-	-	-	-		
Seed yield (kg/ha) at Mauranipur										
SLS 61	1063	1385	1450	1299	E	23.13	69	5.38		
NDL 2004-05	1146	1410	1469	1341	F	23.13	69	-		
T397	953	1326	1399	1226	E × F	40.07	NS	-		
Mean	**1054**	**1374**	**1439**	-	-	-	-	-		
Net monetary return (Rs/ha) at Mauranipur										
SLS 61	15875	24233	25329	21812	E	647.46	1941	8.97		
NDL 2004-05	18209	25091	26243	23181	F	647.46	1941	-		
T397	12824	22758	24293	19958	E × F	1121.63	NS	-		
Mean	**15636**	**24027**	**25288**	-	-	-	-	-		
Seed yield (kg/ha) at Raipur										
NDL 2004-05	895	973	1017	962	E	21.76	64	9.62		
LC 2279-4	483	523	625	544	F	18.85	55	-		
PKDL 52	420	548	605	524	E × F	37.69	NS	-		
T 397	643	674	734	684	-	-	-	-		
Mean	**610**	**680**	**745**	-	-	-	-	-		
Net monetary return (Rs./ha) at Raipur										
NDL 2004-05	18889	15724	15729	15447	E	543.82	1595	-		
LC 2279-4	4580	4490	5926	4999	F	470.90	1373	-		
PKDL-52	3024	5114	5418	4519	E × F	-	NS	-		
T397	8581	8265	8661	8502	-	-	-	-		
Mean	**7768**	**8399**	**8934**	-	-		-	-		
Seed yield (kg/ha) at Nagpur										
NDL 2004-05	953	1296	1398	1216	E	36.3	106	-		
LC 2279-4	633	962	997	864	F	31.3	92	-		
PKDL-52	455	552	726	578	E × F	65	NS	-		
T397	699	1226	1193	1039	-	-	-	-		
Mean	**685**	**1009**	**1078**	-	-	-	-	-		
Net monetary return (Rs./ha) at Nagpur										
NDL 2004-05	21823	32151	34950	29645	E	1211	3562	-		
LC 2279-4	11595	21474	22101	18397	F	1047	3086	-		
PKDL-52	5897	8369	13298	9186	E × F	2101	NS	-		
T 397	13668	29929	28419	24010	-	-	-	-		
Mean	**13250**	**22989**	**24699**	-	-	-	-	-		

A07101: SLS61, A07102:NDL2004-05, A07103: T397, A07104: LC2279-4, A07105: PKDL:52

Powarkheda

SLS 61 and NDL 2004-05 both out yielded significantly than T397 (Table 3.10.1). Net monetary returns of 150% RDF was maximum but 100% RDF followed it very closely. SLS 61 gave significantly higher yield at 100% RDF (80 : 40 : 20) while NDL 2004-05 out yielded significantly at 150% RDF (120 : 60 : 30).

Mauranipur

Both the newly developed entries *viz*, SLS 61 and NDL 2004-05 gave significantly higher yield than T 397 (Table 3.10.1). Net monetary return followed the similar trend of seed yield. Though, seed yield (1439 kg/ha) recorded at 150% RDF was significantly superior than 50% RDF and 100% RDF but net monetary returns obtained at 150% RDF and 100% RDF were at par.

Raipur

NDL 2004-05 significantly superseded to T397 with regard to seed yield and NMR but LC 2279-4 and PKDL 52 were observed inferior to T397 in these respects (Table 3.10.1). Fertilizer application @ 150% RDF brought significant increase in seed yield over 100% RDF (80 : 50 : 30) and 50% RDF but net monetary return was statistically equall at 100% RDF and 150% RDF.

Nagpur

NDL 2004-05 gave significantly higher seed yield and NMR than T397 but LC 2279-4 and PKDL-52 was reduced in these respects (Table 3.10.1). Application of fertilizer upto 150% RDF increased the seed yield and NMR both with significant margin but 100% RDF (60:30:00) and 150% RDF (90:45:00) were at par.

Sowing schedule × entries

Powarkheda

SLS 61 and NDL 2004-05 both significantly out yielded than T397. Seed yield (984 kg/ha) was also significantly higher when it was sown during second week of November as compared to earlier and latter sowings (Table 3.10.2.1). SLS 61 gave higher yield when sown during second week of November but it was on par with last sowing during last week of November. Whereas, NDL 2004-05 produced significantly higher yield when sown during second week of November as compared to earlier and latter sowings.

Mauranipur

Seed yield among the treatments of sowing schedule as well as entries could not exhibit significant differences (Table 3.10.2.1). SLS 61 and NDL 2004-05 both gave significantly higher NMR than T397. The net monetary return (Rs. 23306/ha) was observed significantly maximum with first sowing during last week of October but it was on par with sowing of second week of November. Interaction effect of these two factors could not be observed significant in the case of net monetary returns too.

Table 3.10.2.1 Response of AVT (I) II year entries against sowing schedule in zone III

Sowing Schedule	Entries			Mean	Sources	SE (M) ±	CD at 5%	CV %
	SLS 61	NDL 2004-05	T 397					
Seed yield (kg/ha) at Powarkheda								
October last week	638	658	261	452	D	12.90	45	3.82
November II week	1393	1066	492	984	E	18.11	31	
November last week	1256	860	479	865	E with in D	10.46	54	
Mean	**1095**	**861**	**411**	-	D with in same / diff E	-	58	
Plant stand (000/ha) at Mauranipur								
October last week	887	943	883	905	D	13.88	NS	2.74
November II week	928	958	920	935	E	12.61	22	
November last week	915	942	913	923	E with in D	7.28	NS	
Mean	**910**	**948**	**905**	-	D within same/diff. E	-	-	
Seed yield (kg/ha) at Mauranipur								
October last week	1357	1440	1241	1346	D	45.59	NS	9.56
November II week	1306	1402	1202	1303	E	62.13	NS	
November last week	1208	1272	1273	1251	E with in D	35.87	NS	
Mean	**1290**	**1372**	**1239**	-	D within same in diff. D			
Net monetory return (Rs./ha) at Mauranipur								
October last week	23612	25943	20364	23306	D	585.37	2026	10.12
November II week	21191	24893	19279	22121	E	1093.18	1875	
November last week	19461	21239	17417	19372	E with in D	631.15	NS	
Mean	**21755**	**24025**	**19020**	-	D with in same/diff. E	-	NS	

A07101:SLS61, A07102: NDL 2004-05, A07103: T397

Raipur

NDL 2004-05 significantly Superseded to T397 with regard to seed yield and NMR but LC 2279-4 and PKDL-52 were observed inferior to T397 (Table 3.10.2.2). Seed yield (816 kg/ha) and NMR (Rs. 11241/ ha) were recorded significantly higher when sown during last week of November but these were on par with the sowing performed during second week of November.

Nagpur

NDL 2004-05 significantly excelled T397 with regard to seed yield and NMR but LC 2279-4 and PKDL-52 both were observed inferior to T 397 (Table 3.10.2.2). The crop sown during last week of October gave significantly higher seed yield (963 kg/ha) and NMR (Rs. 21567/ha) as compared to latter sowings. The interaction effect between sowing schedule × entries for seed yield was also signicicant. NDL 2004-05 and PKDL 52 gave higher yield when sown during last week of October but LC 2279-4 yielded more when sown during second week of November. However, the seed yield recorded in first two sowings were at par and significantly superior to last sowing.

Table 3.10.2.2 Response of AVT (I) 2nd year entries against sowing schedule in Zone IV

Sowing Schedule	Entries (E)				Mean	Sources	SE (M) ±	CD at 5%	CV%
	NDL 2004-05	LC 2279-4	PKDL-52	T397					
				Seed yield (kg/ha) at Raipur					
October last week	748	644	614	723	682	D	29.42	102	
November II week	885	697	673	752	752	E	31.25	91	
November last week	992	735	705	831	816	E with in D	-	**NS**	
Mean	**875**	**692**	**664**	**769**	-	D with in same or diff D	-	**NS**	
				Net monetary returns (Rs./ha) at Raipur					
October last week	9536	6941	6191	8928	7899	D	708	2450	
November II week	12968	8268	7670	9657	9641	E	775	2249	
November last week	15645	9219	8475	11626	11241	E with in D	-	NS	
Mean	**12716**	**8142**	**7445**	**10070**	-	D within same or diff. E	-	-	
				Seed yield (Kg/ha) at Nagpur					
October last week	1246	775	875	730	963	D	14.2	49	
November II week	1147	866	825	1054	801	E	25.6	74	
November last week	933	891	700	875	704	E with in D	45.6	139	
Mean	**1021**	**769**	**619**	**882**	-	D with in same or diff. E	-	-	
				Net monetary return (Rs/ha) at Nagpur					
October last week	30627	20712	7379	27550	21567	D	483.6	1722	
November II week	24530	11973	14444	14668	16389	E	852.5	2473	
November last week	15128	13419	9886	14729	13290	E with in D	1478	NS	
Mean	**23426**	**15356**	**10570**	**18981**	-	D with in same or diff. E	-	NS	

A07102:NDL 2004-05, A07103: T397, A07104: LC2279-4, A07105: PKDL-52

Thus results obtained at Powarkheda as well as Mauranipur of Zone III and Raipur as well Nagpur of Zone IV for newly developed entries of AVT (I) 2nd year may be summarized as ;

1. 100% RDF at Mauranipur as well as Powarkheda for SLS 61 and NDL 2004-05, and at Raipur as well as Nagpur for NLD 2004-05, LC 2279-4 and PKDL-52 was observed optimum dose of fertilizer application.
2. Second week to last week of November for SLS 61 and second week of November for NDL 2004-05 at Powarkheda, whereas last week of October to second week of November for both the AVT (I) 2nd year entries (SLS 61 and NDL 2004-05) at Mauranipur were observed optimum sowing schedule for higher seed yield and NMR.
3. NDL 2004-05, LC2279-4 and PKDL 52 entries of AVT (I) for Zone IV recorded significantly higher NMR when sown during second week to last week of November at Raipur and last week of October to second week of November at Nagpur.

3.11 Studies on the response of AVT (DP) second year entries towards fertilizer application and sowing schedule

This experiment was allotted to Palampur in Zone I and Kanpur, Faizabad and Patna in Zone II with a view to see response of AVT (DP) entries of second year testing against fertility application and sowing schedule in two separate experiments. LMS 95-4 (A 07112) and LCK 5021 (A 07113) in Zone I, whereas only LCK 5021 (A07113) in Zone II were evaluated for the purpose. Nagarkot (A 07111) and Shikha (A07115) in Zone I while Parvati (A 07114) and Shikha (A 07115) in Zone II were also sown for comparison. The results of this experiment are narrated below ;

Zone I : Palampur

Fertilizer application × entries

Non of newly developed entries could not supersede to Nagarkot but were observed significantly superior than Shikha with regard to seed yield (Table 3.11.1). Seed yield (606 kg/ha) recorded at 150% RDF was observed significantly superior to 50% RDF and 100% RDF. However, 150% RDF gave 58 kg/ha higher yield than 100% RDF which could not cope up with the price involved for the purchase 50% higher fertilizer.

Sowing Schedule × entries

LCK 5021 gave significantly higher seed yield (830 kg/ha) over all the entries (Table 3.11.1). Seed yield was also significantly higher when sown during last week of October as compared to last two sowings.

Thus it is concluded that newly developed entries of Zone I (LMS 95-4 and LCK 5021) may give higher seed yield when sown during last week of October and with the use of 100% RDF (50 : 40 : 20 kg NPK/ha).

Table 3.11.1 Response of AVT (DP) entries to fertilizer application and sowing schedule at Palampur

Fertilizer / Sowings	Entries (E)				Mean	Sources	SE (M) ±	CD at 5%	CV%
	Nagarkot	LMS 95-4	LCK-5021	Shikha					
				Plant stand (000/ha)					
50% RDF	1247	1247	1027	1018	1135	F	46.20	136	12.90
100% RDF	1300	1293	1169	1050	1203	E	55.35	157	-
150% RDF	1473	1467	1293	1307	1385	F×E	92.40	NS	-
Mean	**1340**	**1336**	**1163**	**1125**	**1241**				
				Seed yield (kg/ha)					
50% RDF	567	472	443	277	440	F	12.61	37	8.22
100% RDF	709	587	545	350	548	E	14.57	43	-
150% RDF	774	638	602	410	606	F × E	25.22	NS	-
Mean	**683**	**566**	**530**	**346**	**531**				
				Plant stand (000/ha)					
Oct. last week	1101	965	838	923	957	D	27.93	82	11.81
Nov. II week	878	762	877	875	848	E	32.25	NS	-
Nov. last week	625	695	724	570	653	D × E	55.86	164	-
Mean	**868**	**807**	**813**	**789**	**819**				
				Seed yiled (kg/ha)					
Oct. last week	799	844	1292	1204	1035	D	28.68	84	13.50
Nov. II week	800	629	662	593	671	E	33.11	97	-
Nov. Last week	515	488	536	466	501	D × E	57.35	168	-
Mean	**705**	**654**	**830**	**754**	**736**				

A07111: Nagarkot, A07112: LMS 95-4, A07113; LCK 5021, A07115: Shikha, RDF: Recommended dose of fertilizer

Zone II

Fertilizer application × entries

The results of this experiment are given in Table 3.11.2

Table 3.11.2 Response of AVT (DP) 2nd year entries against fertilizer application in Zone II

Fertilizer application (F)	Entries (E)			Mean	Sources	SE (M) ±	CD at 5%	CV%
	LCK-5021	Parvati	Shikha					
				Plant stand (000/ha) at Patna				
F_1	2118	3264	2629	2670	E	187	559	17.62
F_2	3093	4318	3857	3756	F	187	559	-
F_3	2761	3567	2989	3106	E × F	323	NS	-
Mean	**2657**	**3716**	**3158**	**3177**				
				Seed yield (kg/ha) at Patna				
F_1	867	1224	897	996	E	79	236	20.77
F_2	1288	1539	1150	1326	F	79	236	-
F_3	1070	1219	1002	1097	E × F	137	NS	-
Mean	**1075**	**1327**	**1016**	**1140**				
				Fibre yield (kg/ha) at Patna				
F_1	751	973	882	868	E	42	125	14.26
F_2	906	1136	1001	1015	F	42	125	-
F_3	485	781	947	737	E × F	72	NS	-
Mean	**714**	**963**	**943**	**873**				
				Seed yield (kg/ha) at Faizabad				
F_1	881	1017	764	887	E	39	117	9.87
F_2	1300	1447	1158	1302	F	39	117	-
F_3	1361	1506	1203	1356	E × F	67	NS	-
Mean	**1181**	**1323**	**1042**	**1182**				
				Fibre yield (kg/ha) at Faizabad				
F_1	583	672	503	586	E	25	76	9.79
F_2	858	958	764	860	F	25	76	-
F_3	897	994	794	895	E × F	44	NS	-
Mean	**780**	**875**	**687**	**781**				
				Plant stand (000/ha) at Kanpur				
F_1	1258	1527	13058	1365	E	45	135	10.13
F_2	1117	1517	1383	1339	F	45	NS	-
F_3	1108	1417	1350	1292	E × F	78	NS	-
Mean	**1161**	**1487**	**1347**	-				
				Seed yield (kg/ha) at Kanpur				
F_1	1798	1654	1819	1757	E	57	170	7.85
F_2	2296	2136	2572	2334	F	57	170	-
F_3	2333	2245	2677	2418	E × F	98	NS	-
Mean	**2143**	**2012**	**2356**	-				
				Fibre yield (kg/ha) at Kanpur				
F_1	619	800	693	704	E	18	NS	6.60
F_2	833	852	866	850	F	18	54	-
F_3	920	899	916	912	E × F	31	99	-
Mean	**791**	**850**	**825**	-				

F_1 = 50% RDF, F_2 = RDF, F_3 = 150% RDF, RDF: Recommended dose of fertilizer
A07113: LCK 5021, A07114: Parvati, A07115: Shikha

Patna

LCK 5021 could not supersede Parvati with regard to seed and fibre yields both (Table 3.11.2). However, seed yield of LCK 5021 and Shikha was at par. Seed (1326 kg/ha) and fibre (1015 kg/ha) yields were found significantly higher at 100% RDF (80 : 40 : 40 kg NPK/ha) than 50% RDF and 150% RDF.

Faizabad

Seed (1181 kg/ha) and fibre (780 kg/ha) yields of LCK 5021 were observed significantly higher than Shikha but these were lower than Parvati (Table 3.11.2). Application of fertilizer @ 150% RDF gave maximum seed and fibre yields but these were significantly superior than 50% RDF only.

Kanpur

LCK 5021 yielded numerically higher seed yield (2143 kg/ha) than Parvati but it was substantially lower than Shikha (Table 3.11.2). The fibre yield of LCK 5021 was observed lower than Parvati and Shikha. Seed yield (2418 kg/ha) was recorded significantly higher at 150% RDF than 50% RDF, while, fibre yield recorded at 150% RDF was observed significantly superior to 50% RDF and 100% RDF. The interaction between sowing schedule × entries was observed significant for fibre yield. Though, LCK 5021 gave significantly higher fibre yield at 150% RDF but it was on par with 100% RDF.

Sowing Schedule × entries

This experiment was viated at Faizabad therefore, the results obtained at Kanpur and Patna centres are reported here ;

Kanpur

Entries could not bring treatment effect on seed and fibre yields (Table 3.11.3). Seed yield (2431 kg/ha) and fibre yield (778 kg/ha) were observed significantly higher when sown during last week of October over latter sowings. However, fibre yield recorded during first two sowings were at par.

Patna

LCK 5021 could not show any superiority over Parvati and Shikha with regard to seed and fibre yields (Table 3.11.3). The double purpose linseed yielded significantly higher seed (825 kg/ha) and fibre (274 kg/ha) when sown during first week of December as compared to last sowing during last week of December as first two sowings were at par.

Thus the results obtained at Kanpur, Faizabad and Patna for AVT (DP) second year entry of Zone II (LCK 5021) may be summarized as;

1. A fertilizer dose of 100% RDF was observed optimum for AVT (DP) entry in Zone II.
2. LCK 5021 gave higher seed and fibre yields when sown during last week of October as compared to November sowings at Kanpur and first week of December over latter sowings at Patna.

Table 3.11.3 Response of AVT (DP) 2nd year entries against sowing schedule in Zone II

Sowings	Entries			Mean	Sources	SE (M) ±	CD at 5%	CV%
	LCK-5021	Parvati	Shikha					
				Plant stand (000/ha) at Kanpur				
Oct. last week	1376	1542	1288	1402	D	65.94	228	9.72
Nov. II week	1600	1996	1504	1700	E	78. 73	134	-
Nov. last week	1646	2017	1542	1735	E with in D	45.25	NS	-
Mean	**1541**	**1851**	**1445**	**1612**	D with in Same/diff. E	-	-	-
				Seed yield (kg/ha) at Kanpur				
Oct. last week	2496	2292	2504	2431	D	42.79	148	13.25
Nov. II week	1817	1740	1871	1809	E	127.93	NS	-
Nov. last week	1601	1466	1593	1554	E with in D	73.86	NS	-
Mean	**1971**	**1833**	**1989**	**1931**	D with in Same/diff. E	-	-	-
				Fibre yield (kg/ha) at Kanpur				
Oct. last week	767	870	698	778	D	20.22	70	18.18
Nov. II week	769	770	639	726	E	65.01	NS	-
Nov. last week	606	707	611	641	E with in D	37.54	NS	-
Mean	**714**	**782**	**649**	**715**	D with in Same/diff. E	-	-	-
				Plant stand (000/ha) at Patna				
Dec. I week	2162	2738	2412	2437	D	29.80	103	6.31
Dec. II week	1664	2138	1797	1867	E	61.02	104	-
Dec. last week	1363	1667	1455	1495	E with in D	35.23	NS	-
Mean	**1730**	**2181**	**1888**	**1933**	D with in Same/diff. E	-	NS	-
				Seed yield (kg/ha) at Patna				
Dec. I week	844	855	776	825	D	33.16	115	15.72
Dec. II week	794	798	701	764	E	56.23	96	-
Dec. last week	604	623	444	557	E with in D	32.47	NS	-
Mean	**747**	**759**	**640**	**715**	D with in Same/diff. E	-	-	-
				Fibre yield (kg/ha) at Patna				
Dec. I week	277	284	261	274	D	13.66	47	15.10
Dec. II week	214	273	202	230	E	18.41	32	-
Dec. last week	156	289	237	228	E with in D	10.63	55	-
Mean	**216**	**282**	**234**	**244**	D with in Same/diff. E	-	60	-

A07113: LCK 5021, A07114: Parvati, A07115: Shikha

3.12 Station trials: Response of EEMT entries to seed rate at Sagar

Entries x Seed rate : JLS a superseded to all with regards seed yield (1163 kg/ha) and NMR (Rs. 26099/ha) but was on par with SLS 67 (Table 3.12). Seed yield (1107 kg/ha) and net monetary return (Rs. 24419/kg) were also recorded significantly higher when 30 kg/ha seed rate was used.

Entries x fertilizer application : Seed yield (1163 kg/ha) and net monetary return (Rs. 26134/ha) were recorded higher when JLS 9 was sown as compared to SLS 67, LMS 153 and T 397 (Table 3.12). Though seed yield (1135 kg/ha) recorded at 150% RDF was observed significantly superior to 50% and 100% RDF but net monetary monetary return recorded in 100% RDF and 150% RDF were at par. The newly developed entries fetched at par NMR at 100% RDF and 150% RDF.

Table 3.12 Response of EEMT entries to agronomic inputs at Sagar

Seed rate/Fertilizer application	Varieties (V)								
	SLS-67	LMS-153	JLS-9	T-397	Mean	Sources	SE (M) ±	CD at 5%	CV %
Seed rate (kg/ha) 's'									
				Plant stand (000/ha)					
25	524	605	608	988	682	V	22.89	64	9.27
30	536	730	778	930	744	S	19.82	58	
35	723	670	792	1001	796	V × S	39.65	116	
Mean	**594**	**668**	**726**	**973**	**741**				
				Seed yield (kg/ha)					
25	871	1004	1027	848	938	V	35.98	106	10.54
30	1146	1049	1324	908	1107	S	31.16	91	
35	1220	871	1138	885	1029	V × S	62.32	183	
Mean	**1079**	**975**	**1163**	**880**	**1024**				
				Net Monetary Return (Rs/ha)					
25	17422	21432	22112	16752	19430	V	1082.20	3174	
30	25639	22672	30932	18432	24419	S	937.22	2749	14.80
35	27712	17222	25252	17672	21965	V × S	1874.43	5498	
Mean	**23591**	**20442**	**26099**	**17619**	**21938**				
Fertilizer application F"									
				Plant stand (000/ha)					
50% RDF	955	673	942	1071	910	V	30.98	91	10.22
100% RDF	624	793	1124	1172	928	F	26.83	NS	
150% RDF	587	967	987	1023	891	V × I	53.65	157	
Mean	**722**	**811**	**1017**	**1089**	**910**				
				Seed yield (kg/ha)					
50% RDF	938	774	1101	863	919	V	24.33	71	7.02
100% RDF	1116	930	1153	1071	1068	F	21.07	62	
150% RDF	1220	997	1235	1086	1135	V × F	42.14	NS	
Mean	**1091**	**900**	**1163**	**1007**	**1040**				
				Net Monetory return (Rs/ha)					
50% RDF	19880	14960	24770	17640	19313	V	729.24	2139	9.74
100% RDF	24721	19141	25841	23381	23271	F	631.54	1852	
150% RDF	27352	20662	27792	23322	24782	V × F	1263.09	3705	
Mean	**23984**	**18254**	**26134**	**21448**	**22455**				

RDF: Recommended dose of fertilizer

4. PATHOLOGY

A total of eight trials constituted the Linseed Pathology Technical programme for year 2007-08 as approved in Annual group meeting 2007 held at MPAUT, Udaipur. The detailed allocation and execution of the programme are given as under :

Technical Programme for the year 2007-08

Sl. No.	Experiments allotted	Year of commencement	Total testing year	Testing centres	Remarks
4.1	Survey of diseases prevailing in the region	Regular programme	Regular	All AICRP centres	Data received only from 9 centres
4.2	Screening of germplams for wilt, Alternaria, powdery mildew and rust diseases	Regular	Regular	Faizabad, Jashipur, Kangra, Kanke, Kanpur, Ludhiana, Mauranipur, Nagpur Raichur, Raipur and P.C. Unit	Full execution
4.3A	Uniform Disease Nursery Trial (Natural)	Regular	Regular	All AICRP centres	Full execution
4.3. B	UDN artificial (UDNA)	Regular	Regular	Wilt : Kanpur, Raipur AB : Berhampore, Faizabad, P.C. Unit, Raipur PM : Mauranipur, Nagpur, Raichur, Raipur Rust : Kangra, Kanke	Full execution
4.4	Evaluation of promising entries elite material under high inoculum pressure	Regular	Regular	As above	Full execution
4.5	Monitoring of diseases in agronomical trials	Regular	Regular	All centres conducting agronomical trials	Data received only from Kanke, Kangra and Raipur centres
4.6	Integrated disease Management in linseed	2006-07	2 years	Faizabad, Kanke, Ludhiana, P.C. Unit, Raipur	Full execution
4.7	Studies on the variability of major pathogens	2007-08	1 year	Fusarium : Kanpur, Raipur AB :' Faizabad, P.C. Unit Rust : Kangra	No data recorded from any assigned centre work initiated at P.C. unit.
4.8	Initial Disease screening Nursery (IDSN)	Regular	Regular	AB : Faizabad, P.C. Unit, Raipur PM: Mauranipur, Nagpur Rust : Kangra, Kanke, Wilt : Kanpur, Raipur, Kangra	Full execution

4.1 Survey of linseed diseases in different agro climatic regions

This is an observational experiment. The objective of the trial is to record the incidence and severity of diseases at different locations/regions and find correlation with the meteorological parameters. The experiment was assigned to all AICRP (linseed) centres but data were received only from Faizabad, Jashipur, Kangra, Kanke, Kanpur, Mauranipur, Nagpur, P.C. Unit and Raipur centres (Table 4.1). However, the meteorological

Table 4.1 Survey of linseed diseases at different centres/locations (2007-08)

Sl. No.	AICRP Centre	Diseases observed	Location	Varieties affected	Date of sowing	Date of appearance	Date of final observation	Diseas severity (%)	Temperature (^{0}C)		Relative humidity (%)		Rain fall (mm)	No. of rainyday	Sun shine hours	Wind velocity 24 hrs Av.
									Min	Max	Min	Max				
1.	Faizabad	Wilt	Kumarganj Faizabad	Chambal	23.10.07	11.11.07	14.2.08	90.0	12.2	28.9	56.7	92.7	0	-	7.8	-
		AB	-do-	Chambal	23.10.07	15.12.07	28.3.08	75.5 to 85.5	4.6	22.6	42.4	92.4	0	-	4.6	-
		PM	-do-	T-397	24.10.07	20.2.08	15.3.08	85.85	8.7	26.4	42.8	83.4	0	-	6.9	-
2.	Jashipur	Wilt	Junposhi, Nana and 7 other villages	Local	Last Nov.	Mid Dec	17.2.08	1.0	9.0	25.0	-	-	0	-	-	-
		AB	-do-	Local	Last Nov.	Last Jan.	9.3.08	0.8 to 55.0	12.0	23.0	-	-	0	-	-	-
		PM	-do-	Local	Last Dec.	Ist Feb	9.3.08	1.0-2.3	11.0	24.0	-	-	0	-	-	-
		Rust	-do-	Local	Ist Dec.	-	053.08	0.5-1.0	-	-	-	-	-	-	-	-
3.	Kangra	Wilt	Kangra	Chambal	15.11.07	7.12.07	7.3.08	100.0	6.0	22.1	70.0	91.0	0	0	-	-
			Palampur	Gaurav	15.10.07	30.11.07	25.4.08	20.0	7.0	23.4	34.0	73.0	0	0	-	-
			Rait	Kangra, local	15.10.07	10.11.07	21.4.08	10-15.0	12.0	25.7	34.0	58.0	0	0	-	-
		AB	Not appeared													
		PM	Kangra	Himalini	15.11.07	29.3.08	15.4.08	10.0	10.1	29.0	46.0	95.0	0	0	-	-
			Palampur	T-397	15.10.07	25.3.08	25.4.08	80.0	9.9	29.3	45.0	89.0	0	0	-	-
			Rait	Kangra local	15.10.07	02.4.08	21.4.08	10-25.0	11.6	26.0	44.0	91.0	49.2	4	-	-
		Rust	Kangra	Chambal	16.11.07	01.3.08	10.4.08	100.0	7.8	26.2	76.0	90.0	0	0	-	-
			Palampur	Chambal	15.10.07	15.3.08	25.4.08	25.0	10.8	28.2	52.0	90.0	0	0	-	-
			Rait	Kangra local	25.10.07	7.3.08	21.4.08	10-25.0	8.2	22.6	84.0	94.0	0	0	-	-
4.	Kanke	Wilt	Patra	Sweta	27.11.07	15.12.07	17.3.08	20-25	9.0	24.0	51.6	87.6	0	0	51.6	7.4
			Toli													

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		AB	Kadma	T-397	30.11.07	23.12.07	2.4.08	15-20	3.9	22.4	53.6	85.9	0	0	67.4	9.63
		PM	Exptl. area BAU	BAU-06-12	14.11.07	17.2.08	26.3.08	20-25	4.1	23.0	33.0	87.0	0	0	73.0	10.4
		Rust	RAC farm BAU	Chambal	23.11.07	25.2.08	3.4.08	10-15	7.9	25.7	43.0	88.0	0	0	38.7	5.54
				RLC-52												
5.	**Kanpur**	Wilt	Nawabganj Res.	S-99-3	10.12.07	25.12.07	20.3.08	100.0	8.6	23.6	66.1 (Av.)		3.0	1	5.2	-
			Farm	LCK-9303												
		AB	Oilseed Res. Farm	Shekhar Parvati	22.12.07	11.1.08	19.3.08	5-10	7.4	21.9	59.5 (Av.)		0	0	4.0	-
			Deegh Res. Farm	Laximi-27	5.11.07	20.12.07	25.3.08	10-20	8.6	23.6	66.1 (Av.)		3.0	1	5.2	-
6	**Mauranipur**	Wilt	Crop Res. Farm	4/47	20.11.07	12.12.07	12.3.08	0.2								
		PM	-do	Chambal	20.11.07	22.2.08	-do-	75.0								
7.	**Nagpur**	Wilt	Asta	C-429	Sep. 2007	Nov. 2007	Jan. 08	10-12	16.3	30.82	39.75	66.25	78.7	2	8.3	-
			Pombhurna	NL-97	Sep. 2007	Nov. 2007	-do-	5-6	-do-	-do-	-do-	-do-	-do-	-do-	-do-	-
			Ralegaon	NL-142	Oct. 2007	Dec. 2007	-do-	3-4	13.08	29.18	36.2	62.8	0	0	7.56	-
		AB	Asta	NL-97	Sep. 2007	Nov. 2007	Jan. 2008	12-15	16.3	30.82	39.75	66.25	78.7	2	8.3	-
			Pombhurna	NL-142	Sep. 2007	Nov. 2007	-do-	8-12	16.3	30.82	39.75	66.25	78.7	2	8.3	-
			Wardha	Padmini	Oct. 2007	Dec. 2007	-do-	6-8	13.8	29.18	36.2	62.8	0	0	7.56	-
		PM	Wardha	Padmini	Sep. 2007	Nov. 2007	Jan. 08	20-22%	16.3	30.82	39.75	66.25	78.7	2	8.3	-
			Pombhurna	NL97	Sep. 2007	Nov. 2007	-do-	25-30	16.3	30.82	39.75	66.25	78.7	2	8.3	-
			Asta	NL97	Oct. 2007	Dec. 2007	-do-	25-30	13.08	029.18	36.2	62.8	0	0	7.56	-
		Cusculta	Asta	C-429	Sept-07	Nov. 2007	Jan. 08	50-60	16.3	30.82	39.75	66.25	78.7	2	8.3	-
8.	P.C. Unit	Wilt	Oil seed Res. Farm	Chambal	7.12.07	22.12.07	1.4.08	2-10	8.3	23.5	37.0	85.0	0	0	7.0	-

Contd....

	AB	-do-	Chambal	7.12.07	29.12.07	1.4.08	30-60	8.3	23.5	37.0	85.0	0	0	7.0	-
			Kanpur local				30-65								
	PM	-do-	Chambal	7.12.07	28.2.08	10.4.08	60.00	11.7	26.2	41.0	87.0	0	0	5.6	-
			Garima				65.0								
			Shekhar				55.0								
	Rust	*-do-*	*RLC-52*	7.12.07	29.3.08	16.4.08	10.0	18.5	35.1	28.0	58.0	0	0	7.3	-
	Sclerotium rot	-do-	ES-44	7.12.07	20.2.08	15.4.08	30.0	8.1	24.0	31.6	66.0	0	0	9.5	-
			L. grandiflorum												
Raipur	Wilt	Kobiya	Dipika local	28.12.07	2nd week of Jan.	24.3.08	10-40	18.5	29.6	30.0	90.0	0	0	7.5	18.0
		Bansapur	Kartika	15.12.07	24.1.08	24.3.08	8-20	11.9	29.1	30.0	87.0	0	0	8.2	2.1
		Martara	Kartika	18.11.07	24.12.07	24.3.08	10-15	13.4	29.9	34.0	89.0	0	0	9.0	2.0
		Dadhi	Local	Ist week of Nov.	24.12.07	24.3.08	35	13.4	29.9	34.0	89.0	0	0	9.0	2.0
		Chamari	Local & R-552	2nd week of Oct & 28.11.07	14.11.07	24.3.08	15-30	14.2	29.7	39.0	89.0	0	0	8.9	2.5
	AB	Kobiya	Kiran local	28.12.07	24.1.08	24.3.08	5-40	13.8	24.4	54.0	88.0	7.6	1	3.3	3.7
		Bansapur	Kiran	15.12.07	24.1.08	24.3.08	20-65	13.8	24.4	54.0	88.0	7.6	1	3.3	3.7
		Martara	Kartika & local Kartika R-552	18.11.07	24.1.08	24.3.08	25-30	13.8	24.4	54.0	88.0	7.6	1	3.3	3.7
		Dadhi	Local R-552 R Kiran	Ist week Nov.	24.1.08	24.3.08	60.0	13.8	24.4	54.0	88.0	7.6	1	3.3	3.7
		Chamari	Local, R-552 & Kiran	2nd week of Oct. 28.11.07	24.1.08	24.3.08	20-60	13.8	24.4	54.0	88.0	7.6	1	3.3	3.7
	PM	Kobiya	Loal	28.12.07	Last week of Jan. 08	24.3.08	30-50	11.0	25.8	32.0	85.0	1.6	1.	9.2	3.7
		Bansapur	Kartika	15.12.07	24.1.08	24.3.08	5-10	13.8	24.4	54.0	88.0	7.6	1	3.3	3.7
		Martara	Kartika R-552	18.11.07	24.1.08	24.3.08	5-10	13.8	24.4	54.0	88.0	7.6	1	3.3	3.7
		Dadhi	Local	Ist week of Nov. 07	24.1.08	24.3.08	65.0	13.8	24.4	54.0	88.0	7.6	1	3.3	3.7
		Chamari	Local	2nd week of Oct-07	24.1.08	24.3.08	70.0	13.8	24.4	54.0	88.0	7.6	1	3.3	3.7

data were not reported by Mauranipur centre. Like previous years wilt, Alternaria blight, powedery mildew and rust were the major diseases reported. Cuscuta, which is an endemic problem of Chattishgarh, was not reported from Raipur. However its infestation was reported from Nagpur and Selerotium stem rot from Kanpur (P.C. Unit).

Incidence of wilt was reported from all reporting centres. The highest incidence (10-40%) was reported from Raipur followed by Kanke (20-25%) from normal fields. However 100% incidence was reported from Kangra and Kanpur followed by Faizabad (90%). This appears to be from wilt sick fields. A temperature range between 22.1 to 30.82°C (Max) and 6 to 18.0 °C (min) and relative humidity range of 30.0 to 51.6% (min)/66.25 to 90.7% (max) was favourable to disease. No rainfall was reported during disease appearance. Alternaria blight was recorded at all centres except for Kangra and Mauranipur maximum severity of Alternaria blight was reported from Faizabad (75.5 to 85.5%) followed by Kanpur, P.C. unit (30-65%), Raipur (5-60%) and Jashipur (55.0%). The appearance was observed from mid of December to last week of January. The temperature during this period ranged from 3.9-16.3°C (min) and 21.9-30.82°C (max). The relative humidity ranged between 42.4-54.0% (min) and 66.25-92.4% (max). There was a dry spell during crop season. There was only 1-2 showers with about 3.0 to 78.7 mm rainfall and 4.6 to 8.3 sunshine hours. Occurrence of powdery mildew was reported from all centres. The highest diseases score was reported, from Faizabad (85.85%) followed by Palampur (80.0%), Mauranipur (75.0%), P.C. Unit, Kanpur (55-65%). it is interesting to note that the intensity of powdery mildew at Kangra is only 10.0 per cent whereas it is 80.0 per cent at Palampur. The favourable temperature was 4.1-16.3°C (min) and 23.0-30.82 °C (max.) and relative humidity between 33-45.0% (min)/66.25-89.0% (max). There were 1-2 rainy days recording 3.0 to 78.7 mm rainfall and 6.9 to 9.2 sunshine hrs. Rust was recorded at Kangra (100%), Palampur Rait (25.0%), Kanke (10-15%), P.C. Unit, Kanpur (10.0%) and Jashipur (05-1.0%). Here again there is very much difference in disease score at Kangra and Palampur. The first appearance of rust was recorded between first week of March to last week of April. The most favourable temperature range was 7.8-11.0°C (min) and 22.6-28.2°C (max). The humidity range was between 35.1-84.0% (min)/58.0-94.0% (max). Besides above 4 major diseases scleratium stem rot (25-30%) was recorded at P.C. unit Kanpur and *cuscuta* was reported from Nagpur (50-60%).

4.2 Screening of germplasm against Wilt, Alternaria blight, Powdery mildew and Rust diseases.

This is a regular screening programme in which a set of 200 germplams alongwith a resistant and a susceptible check are evaluated against 4 major diseases. The trial was conducted at 11 locations. The test entries were planted alongwith checks in 3M single rows in augumented design. The diseases observations were recorded at respective hot spot locations under natural field conditions.

The following scale was followed for disease scoring

Grade	Disease intensity	Disease reaction
0	Free from disease	HR
1	1 to 10.0% infection	R
2	10.1 to 25.0% infection	MR
3	25.1 to 50.0% infection	MS
4	50.1 to 75.1% infection	S
5	75.1 to 100.0% infection	HS

Table 4.2 Screening of germplasm against diseases

Acc. No.	Germplams	Wilt (%)			Disease rating	Alternaria blight (0-5 scale)						Disease rating	Powdery mildew (0-5 scale)				Diseases rating	Rust (0-5 scale)		
		Kanpur	Raipur	Kangra		Kanke	Jashipur	Faizabad	Nagpur	Ludhiana Bud (%)	PC Unit		Mauranipur	Nagpur	Raichur	P.C. Unit		Kangra	Kanke	Disease rating
2101	T-397	16.94	19.81	5.1	MR	3	2	3	2	0	3	MR	4	5	3	3	S	5	4	HS
2102	LCK-9414	35.29	100	NG	S	1	-	2	2	0	1	R	1	0	3	0	R	NG	2	MR
2103	LCK-9420	14.89	22.81	0.5	MR	1	1	3	2	0	2	MR	1	3	3	2	MS	0	3	MS
2104	LCK-9426	2.32	100	26.3	MS	2	1	3	3	6.9	3	MS	1	1	2	2	MR	4	2	S
2105	LCK-9436	3.70	13.24	8.8	R	1	1	3	2	0	2	MR	2	1	4	2	MR	0	2	R
2106	LMH-38	3.57	38.24	23.1	MR	1	2	3	2	13.3	2	MR	1	1	2	2	MR	0	2	MR
2107	LMH-43	14.16	30.72	4.6	MR	2	2	2	2	20.0	1	MR	1	0	3	2	MR	0	3	MS
2108	LMH-62	2.85	89.53	10.3	MR	1	1	3	2	13.3	2	MR	1	1	2	2	MR	0	2	MR
2109	LMH-16-5	11.76	100	75.0	HS	2	-	2	2	33.3	1	MR	1	5	3	2	S	0	2	MR
2110	LMH-90-2	4.56	25.58	10.3	MR	3	1	2	1	10.0	2	MR	1	3	3	2	MS	0	2	MR
2111	LMH-90-7	10.71	42.74	3.8	MR	2	3	3	3	13.0	2	MS	1	1	4	2	MR	0	2	MR
2112	LMH-91-24	4.76	50	3.0	MR	2	-	3	3	53.0	2	MS	2	3	3	2	MS	1	1	R
2113	NDL-8804	7.69	96.83	70.0	HS	2	-	2	2	52.0	2	MR	2	4	2	1	MR	1	2	MR
2114	NDL-8809	6.66	94.69	4.9	MR	3	-	NG	2	54.0	2	MS	4	5	3	1	HS	2	1	MR
2115	NDL-14	1.33	65.69	12.1	MR	3	2	4	2	52.0	2	MS	4	5	3	0	HS	1	2	MR
2116	NDL-20	14.28	95.10	10.0	MR	2	-	3	2	50.0	2	MS	4	4	2	2	S	2	2	MR
2117	NDL-24	2.66	66.67	1.2	MR	3	2	2	2	52.0	2	MR	4	5	4	0	HS	0	1	R
2118	NDL-61	17.64	95.45	52.9	HS	1	2	NG	2	54.0	2	MR	4	3	3	2	MS	0	3	MS
2119	NDL-82	20.40	100	100.0	HS	1	-	NG	3	26.6	3	MS	3	5	3	2	MS	-	4	S
2120	NDL-91	24.44	100	85.0	HS	3	-	2	2	52.0	2	MR	4	5	2	2	S	3	3	MS
	Check I	11.53	23.80	10.9	MR	1	1	2	2	26.3	1	MR	-	0	4	0	MR	0	2	MR
	Check II	44.89	99.09	50.0	MS	2	1	3	2	52.0	3	MS	-	5	4	2	S	4	3	S

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2121	NL-93	15.55	22.54	4.0	MR	3	2	2	2	28.0	2	MR	4	5	3	0	HS	0	2	MR
2122	NL-97	6.52	76	35.3	MR	1	2	2	3	0	2	MR	1	1	3	2	MR	1	2	MR
2123	RL-29-8	9.09	27.10	80.0	MR	2	3	2	2	16.0	1	MR	1	1	4	0	R	0	2	MR
2124	RL-43-5	4.54	100	25.9	MS	2	-	2	3	6.9	2	MR	4	5	3	0	HS	1	2	MR
2125	RL-56-6-2	1.31	100	42.9	HS	1	3	NG	1	0	1	R	1	1	2	0	R	0	2	MR
2126	RL-903	7.14	94.57	50.0	HS	2	-	2	1	13.3	2	MR	1	0	2	0	R	0	2	MR
2127	RL-906	14.28	85.71	50.0	HS	2	3	2	2	26.6	2	MR	1	1	2	0	R	0	1	R
2128	Kiran	10.86	69.57	6.7	MR	2	-	2	2	42.8	2	MR	1	1	4	0	R	4	2	S
2129	RL-914	30.00	91.36	75.0	HS	4	-	2	2	20.1	1	MR	1	0	3	0	R	0	2	MR
2130	RL-925	44.00	75	100.00	HS	2	4	2	2	0	1	MR	1	0	3	0	R	-	3	MS
2131	RL-951	13.33	100	100.00	HS	3	-	NG	NG	10.3	1	MR	1	NG	2	0	R	-	2	MR
2132	RL-966	100.00	100	100.00	HS	2	-	NG	2	0	2	MR	1	0	2	1	R	-	2	MR
2133	RL-967	100.00	100	100.00	HS	2	-	NG	2	14.3	2	MR	2	2	2	0	MR	-	1	R
2134	RL-993	100.00	68.75	50.00	S	2	-	NG	2	32.6	2	MR	1	2	2	0	MR	-	1	R
2135	RL-(U)-2	50.00	100	NG	HS	3	-	NG	NG	No seed	NG	MS	4	NG	2	NG	MS	NG	2	MR
2136	RL-(U)-3	90.00	17.19	9.0	MR	3	1	3	3	28.6	3	MS	1	0	3	0	R	3	1	MS
2137	RLC-27	5.55	60.47	100.00	HS	2	-	4	2	40.0	3	MS	4	5	3	1	HS	-	2	MR
2138	RLC-29	38.00	93.15	100.00	HS	2	-	3	2	432.3	3	MS	4	5	3	1	HS	-	1	R
2139	RLC-40	80.00	24.66	2.9	MS	3	-	3	1	48.1	3	MS	2	0	4	0	MR	1	2	MR
2140	RLC-46	7.60	100	78.6	HS	3	-	2	3	10.0	4	MS	1	0	4	0	R	1	2	MR
	Check I	5.26	16.66	15.0	MR	2	-	2	3	6.7	1	MR	1	0	5	0	R	0	2	MR
	Check II	40.00	98.70	60.0	S	4	-	4	3	35.7	3	MS	4	5	5	2	HS	4	3	S
2141	RLC-47	91.16	30.77	75.4	HS	2	-	3	1	20.8	3	MR	1	0	3	1	R	1	1	R
2142	RLC-48	10.00	20.66	28.6	MR	3	-	4	2	24.1	3	MS	3	5	2	2	MS	0	2	MR
2143	RLC-51	4.76	10.37	90.0	S	2	-	3	2	18.0	3	MR	4	5	2	0	S	2	3	MS

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2144	RLC-53	8.00	57.65	100.0	HS	2	-	NG	2	16.1	2	MR	3	5	NG	0	S	-	2	MR
2145	RLC-55	15.00	51.32	100.0	HS	2	-	NG	2	22.2	3	MR	3	5	3	0	S	-	2	MR
2146	RLC-56	6.00	22.11	40.5	MR	3	4	3	2	37.9	2	MS	4	5	2	2	S	5	2	HS
2147	RLC-57	6.17	28.96	90.0	S	2	-	3	2	10.3	2	MR	4	5	2	2	S	3	3	MS
2148	RLC-59	8.62	13.37	1.5	R	3	4	2	2	8.0	3	MS	4	5	4	2	S	5	2	HS
2149	RLC-60	5.33	42.33	10.2	MR	3	5	4	2	23.0	3	S	3	5	4	1	S	5	2	HS
2150	SLS-7	11.11	37.33	20.1	MR	2	5	3	2	9.0	2	MR	2	4	3	1	S	0	2	MR
2151	SLS-8	-	100	100.00	HS	-	-	Missing	No seed	Missing	2	MR	-	Seed not received	-	0	R	-	-	-
2152	SLS-9	12.00	100	25.0	S	2	-	4	2	52.0	2	S	4	5	4	0	HS	1	2	MR
2153	SLS-21	2.17	7.53	2.9	MR	3	1	3	2	54.0	2	MR	1	0	3	0	R	3	2	MS
2154	Neelum	3.11	17.5	13.4	MR	2	1	3	2	24.0	3	MR	4	0	2	1	MR	1	2	MR
2155	EC-399085	2.17	11.24	5.6	MR	2	1	3	2	0	2	MR	1	0	4	0	R	1	2	MR
2156	EC-399086	5.19	85.83	32.9	MS	3	1	4	2	8.3	3	MS	1	0	3	0	R	5	4	HS
2157	RSJ-1	2.17	35.62	2.5	MR	2	3	5	2	20	4	S	1	0	3	0	R	3	2	MS
2158	RSJ-2	2.11	24.42	0	MR	3	3	5	2	0	4	S	1	0	2	0	R	3	2	MS
2159	RSJ-3	2.13	11.90	15.8	MR	2	4	5	2	0	3	S	1	0	3	0	R	4	3	S
2160	RSJ-4	2.43	58.93	21.0	S	2	3	5	2	13.3	3	MS	2	5	3	0	S	1	2	MR
	Check I	12.50	87.17	7.1	S	2	-	2	2	32.0	2	MR	1	0	4	0	R	0	2	MR
	Check II	73.33	51.16	50.0	S	2	-	3	2	52.0	3	MS	4	5	4	2	HS	4	3	S
2161	RSJ-5	8.64	80.82	28.6	S	2	1	3	2	20.0	3	MR	1	0	3	0	R	2	2	MR
2162	RSJ-6	5.10	14.29	3.8	MR	3	1	3	2	8.7	3	MS	1	0	3	0	R	1	2	MR
2163	RSJ-7	63.63	15.38	6.4	MR	2	1	NG	3	7.1	2	MR	1	0	2	0	R	3	3	MS
2164	Papsenda	26.08	100	91.0	HS	2	-	NG	2	20.0	3	MR	2	3	2	0	MR	1	3	MS
2165	Tissili Satna	-	100	100.0	HS	-	-	3	No seed	-	3	MS	-	Seed not received	-	0	R	-	-	-

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2166	Tissili Amdera	7.14	100	100.0	HS	2	-	3	2	28.0	3	MS	4	5	2	1	S	-	4	S
2167	Tikamgarh Chanser	12.00	100	95.0	HS	2	-	3	2	20.0	3	MS	2	5	3	2	MS	2	2	MR
2168	Tikamgarh trans local	28.00	83.33	15.4	MS	3	-	3	2	22.0	3	MS	2	0	4	0	MR	5	2	MS
2169	JLT-84-5-1	9.37	60	3.5	MR	2	2	3	2	28.0	3	MS	2	0	2	0	MR	5	1	HS
2170	Ireland (Tikamgarh Flax)	14.28	95.29	9.6	MS	2	1	3	3	8.0	3	MS	3	5	2	2	S	4	1	S
2171	Warodha	7.69	85.19	6.3	MS	3	3	3	3	28.0	2	MS	2	5	2	0	MR	5	4	HS
2172	OR-3-1 (Tikamgarh)	8.97	100	16.7	MS	2	1	2	3	44.0	2	MR	2	0	2	0	MR	4	2	S
2173	Sumerpur local	13.88	85.71	15.4	MS	2	4	2	3	52.0	2	S	1	0	3	0	R	5	4	HS
2174	EC-397750	7.14	82.5	23.5	MS	2	4	2	3	38.0	2	MS	3	5	2	0	S	2	2	MR
2175	Neelum	7.69	100	15.0	MS	2	2	4	2	24.0	3	MR	4	5	2	3	S	1	2	MR
2176	EC-397752	75.00	22.94	10.9	S	1	5	3	2	8.0	2	MR	1	5	3	3	S	4	2	S
2177	EC-397755	5.12	100	100.0	HS	2	1	4	2	10.0	3	MR	4	0	4	2	S	-	3	MS
2178	EC-397757	6.90	13.84	4.5	MR	2	1	3	3	0	3	MS	4	5	3	3	HS	4	4	S
2179	EC-397759	5.26	28.26	14.3	MR	2	2	4	2	28..0	3	MS	4	5	2	3	S	5	4	HS
2180	EC-397760	8.82	9.29	8.8	R	1	1	3	2	20.0	2	MR	1	5	2	2	MR	0	1	R
	Check I	12.96	15.31	10.7	MR	2	-	3	2	24.0	1	MR	1	0	4	0	R	0	1	R
	Check II	80.00	97.91	45.9	HS	3	-	4	2	52.0	3	MS	4	5	4	3	HS	4	3	S
2181	N-55	60.00	18.87	1.7	MR	2	1	3	2	32.0	3	MS	4	5	3	3	S	4	2	S
2182	N-110	31.11	85.71	84.4	HS	3	1	NG	2	33.3	3	MS	4	5	2	2	S	3	2	MS
2183	UP-82	12.50	24.59	7.5	MR	2	1	3	3	8.0	3	MS	4	5	3	2	S	0	3	MS
2184	UP-1-15	20.00	21.74	9.1	MR	2	-	NG	2	18.0	3	MR	4	5	3	2	S	2	2	MR
2185	MS-1	26.00	100	36.0	S	3	-	NG	2	10.0	2	MR	4	5	2	2	S	1	3	MS

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2186	MS-14	25.00	30.69	5.2	MR	3	2	3	2	22.0	2	MR	4	5	3	2	S	0	2	MR
2187	B-7	13.79	55	35.3	MR	2	2	3	2	52.0	2	MR	4	5	2	2	S	0	3	MS
2188	BSL-1	9.09	44.19	18.2	MR	3	2	2	2	40.0	2	MR	4	5	NG	3	S	0	2	MR
2189	BSL-2	17.07	67.83	25.9	MS	2	2	3	2	52.0	3	MS	1	5	2	4	S	1	2	MR
2190	BSL-4 yellow	11.11	100	100.0	HS	2	5	4	3	28.0	2	HS	2	0	2	0	MR	-	3	MS
2191	BSL-9	19.04	58.33	80.0	HS	1	1	3	2	52.0	2	MR	4	5	2	0	S	0	2	MR
2192	BSL-10	17.39	98.73	76.9	HS	2	-	NG	2	44.0	2	MR	4	5	3	0	S	0	1	R
2193	BSL-11	8.33	60.32	3.3	MR	2	-	3	2	20.0	2	MR	4	5	3	1	S	1	3	MS
2194	BSL-12	20.00	98.21	8.7	MR	2	-	4	2	26.0	2	MR	4	5	4	0	S	1	2	MR
2195	BSL-14	14.45	42.59	28.6	MS	3	-	3	2	28.0	2	MS	4	5	4	0	S	1	2	MR
2196	FRW-1	-	100	95.0	HS	-	-	Missing	Seed not received	Missing	2	MR	-	Seed not received	-	0	R	4	-	S
2197	KYS-1	-	100	100.0	HS	-	-	Missing	Seed not received	Missing	2	MR	-	Seed not received	-	0	R	-	-	-
2198	KYS-2	26.66	97.24	100	HS	2	-	WILTED 100%	2	50.0	2	MR	4	5	3	0	S	-	2	MR
2199	KYS-7	26.31	10.04	20.0	MR	2	1	4	2	30.0	2	MR	1	5	2	0	MR	5	3	HS
2200	Gaurav	8.16	31.76	66.7	S	1	-	2	2	52.0	2	MR	4	5	2	0	S	4	2	S
	Check I	16.32	10.04	9.5	MR	2	-	2	2	26.0	1	MR	1	0	4	0	R	0	2	MR
	Check II	40.00	96.40	40.0	S	2	-	4	2	38.0	3	MS	4	5	5	3	HS	4	3	S
2201	KYS-15	8.64	28.39	7.9	MS	1	3	3	2	52.0	3	MS	1	5	3	2	MS	5	2	HS
2202	KYS-16	8.97	25.55	26.3	MS	2	3	3	2	52.0	3	MS	1	5	3	2	MS	5	3	HS
2203	KFS-11	-	100	95.0	HS	-	-	Missing	Seed not received	Missing	1	R	-	Seed not received	-	0	R	4	-	S
2204	1/5-64	93.33	83.05	76.0	HS	1	2	3	2	26.0	2	MR	1	5	2	1	MR	0	2	MR
2205	4/35-1/1-4	17.39	100	100.0	HS	2	-	3	2	52.0	2	MR	1	1	3	0	R	-	1	R

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2206	4/47-2/1-2	26.19	92	40.0	S	1	3	2	2	22.0	2	MR	1	0	3	0	R	0	3	MS
2207	4/49-1/1-5	33.33	92.68	48.0	S	2	2	2	2	52.0	2	MR	1	4	3	1	MS	3	2	MS
2208	45/1	50.00	100	100.0	HS	2	-	Wilted 100%	2	44.0	2	MR	1	5	3	2	S	-	2	MR
2209	65/2	15.78	100	100.0	HS	2	-	NG	2	52.0	1	MR	2	5	NG	1	S	-	3	MS
2210	H-267-2	11.11	67.57	10.0	S	2	2	2	2	52.0	2	MR	2	5	2	2	MR	2	2	MR
2211	W/17-1	7.14	31.71	37.5	MS	2	1	3	2	52.0	2	MR	2	0	1	1	R	0	3	MS
2212	6-9-9-2	13.79	94.74	100.0	HS	3	-	3	2	26.0	2	MS	2	0	2	1	MR	-	2	MR
2213	5/1	7.69	16.67	14.8	MR	2	2	3	2	20.0	3	MR	3	5	3	2	S	1	2	MR
2214	5/3	66.66	8.70	7.2	MR	3	1	3	3	22.0	3	MS	1	5	3	1	S	0	2	MR
2215	4/47	28.57	100	5.3	MS	3	3	2	2	48.0	2	MS	1	0	3	0	R	0	2	MR
2216	21/4k	10.57	100	14.3	MR	2	3	2	2	52.0	2	MR	2	0	2	0	MR	0	3	MS
2217	T-71	7.31	95.74	100.0	HS	1	1	NG	2	52.0	2	MR	3	0	1	0	R	-	1	R
2218	T-126	7.69	94.59	100.0	HS	2	-	3	2	26.0	2	MR	2	5	3	1	S	-	2	MR
2219	Khaiwar	66.66	100	100.0	HS	3	-	2	2	54.0	3	MS	4	5	3	1	S	-	2	MR
2220	T-397	2.56	11.56	5.0	MR	3	4	4	2	22.0	3	S	4	5	3	2	S	5	4	HS
	Check I	6.97	16.12	10.0	MR	2	-	2	2	18.0	2	MR	1	0	4	0	R	0	2	MR
	Check II	51.85	85.45	55.0	HS	3	-	3	2	52.0	3	MS	4	5	4	3	S	4	3	S
2221	R-849	18.75	13.16	30.3	MR	2	-	2	2	0	2	MR	3	0	2	0	MR	1	2	MR
2222	Raju-3	9.52	66.67	50.0	S	3	-	2	2	24.0	3	MR	2	5	2	2	MR	2	2	MR
2223	ICAR-3	22.22	50	22.2	MR	2	3	3	2	0	3	MS	1	1	2	0	R	1	1	R
2224	ICAR-4	30.43	86.84	47.8	S	2	-	3	2	30.0	2	MR	4	1	2	0	MR	1	2	MR
2225	NP-69	15.78	100	100.0	HS	3	-	3	2	44.0	3	MS	4	5	3	1	S	-	2	MR
2226	NP-485	22.22	100	100.0	HS	2	2	3	2	40.0	3	MS	1	5	4	0	S	-	2	MR
2227	NP--Hyb-4	8.27	95-95	100.0	HS	3	1	Wilting 100%	2	18.0	3	MR	4	0	3	0	MS	-	2	MR

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2228	NP --Hyb-8	10.71	35.83	4.3	MR	1	1	3	2	22.0	2	MR	4	5	2	2	S	5	1	HS
2229	NP--Hyb-34	11.10	80.77	90.0	HS	1	1	4	2	52.0	3	MS	4	5	2	2	S	4	2	S
2230	NP--Hyb-42	13.04	18.68	34.9	MR	2	3	3	1	18.0	2	MR	1	5	2	2	MR	5	2	HS
2231	Kiran	33.33	13.57	7.3	MR	2	3	3	2	22.0	2	MR	1	1	4	0	R	3	2	MS
2232	NP--Hyb-47	12.24	95.77	75.0	HS	3	1	4	2	52.0	2	MS	4	5	3	3	S	3	2	MS
2233	NP--Hyb-**49**	29.16	91.03	6.0	MR	2	1	4	2	44.0	3	MS	4	5	3	2	S	5	2	HS
2234	NP--Hyb-69	30.76	97.30	75.0	HS	3	2	Wilting 100%	2	38.0	3	MS	4	5	3	2	S	1	3	MS
2235	NP--Hyb-87	11.11	78	90.0	HS	3	2	4	2	52.0	4	S	4	5	2	3	S	2	2	MR
2236	NP(RR)-36	8.77	100	45.5	MS	2	2	1	2	30.0	1	MR	3	5	3	0	S	1	2	MR
2237	NP(RR)-38	12.50	14.07	2.1	MR	2	4	3	3	30.0	2	MS	1	1	3	0	R	4	1	S
2238	Linum	-	100	100.0	HS	-	-	Missing	Seed not received	Missing	2	MR	-	Seed not received	-	0	R	-	-	-
2239	NP(RR)-76	88.88	3.17	12.2	MR	3	1	3	2	52.0	2	MS	1	0	3	0	R	1	2	MR
2240	NP(RR)-151	86.66	68.46	75.0	HS	2	1	3	3	52.0	3	MS	4	5	1	2	S	1	2	MR
	Check I	11.90	16.25	12.5	MR	2	1	3	2	16.0	2	MR	1	0	4	0	R	0	1	R
	Check II	45.38	97.02	47.2	HS	2	2	4	2	52.0	2	MR	4	5	5	2	HS	5	3	HS
2241	NP (RR)-152	2.36	59.43	18.8	MR	2	2	Wilting 100%	3	52.0	2	MR	1	0	3	2	MR	0	2	MR
2242	NP (RR)-160	3.45	20.98	50.0	MR	3	2	Wilting 100%	2	26.0	2	MR	4	5	3	3	MS	0	2	MR
2243	NP (RR)-187	2.56	99.34	100.0	HS	2	-	Wilting 100%	2	52.0	3	MS	2	5	3	2	MS	-	2	MR

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2244	NP (RR)-196	15.68	64.10	17.6	MR	2	1	3	2	28.0	2	MR	4	5	3	3	S	0	3	MS
2245	NP (RR)-201	13.33	27.11	38.7	MS	1	3	3	2	50.0	3	MS	3	5	3	2	MS	5	1	HS
2246	NP (RR)-260	4.23	95.79	60.0	S	3	-	3	3	52.0	2	MS	3	5	3	2	MS	0	2	MR
2247	NP (RR)-261	3.17	96	100.0	HS	2	1	Wilting 100%	2	54.0	4	MR	3	5	3	2	MS	-	2	MR
2248	NP (RR)-273	2.19	49.62	27.7	MS	3	1	3	2	52.0	3	MS	4	5	3	2	S	2	3	MS
2249	NP (RR)-401	4.25	12	4.3	MR	3	1	3	2	52.0	2	MS	4	5	3	1	S	2	2	MR
2250	NP (RR)-405	9.33	96.17	90.0	HS	2	1	4	2	52.0	4	S	2	5	3	2	MS	0	2	MR
2251	NP (RR)-463	10.00	96.77	42.9	MS	2	2	4	2	52.0	2	MR	4	5	4	2	S	5	2	HS
2252	NP (RR)-465	-	100	95.0	HS	-	-	Missing	Seed not received	x	2	MR	-	Seed not received	-	1	R	4	-	S
2253	NP (RR)-485	2.75	100	1.4	MR	2	4	4	2	38.0	3	S	4	5	3	1	S	5	2	HS
2254	T-397	9.09	22.03	7.9	MR	4	5	4	2	24.0	3	S	4	5	2	2	S	5	3	HS
2255	NP (RR)-486	3.19	93.10	100.0	HS	2	-	Wilting 100%	2	36.0	3	MS	3	5	4	1	S	-	2	MR
2256	NP (RR)-492	2.75	100	100.0	HS	3	-	4	2	52.0	3	S	2	5	2	0	MR	-	2	MR
2257	NP (RR)-591	7.25	73.68	26.9	MS	1	2	3	3	46.0	1	MS	2	3	2	0	MR	0	2	MR
2258	BC-32	5.16	98.81	100.0	HS	2	-	Wilting 100%	2	50.0	4	S	3	5	2	-	S	-	2	MR
2259	GLC-1	87.02	62.22	21.4	HS	3	1	4	2	40.0	2	MS	4	3	3	1	MS	0	2	MR
2260	GLC-3	76.77	71.93	22.2	HS	2	2	2	2	38.0	2	MR	2	1	3	0	MR	1	2	MR
	Check I	17.85	14.56	10.9	MR	2	-	2	2	12.0	1	MR	1	0	4	0	R	0	2	MR
	Check II	71.42	90.38	56.5	HS	3	2	3	2	14.0	3	MS	4	5	4	3	HS	5	2	HS
2261	GLC-4	4.39	100	100.0	HS	2	-	2	2	52.0	3	MR	4	5	3	2	HS	-	2	MR

Contd....

2262	GLC-5	28.84	95.12	14.8	MS	2	3	4	2	52.0	2	MS	4	5	3	1	HS	2	3	MS
2263	GLC-36	42.22	65.52	8.1	S	2	3	3	1	52.0	2	MS	4	5	2	3	HS	1	1	R
2264	LC-51	85.71	87.65	17.6	HS	2	3	3	2	30.0	2	MS	3	5	2	1	MS	0	2	MR
2265	LC-7.3	57.14	100	3.8	S	2	5	4	2	18.0	3	MS	2	5	2	3	MS	5	3	HS
2266	LC-134	13.33	81.25	6.6	MS	3	2	5	2	52.0	3	MS	1	5	3	2	MS	0	2	MR
2267	LC-207	30.76	98.91	95.0	HS	2	2	3	2	24.0	2	MR	2	5	4	3	HS	3	2	MR
2268	LC-239	52.12	98.32	95.0	HS	3	2	4	2	30.0	2	MS	4	5	5	2	HS	3	2	MS
2269	LC-268	15.30	80.65	4.0	MR	3	1	3	2	52.0	2	MS	1	5	4	3	MS	0	3	MS
2270	KL-43	22.66	4.05	10.3	MR	2	1	2	2	4.0	2	MR	1	0	4	0	R	0	2	MR
2271	KL-122	24.19	15.19	22.4	MR	2	2	2	2	20.0	2	MR	4	5	4	1	HS	1	2	MR
2272	KL-136	40.00	18.56	50.0	MS	2	1	2	2	34.0	3	MR	3	5	4	2	S	3	2	MS
2273	KL-160	40.00	14.47	3.5	MR	3	1	2	2	22.0	2	MR	4	3	3	2	MS	0	2	MR
2274	KL-471	47.50	60	90.0	S	2	1	NG	2	50.0	3	MR	2	5	3	3	MS	2	3	MS
2275	A-1-3-1	9.72	12.09	12.2	MR	3	1	3	2	52.0	2	MS	4	2	2	0	MR	2	3	MS
2276	A-4-1-2	2.17	31.76	13.0	MR	2	2	4	2	30.0	I	MR	4	3	2	0	MS	2	I	MR
2277	A-4-3-1	8.24	80.43	75.0	HS	2	1	NG	2	50.0	4	MR	4	5	2	0	S	3	3	MS
2278	A-6-1-2	27.69	7.89	3.8	MR	3	2	4	1	52.0	2	MS	4	5	2	0	S	5	2	HS
2279	A-13-1	13.23	14.23	4.0	MR	2	1	4	1	26.0	3	MS	4	5	2	1	S	5	2	HS
2280	A-9-2-1	6.89	84.62	75.0	HS	2	-	2	2	10.0	2	MR	4	5	2	0	S	0	3	MS
-	Check I	15.00	19.88	18.0	MR	3	-	2	2	20.0	2	MR	1	0	4	0	S	0	2	MR
	heck II	54.00	93.67	50.0	HS	4	-	4	2	42.0	3	MS	4	5	4	2	HS	4	3	S

Contd....

2281	A-16-1-1	2.46	84.31	95.0	HS	2	-	2	2	8.0	3	MR	4	5	3	0	S	5	2	HS
2282	A-21-2-2	4.00	14	20.0	MR	2	1	3	2	20.0	2	MR	1	0	3	0	R	0	1	R
2283	A-32-2	17.24	43.84	14.3	MR	2	1	2	2	8.0	4	MR	3	5	2	0	MS	0	2	MR
2284	A-90-2	28.57	26.74	33.5	MS	2	2	2	2	20.0	3	MR	3	3	2	0	MS	0	3	MS
2285	Kiran	8.88	19.14	4.7	MR	2	3	3	2	22.0	3	MS	1	1	2	0	R	4	2	S
2286	Afg-14	7.31	23.40	8.8	MR	2	1	4	2	20.0	3	MR	2	4	3	0	MS	3	1	MS
2287	Afg-8	3.77	20	6.7	MR	3	3	3	2	22.0	3	MS	4	5	3	0	S	5	2	HS
2288	FR-1	6.15	90.05	21.4	MR	3	2	4	2	0	2	MR	4	5	3	0	S	5	2	HS
2289	FR-4	5.10	95.39	95.0	HS	2	1	5	2	24.0	2	MR	4	5	2	0	S	2	2	MR
2290	FR-13	15.21	22.88	10.3	MR	2	1	4	2	0	3	MR	2	5	3	0	MS	5	3	HS
2291	Fx-8	11.62	66.67	18.2	MR	3	1	4	2	52.0	3	MS	4	5	3	0	S	2	2	MR
2292	Fx-168	2.10	84.48	100.0	HS	2	-	4	2	52.0	3	MS	4	5	3	1	S	-	2	MR
2293	Punjab f lax	3.25	75.71	3.8	MR	3	2	3	2	54.0	3	MS	4	5	3	0	S	0	2	MR
2294	ICA-32/64	8.10	49.48	39.5	MS	2	2	3	2	0	2	MR	4	5	3	1	S	3	3	MS
2295	MY-1	3.57	95.38	95.0	HS	3	-	3	2	52.0	2	MS	4	5	1	2	S	0	2	MR
2296	CH-490 (-1-148)	4.20	98.89	100.0	HS	2	-	3	2	24.0	3	MS	4	5	2	00	S	-	2	MR
2297	C-I-2063	15.78	77.70	100.0	HS	2	-	3	2	30.0	2	MR	4	2	3	0	MS	-	3	MS
2298	EC-14	5.26	85.56	100.0	HS	3	-	2	2	30.0	2	MR	4	3	3	1	MS	-	2	MR
2299	EC-256	7.14	15.89	11.0	MR	2	1	2	2	20.0	2	MR	4	5	3	1	S	4	2	S
2300	EC-493	22.22	67.48	100.0	HS	2	-	2	2	30.0	2	MR	4	4	2	1	S	-	2	MR
	Check I	6.25	7.98	15.0	MR	3	-	2	2	0	2	MR	1	0	5	0	R	0	2	MR
	Check II	64.58	90.65	52.0	HS	3	-	3	2	32.0	3	MS	4	5	5	3	HS	4	3	S

The detailed disease reaction recorded at different centres are given in Table 4.2 and the promising lines up to moderately resistant level are given. The criteria for catagorization was that the entries showing resistant reaction (below 10%) was considered as resistant and those found moderately resistant (below 25%) at more than half location were grouped in moderately resistant category and so on.

A. Wilt : 3 locations, Kanpur, Raipur, Kangra

(i) Resistant at all locations (HR): EC-397760

(ii) Resistant at more than half (2) location and MR in third locations (R): LCK-9436, RLC-59

(iii) Disease below 25% at all or more than half (2) locations (MR): 25 accessions

B. Alternaria blight : 6 locations, Faizabad, Jashipur, Kanke, Ludhiana, Nagpur and P.C. Unit

(i) Resistant at all location (HR): Nil

(ii) Resistant at more than half locations (R): LCK-9414, RL-56-6-2, RL-903, KFS-11.

(iii) Disease below 25% at more than half locations (MR): 119 accessions.

C. Powdery mildew : 4 locations, Mauranipur, Nagpur, Raichur and Raipur

(i) Resistant at all locations (R): Nil

(ii) Resistant at more than half locations (MR): Locations : Mauranipur, Nagpur Rachur, Raipur, LCK-9414, RL-298, RL-56-6-2, RL-903, RL-906, RL-914, RL-925, RL-951, RL-966, RL(U) 3, RLC-46, SLS-8, SLS-21, EC-399085, EC-399086, RSJ-1, RSJ-2, RSJ-3, RSJ-5, RSJ-6, RSJ-7, Tissili Satna, Sumerpur local, FRW-1, KYS-1, KFS-11, 4/35-1/1/4, 4/47-2/1-2, W/17-1, 4/47, T-71, ICAR-3 NP(RR)-38, NP(RR)-76, NP(RR)-465, KL-43, A-21-22-2-, Linum grandiflorum Kiran (RC) (Total 40 accessions)

(iii) Disease below 25% at more than half locations (MR): 35 accessions.

D. Rust : 2 locations, Kanke, Kangra

(i) Free (0) or R(1) at all locations (R): LCK-9436, LMH-91-24, NL-24, RL-906, RL-967, RLC-29, RLC-47, EC-397760, BSL-10, 4/35-1/1-4, T-71, ICAR-3, GLC-36, A-21-2-2

Disease below 25% at more than half locations (MR) : 96 accessions

4.3 Uniform Disease Nursery Trial (UDN)

The entries of all breeding trials *i.e.*, IVT and AVT alongwith zonal and national checks were evaluated against 4 major diseases under natural field condition (UDN natural) and the entries of advance breeding trials (AVT) were evaluated against 4 diseases under artificial disease nurseries (UDNA).

4.3.A UDN natural (UDN)

The UDN (natural) included 72 entries of IVT and AVT trials. The trial was conducted at 14 locations. The entire set was planted in 3M single rows, the distance between row to row was 45 cm. The resistant and susceptible checks were planted after each set of 20 test entries. The entries were evaluated against 4 major diseases at respective hot spot locations. The observations were recorded at regular intervals from first appearance to crop maturity.

The detailed observations are presented in Table 4.3.A. The criteria for different catagories are same as given in trials no. 4.2 However, for rust the highest score was taken into account. The promising cultures are listed

A. Wilt : 6 locations, Kanpur, Raipur, Faizabad, Jashipur, Kanke, Kangra

(i) Entries found resistant (below 10%) at all locations (HR): JLT-204

(ii) Resistant at more than half locations (R): BAU-06-17, BAU-2K-20, KL-248, KL-232, LCK-6028, LMS-23-6, LCP-147, PKDL-65, RLC-112, RLC-116, RLC-121. SLS-66. Baner. LC-54. Nagarkot, Padmini, Parvati, Shekhar, T-397 and Kiran (RC)

(iii) Disease below 25% at more than half locations (MR): JLT-215, KL-219, LBR-6, LCP-146, LCK-2007, LCK-7034, LCK-7035, LMS-95-4, LMS-149-4, LMS-23-6, LMS-P-3, LMS-P-5, NDL-2005-24, NDL-2005-34, NL-119, NL-260, OLC-99-57, PCL-35-06, PKDL-52, PKDL-71, PKDL-73, PKDL-74, PKDL-75, RL-26016, RL-26018, RLC-114, RLC-115, RLC-117, SLS-61, SLS-67, SLS-68, SLS-72, SLS-73, J-23, JLS-9, Meera, NL-97, R-552, Sheela, Surabhi, Suyog

B. Alternaria blight : 9 locations, Berhampore, Fiazabad, Jashipur, Kanke, Kaul, Kota, Ludhiana, P.C. Unit, Raipur

(i) Entries resistant (below 10%) at all locations (HR): Nil

(ii) Resistant (below 10%) at more than half locations (R): Nil

(iii) Disease below 25% at more than half locations (MR): BAU-2K-20, JLT-204, KL-219, KL-232, LCP-146, LCP-147, LCK-5021, LCK-6028, LCK-7034, LCK-7035, LMS-75-4, LMS-23-6, NDL-2005-5, NDL-2005-17, NDL-2005-29, NL-260, PKDL-65, PKDL-71, PKDL-75, RL-26018, RLC-112, RLC-114, RLC-116, RLC-121, SLS-68, SLS-78, Baner, J-23, JLS-9, LC-54, Meera, Nagarkot, NL-97, Padmini, Parvati, Sheela, Shekhar, Surabhi

C. Powdery mildew : 7 locations, Kota, Mauranipur, Nagpur, Kaul, Raichur, Raipur, Kanke

(i) Entries resistant (below 10%) at all locations (HR): Nil

(ii) Resistant (below 10%) at more than half location (R): BAU-06-17, KL-219, JLT-215, LCK-6028, LCP-147, LMS-149-4, NL-119, NL-260, PKDL-52, PKDL-62, PKDL-65, RLC-112, RLC-114, RLC-116, RLC-117, RLC-121, SLS-66, SLS-68, J-23, Meera, Nagarkot, NL-97, Sheela, Kiran (RC).

(iii) Disease below 25% at more than half locations (MR): BAU-2K-20, KL-232, KL-248, LC-2279-4, LCP-146, LCK-5021, LMS-95-4, LMS-P-3, LMS-P-5, OLC-99-57, PCL-1-06, PCL-12-3-06, PKDL-72, PKDL-75, RLC-115, SLS-67, SLS-72, Baner, JLS-9, Padmini, Parvati, R-552, Shekhar, Surabhi, Suyog.

D. Rust : 2 locations, Kanke, Kangra

(i) Disease free (0) at both locations (HR): Nil

(ii) Disease below 10% at both locations (R): JLT-204, LC-2279-4, LCK-5021, LCP-147, LMS-95-4, LMS-149-4, NL-260, PKDL-71, RLC-112, Baner, Parvati, Shekhar.

(iii) Disease below 25% at both location (MR): BAU-2K-20, KL-248, LCP-146, LCK-7034, LCK-7035, LMS-23-6, LMS-P-5, NDL-2005-5, NDL-2005-17, OLC-99-57, PCL-1-06, PCL-12-3-06, PKDL-62, PKDL-72, PKDL-73, RL-26018, RLC-115, RLC-121, SLS-66, SLS-68, SLS-72, SLS-73, J-23, LC-54, Nagarkot, Padmini, Sheela, Surabhi.

4.3 (A) Uniform disease nursery trial (UDN)

UDN No.s	Entries	Wilt (%)						Disease reaction	Alternaria blight (0-5 scale)											Ave-rage Disease reac-tion	Powdery mildew (0-5 scale)							Rest (0-5 scale)			Average disease reaction
		Kan-pur	Rai-pur	Jashi-pur	Kan-ke	Kan-gra	Faiza-bad		Berhampore		Faizabad		Jashi pur	Kan-ke	Ka-ul	Ko-ta	Lud-hiana bud (%)	P.C. Unit	Rai-pur		Kota	Maur-anipur	Nag-pur	Ka-ul	Rai-chur	Rai-pur	Kan-ke	Ave-rage disease reaction	Kan-gra	Kan-ke	
									Leaf	Bud	Leaf	Bud																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	BAU-06-17	0.0	4.15	0	5.3	13.7	10	R	4	8.5	3	25.50	1	2	0	3	10.0	3	2	MS	3	1	0	1	3	1	2	R	3	2	MS
2	BAU-2K-20	0.0	7.27	0	17.2	4.7	0	R	3	16.2	1	5.5	1	2	0	3	30.0	2	2	MR	4	1	4	2	3	1	2	MR	0	2	MR
3	JLT-204	0.0	5.13	5	4.1	5.0	0	HR	2	5.5	3	20.50	1	1	1	3	10.0	3	2	MR	4	1	4	3	3	0	3	MS	0	1	R
4	JLT-215	21.27	10.83	97	13.9	64.7	40	MR	3	21.5	4	25.45	2	2	0	4	26.0	3	3	MS	3	1	0	1	4	0	2	R	2	3	MS
5	KL-248	22.22	4.88	0	7.6	3.3	0	R	1	9.1	3	25.45	1	2	3	3	52.0	2	1	MS	3	1	2	1	3	0	2	MR	0	2	MR
6	KL-232	0.0	6.57	0	14.7	10.0	0	R	1	8.2	3	25.0	1	2	1	3	14.0	2	2	MR	4	1	0	2	3	0	3	MR	2	3	MS
7	LBR-6	13.69	9.66	85	19.3	16.9	0	MR	-	-	4	20.50	4	1	1	4	26.0	2	2	MS	3	2	5	0	3	5	3	S	5	2	HS
8	LC-2279-4	15.64	56.52	98	6.6	25.0	70.0	MS	1	8.5	3	20.50	1	3	1	4	26.0	2	1	MS	3	1	2	0	3	2	2	MR	0	1	R
9	LCP-146	17.24	17.46	99	13.8	80.0	70.5	MR	1	7.6	2	10.50	1	3	2	2	26.0	2	1	MR	4	2	1	4	3	0	1	MR	0	2	MR
10	LCK-5021	33.33	6.67	80	14.7	79.2	40.75	MS	2	6.4	2	10.50	2	2	1	3	22.0	2	1	MR	4	1	0	2	2	1	2	MR	1	1	R
11	LCK-6028	0.0	5.56	60	9.6	10.5	10.5	R	2	8.2	2	15.50	2	2	2	4	16.6	2	2	MR	2	1	1	0	2	0	2	R	1	3	MS
12	LCK-7002	0.0	1.55	5	16.7	100.0	5.5	MR	1	9.2	2	15.50	1	3	3	3	20.0	2	1	MS	3	1	5	3	2	3	3	MS	-	3	MS
13	LCK-7034	20.83	4.71	70	5.1	15.0	5.5	MR	2	7.8	2	10.50	2	2	1	3	14.0	2	2	MR	2	2	5	4	2	4	3	S	2	2	MR
14	LCK-7035	0.0	10.11	75	10.0	3.7	5.75	MR	2	9.9	2	15.50	3	2	1	3	24.0	2	1	MR	4	2	1	3	3	0	3	MS	1	2	MR
15	LMS-95-4	19.23	6.74	10	13.2	29.2	10.8	MR	2	6.5	1	8.5	2	3	2	4	0	2	2	MR	4	2	1	1	3	1	2	MR	1	1	R
16	LMS-149-4	15.62	3.65	5	16.3	8.9	5.5	MR	3	22.1	5	30.25	2	3	1	3	2.0	3	2	MS	3	1	1	0	4	0	2	R	0	1	R
17	LMS-23-6	11.11	5.08	15	13.4	17.9	0	MR	3	9.1	2	15.00	1	3	0	3	18.0	2	2	MR	3	1	1	4	3	0	3	MS	0	2	MR
18	LMS-63-6	0.0	7.44	0	15.2	2.9	0	R	3	4.5	3	15.50	2	1	1	4	32.0	3	1	MS	4	2	3	3	3	0	1	MS	0	3	MS
19	LMS-P-3	0.0	13.08	0	11.7	1.4	5.25	MR	3	35.6	4	25.75	3	2	3	2	6.0	3	2	MS	3	1	1	2	3	0	2	MR	0	3	MS
20	LMS-P-5	0.0	22.37	0	7.9	11.1	5.50	MR	3	17.5	4	30.00	1	3	0	3	24.0	2	2	MS	3	1	0	3	2	0	3	MR	0	2	MR
	Check I	10.0	5.11	20	9.3	10.0	30.50	R	-	-	3	20.50	2	2	2	-	22.0	1	4	MR	-	1	0	4	2	0	1	R	0	2	MR
	Check II	70.0	10.25	98	21.0	50.0	40.0	HS	-	-	2	10.50	-	3	3	-	28.0	3	4	MS	-	4	5	4	5	5	2	HS	5	3	HS
21	NDL-2005-5	100.0	25.0	100	20.0	100.0	60.50	HS	3	5.5	2	15.75	-	1	0	4	24.0	2	2	MR	4	3	5	3	4	4	3	S	-	2	MR
22	NDL-2005-17	100.0	8.76	100	24.0	100.0	75	HS	4	22.5	2	15.50	-	2	4	4	14.0	2	2	MR	3	4	5	3	3	3	2	MS	-	2	MR

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23	NDL-2005-24	0.0	23.08	95	26.3	25.0	80.0	MR	4	21.8	2	10.85	3	2	4	3	20.0	3	2	MS	4	4	5	2	3	4	3	S	5	1	HS
24	NDL-2005-26	100.0	2.47	100	21.3	100.0	80.50	HS	4	14.7	2	15.50	-	2	0	4	34.0	3	2	MS	4	4	5	3	2	5	4	S	-	3	MS
25	NDL-2005-29	100.0	6.25	99	12.4	100.0	90.0	HS	4	16.1	2	10.50	2	1	2	2	28.0	3	2	MR	3	4	5	4	3	5	2	HS	-	3	MS
26	NDL-2005-34	100.0	13.33	5	17.3	16.6	0	MR	3	7.2	2	10.50	3	2	3	2	20.0	3	3	MS	4	4	5	4	3	5	4	HS	5	2	HS
27	NL-119	0.0	3.09	30	9.8	13.3	5.5	MR	4	13.5	2	15.75	4	2	1	4	18.0	3	3	MS	4	1	0	1	2	1	2	R	5	2	HS
28	NL-260	0.0	5.13	100	16.6	20.8	5.5	MR	4	31.2	2	10.50	-	1	1	4	18.0	3	1	MR	3	1	0	0	2	0	1	R	0	1	R
29	OLC-99-57	0.0	2.02	0	13.5	33.3	10.85	MR	3	15.4	2	15.25	3	3	1	3	26.0	3	3	MS	3	1	*0*	*4*	*2*	*0*	*3*	*MR*	*0*	*2*	*MR*
30	PCL-1-06	0.0	2.96	100	19.4	100.0	8.5	HS	4	11.1	3	25.50	-	2	1	3	32.0	2	3	MS	4	2	3	0	3	0	2	MR	-	2	MR
31	PCL-35-06	100.0	5.75	0	14.3	2.1	70.50	MR	4	12.9	1	4.5	3	2	0	4	38.0	3	-	MS	4	4	5	3	3	5	2	HS	5	3	HS
32	PCL-12-3-06	100.0	5.12	100	16.2	100.0	60.50	HS	3	6.1	2	10.8	-	3	0	4	26.0	2	2	MS	2	4	2	0	2	2	2	MR	-	2	MR
33	PKDL-52	100.0	4.0	0	8.9	11.1	40.45	MR	3	13.0	4	25.50	3	3	2	3	20.0	3	3	MS	4	1	0	0	2	0	1	R	4	3	S
34	PKDL-62	0.0	2.59	5	15.2	40.0	25.5	MR	3	17.5	3	20.50	2	1	3	3	14.0	3	2	MS	4	1	0	0	3	1	2	R	0	2	MR
35	PKDL-65	0.0	3.08	5	21.3	5.0	15.5	R	3	19.2	2	15.25	3	2	1	2	16.0	3	2	MR	3	1	0	0	2	0	3	R	3	2	MS
36	PKDL-71	0.0	2.49	30	25.7	5.0	2.5	MR	2	8.0	1	5.8	3	3	1	3	4.0	3	2	MR	3	1	0	3	3	0	3	MS	0	1	R
37	PKDL-72	100.0	1.57	90	16.1	7.7	0	HS	3	8.4	3	25.75	3	3	3	3	10.0	3	2	MS	3	2	5	0	2	2	2	MR	0	2	MR
38	PKDL-73	100.0	1.54	10	19.5	5.0	5.5	MR	3	23.1	2	15.75	3	3	3	3	20.0	2	2	MS	4	1	4	0	3	2	3	MS	1	2	MR
39	PKDL-74	100.0	2.91	5	13.2	4.4	0	MR	4	17.2	4	30.25	4	2	4	4	10.0	2	3	S	3	1	0	2	3	0	3	MS	4	2	S
40	PKDL-75	0.0	3.31	0	16.4	100.0	30.5	MR	3	15.0	2	15.75	2	2	1	4	24.0	2	2	MR	3	2	1	2	3	0	2	MR	-	3	MS
	Check I	12.0	6.03	99	11.9	12.5	30.5	MR	-	-	2	15.50	-	2	3	-	4.0	2	3	MR	-	1	0	4	4	0	3	S	0	2	MR
	Check II	70.0	6.28	100	17.3	45.0	60.5	HS	-	-	2	15.50	-	2	0	-	26.0	3	-	MS	-	4	5	2	4	5	2	HS	4	2	S
41	RL-26016	8.40	11.21	99	18.5	28.6	5.5	MR	3	9.0	2	15.50	-	1	0	4	26.0	3	2	MS	2	3	5	0	3	4	2	MS	0	3	MS
42	RL-26018	9.61	6.4	99	21.9	50.0	0	MR	3	6.5	1	5.75	-	2	1	3	26.0	2	2	MR	3	3	5	3	2	5	3	MS	0	2	MR
43	RLC-114	12.82	1.20	30	21.6	18.4	0	MR	3	2.3	4	25.50	3	2	1	3	20.0	2	2	MR	3	1	0	0	2	0	4	R	4	1	S
44	RLC-115	18.85	1.23	15	13.5	5.0	0	MR	4	15.8	5	30.50	3	3	1	3	10.0	3	2	MS	2	1	3	0	2	4	2	MR	2	2	MR
45	RLC-116	13.51	2.83	5	19.3	7.5	0	R	4	20.0	5	35.25	3	2	0	4	6.0	2	2	MR	3	1	0	0	3	0	4	R	4	2	S
46	RLC-117	16.94	5.26	55	13.5	5.9	0	MR	3	10.0	4	30.50	3	3	0	4	26.0	2	2	MS	3	1	0	0	3	0	2	R	4	1	S
47	RLC-121	20.83	5.93	0	17.6	5.8	0	R	3	8.4	4	30.50	1	2	0	4	20.0	3	2	MR	3	1	0	0	3	0	1	R	0	2	MR

Contd....

48	SLS-61	16.39	3.77	90	11.7	42.8	0	MR	3	7.2	4	35.50	1	2	1	4	28.0	3	-	MS	3	1	3	0	2	-	3	MS	1	3	MS
49	SLS-66	10.10	5.6	0	14.3	11.0	0	R	3	5.6	4	25.75	1	3	2	4	26.0	3	2	MS	3	1	0	0	2	1	2	R	0	2	MR
50	SLS-67	20.00	13.56	2	10.0	27.3	0	MR	3	7.8	5	30.75	4	3	3	3	26.0	4	2	MS	4	1	0	1	2	2	2	MR	0	3	MS
51	SLS-68	10.10	3.90	30	16.9	11.1	5.5	MR	3	24.0	3	30.50	2	2	1	3	12.0	3	2	MR	3	1	0	1	4	0	1	R	1	2	MR
52	SLS-71	71.62	3.72	60	17.5	30.6	10.5	MS	3	5.5	4	25.50	3	1	1	3	6.0	4	2	MS	3	2	3	3	4	1	2	MS	3	3	MS
53	SLS-72	13.33	3.98	5	20.3	11.8	0	MR	2	4.2	4	25.75	3	3	0	3	24.0	3	3	MS	4	2	0	2	3	1	2	MR	0	2	MR
54	SLS-73	0.0	2.47	85	22.2	42.9	0	MR	2	3.5	3	25.00	2	2	1	3	24.0	3	3	MR	3	3	3	3	3	5	3	MS	0	2	MR
55	Baner	19.23	2.35	0	9.6	44.7	0	R	2	7.9	3	20.50	2	3	2	3	28.0	2	2	MR	3	1	0	3	4	1	2	MR	1	1	R
56	J-23	100.00	3.06	5	17.3	13.6	0	MR	2	8.0	5	30.50	2	3	1	3	14.0	3	2	MR	4	1	0	1	2	2	1	R	1	2	MR
57	JLS-9	13.69	3.96	35	23.4	92.8	0	MR	2	6.2	5	35.75	3	2	0	4	18.0	3	2	MR	3	2	1	4	3	1	2	MR	1	3	MS
58	LC-54	0.0	4.10	30	25.3	6.3	0	R	2	7.8	2	15.75	3	1	0	4	20.0	2	2	MR	4	2	5	3	3	2	2	MS	0	2	MR
59	Meera	0.0	7.51	95	13.3	80.0	0	MR	2	9.1	3	20.50	4	1	1	4	12.0	2	2	MR	4	1	0	0	3	1	1	R	0	3	MS
60	Nagarkot	0.0	6.76	0	12.2	20.0	5.8	R	2	8.3	3	25.50	1	3	1	4	26.0	2	1	MR	3	1	0	1	4	1	3	R	0	2	MR
	Check I	10.00	5.28	98	13.0	9.0	10.8	R	-	-	3	25.50	2	2	1	-	10.0	2	3	MR	-	1	0	4	2	0	2	R	0	2	MR
	Check II	80.00	8.19	100	25.3	40.0	20.5	S	-	-	3	25.75	-	2	1	-	30.0	2	3	MS	-	4	5	2	2	5	3	S	5	3	HS
61	NL-97	11.62	6.90	95	24.5	29.4	5.5	MR	3	8.2	4	30.00	2	3	0	3	10.0	2	2	MR	3	1	0	1	2	1	3	R	5	2	HS
62	Padmini	0.0	3.81	5	19.1	22.2	5.5	R	2	5.0	3	25.75	1	2	1	3	20.0	2	1	MR	3	1	0	2	2	1	2	MR	0	2	MR
63	Parvati	0.0	2.89	0	13.5	100.0	2.5	R	2	1.8	3	25.75	4	2	1	4	26.0	2	2	MR	2	2	0	0	3	1	2	MR	-	1	R
64	R-552	17.24	3.45	70	11.4	19.2	0	MR	3	8.5	3	25.75	3	3	1	3	28.0	2	3	MS	2	2	3	1	3	1	3	MR	5	1	HS
65	Sheela	0.0	4.30	80	22.2	100.0	0	MR	2	22.0	3	20.50	2	1	0	3	30.0	2	1	MR	3	1	0	1	2	0	1	R	-	2	MR
66	Shekhar	10.52	4.94	5	7.0	38.5	20.5	R	2	8.7	4	30.50	1	2	1	4	24.0	3	2	MR	3	1	3	2	2	1	2	MR	0	1	R
67	Surbhi	9.09	4.59	97	18.6	85.7	0	MR	2	20.9	3	25.50	1	1	2	4	4.0	2	1	MR	3	2	3	3	2	0	2	MR	0	2	MR
68	Suyog	30.76	8.12	5	16.5	29.4	0	MR	2	23.4	4	25.75	3	3	0	3	8.0	3	2	MS	2	2	3	0	3	2	2	MR	0	3	MS
69	T-397	12.19	9.58	0	13.2	10.8	0	R	3	19.5	4	30.00	3	2	1	3	20.0	4	-	MS	2	4	5	0	3	5	2	S	5	3	HS
70	LCP-147	14.08	6.56	0	10.0	4.8	0	R	3	6.2	2	15.25	2	2	1	3	8.0	2	1	MR	3	1	0	0	4	0	2	R	0	1	R
71	RLC-112	-	6.41	0	-	4.3	-	R	2	7.8	-	-	3	-	-	4	-	2	1	MR	3	1	-	-	-	0	-	R	0	-	R
72	KL-219	-	13.04	1	-	100.0	-	MR	1	20.6	-	-	2	-	-	4	-	2	2	MR	3	1	-	-	-	1	-	R	-	-	-
	Check I	14.08	4.41	70	11.5	-	10.5	MR	1	5.5	3	20.75	3	2	-	4	10.0	2	3	MR	3	1	0	-	4	0	2	R	-	2	MR
	Check II	74.70	6.40	100	19.3	-	20.50	S	4	37.2	4	30.25	-	3	-	3	26.0	3	-	MS	3	4	5	-	4	5	3	HS	-	3	MS

4.3.B UDN under artificial condition (UDNA)

The UDNA included all entries of Advance varietal trials (AVT) including checks. The set included 23 entries, which were screened against 4 major diseases at respective hot spot locations. The detailed diseases reactions are given in table 4.3B. and the promising lines are given diseases wise as under.

4.3 (B) UDN under artificial condition (UDNA) 2007-08

UDN No.	Entries/ UDNA Nos	Wilt (%)				Average disease reaction	Alternaria blight (0-5 scale)						Average disease reaction	Powdery mildew (0-5 scale)				Average disease reaction	Rust (0-5 scale)		Average disease reaction
		Rai-pur	Kan-pur	Kan-gra	Faiza-bad		Berham-pore		Faiza-bad		Ludh-iana	P.C. Unit		Maura-nipur	Nag-pur	Rai-chur	P.C. Unit		Kan-gra	Kan-ke	
							Leaf	Bud	Leaf	Bud											
1	BAU-2K-20	14.41	12.82	5.3	5.0	MR	1	3.6	2	8.5	18.0	2	MR	1	5	4	0	HS	0	1	R
2	JLT-2004	18.89	15.62	9.0	10.0	MR	2	5.3	4	20.0	52.0	2	S	1	1	3	0	R	0	2	MR
3	LC-2279-4	59.09	0.0	100.0	60.0	S	2	6.9	2	10.5	26.0	2	MR	1	1	3	2	MR	-	2	MR
4	LCK-5021	68.29	21.62	85.7	60.0	S	2	5.5	3	15.75	28.0	2	MS	2	1	3	0	MS	0	1	R
5	LCK-6028	82.80	0.0	37.5	15.0	MS	3	19.2	3	10.50	4.0	2	MS	2	3	2	0	MR	0	3	MS
6	LMS-95-4	58.52	0.0	38.5	30.0	MS	4	6.8	4	25.5	20.0	2	S	2	3	3	0	MS	1	2	MR
7	LMS-149-4	11.50	2.70	50.0	5.0	MR	3	9.5	4	20.5	26.0	3	MS	1	2	2	0	MR	0	2	MR
8	NDL-2004-5	97.5	0.0	100.0	70.0	HS	2	8.5	4	20.5	14.0	2	MR	4	5	3	0	HS	-	3	MS
9	PKDL-52	9.32	0.0	7.0	0.0	MR	2	24.6	4	25.5	24.0	3	MS	1	1	2	0	R	3	2	MS
10	PKDL-62	20.73	0.0	4.5	15.0	MR	2	23.8	3	20.5	24.0	2	MR	1	1	2	0	R	1	1	R
	Check I	53.63	0.0	7.8	70.0	S	-	-	3	15.5	30.0	2	MS	1	0	4	0	R	0	1	R
	Check II	98.00	40.00	70.00	70.5	HS	-	-	4	25.5	34.0	2	MS	4	5	4	3	S	5	3	HS
11	PKDL-65	22.35	14.63	7.3	5.0	MR	2	9.9	5	30.5	60.0	2	S	1	1	3	0	R	1	1	R
12	Kanpur local	97.78	0.0	100.0	80.5	HS	2	9.5	5	30.5	10.0	3	MS	2	5	2	3	MS	-	2	MR
13	RLC-115	25.12	18.33	8.3	15.0	MR	2	8.7	5	35.5	28.0	3	MS	2	3	2	1	MR	2	3	MS
14	SLS-61	33.33	13.75	11.5	60.0	MS	2	6.8	4	30.5	24.0	3	MS	2	3	3	0	MS	1	2	MR
15	SLS-68	30	17.24	9.1	10.0	MR	2	24.6	4	30.85	30.0	3	MS	2	3	4	0	MS	1	2	MR
16	J-23	15.31	4.54	13.8	5.5	MR	3	23.8	5	35.5	30.0	3	MS	1	2	3	0	MR	1	1	R
17	Meera	37.5	0.0	83.3	40.5	MS	2	7.9	4	30.75	24.0	2	MR	1	0	3	0	R	0	3	MS
18	Nagarkot	14.83	0.0	19.0	10.0	MR	3	7.8	4	30.25	26.0	2	MS	2	1	3	1	MR	0	2	MR
19	Padmini	21.65	0.0	2.8	10.0	MR	1	9.2	4	30.25	30.0	2	MS	2	1	3	0	MR	0	2	MR
20	Parvati	33.83	0.0	100.0	50.25	S	2	8.0	4	25.75	28.0	2	MS	1	1	2	1	R	-	2	MR
	Check I	18.42	0.0	6.3	75.5	MR	1	6.2	3	20.75	30.0	2	MS	1	-	4	0	R	0	1	R
	Check II	11.59	71.42	62.3	85.75	S	4	39.5	5	30.50	32.0	3	MS	4	-	4	3	S	5	3	HS
21	R-552	7.27	0.0	7.4	5.8	R	3	25.0	5	30.50	18.0	2	MS	3	2	3	0	MS	5	2	HS
22	Surabhi	25.00	0.0	92.3	25.0	MR	2	7.8	2	10.50	30.0	2	MR	1	0	3	0	R	5	1	HS
23	T-397	90.62	0.0	3.3	5.0	R	3	9.4	4	25.75	20.0	4	S	4	5	2	3	HS	5	3	HS

A. Wilt : 4 locations, Raipur, Kanpur, Kangra, Faizabad

(i) Entries resistant (below 10%) at all locations (HR): PKDL-52, R-552

(ii) Resistant at moe than half location (R): T-397

(iii) Disease below 25% at more than half location (MR): BAU-2K-20, JLT-204, LMS-149-4, PKDL-62, PKDL-65, RLC-115, SLS-68, J-23, Nagarkot, Padmini, Surabhi, Kiran (RC)

B. Alternaria blight : 4 locations, Berhampore, Faizabad Ludhiana, P.C. Unit

(i) Resistant at more thna half location (R): Nil

(ii) Disease below 25% at more than half locations (MR): BAU-2K-20, LC-2279-4, NDL-2004-5, PKDL-62, Meera, Surabhi

C. Powdery mildew : 4 locations Muranipur, Nagpur, Raichur, P.C. Unit

(i) Disease below 10% at more than half location (R): JLT-204, PKDL-52, PKDL-62, PKDL-65, Meera, Surabhi, Kiran (RC)

(ii) Disease below 25% at more than half locations (MR): LC-2279-4, LMS-149-4, SLS-61, Nagarkot, Padmini, Parvati

D. Rust: 2 locations, Kanke, Kangra

(i) Disease below 10% at both location (R): BAU-2K-20, LCK-5021, PKDL-62, PDKL-65, J-23, Surabhi

Multiple resistant lines : PKDL-62, Surabhi

4.4 Evaluation of promising entries/elite material under high inoculums pressure

The promising entries (elite material) from previous years testing were retested in 4 sets against 4 major diseases under high inoculum pressure at respective hot spot locations. The results are given diseasewise as under.

A. Wilt : 3 locations; Raipur, Kanpur, Kangra . The set included 31 entries planted in 3 M single rows in wilt sick fields at Kanpur, Raipur and Kangra. A resistant and susceptible checks were planted after every set of 10 test entries. The detailed disease reaction of different centres are presented in Table 4.4.1 and summarized below.

(i) Disease (below 10%) at all locations (HR): H-22

(ii) Resistant at two and MR (below 25%) at third location (R): KL-1, NP-47, PKDL-43, Polf-23, KL-31, NO. 1536, RLC-94, RLC-106, Ayogi, Kiran (RC)

(iii) R or MR at two locations (MR): BAU-9906, LC-2014, LC-2021, 12JBP local, 12 JBP-1986, CI-1594, Polf-5, L-103, NP(RR) 65

B. Alternaria blight : 5 locations, Berhampore, Fiazabad, P.C. Unit, Ludhiana, Raipur.

The trail included 22 entries and two chekcs *viz.,* Sheela (RC) and Chambal (SC) sown after every set of 10 test entries. The artificial conditions were created by frequent irrigation and spray or aqueous suspention of inoculum. The results are presented in Table 4.4.2. and the promising lines are given below.

(i) Disease below 10% (R) at more than half location (R): Ayogi, H-34, Polf-22, Polf-19

Table 4.4.1 Evalution of promising entries/elite material under high inoculums pressure against wilt

S. No.	Entries	Disease Intensity (%)			Average disease reaction
		Raipur	Kanpur	Kangra	
1	RLC-52	30.56	100.00	4.7	MS
2	S-91-3	50	100.00	9.8	S
3	S-91-35	60.49	100.00	2.0	HS
4	Sagar local (Baroda Sagur)	98.63	100.00	100.00	HS
5	BAU-9906	65.12	00.00	6.6	MR
6	KL-1	23.39	00.00	7.5	R
7	LC-2014	100	00.00	8.9	MR
8	LC-2021	42.98	00.00	6.9	MR
9	LC-2023	60	100.00	4.9	HS
10	LC-2127	34.78	100.00	5.2	MS
	Check I	92.50	7.00	80.0	HS
	Check II	-	87.00	6.7	HS
11	LC-2045	30.23	100.00	1.9	MS
12	LCK-9303	29.35	100.00	3.1	MS
13	LCK-9320	97.06	00.00	35.4	MS
14	12 JBP local	35.10	0.0	4.6	MI
15	12 JBP-1986	35.19	0.0	4.1	MI
16	CI-1594	28.14	4.25	4.1	MI
17	H-22	10.91	00.00	1.7	HI
18	NP-47	15.78	0.0	3.6	R
19	PKDL-43	17.83	0.0	4.2	R
20	Polf-5	33.33	0.00	1.6	MI
	Check I	96.92	13.41	90.0	HS
	Check II	-	46.62	5.4	M
21	Polf-23	22.37	00.00	7.2	R
22	L-103	27.33	00.00	1.5	MR
23	KL-1	20.73	00.00	8.1	MR
24	KL-31	19.80	7.69	4.5	R
25	No. 1536	13.82	7.54	3.0	R
26	RLC-94	21.00	2.5	2.2	R
27	RLC-106	13.07	00.00	1.8	R
28	Ayogi	23.58	00.00	2.1	R
29	NP(RR) 65	66.67	00.00	11.6	MR
30	Kiran (RC)	13.17	00.00	3.9	MR
31	R-7 (Sc)	96.88	34.16	48.6	MS

Table 4.4.2 Evaluation of promising entries/elite material under high inoculum against Alternaria blight

Sl. No.	Test Entries	Disease Intensity (0-5 scale)							
		Berhampore		Faizabad	P.C. Unit		Ludhiana	Raipur	Average Disease reaction
		Leaf	Bud		Leaf	Bud			
1	LC-2002	1.7	15.5	2	1	20.0	16.0	1	MR
2	LC-2021	1.7	9.2	2	0	20.0	12.0	1	MR
3	LC-2023	2.0	5.6	3	0	20.0	12.0	2	MR
4	LC-2032	2.5	7.8	3	0	15.0	12.0	1	MR
5	LC-2057	2.0	4.2	3	0	15.0	14.0	1	MR
6	Ayogi	1.7	17.3	1	0	10.0	12.0	1	R
7	H-34	2.0	8.8	1	0	5.0	12.0	1	R
8	Polf-22	2.0	7.6	1	0	8.0	8.0	1	R
9	A-202	1.7	6.5	1	0	10.0	8.0	1	R
10	BAU-610A	2.0	14.9	1	0	18.0	12.0	1	MR
	Check I	-	-	3	0	25.0	16.0	1	MR
	Check II	-	-	5	2	30.0	20.0	5	HS
11	JRF-3	2.0	16.2	1	0	10.0	12.0	1	MR
12	Polf-15	1.3	24.1	3	0	15.0	8.0	2	MR
13	Polf-17	1.0	8.0	2	0	7.0	12.0	1	MR
14	Polf-19	1.3	7.2	1	0	5.0	16.0	1	R
15	Polf-29	1.3	6.4	2	0	25.0	24.0	1	MR
16	ES-44	1.3	6.2	1	0	15.0	12.0	2	MR
17	H-15	1.5	9.1	2	0	10.0	16.0	2	MR
18	H-43	1.5	21.8	2	0	20.0	16.0	1	MR
19	JRF-1	2.0	7.0	2	0	20.0	14.0	1	MR
20	LCK-9436	2.5	7.5	3	0	30.0	12.0	2	MR
	Check I	-	-	3	0	18.0	12.0	-	MS
	Check II	-	-	4	3	28.0	14.0	-	MS
21	Polf-5	2.0	16.5	2	0	40.0	24.0	1	MR
22	Polf-34	2.0	17.8	3	0	15.0	30.0	1	MR
23	Sheela (RC)	1.0	6.2	3	1	30.0	32.0	1	MS
24	Chambal (SC)	4.0	39.8	5	2	35.0	28.0	5	HS

(ii) Disease below 25% at more than half locations (MR): LC-2002, LC-2021, LC-2023, LC-2057, BAU-610A, JRF-3, Polf-15, Polf-17, Polf-29, ES-44, H-15, H-43, JRF-1, LCK-9436, Polf-5, Polf-34, Sheela (RC)

Table 4.4.3 Evaluation of promising entries/elite material under hight inoculum pressure against powdery mildew

S. No.	Entries	Disease Intensity (0-5 scale)					Average disease reaction
		Mauranipur	Nagpur	Raichur	Raipur	P.C. Unit	
1	KL-1	1	0	3	0	0	R
2	LC-2021	1	0	3	0	0	R
3	LCK-9111	1	0	2	0	0	R
4	LCK-9406	1	1	3	0	0	R
5	KL-134	2	5	3	5	3	HS
6	Tiswari	4	5	2	5	1	HS
7	Redving Raipur	2	2	2	4	3	S
8	S-91-5	1	0	3	1	3	R
9	S-91-6	1	0	3	0	3	R
10	S-91-7	1	1	2	0	3	R
	Check I	-	-	4	-	2	S
	Check II	-	-	4	-	3	S
11	S-91-20	2	1	3	1	3	MR
12	S-91-23	1	0	3	0	3	R
13	S-91-25	1	0	3	0	3	R
14	S-91-26	1	0	2	0	3	MR
15	S-91-27	2	3	2	5	3	MS
16	S-91-35	1	1	3	1	3	R
17	S-91-44	2	0	2	1	3	MR
18	S-91-50	2	0	2	1	3	MR
19	Summit	2	3	3	2	0	MS
20	Sonarhati	1	0	3	1	0	R
	Check I	1	1	4	0	0	R
	Check II	4	5	4	5	2	HS
21	Silwani	4	2	3	5	3	S
22	KL-178	1	0	2	0	0	R
23	NP-23-2K	2	0	3	0	0	MR
24	Polf-29	1	0	2	0	0	R
25	Polf-31	1	0	3	0	0	R
26	RLC-34	2	1	2	0	0	MR
27	RLC-35	2	0	3	0	0	MR
28	LCK-87391	2	0	4	0	0	MR
29	LCK-89512	1	0	4	0	0	R
30	LH-1	1	0	3	0	0	R
	Check I	-	-	-	-	0	R
	Check II	-	-	-	-	3	MS
31	NP-100	1	0	2	0	1	R
32	R-1141/4	1	0	2	0	0	R
33	RL-15-1	1	0	3	0	1	R
34	RL-903	1	0	3	0	0	R
35	RLC-93	1	0	2	0	0	R
36	RLC-95	1	0	2	0	0	R
37	LCK-8504	1	1	3	0	0	R
38	LCK-8722	1	0	3	0	1	R
39	Mahoba local	1	0	3	0	0	R
40	Mayurbhanj local	2	5	3	1	0	MS
	Check I	1	1	4	0	1	R
	Check II	4	5	4	0	3	HS
41	NP-27	2	0	3	5	0	MS
42	NPHY-10	2	0	2	0	1	MR
43	NP(RR)-412	1	2	2	0	1	MR
44	Garima	1	1	3	0	3	MS
45	Kiran (RC)	-	1	3	0	1	R
46	Chambal (SC)	-	5	4	-	3	S

Table 4.4.4 Evaluation of promising entries/elite material under high inoculum pressure against rust

Sl. No.	Entries	Disease Intensity (05- Scale)		
		Kangra	Kanke	Average disease reaction
1	RLC-48	0	2	MR
2	RLC-49	2	1	MR
3	RLC-102	1	2	MR
4	R-204 X 4/	0	2	MR
5	S-91-29	-	3	MS
6	S-91-38	1	1	R
7	Sirmor	0	3	MS
8	Solapur-9	0	2	MR
9	Sydnog-20	-	2	MR
10	H-43	0	2	MR
	Check I	0	1	R
	Check II	4	3	S
11	DPL-19	0	1	R
12	KL-1	0	1	R
13	KL-190	0	2	MR
14	LC-2002	0	2	MR
15	LC-2023	0	1	R
16	LC-2127	0	3	MS
17	LCK-8951	1	2	MR
18	LCK-9011	0	3	MS
19	LCK-9216	1	2	MR
20	LCK-9312	1	2	MR
	Check I	0	1	R
	Check II	4	3	S
21	LCK-9313	0	2	MR
22	LCK-9320	0	1	R
23	LCK-9436	0	3	MS
24	Ayogi	2	1	MR
25	BAU-9906	1	1	R
26	BAU-2K-2	0	1	R
27	DPL-21	1	1	R
28	KL-221	0	1	R
29	OR-1-4	0	2	MR
30	PKDL-42	3	1	MS
	Check I	0	2	MR
	Check II	4	3	S
31	Polf-5	0	2	MR
32	Polf-19	0	3	MS
33	R-1017	1	2	MR
34	BAU-2K-1	1	2	MR
35	ES-44	0	1	R
36	JRF-3	0	1	R
37	H-40	-	2	MR
38	NP(RR)	0	3	MS
39	OR-8-44	0	2	MR
40	Polf-14	0	2	MR
41	Polf-31	1	2	MR
42	R-966-5	0	3	MS
43	RLC-29-8	1	3	MS
44	Surabhi (R	0	1	R
45	Neela (SC)	4	3	S

C. Powdery mildew : 5 locations, Muaranipur, Nagpur, Raichur, Raipur, P.C. Unit

The experiment included 44 test entries and chekcs viz., Kiran (RC) and Chambal (SC). Other experimentation was same as in case of alternaria blight. The detailed observations of different centres are presented in Table 4.4.3 and the promising lines are given below.

(i) Disease below 10% at more than half location (R): KL-1, LC-2021, LCK-9111, LCK-9406, S-91-5, S-91-6, S-91-7, S-91-23, S-91-25, S-91-35, Sonarhati, KL-178, Polf-29, Polf-31, LCK-89512, LH-1, NP-100, R-114/4, RL-15-1, RL-903, RLC-93, LCK-8504, LCK-8722, Mahoba local, Kiran (RC).

(ii) Disease below 25% at more than half location (MR): S-91-20, S-91-26, S-91-44, S-91-50, NP-23-2K, RLC-34, RLC-35, LCK-87391, NPHY-10, NP (RR) 412.

D. Rust : 2 locations; Kanke, Kangra

A total of 43 promising lines were evaluated against rust at two hot spot locations. The experimental details were same as in case of AB and PM. The detailed disease reaction is given in Table 4.4.4. and summarized below. In case of rust the highest score was taken into account.

(i) Disease score below 10% at more than half locations (R) : S-91-38, DPL-19, KL-1, LC-2023, LCK-9320, BAU-9906, BAU-2K-20, DPL-21, KL-221, ES-44, JRF-3, Surabhi

(ii) Disease below 25% at more than half locations (MR): RLC-48, RLC-49, RLC-102, R-204 X 4/9, SOLAPUR-9, SYDNOG-20, H-43, KL-190, LC-2002, LCK-89512, LCK-9216, LCK-9312, LCK-9313, Ayogi, OR-1-4, Polf-5, R-1017, BAU-2K-14, H-40, OR-8-44, Polf-14, Polf-31.

4.5 Monitoring of diseases in agronomical trials : This is an observational trial assigned to all those centres, conducting agronomical trials. The objective of the trial was to find correlation between agronomical treatment and disease incidence and severity. The expectation was that the observations may yield components for IPM. However, the observations were recorded by only three centres viz., Kangra, Kanke and Raipur, which is given as under.

4.5.1 Effect of zinc with an without FYM in linseed based cropping sequence (Expt No.1)

The trial allocated at Kanke included 8 treatments. The cropping sequence was balck gram-linseed. The severity of alternaria blight and rust were reported. As evidence in table 4.5.1. the results were random nothing could be concluded from the results. However, minimum disease severity i.e. AB (score 1) and Rust (score 1) was recorded in T2 i.e. application of $ZnSo_4$ (25 kg/ha) to kharif crop with no FYM to kharif crop.

4.5.2 Studies on moisture conservation practices for linseed under rainfed situation (Expt No. 3)

Locations : Raipur, Nagpur, Sagar, Kanke, Faizabad and Muranipur. The disease observations were reported only from Kanke. The trial included seven treatments, Out of 7 minimum disease score (both AB and rust in 1 score)was recorded in T5 i.e. soil mulching at 30 DAS and highest score in treatment No. 1 *i.e.* No. mulching (Table 4.5.2)

4.5.3 Studies on sowing time in relation to newly released varieties for double cropping system (Expt No. 4)

Locations : Assured irrigation: Faizabad (rice-linseed), Powarkheda (Soybean-linseed) adn Raipur (Soybean-linseed) The desease observations were received only from Raipur.

Table 4.5.1 Monitoring of diseases - Effect of zinc with and without FYM in linseed base cropping sequence at Kanke

Sl. No.	Treatment	Disease severity (0-5 scale)	
		Alternaria blight	Rust
1.	Application of $ZnSo_4$ (25 kg/ha) to both crops with no FYM to kharif crop	3	2
2.	Application of $ZnSo_4$ (25 kg/ha) to kharif crop with no FYM to kharif crop	1	1
3.	Application of $ZnSo_4$ (25 kg/ha) to rabi crop with no FYM to kharif crop	2	2
4.	Application of $ZnSo_4$ (25 kg/ha) to both the crop with 5 t/ha FYM to kharif crop.	2	1
5.	Application of $ZnSo_4$ (25 kg/ha) to kahrif crop with 5 t/ha FYM to kharif crop	3	2
6.	Application of $ZnSo_4$ (25 kg/ha) to rabi crop with 5 t/ha FYM to kharif crop	3	2
7.	Application of recommend dose of NPK to both the crops	2	1
8.	Absolute control i.e. No NPK, Zn or FYM	2	2

Table 4.5.2 Monitoring of diseases - Studies on moisture conservation practices for linseed under rainfed situation at Kanke

Sr. No.	Treatments	Diseases severity (0-5 scale)	
		AB	Rust
1	No mulching	4	3
2	Straw mulching @ 10 t/ha	2	1
3	Spreading of FYM @ 10 t/ha as a mulch	3	2
4	Incorporation of FYM in soil @ 10 t/ha	2	2
5	Soil mulching at 30 DAS	1	1
6	Soil mulching at 30 DAS and after first rain shower	3	2
7	Hand weeding but noremoval of weeded plants from the field	3	2

The trial was conducted in-split-plot design with 12 treatment combinations in 3 replications sowing time (3) were in main plot and newly release varieties (4) were in subplot

A. Sowing time (main plot) 3

D_1 - Last week of October

D_2 - IInd week of November

D_3 - Last week of November

Table 4.5.3 Monitoring of diseases-studies on sowing time in relation to newly released linseed varieties for double cropping system at Raipur

Sub plots	Disease Incidence (Wilt)%				
Main plot date of sowing	V_1	V_2	V_3	V_4	Row mean
D_1	9.07 (17.53)	7.23 (15.60)	8.02 (16.45)	9.30 (17.76)	8.38 (16.83)
D_2	15.08 (22.85)	11.03 (19.40)	7.22 (15.59)	19.46 (22.42)	11.78 (20.07)
D_3	4.17 (11.79)	6.53 (14.80)	5.90 (14.06)	8.58 (17.03)	6.20 (14.42)
Col Mean	8.93 (17.39)	8.16 (16.60)	7.02 (15.36)	10.67 (19.07)	8.66 (17.11)

SE of any subplot mean within same main plot	3.07
SE main plot	2.70
SE subplot	1.77
CD for subplot mean within same main plot at 5% land	8.92
CD for main plot at 5% level	14.15
CD for subplot at 5% level	6.95

B. Sub-plot varieties 4, 3 newly released and one check, V_1-RLC-79, V_2-Kiran, V_3-JLS-9, V_4-NL-97 other details given in Agronomy, section.

Incidence of wilt was reported in the trial from Raipur centre. It was evident from results presented in Table 4.5.3. that numerically minimum disease percentage, was recorded in D_3(6.20%) followed by D_1(8.38) and D_2(11.78) through statistically . The were at par. As regards varieties (subplot) minimum disease score was recorded in V_3 (7.02%) followed by V_2(8.16%), V_1(8.93%) and V_4(10.67%). In treatment combinations minimum disease was scored in D_3V_1 (4.17%) followed by D_2V_3 (5.90%), D_3V_2(6.53%) D_1V_2(7.23) and so on. However the results are statistically at par or nonsignificant.

4.5.4. Intercropping studies in seed drill sown *rabi* crops in association with linseed

Location: Raipur, Nagpur, Sagar, Powarkheda, Palampur and Kanpur (P.C. Unit)

The trial included 13 treatments sown in RBD in 3 replications.

The disease observations were taken only Palampur.

A. Palampur : The disease observations were recorded in the trial. Since variety DPL-17 used in the trial is resistant to major disease in the area, therefore, no disease incidence could be recorded.

4.5.5 Studies on bioefficacy of new herbicides for weed management in irrigated linseed

Location : Palampur, Kanpur (P.C. Unit), Faizabad, Raipur, Mauranipur and Powarkheda.

Thue trial included 12 treatments combinations sown in RBD in 3 replications. Other details given in Agronomy chapter.

The disease observations were recorded at Palampur and Raipur centres only.

A. Palampur

The observations on diseaes were taken. Alternaria blight and powdery mildew did not appear in the variety DPL-17 used in the trial. Very low incidence of rust (below 5%) was observed in all the treatments and no treatment effect was noticed.

Table 4.5.5 Monitoring of diseases-bioefficacy of new herbicides for weed management in irrigated linseed at Raipur

Sl. No.	Treatments	Disease Incidence (%)
1.	Hand weeding twice at 20-25 and 40-45 DAS	34.46 (35.95) (9)
2.	Isoproturon @ 1 kg/ha (Post emergence)	27.53 (31.65) (4)
3.	Isoproturon @ 1 kg/ha + 2, 4D @ 0.5 kg/ha (Post emergence)	37.36 (37.68) (10)
4.	Sulfo sulfuron 10g/ha (Post emergence)	31.25 (33.99) (7)
5.	Sulfo sulfuron 20g/ha (Post emergence)	43.18 (41.08) (11)
6.	Sulfo sulfuron 30g/ha (Post emergence)	49.08 (44.47) (12)
7.	Clodinafop 60g/ha (Post emergence)	27.46 (31.60) (3)
8.	Clodinafop 80g/ha (Post emergence)	15.89 (23.49) (1)
9.	Clodinafop 100g/ha (Post emergence)	31.87 (34.37) (8)
10.	Clodinafop 60g/ha+2, 4D @ 0.5 kg/ha (Post emergence)	30.50 (33.52) (5)
11.	Clodinafop 80g/ha+2, 4D @ 0.5 kg/ha (Post emergence)	30.74 (33.67) (6)
12.	Weedy Check	19.08 (25.90) (2)
	General mean	31.19 (33.95)
	S.E. (m) ±	3.86
	C.D.	NS

B. Raipur

It was evident from the data presented in Table 4.5.5. by that minimum incidence of wilt (15.89%) was in T_8 *i.e.,* cladinofop @ 80g/ha followed T_{12} *i.e.,* weedy check (19.08%) and 17 *i.e.,* clodinofop @ 60 g/ha. Although the results were statiscally non significant but effect of cladinofop in reducing wilt percentage was clear.

4.5.6. Studies on the response of AVT (I) II year entries to fertilizer application and sowing schedule (Expt No. 10.2)

Location : Powarkheda, Raipur, Mauranipur, Nagpur. The disease observations were recorded only at Raipur. The trial including 12 treatment combinations was conducted in split plot design in 4 replications

A. Main plot-sowing dates (3), D_1=Last week of October, D_2= IInd week of November, D_3= Last week of November

B. Subplot- Varieties (4)

Raipur

The results presented in table 4.5.6 revealed that on mean basis minimum incidence (4.49%) of wilt was observed in third date of sowing followed by D_1 and D_2. Individually least disease percentage (2.05%).

With first date of sowing in variety V_4 *i.e.,* PDKL-52 and maximum in first date of sowing with variety V_3 (LC-2279-4) average minimum disease was recorded in V_1 (NDL-2004-05) followed by V_4 (PKDL-52). However the results were statistically at par.

Table 4.5.6 Monitoring of diseases - studies on the response of AVT (I) IInd year entries to sowing dates at Raipur

Main plot sowing dates	Disease incidence (wilt) %				
	V_1	V_2	V_3	V_4	Row Mean
D_1	5.32 (13.33)	6.68 (14.98)	9.81 (18.25)	2.05 (8.23)	5.61 (13.70)
D_2	4.11 (11.70)	4.10 (11.68)	6.93 (15.26)	9.21 (17.67)	5.92 (14.08)
D_3	3.40 (10.62)	7.71 (16.12)	2.94 (9.87)	4.54 (12.30)	4.49 (12.23)
Col mean	4.24 (11.88)	6.07 (14.26)	6.24 (14.46)	4.86 (12.73)	5.32 (13.33)
Factor combination					
SE (m) ± sub plot within main plot		1.51			
SE (m) ± mean main plot		1.41			
SEM subplot		0.87			
CD for main plot (5%)		3.93			
CD for subplot (5%)		2.52			

V_1 = NDL - 2004-05, V_2 = T-397, V_3 = LC-2279-4, V_4 = PKDL-52

4.5.7 Studies on response of AVT (DP) entries to sowing schedule (Expt. 11.1)

Locations : Palampur, Kanpur, Faizabad and Patna. Disease observations were recorded by only Palampur Centre. The trial including 12 treatments was conducted in split plot design in which sowing dates (3) were in main plot and varieties (4) in subplot.

Palampur

Four varieties were tested at 3 sowing dates. Observations were reported on rust, wilt and powdery mildew diseases. The results revealed that all varieties were highly resistance to rust since no disease was observed in any variety at any sowing date except for V_4 (Shikha) in second date of sowing. Varieties V_1 (Nagarkot)

Table 4.5.7 Monitoring of diseases - response of AVT (DP) entries to sowing schedule

Sl. No.	Treatments	Disease reaction (Av. of 3 replications)		
		Rust (0-5 scale)	Wilt (%)	Powdery mildew (0-5 scale)
1.	D_1V_1	0	2.5	1
2.	D_1V_2	0	27.0	1
3.	D_1V_3	0	20.4	2
4.	D_1V_4	0	2.0	2
5.	D_2V_1	0	2.4	2
6.	D_2V_2	0	19.3	2
7.	D_2V_3	0	17.5	2
8.	D_2V_4	1	1.8	4
9.	D_3V_1	0	2.0	2
10.	D_3V_2	0	20.0	2
11.	D_3V_3	0	18.0	2
12.	D_3V_4	0	2.0	4

D_1 = Last week of October, D_2 = IInd week of November, D_3 = Last week of November
V_1 = Nagarkot, V_2 = LMS-95-4, V_3 = LCk-5021, V_4 = Shikha

and V_4 (Shikha) were highly resistant to wilt while V_2 (LMS-95-4) and V_3 (LCK-5021) were moderately resistant. However, there was decline in percentage of wilt in later sowing dates (D_2, D_3) as compared to first date of sowing (D_1). As regards powdery mildew varieties V_1 and V_2 were resistant to powdery mildew while V_3 and V_9 were moderately resistant. The disease intensity increase with later sowing dates particularly in V_4 (Shikha) in D_2 and D_3 (Table 4.5.7).

4.5.8 Studies on response of AVT (DP) entries to fertilizer application (Expt No. 11.2)

Location : Palampur, Kanpur, Faizabad, Patna. The disease observations were recorded only at Palampur. The same 4 varieties as above were tested at three fertility levels *i.e.*, 50% RDF (F_1), 100% RDF (F_2), 150% RDF (F_3)

Observations were recorded on rust, wilt and powdery mildew diseases. All varieties were free of rust. V_1 (Nagarkot) and V_4 (Shikha) were resistant to wilt while V_2 (LMS-95-4) and V_3 (LCK-5021) were moderately resistant. There was no impact of fertility level. As regards powdery mildew V_1, V_2, V_3 were free of disease while V_4 (Shikha) was moderately resistant. However, at F_3 (150% RDF) V_4 (Shikha) showed moderately susceptible reaction.

Table 4.5.8 Monitoring of diseases - response of AVT (DP) entries to fertilizer application

Sl. No.	Treatments	Disease reactions (Av. of 3 replications)		
		Rust (0-5 scale)	Wilt (%)	Powdery mildew (0-5 scale)
1.	F_1V_1	0	5.0	0
2.	F_1V_2	0	11.0	0
3.	F_1V_3	0	22.5	0
4.	F_1V_4	0	7.2	2
5.	F_2V_1	0	5.5	0
6.	F_2V_2	0	10.0	0
7.	F_2V_3	0	20.0	0
8.	F_2V_4	0	5.0	2
9.	F_3V_1	0	5.0	0
10.	F_3V_2	0	12.5	0
11.	F_3V_3	0	25.0	0
12.	F_3V_4	0	7.5	3

F_1 = 50% RDF, F_2 = 100% RDF, F_3 = 150 RDF

4.6 Integrated Disease Management in linseed

Locations : Faizabad, Knake, Ludhiana, P.C. Unit, Raipur

The trial started in 2006-07 comprising of 10 treatments (modules). The treatments included seed treatment with recommended chemical fungicide (Topsin-M) or biocontrol agent (Bioderma) alone without any spray or in combination with spray of recommended chemical fungicide (macozeb) botanical (neem leaf and garlic bulb extract). The recommended practice and control plots without any plant protection were also taken for comparison. The experimental details are given as under.

Design : RBD, Replications: 3; Plot size: 4x3 M; Time of sowing: First week of November.

Treatments:10

1. Seed treatment with Trichoderma viride (4 g/kg seed)
2. ST with Topsin M (2 g/kg seed)
3. ST with *T viride* + 2 sprays of neem leaf extract (5.0%)
4. ST with *T viride* + 2 sprays of garlic extract (5.0%)
5. ST with *T viride* + 2 sprays of mancozeb (0.25%)
6. ST with Topsin M + 2 sprays of neam leaf extract (5.0%)
7. ST with Topsin M + 2 sprays of garlic extract (5.0%)
8. ST with topsin M + 2 sprays of mancozeb (0.25%)
9. Control (No plant protection)
10. Recommended practice (ST with Thiram @ 3g/kg seed and 2 spryas of mancozeb @ 0.25%)

Recommended agronomic practices : NPK (80:40:40)

Irrigations : 3, variety : Shekhar

Spray : 2, *i.e.* one prophylactic (30 DAS) and second on disease appearance.

Date to be recorded : Disease severity, seed yield, 1000 seed weight, Benefit cost rato.

The data of all centres are presented in Tables 4.6.1 and 4.6.2 and discussed centrewise as under.

Table 4.6.1 Integrated disease management in linseed-disease intensity at different locations

Sl. No.	Treatments	Doses	Disease Intensity (%)					
			Faizabad		Kanke	P.C. Unit	Raipur	Ludhiana
			Leaf	Pod				
1.	ST with *T. viride*	4 g/kg	60.43 (51.02)	27.11 (31.18)	24.76 (29.84)	41.64 (40.19)	17.63 (24.83)	38.3
2.	ST with Topsin M	2 g/kg	59.27 (50.34)	25.79 (30.52)	23.99 (29.33)	40.00 (39.23)	16.38 (23.87)	36.5
3.	ST *T. viride* + Spray of Neem L extract	5.0%	39.57 (38.98)	24.65 (29.77)	19.08 (25.90)	33.90 (35.66)	15.49 (23.18)	36.8
4.	ST *T. viride* + Spray of Garlic extract	5.0%	39.16 (38.74)	19.37 (26.11)	20.15 (26.67)	36.00 (36.87)	24.67 (29.78)	33.3
5.	ST *T. viride* + Spray of Mancozeb	0.25%	25.09 (30.06)	12.87 (21.02)	21.92 (27.92)	31.64 (34.23)	17.08 (24.41)	32.7
6.	S.T. Topsin M + Spray of Neem L extract	5.0%	43.08 (41.02)	22.16 (28.08)	17.00 (24.35)	32.31 (34.64)	15.49 (23.18)	33.7
7.	S.T. Topsin M + Spray of Garlic extract	5.0%	48.08 (43.90)	20.91 (27.21)	18.41 (25.41)	33.31 (35.25)	10.23 (18.65)	33.3
8.	S.T. Topsin M + Spray of Mancozeb	0.25%	23.83 (29.22)	13.15 (21.26)	15.79 (23.48)	31.64 (34.23)	9.49 (17.94)	25.3
9.	Control (untreated)	-	61.60 (51.71)	30.38 (33.45)	29.77 (33.07)	41.0 (39.87)	24.02 (29.35)	42.8
10.	Recommended practice *i.e.*, ST Thiram (3 g/kg) + 2 spray of Mancozeb	0.25%	26.37 (31.13)	13.94 (21.92)	13.23 (27.33)	31.64 (34.23)	13.31 (21.40)	30.3
	General Mean		42.37 (40.61)	20.68 (27.05)	20.23 (26.73)	35.28 (36.44)	16.10 (23.66)	
	SE (m) Tr.		1.20	0.93	0.44	0.84	1.89	-
	CD Tr. (P=0.05)		4.90	3.80	1.77	3.44	7.70	5.7
	CD Tr. Vs. Control (P=0.05)		5.18**	4.01**	1.87**	2.64*	7.97**	-

Table 4.6.2 Integrated disease management in linseed-seed yield, test weight and oil content at different locations

Sl. No.	Treatments	Seed yield (kg/ha)					Test weight (g)			Oil content (%)
		Faizabad	Kanke	P.C. Unit	Raipur	Ludhiana	Faizabad	Raipur	Ludhiana	P.C. Unit
1.	ST with *T. viride*	725	777.78	902.78	950.00	1080.00	6.63	8.32	7.4	39.32
2.	ST with Topsin M	679	791.67	930.56	900.00	1114.60	6.64	8.20	7.5	40.06
3.	ST *T. viride* + Spray of Neem L extract	846	875.00	958.33	805.56	1124.00	6.71	8.09	7.5	39.89
4.	ST *T. viride* + Spray of Garlic extract	971	805.56	902.78	958.33	1126.60	6.96	8.18	7.7	40.80
5.	ST *T. viride* + Spray of Mancozeb	1137	833.33	958.33	852.78	1233.30	7.17	8.41	7.5	39.93
6.	S.T. Topsin M + Spray of Neem L extract	833	916.67	930.56	816.67	1178.00	6.69	8.29	7.5	40.73
7.	S.T. Topsin M + Spray of Garlic extract	9.38	958.33	930.56	881.94	1180.00	6.76	8.22	7.7	39.75
8.	S.T. Topsin M + Spray of Mancozeb	1104	1000.00	986.11	937.50	1311.70	7.05	8.05	8.1	39.51
9.	Control (untreated)	617	722.22	861.11	86.11	921.00	6.62	8.14	7.1	40.90
10.	Recommended practice *i.e.*, ST Thiram (3 g/kg) + 2 spray of Mancozeb	1142	1069.44	986.11	797.22	1286.70	7.18	8.34	8.0	41.31
	General Mean	899.17	875.00	934.72	888.61	-	6.84	8.22	-	40.22
	SE (m) Tr.	67.88	42.15	33.29	54.16	-	0.02	0.08	-	0.11
	CD Tr. (P=0.05)	276.29	171.57	-	-	26.00	0.10	-	0.5	0.43**
	CD Tr. Vs. Control (P=0.05)	291.24**	180.35**	NS	NS		0.11**	NS	-	0.44**

A. Faizabad

The data revealed that minimum severity of Alternaria blight (23.83, 13.15% an leaf and bud respectvity) was observed in treatment no. 8 *i.e.*, ST. with Topsin M + 2 sprays of mancozeb. This was followed and statically at par with treatment No. 5 *i.e.*, ST with T. viride + 2 sprays of mancozeb. Highest disease score (61.60, 30.38% on leaf and bud) was recorded in control plots, which was at par with T_1 *i.e.*, ST with T. viride alone and T_2 *i.e.*, ST with Topsin M alone. As regards yield maximum seed yield (1142 kg/ha) was recorded in Treatment No. 10 *i.e.*, recommended practice followed by T_5 (1137 kg/ha) and T-8 (1104 kg/ha). All the three were statistically at par. Similar trend was found in 1000 seed weight. Maximum (7.18 g) in T_{10} followed and at par with T_5 (7.17 g) and T_8 (7.05) (Table 4.6.1 and 4.6.2).

B. Kanke

It was evident from data presented in Table 4.7A that minimum disease severity (13.23%) was in T_{10} *i.e.*, recommended practice followed by T_8 (15.79 and T_6 (17.0) *i.e.*, ST with Topsin M and 2 sprays of neem leaf extract. Similar trend was observed with respect to seed yield. Maximum yield (1069 kg/ha) was recorded

in T_{10} followed by T_8 (1000 kg/ha) and T_6 (916 kg/ha) although they were statistically at par. Minimum seed yield (722.22 kg/ha) was recorded in T_9 *i.e.*, control (Table 4.6.2)

C. P.C. Unit, Kanpur

It was evident from the results that minimum disease intensity of Alternaria blight (31.64%) was in T_{10} recommended practices T_8 *i.e.*, ST with Topsin M + 2 sprays of manocozeb and T_5 *i.e.*, ST with *T. viride* + 2 sprays of mancozeb. They were at par with T_6, T_7 and T_3. Maximum disease score was in T_1 (41.64%) T_9 (41.0%) and T_2 (40.0%), which were same statistically (Table 4.6.1). Seed yield was also maximum (986.11 kg/ha) in T_{10} and T_8 followed and par with T_5 and T_3 (958.33 kg/ha). However, the results of yield were statistically non significant. As regards oil content maximum oil content was recorded in T_{10} (41.31%) followed by T_9 (40.90%), T_4 (40.80%) and T_6 (40.73%) (Table 4.6.2).

D. Ludhiana

The data revealed that minimum bud infection (25.3%) was observed in T_8 *i.e.*, ST with Topsin M + 2 sprays of mancozeb, statistically at par with T_{10} (30.3%). It was followed and at par with T_5, T_7 and T_4. Maximum disease percentage was observed in T_9 *i.e.*, control (Table 4.7.A). As regards yield, it was highest (13.11 kg/ha). Yield of T_8 was at par with T_{10} and T_{10} was par with T_5. The test weight was also highest in T_8 (8.1 g) at par with T_{10} (8.0). Test weight in other treatments were same (Table 5.6.2).

E. Raipur

In Raipur situation minimum disease was scored in T_8 (9.49%) followed and at par with T_7 (10.23%). Maximum intensity of disease (29.35%) was recorded in T_9 *i.e.*, control (24.02%) (Table 4.7.A). However, the maximum yield (986.11 kg/ha) was recorded in T_{10} *i.e.*, recommended practice followed by T_4 (958.33 kg/ha) and T_1 (950.11 kg/ha). The results were statistically nonsignificant. The test weight was highest in T_5 (8.41 g) followed by T10 (8.34 g) and T1 (8.32 g). Again the data of test weight was statistically non significant. (Table 4.6.2)

4.7. Studies on the variability of major pathogens

The studies were initiated at P.C. Unit. The Alternaria blight pathogens (*Alternaria lini* and *A. linicola*) were isolated from diseased samples collected from seven locations *viz.,* Kanpur, Berhampore, Kangra, Kaul, Ludhiana, Nagpur and Raipur. A total of nine cultures were isolated. Similarly seven cultures of wilt pathogen (*Fusarium oxysporum* f. spp. *lini*) were isolated from Berhampore, Jashipur, Kanpur, Kangra, Kanke, Nagpur, Raipur centres samples. The studies on variability at molecular level through RAPD markers is under process.

4.8 Initial Disease screening Nursery Trial

The experiment was constituted with the objective the make a preliminary screening of the entries against wilt, Alternaria blight, powdery mildew and Rust disease before including in IVT trials. A total of 84 entries were included in this trial which were evaluated against 4 major diseases at respective hot spot/locations. The detailed disease reaction is presented in Table 4.9 and promising lines are listed below:

1. Wilt

Locations : Kanpur, Raipur, Kangra

The entire set was screened at above locations. The disease pressure was high at all the location. The lines are mentioned below:

Entries resistant (R) at all the location - LCK-8015.

Entries R at two location - RL-26018, RL-26021, RL-26005, RL-27005, LCK-8005, LCK-8013, LCK-8017, LCK-8018, LCK-8024, LCK-8028

2. Alternaria blight

Locations : Faizabad and P.C. Unit Kanpur

None of the entries was found resistant at both the locations. The promising lines observed were as under:

- Resistant to both the locations - Nil
- R to one and MR to other location - RL-27022, RL-27007, RL-27020, RL-27001, RL-27013, RL-27008, LCK-8009.

3. Powdery Mildew

Locations : Raichur, Mauranipur, Nagpur, P.C. Unit

The disease pressure was high at Raichur and Nagpur, therefore none of the entry was found resistant at all the locations entries found promising at more than one locations are listed below :

Resistant at all locations - Nil

R at three locations - RL-26024, RL-27018, RL—27028, RL-27017, RL-27025, RL-27001, RL-27021, RL-27008, LCK-8005, LCK-8012, LCK-8014, LCK-8015, Rashmi, LCK-8017, LCK-8018, LCK-8028, LCK-8030, Sikha, NL-210.

4. Rust

Location : Kanke, Kangra

Entries found free or resistant screened at both centres are given as under and other details are given in Table 4.9.

Free at both locations - Nil

Free or Resistant at both locations - RL-26008, RL-26016, RL-26024, RL-27022, RL-27019, RL-27027, RL-27023, LCK-8008, Shekhar, LCK-8019, LCK-8025, NL-210.

Table 4.8 Initial Disease Screening Nursery (IDSN)

S. No.	Entries	AB														
		Wilt (%)				Alternaria blight (0-5 scale)			Powdery mildew (0-5 scale)					Rust (0-5 scale)		
		Kan-pur	Rai-pur	Kan-gra	Average disease reaction	Faiza-bad	P.C. Unit	Average disease reaction	Raichur	Maura-nipur	Nagpur	P.C. Unit	Average disease reaction	Kangra	Kanke	Average disease reaction
1	RL-26026	7.69	75.44	8.4	MR	4	3	S	2	2	5	0	MR	2	2	MR
2	RL-26008	14.54	26.15	12.6	MR	3	2	MS	2	1	2	0	MR	0	1	R
3	RL-26028	24.00	57.73	21.4	MS	3	3	MS	2	1	5	0	MR	1	3	MS
4	RL-26022	31.25	64.41	3.7	MS	4	4	S	3	2	1	0	MR	0	2	MR
5	RL-26023	17.77	35.51	2.7	MR	3	-	MS	3	2	3	0	MS	1	2	MR
6	RL-26016	45.45	94.29	12.1	MS	3	3	MS	2	3	5	0	MS	1	1	R
7	RL-26004	51.76	39.86	1.2	MS	5	3	S	3	2	5	0	MS	1	3	MS
8	RL-25114	16.00	87.30	12.5	MR	2	4	S	3	3	5	0	MS	2	3	MS
9	RL-26027	16.00	76.06	9.5	MR	2	3	MS	3	3	5	2	MS	2	2	MR
10	RL-26024	72.72	56.15	17.4	S	1	3	MS	3	1	1	0	R	0	1	R
11	RL-26018	0.0	42.36	2.4	MR	4	2	S	3	3	5	2	MS	1	2	MR
12	RL-26021	0.0	97.01	3.9	MR	2	3	MS	3	4	5	1	S	0	3	MS
13	RL-26005	0.0	27.61	3.0	MR	3	3	MS	3	3	4	0	S	1	2	MR
14	RL-26003	0.0	61.04	28.2	MS	2	3	MS	3	3	4	0	S	2	1	MR
15	RL-26010	0.0	89.29	37.2	MS	2	3	MS	2	3	3	0	MS	0	2	MR
16	RL-27022	0.0	75	20.5	MR	1	2	MR	2	2	5	0	MR	1	1	R
17	RL-27005	0.0	30.39	2.2	MR	3	4	MS	3	2	5	0	S	0	3	MS
18	RL-27002	0.0	95.40	85.1	HS	3	3	MS	2	1	4	2	MR	0	2	MR
19	RL-27018	0.0	36	14.7	MR	3	3	MS	2	1	1	0	R	0	2	MR
20	RL-27028	0.0	40	25.6	MS	2	3	MS	3	1	0	0	R	0	3	MS
	Check I	0.0	18.96	6.0	MR	2	3	MS	4	1	0	0	R	0	2	MR
	Check II	38.46	98.24	60.0	S	3	4	S	4	4	5	3	S	4	3	S
21	RL-27007	0.0	26.28	73.9	MS	1	2	MR	3	2	1	0	MR	0	2	MR
22	RL-27030	0.0	22.15	14.5	MR	3	3	MS	3	4	5	3	S	4	1	S
23	RL-27017	100.00	46.84	21.9	S	2	2	MR	3	1	1	0	R	1	3	MS
24	RL-27025	100.00	39.58	84.8	HS	2	2	MR	2	1	0	0	R	0	2	MR
25	RL-27020	100.00	29.79	29.4	MS	1	2	MR	2	1	3	3	MS	0	2	MR
26	RL-27012	100.00	50.65	75.8	HS	2	2	MR	2	1	1	2	MR	0	3	MS
27	RL-27015	100.00	79.84	75.0	HS	2	2	MR	3	2	0	0	MR	0	2	MR
28	RL-27019	100.00	57.24	80.0	HS	NG	3	MS	3	3	5	2	MS	1	1	R
29	RL-27011	100.00	86.41	100.0	HS	2	3	MS	2	3	5	0	MS	-	2	MR
30	RL-27026	100.00	58.16	30.0	S	3	3	MS	2	2	1	0	MR	1	2	MR
31	RL-27001	100.00	61.54	77.9	HS	1	2	MR	2	1	0	0	R	4	3	S
32	RL-27024	100.00	59.09	7.7	S	2	3	MS	2	1	5	0	MR	1	2	MR
33	RL-27021	100.00	35	89.6	HS	3	3	MS	3	1	0	0	R	0	2	MR
34	RL-27027	100.00	19.67	41.7	MS	3	3	MS	3	3	2	0	MS	1	1	R
35	RL-27027	18.03	41.88	7.8	MS	5	4	HS	3	4	5	2	S	4	3	S
36	RL-27004	14.63	51.77	25.3	MS	5	4	HS	3	4	5	3	S	3	2	MS
37	RL-27023	19.64	22.14	4.2	MR	3	3	MS	3	1	0	0	R	0	1	R
38	RL-27010	14.28	34.42	5.6	MS	5	3	S	2	4	5	3	S	5	2	HS
39	RL-27022	17.24	36.96	40.2	MS	4	2	S	2	4	5	2	S	3	3	MS
40	RL-27006	100.00	77.63	26.7	HS	3	2	MS	3	3	3	0	MS	0	2	MR
	Check I	15.00	14.77	4.0	MR	2	2	MR	4	1	0	0	R	0	1	R
	Check II	100.00	100	51.7	HS	3	3	MS	4	4	5	3	S	4	3	S

41	RL-27013	18.60	36.70	41.3	MS	1	2	MR	3	1	0	2	MR	3	3	MS
42	RL-27008	10.14	43.14	31.0	MS	1	2	MR	3	1	1	0	R	0	2	MR
43	RL-27009	37.97	68.53	90.0	HS	3	3	MS	2	2	5	3	MS	1	3	MS
44	RL-27014	18.36	60.19	95.0	HS	2	2	MR	2	2	1	0	MR	0	2	MR
45	RL-27003	21.05	88	33.3	MS	2	3	MS	3	2	3	0	MS	1	2	MR
46	RL-27016	16.07	40	100.0	MS	4	3	S	3	2	1	0	MR	-	3	MS
47	LCK-8001	47.82	100	84.2	HS	3	3	MR	3	2	5	1	MR	1	2	MR
48	LCK-8002	86.66	82.46	100.0	HS	NG	2	MR	2	2	5	1	MR	0	2	MR
49	LCK -8003	36.36	34.21	7.8	MS	2	2	MR	2	2	3	1	MR	0	3	MS
50	LCK -8004	0.0	100	100.0	HS	NG	3	MS	3	2	3	2	MS	-	2	MR
51	LCK -8005	0.0	100	6.9	MR	2	2	MR	2	1	1	1	R	0	3	MS
52	LCK -8006	0.0	100	100.0	HS	NG	2	MR	4	3	5	2	HS	-	2	MR
53	LCK -8007	100.00	91.30	9.5	HS	3	2	MR	3	2	5	3	MS	0	2	MR
54	LCK -8008	22.22	86.21	44.0	MS	NG	2	MR	3	2	5	1	MS	1	1	R
55	LCK -8009	0.0	91.11	42.3	MS	1	2	MR	2	3	5	2	MS	3	3	MS
56	LCK -8010	0.0	37.84	6.3	MS	3	3	MS	2	1	2	0	MR	0	2	MR
57	LCK -8011	0.0	82.93	68.2	HS	3	3	MS	3	1	2	0	MR	0	2	MR
58	LCK -8012	17.24	84.21	15.1	MR	NG	2	MR	3	1	1	0	R	2	2	MR
59	LCK -8013	0.0	62.63	9.7	R	2	2	MR	3	2	4	1	MS	1	3	MS
60	LCK -8014	0.0	92.68	18.4	MR	3	3	MS	2	1	1	0	R	1	2	MR
	Check I	13.12	14.41	5.0	MR	2	3	MS	4	1	0	0	R	0	2	MR
	Check II	75.13	100	55.0	HS	3	3	MS	4	4	5	3	HS	4	3	S
61	LCK-8015	0.0	25	3.3	R	4	3	S	2	1	1	0	R	2	2	MR
62	Shekhar	0.0	66.67	7.8	MR	2	3	MS	2	2	5	2	MR	0	1	R
63	Rashmi	100.00	57.14	4.8	S	NG	2	MR	3	1	0	0	R	0	2	MR
64	Sweta	100.00	80	1.4	HS	3	2	MS	3	2	5	2	MS	1	3	MS
65	LCK-8016	100.00	50	15.0	S	5	3	HS	2	3	5	3	MS	0	2	MR
66	LCK-8017	0.0	100	1.7	MR	2	2	MR	3	1	0	0	R	0	3	MS
67	LCK-8018	0.0	88.52	2.6	MR	NG	2	MR	3	1	0	0	R	0	2	MR
68	LCK-8019	22.22	74.19	3.3	MR	NG	3	MS	2	1	0	2	MR	0	1	R
69	LCK-8020	20.68	59.26	3.0	MR	3	3	MS	3	2	4	1	MS	0	2	MR
70	LCK-8021	0.0	97.06	100.0	HS	3	2	MS	3	2	0	1	MR	-	3	MS
71	LCK-8022	0.0	88.46	73.5	HS	4	2	S	4	2	0	0	MR	0	3	MS
72	LCK-8023	0.0	71.43	10.3	MR	3	3	MS	3	2	3	2	MS	0	2	MR
73	LCK-8024	0.0	15.56	3.8	MR	2	3	MS	3	3	5	3	S	1	2	MR
74	LCK-8025	17.39	84.62	83.3	HS	2	3	MS	3	4	5	3	HS	0	1	R
75	LCK-8026	12.50	100	8.9	MR	2	3	MS	2	2	3	1	MR	1	3	MS
76	LCK-8027	14.63	26.09	4.1	MR	2	3	MS	2	2	5	1	MR	1	2	MR
77	LCK-8028	0.0	37.10	3.7	MR	2	2	MR	2	1	0	0	R	2	1	MR
78	LCK-8029	0.0	56.36	18.6	MR	3	2	MS	3	3	0	0	MS	2	2	MR
79	LCK-8030	0.0	88.89	16.1	MR	NG	2	MR	3	1	0	0	R	0	2	MR
80	Shikha	0.0	66.67	66.6	S	4	2	S	3	1	0	0	R	0	3	MS
	Check I	0.0	21.45	7.5	MR	2	2	MR	4	1	0	0	R	0	2	MR
	Check II	65.11	100	50.0	HS	3	3	MS	4	4	5	3	HS	4	3	S
81	Shikha	18.18	78.85	56.4	S	NG	2	MR	3	1	5	2	MS	1	3	MS
82	T-397	12.72	96.92	28.8	MS	2	3	MS	3	3	5	2	MS	1	2	MR
83	NL-210	0.0	85.89	20.8	MR	NG	2	MR	2	1	1	0	R	1	1	R
84	LC-2279-4	100.00	85	22.2	HS	NG	2	MR	2	1	1	2	MR	0	2	MR

5. ENTOMOLOGY

Technical programme of linseed entomology for the year 2007-08, comprising eight trials on (i) Population dynamics of major insect-pests, (ii) Host plant resistance for bud fly, (iii) Economic injury level of bud fly (iv) Integrated management of bud fly in rain fed / irrigated, (v) Effect of intercropping on bud fly infestation and (vi) Effect of neem based formulation on bud fly infestatoin, was executed at different locations. The results are being presented experiment-wise under here :

5.1 Population dynamics of major insect-pests of linseed with particular reference to bud fly

This trial was allotted to Faizabad, Mauranipur, Raipur and Nagpur centres, but it could not be executed at Mauranipur. Centre-wise results are as under :

Faizabad

Bud fly (*Dasyneura lini*), leaf miner (*Chromatomyia horticola*) and gram pod borer *(Helicovera armigera)* were found attacking linseed crop at different crop growth stage alongwith coccinellids as natural enemy on linseed varieties Neelum and Garima sown on Nov. 17, 2007 (Table 5.1.1). Leaf miner appeared during first week of January with 1.0 and 0.7 larva/plant on respective cultivars, which increased thereafter touching the maximum intensity of 14.2 and 11.3 larva/plant in second week of March. Bud fly infestation started in 3rd and 4th week of January with its initial infestation of 0.6 and 0.7% on these varieties and highest bud infestation being 17.0 and 9.2% was recorded on Neelum and Garima varieties at dough stage of crop, respectively. The population of coccinellids remained below one/10 plant through out the cropping season from January.

Raipur

Incidence of bud fly, thrips, coccinellids and spider was noticed on Neelum and Kiran varieties sown on Nov. 27, 2007. Population of thrips being 2.2 and 2.8 / Plant was recorded on Neelum and Kiran varieties in the end of December, respectively, which showed an increasing trend upto second week of February with 39.0 and 51.2 thrips/plant on these cultivars (Table 5.1.2). Bud fly appeared in first week of February with initial infestation of 1.9 and 1.1% bud infestation on these cultivars, which was recorded at maximum level of 34.1 and 28.4% at dough stage of crop. Population of spider and coccinellids remained around one per plant during reproductive phase of crop. It is clear from the data that February was the most suited month for bud fly as well as thrips multiplication.

Nagpur

Linseed varieties Neelum and NL-97 sown on Nov. 5, 2007 were mainly attacked by thrips and bud fly (Table 5.1.3). Incidence of thrips was started in third week of December with the initial population of 0.2 thrips/plant on both the varieties, which increased thereafter till the end of January. Maximum intensity being 6.4 and 6.5 thrips/plant was recorded on NL-97 and Neelum varieties in the end of January with a decreasing trend onwards, respectively. Bud fly appeared in first week of January with initial bud infestation of 0.9 and 1.2 per cent on respective varieties and it increased continuously till dough stage of the crop showing 36.4 and 52.3 per cent bud infestation. Weather parameters as well as crop stage during January suited the most for best multiplication of thrips, while February was suitables month for bud fly.

Multi-location results on population dynamics of major insect pests in linseed indicated that leaf miner (*Chromatomyia horticola* Gour.), thrips (*Caliothrips indicus* Bagnall), bud fly (*Dasyneura lini* Barnes)

and gram pod borer (*Helicoverpa armigera* Hubner) were noticed as major insect-pests in linseed ecosystem. Weather factors during January and February favoured the multiplication of thrips and bud fly, respectively.

Table 5.1.1 Population dynamics of major insect-pests at Faizabad

S. No.	Data of observation	Neelum				Garima			
		Bud fly infestation (%)	Leaf miner / plant	Gram pod borer	Coccinellds / 10 plant	Bud fly infestation (%)	Leaf miner / plant	Gram pod borer	Coccinellids / 10 plant
1.	9.1.08	-	1.0	-	-	-	0.7	-	-
2.	16.1.08	-	2.5	-	0.1	-	1.1	-	-
3.	23.1.08	0.6	4.3	-	0.1	-	2.3	-	0.1
4.	30.1.08	1.2	5.8	-	0.2	0.7	3.1	-	0.2
5.	6.2.08	3.4	7.3	0.3	0.5	0.9	4.2	0.2	0.4
6.	13.2.08	4.7	9.2	0.6	0.6	1.4	6.2	0.6	0.6
7.	20.2.08	8.3	10.3	1.1	0.8	2.8	7.6	1.3	0.7
8.	27.2.08	12.4	12.3	1.7	0.6	4.6	9.1	1.8	0.6
9.	5.3.08	13.8	13.2	2.3	0.5	7.3	10.2	2.7	0.5
10.	12.3.08	15.3	14.2	2.3	0.4	8.9	11.3	2.8	0.4
11.	19.3.08	16.2	14.0	3.2	0.3	9.3	10.4	3.1	0.3
12.	26.3.08	17.0	13.9	1.9	0.2	9.2	10.2	2.0	0.2

Table 5.1.2 Population dynamics of insect pests and natural enemy on linseed crop at Raipur

S. No.	Data of observation	Neelum				Kiran			
		Thrips / plant	Bud fly infestation %	L.B.B. / plant	Spider / plant	Thrips / plant	Bud fly infestation %	L.B.B. / plant	Spider / plant
52	31.12.07	2.2	-	-	-	2.8	-	-	-
1.	07.01.08	5.2	-	-	-	5.6	-	-	-
2.	14.01.08	9.2	-	-	0.4	12.8	-	-	0.6
3.	21.01.08	14.3	-	-	0.7	21.7	-	0.3	0.9
4.	28.01.08	15.5	-	1.1	0.9	22.7	-	0.5	1.3
5.	04.02.08	11.0	1.9	1.8	1.4	17.7	1.1	2.1	1.9
6.	11.02.08	39.0	5.3	1.8	1.3	51.2	4.5	1.9	1.9
7.	18.02.08	27.7	21.8	1.4	1.6	42.3	8.4	1.5	2.1
8.	25.02.08	22.8	25.7	1.0	1.1	19.3	16.1	1.0	1.5
9.	03.03.07	19.2	27.1	0.7	0.8	14.5	19.9	0.9	1.3
10.	10.03.08	6.8	32.9	0.2	0.3	11.3	22.5	0.6	0.9
11.	17.03.08	3.1	33.8	0.1	0.1	5.9	27.5	0.2	0.7
12.	24.03.08	1.9	34.1	0.0	0.0	3.3	28.4	0.1	0.2

Table 5.1.3 Population dynamics of major insect pests at Nagpur

Sr. No.	Date of observation	Meteorological weeks	NL-97		Neelum	
			Thrips / plant	Bud fly infestation %	Thrips / plant	Bud fly infestation %
1.	20-12-07	51	0.2	-	0.2	-
2.	27-12-07	52	0.2	-	0.3	-
3.	03-01-08	01	1.1	0.9	1.3	1.2
4.	10-01-08	02	2.0	1.4	2.4	1.5
5.	17-01-08	03	2.7	1.5	3.0	1.6
6.	24-01-08	04	3.8	2.9	3.9	3.3
7.	31-01-08	05	6.4	6.0	6.5	8.5
8.	07-02-08	06	4.0	14.6	4.3	18.0
9.	14-02-08	07	2.6	24.3	3.1	34.1
10.	21-02-08	08	1.6	32.1	2.0	44.7
11.	28-02-08	09	1.4	33.2	1.7	47.4
12.	*06-03-08*	*10*	*0.2*	*36.4*	*0.3*	*52.3*

5.2.1 Screening of linseed germplasm against bud fly infestation

A set of 100 germplasm (Sl. No. 1701-1800) was sent to Mauranipur, Raipur and Nagpur locations for its screening against bud fly (*Dasyneura lini*) infestation under different agro-climatic conditions. Besides this set of linseed genotypes, a set of 1922 entries of linseed was also evaluated at P.C. Unit, Kanpur. Two checks *i.e.* Neelum (SC) and Neela (RC) were sown after each ten entries. All the test genotypes of 3 m row length with 40 cm row distance were sown on November 22, 2004 at Raipur as well as Nagpur and November 27, 2007 at Kanpur. The crop was raised under recommended agronomic inputs except plant protection application. Bud fly infestation (%) was noticed on five tagged plants / entry by counting the total number of damaged buds and healthy capsules. The results are being discussed as under :

Kanpur (P.C. Unit)

A total of 31 and 21 genotypes were noticed having < 10 and > 50% bud fly infested buds, respectively (Table 5.2.1.1) Germplasm EC-278972 showed minimum bud infestation due to bud fly as well as Alternaria blight, while EC-1395 had highest bud fly infestation bearing few capsules / plant. Status of the mentioned germplasm will be verified in next cropping season.

Raipur

Bud fly infestation ranged between 8.3% on NP (RR)-489 to 57.1% on P-650 (Table 5.2.1.2). Only two genotyps *i.e.*, NP (RR)-489 and Polf-19 could show < 10% bud infestation, while 63, 34 and 1 entries exhibited > 10-25, > 25-50 and > 50% bud infestation, respectively.

Nagpur

Relatively high bud fly infestation ranging between 30-68.7% was noticed at this location in comparison to other centres, as none genotype could show < 25% bud fly infestation (Table 5.2.1.2). However, 66 and 33 germplasm were recorded in the range of > 25-50% and > 50-75% bud fly infestation, respectively.

Conclusively, it can be inferred that extent of bud fly infestation could not match at Raipur and Nagpur locations, as two entries *i.e.* NP (RR)-489 and Polf-19 showing < 10% bud infestation at Raipur exhibited quite higher bud damage being 62.7 and 52.9% on these genotypes at Nagpur. However, eight lines *viz.*, NP (RR)-430, NP (RR)-470, NP (RR)-482, OR-8-44, P-142, Polf-13, Polf-38, and R-17 showing below 35% bud infestation at Nagpur and had narrow margin in bud infestation at Raipur with that of Nagpur location, will be verified in UPN in ensuing *rabi* season (2008-09).

Table 5.2.1.1 Screening of linseed Germplasm for bud fly resistance at Kanpur

Range of bud infestation (%)	Germplasm
Upto 10 (31 entries)	A-95B (127), CI-1385 (447),, EC-1392 (661), EC-1424 (688), EC-9969 (2346), EC-13222 (2349), EC-16381 (751), EC-22529CS (766), EC-22688 (775), EC-22713 (777), EC-22848 (781), EC-41605 (827), EC-41618 (831), EC-41672 (851), EC-99029 (901), EC-278972 (2417), EC-282809 (2424), ES-1463 (936), EX-131-10 (958), GS-9 (981), GS-66 (1001), GS-109 (1011), GS-110 (1012), GS-150 (1026), GS-234 (1073), L-118 (1365), LCK-88311 (1411), LW-281-81 (1436), NP (RR)-66 (1641), NP (RR)-412 (1694), SJKO-11 (2495)
Above 50 (21 entries)	CI-1395 (451), EC-21749 (2352), EC-22684 (774), EC-22909 (785), EC-41583 (2393), EC-41607 (828), EC-41689 (856), EC-41722 (860), Neelum (863), EX-6-3 (953), GS-25 (984), GS-41 (991), GS-49 (994), GS-87 (1007), GS-177 (1040), LMH-379 (1422), LS-3 (1426), NP-29 (1524), NP-125 (1596), NP (RR)-37 (1637), NP (RR)-123 (1659)

NB : Figures in parentheses are germplasm serial number maintained at P.C. Unit (L).

Table 5.2.1.2 Germplasm screening for bud fly resistance

Germplasm		Bud fly Infestation (%)		Germplasm		Bud fly Infestation (%)	
		Raipur	Nagpur			Raipur	Nagpur
Sl. No.	Name	(22-11-2007)	(22-11-2007)	Sl. No.	Name	(22-11-2007)	(22-11-2007)
1701	NP(RR)-429	13.3	35.7	1714	NP(RR)-454	39.4	51.4
1702	NP(RR)-430	26.1	33.0	1715	NP(RR)-455	29.5	49.6
1703	NP(RR)-433	25.0	39.9	1716	NP(RR)-458	19.7	36.6
1704	NP(RR)-435	17.9	47.4	1717	NP(RR)-459	24.4	46.2
1705	NP(RR)-436	25.6	44.5	1718	NP(RR)-460	20.0	57.2
1706	GAURAV	12.8	47.0	1719	NP(RR)-462	28.7	59.0
1707	NP(RR)-437	21.7	60.6	1720	NP(RR)-464	14.3	51.7
1708	NP(RR)-439	32.0	64.4		**NEELUM (SC)**	29.1	61.1
1709	NP(RR)-442	25.0	43.6		**NEELA (RC)**	13.5	33.0
1710	NP(RR)-448	15.2	59.1	1721	NP(RR)-467	10.1	39.1
	NEELUM (SC)	29.1	63.4	1722	NP(RR)-469	15.5	42.0
	NEELA (RC)	12.1	36.5	1723	T-397	23.8	30.2
1711	NP(RR)-449	17.6	46.3	1724	NP(RR)-470	30.0	31.4
1712	NP(RR)-450	26.8	54.4	1725	NP(RR)-481	28.6	43.3
1713	NP(RR)-453	18.6	36.7	1726	NP(RR)-482	19.4	30.0

Germplasm		Bud fly Infestation (%)	
		Raipur	Nagpur
Sl. No.	Name	(22-11-2007)	(22-11-2007)
1727	NP(RR)-484	17.7	44.0
1728	NP(RR)-485	30.8	52.4
1729	NP(RR)-489	8.3	62.7
1730	NP(RR)-490	24.8	45.0
	NEELUM (SC)	28.6	55.3
	NEELA (RC)	15.7	31.7
1731	NP(RR)-494	36.6	38.6
1732	NP(RR)-665	16.2	34.9
1733	NP(RR)-126	15.8	31.1
1734	Nahudera (Hamirpur)	38.2	34.5
1735	NATRA-II	37.5	41.1
1736	OP-2-2	27.8	46.1
1737	OR-1-4	26.2	39.6
1738	OR-1-6	36.8	35.3
1739	OR-2-2	14.3	39.6
1740	OR-3-1	38.5	32.2
	NEELUM (SC)	42.8	63.7
	NEELA (RC)	18.6	27.0
1741	OR-8-38	22.2	35.5
1742	OR-8-44	23.5	32.6
1743	OMER-15	45.5	47.3
1744	P-5	30.8	51.2
1745	P-29	22.0	52.4
1746	P-33	12.7	68.7
1747	P-38	14.3	43.5
1748	P-42	17.3	51.2
1749	NEELUM	28.0	58.6
1750	P-53-3-3	17.8	42.7
	NEELUM (SC)	26.6	58.9
	NEELA (RC)	14.6	31.9
1751	P-142	25.9	30.6
1752	P-650	57.1	49.4
1753	PBNL-12	28.6	62.0
1754	PINK PETAL	27.4	47.1
1755	POLF-2	28.3	38.1
1756	POLF-5	42.4	48.8

Germplasm		Bud fly Infestation (%)	
		Raipur	Nagpur
Sl. No.	Name	(22-11-2007)	(22-11-2007)
1757	POLF-9	31.0	55.9
1758	POLF-11	19.7	39.0
1759	POLF-12	26.7	38.8
1760	POLF-13	19.7	34.7
	NEELUM (SC)	27.1	57.2
	NEELA (RC)	16.1	37.1
1761	POLF-14	12.7	45.0
1762	POLF-15	25.0	43.6
1763	POLF-16	20.8	65.7
1764	POLF-17	20.0	36.4
1765	POLF-19	9.1	52.9
1766	POLF-22	25.4	49.7
1767	POLF-23	27.9	61.1
1768	POLF-24	20.2	51.0
1769	POLF-25	25.2	64.0
1770	POLF-26	19.4	54.9
	NEELUM (SC)	30.3	57.3
	NEELA (RC)	13.7	35.2
1771	POLF-28	23.6	47.6
1772	POLF-29	19.8	68.7
1773	POLF-30	15.9	56.3
1774	POLF-31	18.8	45.5
1775	POLF-33	23.3	67.9
1776	POLF-34	22.9	43.2
1777	POLF-35A	17.1	NG
1778	T-397	25.5	40.5
1779	POLF-36	22.4	50.2
1780	POLF-37	16.0	34.3
	NEELUM (SC)	25.2	60.6
	NEELA (RC)	13.1	30.1
1781	POLF-38	21.9	26.4
1782	POLF-39	22.6	43.9
1783	POLF-40	21.9	46.6
1784	POLF-POONA-10	13.3	53.4
1785	PUNJAB-T-4	18.3	45.3
1786	GAURAV	11.3	41.3

Germplasm		Bud fly Infestation (%)	
		Raipur	Nagpur
Sl. No.	Name	(22-11-2007)	(22-11-2007)
1787	PUNJAB-T-50	21.5	64.5
1788	PURI LOCAL	23.0	61.2
1789	PUSA-9	18.0	34.2
1790	PUSA-10	22.5	37.7
	NEELUM (SC)	30.0	51.4
	NEELA (RC)	21.2	29.7
1791	R-1	21.2	65.0
1792	R-2	20.5	47.2
1793	R-4	26.2	57.6
1794	R-5-6	16.6	62.2
1795	R-5-75	17.8	43.3
1796	R-6	23.8	34.6
1797	R-7	26.5	34.4
1798	R-10	17.5	47.6
1799	R-17	22.6	38.9
1800	R-20	27.3	42.4
	NEELUM (SC)	32.9	55.4
	NEELA (RC)	18.7	30.9

5.2.2 Uniform pest nursery trial for bud fly resistance in linseed

Thirty promising genotypes of linseed, selected from the previous year results on bud fly reaction in different screening trials conducted at multi-locations, were evaluated under delayed sowing with checks *i.e.* Neelum (SC) and Neela (RC) sown after ten entries of test material. Each entry was sown in paired rows of 3 m length at 30 cm row distance. Bud fly infestation (%) was recorded at dough stage of the crop on 5 randomly selected plants/entry. The trial could not be conducted at Mauranipur and Berhampore locations. Results received from different centres are portrayed in Table 5.2.2.1 to 5.2.2.3 and discussed centre-wise as under:

Kanpur (P.C. Unit)

Bud infestation varied between 10.2 (JRF-5) to 27.6% (RLC-106) and four entries namely EC-1424, GS-234, JRF-5 and NP-85 showed up to 15% bud fly infestation. Only five genotypes were infested above 25% by this pest.

Faizabad

Five genotypes *viz.* IC-15888, JRF-5, LCK-5021, NDL-2004-05 and RLC-106 exhibited up to 10% bud infestation, while 25 entries were recorded between > 10-25% infestation range. Neelum (SC) was infested between 20.3-21.7% showing low pressure of the pest.

Rewa

A number of 3, 22 and 5 test entries were catagorized in group of upto 10, > 10-25 and > 25-50% bud infestation, respectively, wiith a range of bud fly infestation between 6.8 (NP-72) to 46.2% (JLT-204).

Kota

Nineteen entries showed below 10% bud infestation, while remaining 11 genotypes ranged between > 10-25% bud infestation. The location received low incidence of this pest, as maxiimum bud infestation was recorded to be 23.9% on NP-30K.

Table 5.2.2.1 Uniform Pest Nursery for bud fly reaction in linseed at different locations

Sl. No.	Entries	Bud Fly infestation (%)					
		Kanpur	Faizabad	Rewa	Kota	Raipur	Nagpur
1.	CI-1385	17.1	10.1	12.0	13.1	17.2	40.1
2.	EC-1392	15.5	12.8	10.4	4.1	21.0	45.4
3.	EC-1424	11.2	13.1	17.8	9.7	33.6	35.5
4.	GS-234	12.6	14.3	15.2	16.4	20.9	24.6
5.	IC-15888	19.3	5.7	12.6	7.8	8.3	23.5
6.	Jawahar-1	16.7	13.7	23.0	6.3	17.2	47.0
7.	JLS-9	19.2	19.3	17.0	8.0	18.8	27.9
8.	JLT-204	20.4	14.8	46.2	11.4	13.4	35.1
9.	JRF-5	10.2	6.8	13.3	18.9	8.8	23.8
10.	LCK-5021	23.0	8.1	11.1	6.2	12.8	43.5
	Neelum (SC)	37.8	21.7	26.3	23.3	34.7	52.0
	Neela (RC)	13.6	5.2	12.9	5.6	14.2	26.4
11.	NDL-2004-05	22.3	8.3	18.8	13.6	29.3	53.2
12.	NDL-2005-16	25.1	12.8	16.7	10.6	25.8	51.6
13.	NL-119	20.6	15.3	19.2	12.3	27.2	23.0
14.	NP-5K	25.7	14.8	9.6	7.6	25.0	34.8
15.	NP-8	19.5	13.6	14.0	9.5	24.6	28.8
16.	NP-22	24.1	12.9	11.4	7.8	20.0	59.3
17.	NP-30K	26.6	11.7	32.3	23.9	38.5	30.5
18.	NP-42	21.8	13.2	18.3	7.8	26.6	40.7
19.	NP-72	20.3	10.7	6.8	4.2	16.6	34.6
20.	NP-84	20.1	12.8	30.7	6.0	32.1	37.2
	Neelum (SC)	38.7	20.3	26.0	23.5	33.4	56.0
	Neela (RC)	15.3	6.2	10.2	4.0	16.2	29.4
21.	NP-85	14.7	13.2	12.5	7.6	20.0	21.3
22.	NP-87	18.2	12.8	10.2	6.4	18.1	30.7
23.	NP-96	24.1	16.7	27.1	10.7	25.3	45.5
24.	NP-102	24.9	17.1	14.5	7.6	19.1	31.2
25.	NP-103	20.1	15.3	11.5	14.8	18.0	33.0
26.	NP-119	25.6	12.2	25.6	8.2	26.0	40.2
27.	Neelum	34.7	20.7	20.7	23.3	22.2	50.0
28.	RLC-95	20.8	12.9	17.8	7.9	18.6	44.3
29.	RLC-106	27.6	8.3	8.9	7.5	23.6	45.4
30.	SLS-66	21.1	11.2	11.1	8.0	33.0	54.0
	Neelum (SC)	40.2	21.2	31.3	-	35.6	57.0
	Neela (RC)	12.4	4.8	10.3	-	13.2	32.1

Table 5.2.2.2 Summary of UPN entries for bud fly infestation

Sl. No.	Particulars	Kanpur	Faizabad	Rewa	Kota	Raipur	Nagpur
1.	Sowing date	9-12-07	17-11-07	17-11-07	21-11-07	21-11-07	22-11-07
2.	No. of entries	30	30	30	30	30	30
3.	Bud infestation (%)						
	Minimum	10.2 (JRF-5)	5.7 (IC-15888)	6.8 (NP-72)	4.1 (EC-1392)	8.3 (IC-15888)	21.3 (NP-85)
	Maximum	27.6 (RLC-106)	19.3 (JLS-9)	46.2 (JLT-204)	23.9 (NP-30K)	38.5 (NP-30K)	59.3 (NP-22)
4.	Catagorization						
	Up to 10%	0	5	3	19	2	0
	> 10-15%	4	2	12	7	2	0
	> 15-25%	21	5	10	4	16	5
	> 25-50%	5	0	5	0	10	20
	> 50%	0	0	0	0	0	5
5.	Checks status						
	Neela (RC)	12.4-15.3	4.8-6.2	10.2-12.9	4.0-5.6	13.2-16.2	26.4-32.1
	Neelum (SC)	37.8-40.2	20.3-21.7	26.0-31.3	23.3-23.5	33.4-35.6	52.0-57.0

Table 5.2.2.3 Status of linseed genotypes in UPN showing upto 10% bud infestation at different locations

Sl. No.	Entries	Bud fly infestation (%)*					
		< 10%	> 10-15%	> 15-25%	> 25-50%	> 50%	Range
1.	IC-15888	2	1	2	-	-	5.7-23.5
2.	JRF-5	2	2	1	-	-	6.8-23.8
3.	LCK-5021	1	2	1	1	-	8.1-43.5
4.	NDL-2004-05	1	1	2	1	1	8.3-53.2
5.	NP-5K	1	1	1	2	-	9.6-34.8
6.	NP-72	1	1	2	1	-	6.8-34.6
7.	RLC-106	2	-	1	2	-	8.3-45.4

* Based on Kanpur, Faizabad, Rewa, Raipur and Nagpur Locations.

Raipur

Only two entries namely IC-15888 and JRF-5 were noticed having less than 10% bud infestation, while 18 and 10 genotypes received between > 10-25 and > 25-50% bud infestation, respectiely. Highest bud infestation (38.5%) was observed on NP-30K, against 33.4-35.6% infestation on Neelum (SC).

Nagpur

This location received higher incidence of bud fly, as minimum bud infestation was noticed to be 21.8% on NP-85. Five entries *i.e.* GS-234, IC-15888. JRF-5, NL-119 and NP-85 showed > 10-25% infestation, while 20 and 5 lines had > 25-50 and > 50% bud infestation, respectively. Entry NP-22 was observed having maximum infestation being 59.3 per cent.

Linseed genotype JRF-5, IC-15888, NP-72, EC-1392 and NP-85 were noticed having minimum bud fly infestation at Kanpur, Faizabad and Raipur, Rewa, Kota and Nagpur locations, respectively, while RLC-106 (Kanpur), JLS-9 (Faizabad), JLT-204 (Rewa), NP-30K (Kota and Raipur) and NP-22 (Nagpur) showed the highest bud infestation. Faizabad and Kota locations had lower incidence of this pest in comparison to other centres, while the crop was sown in 3rd week of November at all the locations except Kanpur (Table 5.2.2.2). A number of 5, 3, 19 and 2 genotypes were found having up to 10%bud infestation at Faizabad, Rewa, Kota and Raipur centres, respectively but Kota showing large number of genotypes in this catagory was not considered for further extraction.

Seven genotypes namely IC-15888, JRF-5, LCK-5021, NDL-2004-05, NP-5K, NP-72 and RLC-106 were selected as promising material based on their multi-location reaction to bud fly (Table 5.2.2.3). These seven lines will be retested under UPN in next cropping season (2008-09) for their reaction to bud fly.

5.2.3 Testing of breeding material for bud fly resistance

This experiment was allotted to Kanpur (P.C. Unit), Faizabad, Mauranipur, Berhampore, Rewa, Kota, Raipur and Nagpur locations, but Mauranipur and Berhampore centres did not execute the same. Seventy genotypes of IVT/AVT trials including the check entries were screened at aforesaid locations for bud fly reaction. single rows of test entries were sown during second fortnight of November along with Neelum (SC) and Neela (RC) Planted as checks for bud fly screening after each ten test genotypes. The results on bud fly infestation observed at dough stage of the crop are being presented in Table-5.2.3.1 to 5.2.3.3 and centre-wise discussion is as under :

Kanpur

None genotype could show less than 10% bud infestation on Dec. 4, 2007 sown crop. However, entry LMS-63-6 received minimum bud infestation (15.3%) against maximum being 40.3% on BAU-06-11. A total of 26 and 44 entries were grouped into > 10-25 and > 25-50% bud infestation, respectively.

Faizabad

Eleven entries *viz.* LCK-6028, NDL-2004-05, OLC-10, PKDL-65, RLC-117, JLS-9, LC-54, Parvati, R-552, Sheela and Surabhi received up to 10% bud infestation, while remaining 59 genotypes faced > 10-25% bud damage being maximum 15.1% on LC-2279-4.

Rewa

Bud fly infestation ranged between 4.6 (PKDL-75) to 49.6% (SLS-71) and 10, 38 and 22 genotypes were grouped in the categories of up to 10, > 10-25 and > 25-50% bud infestation, respectively.

Kota

Out of 70 entries, 36 and 34 genotypes were infested in the range of up to 10 and > 10-25% bud infestation, which indicated low incidence of this pest.

Table 5.2.3.1 Screening of breeding material (IVT/AVT entries) for bud fly resistance at multi-locations

Sl. No.	Entries	Bud fly Infestation (%)					
		Kanpur	Faizabad	Rewa	Kota	Raipur	Nagpur
		(4-12-07)	(17-11-07)	(17-11-07)	(21-11-07)	(27-11-07)	(22-11-07)
1.	BAU-06-3	22.5	12.4	9.9	4.0	27.5	24.3
2.	BAU-06-4	29.4	15.0	31.3	8.1	30.8	37.9
3.	BAU-06-6	20.7	11.7	13.3	10.6	4.8	47.5
4.	BAU-06-7	34.1	13.8	33.3	6.1	38.1	52.5
5.	BAU-06-11	40.3	14.6	37.1	19.0	47.8	57.9
6.	BAU-06-12	20.7	12.8	14.8	6.9	16.4	37.6
7.	BAU-06-14	27.1	11.7	26.2	8.2	25.0	34.0
8.	BAU-06-15	19.5	14.3	11.1	6.9	20.2	44.8
9.	BAU-06-16	25.2	10.8	26.8	8.2	26.9	60.6
10.	BAU-06-17	18.6	13.9	5.0	5.9	11.7	20.9
	NEELUM (SC)	39.7	20.8	32.2	22.8	32.5	66.9
	NEELA (RC)	12.5	6.2	16.1	5.5	14.0	35.4
11.	JLT-27	28.3	12.3	17.4	14.9	32.6	70.7
12.	JLT-204	21.9	14.5	10.4	9.7	15.0	69.8
13.	JLT-215	25.8	13.8	8.9	5.4	15.4	63.8
14.	KL-232	29.3	12.6	32.9	16.3	21.0	79.1
15.	LC-2279-4	30.0	15.1	27.7	4.0	34.5	40.1
16.	LCK-5021	25.7	10.1	6.5	3.8	15.4	42.8
17.	LCK-6028	24.5	9.3	17.7	3.6	14.3	47.7
18.	LCK-7002	21.7	11.2	26.9	7.6	44.4	49.0
19.	LCK-7034	19.5	12.1	15.2	5.7	21.1	42.2
20.	LCK-7035	28.3	10.6	13.9	5.5	34.5	43.2
	NEELUM (SC)	41.6	20.8	26.5	22.2	31.0	52.1
	NEELA (RC)	15.2	6.2	10.1	5.4	14.6	29.1
21.	LCP-146	29.5	13.1	27.0	11.9	46.0	37.4
22.	LMS-149-4	22.8	14.2	17.3	9.7	18.8	38.5
23.	LMS-23-6	25.8	10.7	17.6	14.9	28.8	37.1
24.	LMS-63-6	15.3	11.3	8.7	4.2	19.8	40.8
25.	LMS-95-4	26.1	12.6	32.2	3.7	22.8	45.2
26.	LMS-P-3	28.4	13.1	22.2	18.7	29.0	35.1
27.	LMS-P-5	27.0	10.8	23.8	13.8	13.0	42.6
28.	NDL-2004-05	19.8	9.6	8.3	6.6	25.0	53.9
29.	NDL-2005-17	21.5	12.1	36.4	4.1	16.7	57.4
30.	NDL-2005-24	17.8	14.2	11.1	7.7	14.6	51.2
	NEELUM (SC)	42.5	19.8	22.8	23.3	26.9	58.1
	NEELA (RC)	13.9	8.1	19.5	5.9	20.0	34.3

Sl. No.	Entries	Bud fly Infestation (%)					
		Kanpur	Faizabad	Rewa	Kota	Raipur	Nagpur
		(4-12-07)	(17-11-07)	(17-11-07)	(21-11-07)	(27-11-07)	(22-11-07)
31.	NDL-2005-26	32.4	14.2	14.0	13.1	38.0	49.2
32.	NDL-2005-29	26.0	13.8	18.2	11.8	21.7	54.6
33.	NDL-2005-34	30.2	11.1	9.3	9.5	26.1	60.0
34.	NL-260	19.7	10.2	22.7	10.7	23.5	24.0
35.	OLC-10	24.0	8.1	24.6	8.4	17.1	43.8
36.	PCL-1-06	29.2	11.3	23.9	10.3	21.8	45.7
37.	PCL-12-3-06	34.0	12.1	34.1	10.1	35.5	54.3
38.	PCL-35-06	26.7	13.2	18.6	7.7	19.4	49.9
39.	PKDL-52	19.8	10.3	13.0	6.4	24.0	57.8
40.	PKDL-62	31.9	11.3	25.5	13.4	29.3	73.3
	NEELUM (SC)	40.1	19.6	24.5	23.1	30.0	60.4
	NEELA (RC)	11.9	7.8	23.2	4.2	14.5	37.5
41.	PKDL-65	29.5	8.9	36.4	20.8	19.1	49.2
42.	PKDL-71	20.8	13.7	8.4	11.1	21.2	57.4
43.	PKDL-72	27.5	10.8	15.3	9.4	25.5	44.2
44.	PKDL-73	24.7	12.6	19.4	13.8	25.0	48.0
45.	PKDL-74	26.3	11.8	19.7	11.1	21.3	53.3
46.	PKDL-75	20.8	10.3	4.6	8.3	16.7	61.4
47.	RLC-114	25.9	12.3	18.1	9.1	22.2	44.6
48.	RLC-116	31.7	11.6	19.2	15.3	24.9	51.4
49.	RLC-117	23.2	8.1	17.6	18.9	20.0	49.4
50.	RLC-121	21.9	10.7	18.7	14.6	28.6	61.5
	NEELUM (SC)	37.4	18.8	37.1	25.0	32.8	63.2
	NEELA (RC)	14.6	6.9	16.1	5.5	12.2	31.8
51.	SLS-66	19.5	12.3	27.5	7.8	13.2	33.7
52.	SLS-71	30.0	11.6	49.6	7.8	12.5	51.5
53.	BANER	21.7	14.2	5.7	19.5	35.7	37.6
54.	J-23-10	29.8	10.7	28.4	11.8	23.1	35.4
55.	JLS-9	24.2	9.2	13.4	8.4	19.4	28.0
56.	NEELUM	45.3	19.8	19.7	24.2	29.1	53.3
57.	KIRAN	24.9	11.2	28.6	19.3	14.0	47.4
58.	LC-54	30.2	9.8	32.9	3.6	40.0	37.8
59.	MEERA	22.5	13.6	20.2	12.7	19.2	51.4
60.	NAGARKOT	31.6	10.2	32.5	23.6	43.9	45.2
	NEELUM (SC)	43.9	20.9	24.4	24.5	35.1	51.8
	NEELA (RC)	15.4	8.1	13.5	4.3	15.2	30.6

Sl. No.	Entries	Bud fly Infestation (%)					
		Kanpur	Faizabad	Rewa	Kota	Raipur	Nagpur
		(4-12-07)	(17-11-07)	(17-11-07)	(21-11-07)	(27-11-07)	(22-11-07)
61.	NL-97	27.6	11.3	11.5	9.6	19.7	49.4
62.	PADMINI	29.8	10.7	12.4	9.3	19.1	27.2
63.	PARVATI	27.5	8.2	25.1	8.2	13.2	33.5
64.	R-552	34.7	9.8	12.4	16.0	27.3	49.4
65.	SHEELA	31.5	7.9	25.1	21.9	16.7	56.2
66.	SHEKHAR	28.2	11.1	15.8	10.6	26.3	52.1
67.	NEELUM	37.9	20.3	23.2	21.9	25.0	71.0
68.	SURABHI	35.1	9.8	17.3	19.2	42.1	71.8
69.	SUYOG	30.6	13.3	26.0	10.6	26.3	39.2
70.	T-397	31.7	14.1	7.0	15.5	25.1	50.6
	NEELUM (SC)	45.8	18.3	NR	NR	27.6	61.7
	NEELA (RC)	14.3	6.1	NR	NR	12.7	31.9

Table 5.2.3.2 Summary of breeding material for bud fly reaction at multi-locations

Sl. No.	Particulars	Kanpur	Faizabad	Rewa	Kota	Raipur	Nagpur
1.	Sowing date	4-12-07	17-11-07	17-11-07	21-11-07	21-11-07	22-11-07
2.	Bud infestation (%)						
	Minimum	15.3	7.9	4.6	3.6	4.8	20.9
		(LMS-63-6)	(Sheela)	(PKDL-75)	(LCK-6028)	(BAU-06-6)	(BAU-06-17)
	Maximum	40.3	15.1	49.6	23.6	47.8	79.1
		(BAU-06-11)	(LC-2279-4)	(SLS-71)	(Nagarkot)	(BAU-06-11)	(KL-232)
3.	Catagorization						
	Up to 10%	0	11	10	36	1	0
	> 10-25%	26	59	38	34	42	3
	> 25-50%	44	0	22	0	27	39
	> 50%	0	0	0	0	0	28
4.	Checks status						
	Neelum (SC)	37.4-45.8	18.3-20.9	22.8-37.1	22.2-25.0	26.9-35.1	51.8-66.9
	Neela (RC)	11.9-15.4	6.1-8.1	10.1-23.2	4.2-5.9	12.2-20.0	29.1-37.5

Raipur

Only one genotype *i.e.* BAU-06-6 had less than 10% bud fly infestation, while 42 and 27 entries were grouped into > 10-25 and > 25-50% bud infestation category. Some entries like BAU-06-7, BAU-6-11, LCK-7002, LCP-146, NDL-2005-26, Nagarkot and Surabhi had higher bud infestation than the susceptible check (Neelum).

Table 5.2.3.3 Status of IVT/AVT genotypes of linseed showing up to 10% bud infestation at different locations

Sl. No.	Entries	Bud fly infestation (%)*				
		up to 10	> 10-25	> 25-50	> 50%	Range
1.	BAU-06-3	1	3	1	-	9.9-27.5
2.	BAU-06-6	1	3	1	-	4.8-47.5
3.	BAU-06-17	1	4	-	-	5.0-20.9
4.	JLT-215	1	2	1	1	8.9-63.8
5.	LCK-5021	1	2	2	-	6.5-42.8
6.	LCK-6028	1	3	1	-	9.3-47.7
7.	NDL-2004-05	2	2	-	1	8.3-53.9
8.	NDL-2005-34	1	1	2	1	9.3-60.0
9.	OLC-10	1	3	1	-	8.1-43.8
10.	PKDL-65	1	1	3	-	8.9-49.2
11.	PKDL-71	1	3	-	1	8.4-57.4
12.	PKDL-75	1	3	-	1	4.6-61.4
13.	RLC-117	1	3	1	-	8.1-49.4
14.	Baner	1	2	2	-	5.7-37.6
15.	JLS-9	1	3	1	-	9.2-28.0
16.	LC-54	1	-	4	-	9.8-40.0
17.	Parvati	1	1	3	-	8.2-33.5
18.	R-552	1	1	3	-	9.8-49.4
19.	Sheela	1	1	2	1	7.9-56.2
20.	Surabhi	1	1	2	1	9.8-71.8
21.	T-397	1	1	2	1	7.0-50.6

*Based on Kanpur, Faizabad, Rewa, Raipur and Nagpur locations

Nagpur

Due to high incidence of bud fly, none genotype had less than 10% bud infestation. Only three entries *viz.* BAU-06-3, BAU-06-17 and NL-260 received bud damage between > 10-25 per cent, while 39 and 28 genotypes reacted in the group of > 25-50 and > 50 per cent bud infestation, respectively.

It is clear from the data on bud fly infestation at multi-location that it varied between 15.3-40.3, 7.9-15.1, 4.6-49-6, 3.6-23.6, 4.8-47.8 and 20.9-79.1 per cent at Kanpur, Faizabad, Rewa, Kota, Raipur and Nagpur, respectively (Table 5.2.3.2). A total of 11, 10, 36 and 1 entries showed up to 10% bud fly infestation at Faizabad, Rewa, Kota and Raipur locations, respectively. However, more than half of tried entries received up to 10% bud infestation at Kota, while none genotype could be grouped in this category at Kanpur and Nagpur centres. Only 13 entries namely BAU-06-3, BAU-06-6, BAU-06-17, JLT-215, LCK-5021, LCK-6028, NDL-2004-05, NDL-2005-34, OLC-10, PKDL-65, PKDL-71, PKDL-75 and RLC-117 showed up to 10% bud fly infestation at any location of Faizabad, Rewa and Raipur (Table-5.2.3.3). Eight check

entries also showed better performance against bud fly. Out of aforesaid thirteen genotypes, three entries *viz.* BAU-06-3, BAU-06-17 and JLS-9 (check) performed better in comparison to others showing 9.9-27.5, 5.0-20.9 and 9.2-28.0% bud infestation, respectively. Based on these results, the performance of above mentioned thirteen genotypes (BAU-06-3, BAU-06-6, BAU-06-17, JLT-215, LCK-5021, LCK-6028, NDL-2004-05, NDL-2005-34, OLC-10, PKDL-65, PKDL-71, PKDL-75 and RLC-117) will be verified in UPN at multi-location in forthcoming *rabi* season i.e. 2008-09.

Results of screening of linseed genotypes under germplasm evaluation, UPN and breeding material against bud fly revealed that 8, 7 and 13 entries showed promising performance in respective trials. Thus, a total of 26 genotypes excluding the common entries will constitute the UPN for the next cropping season i.e. 2008-09. These entries are BAU-06-3, BAU-06-6, BAU-06-17, IC-15888, JLT-215, JRF-5, LCK-5021, LCK-6028, NDL-2004-05, NDL-2005-34, NP-5K, NP-72, NP (RR)-430, NP (RR)-470, NP (RR)-482, OLC-10, OR-8-44, P-142, PKDL-65, PKDL-71, PKDL-75, Polf-13, Polf-38, R-17, RLC-106 and RLC-117.

5.3 Economic injury level of bud fly in linseed

This experiment was executed at all the locations except Mauranipur. The trial, comprising seven treatments of weekly exposure periods from bud initiation stage replicated thrice, was conducted in Randomized Block Design on linseed variety Neelum. Different levels of bud fly infestation were created by exposing the crop to the pest and then protection of the crop by dimethoate 30 EC @ 0.04% at Raipur and monocrotophos 36 SL @ 0.04% at Nagpur. Bud fly infestation at dough stage and seed yield at harvest were recorded and analysed statistically. Results are being described as under :

Raipur

Weekly exposure of crop to bud fly revealed a positive relationship with bud infestation resulting in reduction of seed yield (Table 5.3.1). Significantly highest seed yield (1635.4 kg/ha) and lowest bud fly infestation (9.1%) was noticed on completely protected crop having no exposure of the crop to bud fly, against lowest seed yield (1041.9 kg/ha) with maximum bud infestation (35.5%) from untreated linseed with full exposure to the pest. Relationship between bud fly infestation (x) and seed yield (y) was established as $y = 1871.71 - 25.1 x$ and economic injury level was calculated being 1.6% bud infestation. Considering unavoidable bud infestation, the actual EIL was determined to be 10.7% bud infestation for two application of dimethoate 30 EC on linseed cv Neelum.

Nagpur

Different levels of bud fly infestation were created by applying monocrotophos 36 SL (0.04%) on linseed variety Neelum sown on Nov. 5, 2007 (Table 5.3.1). Regression equation between bud infestation (x) and seed yield (y) was determined to be $y = 1250.86 - 14.77 x$ and economic injury level was calculated as 1.6% bud infestation. Considering the unavoidable bud infestation of 9.5 per cent, actual EIL was fixed at 11.1 per cent.

It can be inferred from the above cited results on EIL of bud fly in linseed that 10.7 and 11.1 per cent bud infestation in linseed cv Neelum was established for Raipur and Nagpur locations, respectively.

Table 5.3.1 Economic injury level of bud fly in linseed at multi-locations

No. of Sprays	Exposure period (days)	Bud fly infestation (%)		Seed yield (kg/ha)	Computation of EIL
			Raipur		
6	0	9.1	(17.5)	1635.4	1. Gain threshold = 985 ÷ 25 = 39.4 kg/ha
5	7	12.4	(20.5)	1512.7	2. Yield (y) = 1817.71 – 25.12 x (bud inf.)
4	14	16.4	(23.9)	1370.3	3. Calculated EIL = 39.4 ÷ 25.12 = 1.6%
3	21	18.9	(25.8)	1309.3	4. Unavoidable bud infestation = 9.1%
2	28	21.7	(27.7)	1264.0	5. Actual EIL = 10.7% bud infestation
1	35	26.5	(30.9)	1136.0	
0	42	35.5	(34.8)	1041.9	
	SE (m) ±		0.6	61.7	
	CD (P = 0.05)		1.8	190.3	
			Nagpur		
6	0	9.5	(18.0)	1210	1. Gain threshold = 776 ÷ 32 - 24.25 kg/ha
5	7	14.2	(22.2)	1078	2. Yield (y) = 1250.86 – 14.77 x (bud inf.)
4	14	16.8	(24.0)	916	3. Calculated EIL = 24.25 ÷ 14.77 = 1.6%
3	21	21.5	(27.6)	866	4. Unavoidable bud infestation = 9.5%
2	28	27.8	(31.8)	794	5. Actual EIL = 11.1% bud infestation
1	35	38.4	(38.3)	712	
0	42	46.1	(42.8)	605	
	SE (m) ±		0.8	42.5	
	CD (P = 0.05)		2.5	127.0	

NB : Figures in parentheses are angular transformed values.

5.4 Integrated management of bud fly in linseed under rain fed / irrigated agro-ecosystem

This experiment cosisting sixteen treatment combinations was allotted to Kanpur (P.C. Unit), Mauranipur, Raipur and Nagpur, which could not be executed at Mamanipur. The treatment comprising three factors *i.e.* agronomic practices, sowing time and plant protection measures were replicated thrice in RBD with factorial arrangements. Treatment details are as under :

1. Agronomic practices (2)

A_1 Farmers practice (Broadcasting of old variety *i.e.* Neelum (Kanpur), R-552 (Raipur) and Kiran (Nagpur) with no inputs)

A_2 Improved practices (Line sowing of high yielding improved variety (Shekhar) for irrigated conditions at Kanpur with recommended dose of fertilizer and two irrigation at 35 and 70 DAS, while Padmini and Shekhar for Raipur and Nagpur for rainfed practices with RDF, respectively.

2. Sowing time (2)

S_1 Optimum sowing time

S_2 Two weeks delayed sowing

3. Plant protection measures (4)

P_0 No plant protection

P_1 Need based application of insecticide (imidacloprid 200 SL @ 100 ml/ha)

P_2 First spray of insecticide (imidacloprid 200 SL) and second application of botanical (tobacco leaf extract @ 0.5%)

P_3 First spray of botanical and second spray of insecticide.

A uniform application of mancozeb @ 0.25% was also made at bud initiation stage for Alternaria bud flight management. Data on biotic constraints and seed yield were recorded for further analysis. Centre-wise achievements are described as under :

Kanpur (PC Unit)

All the three factors of crop management proved their significance in lowering the bud fly infestation as well as enhancing the seed yield (Table 5.4.1). Significantly lowest bud fly (19.9%) and maximum seed yield (1472 kg/ha) were recorded in improved practices, against maximum bud infestation (30.6%) and lower yield (1261.8 kg/ha) in farmers practices. Role of sowing time of linseed was very clear on insect-pests and seed production, as crop sown at optimum time showed less bud infestation (20.7%) with higher yield (1448.6 kg/ha) in comparison to delayed sowing time with higher bud infestation (29.8%) and lower yield (1285.2 kg/ha). First spray of botanical followed by insecticide (P_3) proved its superiority over other protection schedules showing significantly minimum bud infestation (14.6%) and maximum yield (1658.3 kg/ha).

Raipur

Independent effect of agronomic practice, sowing schedule and plant protection are depicted due to insignificant effect of their interactions (Table 5.4.2). Improved practices in linseed cultivation proved better with 15.1 and 22.0 per cent wilt and bud fly infestation giving higher seed yield being 553.6 kg/ha, respectively, Delayed sowing of crop decreased wilt incidence, but enhanced the bud fly infestation. Crop sown at optimum time provided significantly superior yield (439.1 kg/ha) with 20.4% bud infestation and 30.3% wilt incidence. Among plant protection schedule, application of tobacco leaf extract followed by insecticide was found best providing higher seed yield (459.3 kg/ha) and lower damage by wilt (24.3%) and bud fly (19.8%).

Nagpur

Significantly lower bud fly infestation (28.4%) with higher yield (489.79 kg/ha) were recorded in improved practices of linseed cultivation in comparison to farmers practices (Table 5.4.3). Optimum time sown crop showed significantly minimum bud damage (22.6%) with higher seed production (411.87 kg/ha), while late sown linseed harbored higher bud fly infestation (32.8%) but produced higher yields (414.34 kg/ha). Application of tobacco leaf extract followed by monocrotophos 36 SL @ 0.04% (P_3) and vice-versa (P_2) showed 28.7 and 30.4% bud infestation and 473.41 and 443.41 kg/ha seed yield, respectively.

It can be inferred from the above cited results that cultivation of linseed under improved production technologies and two fortnightly sprays of either tobacco leaf extract and insecticide (imidacloprid 200 SL @ 100 ml/ha / monocrotophos 36 SL @ 0.04%) provided lower bud fly infestation with higher seed production under rainfed / irrigated conditions at Kanpur, Raipur and Nagpur locations.

Table 5.4.1 Effect of crop management practices on bud fly infestation and seed yield of linseed at Kanpur

Agronomic practice / Sowing time	Plant protection schedule				
	P_0	P_1	P_2	P_3	Mean
	Bud fly infestation (%)				
Farmers practice (A_1)	43.5	35.8	24.3	20.6	30.6
	(41.3)	(36.7)	(29.5)	(27.0)	(33.6)
Improved practice (A_2)	32.4	24.3	16.5	9.5	19.9
	(34.7)	(29.5)	(23.9)	(17.9)	(26.5)
Mean	37.9	29.8	20.2	14.6	25.2
	(38.0)	(33.1)	(26.7)	(22.5)	(30.1)
Optimum sowing (S_1)	29.8	22.3	15.4	16.6	20.7
	(33.1)	(28.2)	(23.1)	(24.0)	(27.1)
Delayed sowing (S_2)	46.3	37.9	25.5	12.8	29.8
	(42.9)	(38.0)	(30.3)	(21.0)	(33.1)
Mean	37.9	29.8	20.2	14.6	25.2
	(38.0)	(33.1)	(26.7)	(22.5)	(30.1)
	Seed yield (kg/ha)				
Formers Practice (A_1)	735.8	1211.7	1500.0	1600.0	1261.8
Improved practice (A_2)	1134.7	1414.4	1622.2	1716.6	1472.0
Mean	935.2	1313.1	1561.1	1658.3	1366.9
Optimum sowing (S_1)	1105.6	1435.0	1585.5	1668.2	1448.6
Delayed sowing (S_2)	764.9	1191.1	1536.7	1648.4	1285.2
Mean	935.2	1313.1	1561.1	1658.3	1366.9

Factors	**Bud fly infestation (%)**		**Seed yield (kg/ha)**	
	SE (m) ±	**CD at 5%**	**SE (m) ±**	**CD at 5%**
Agronomic practice (A)	0.37	1.06	40.37	116.19
Sowing time (S)	0.37	1.06	40.37	116.19
Plant protection (P)	0.53	1.55	57.11	164.36
AXP	0.74	2.13	80.74	NS

Table 5.4.2 Effect of different management on bud fly infestation wilt incidence and seed yield of linseed at Raipur

Treatment	Wilt mortality (%)	Bud fly infestation (%)	Seed yield (kg/ha)
	Agronomic Practice		
Farmers practice (A_1)	35.4 (36.2)	25.2 (30.0)	262.1
Improved practice (A_2)	15.1 (22.8)	22.0 (27.8)	553.6
SE (m) ±	1.04	0.28	15.6
CD 5%	3.02	0.83	45.1
	Sowing schedule		
Optimum sowing (S_1)	30.3 (32.7)	20.4 (26.6)	439.1
Delayed sowing (S_2)	20.2 (26.3)	26.9 (31.1)	376.6
SE (m) ±	1.04	0.28	15.6
CD 5%	3.02	0.83	45.1
	Plant Protection		
P_0	26.0 (30.1)	30.0 (33.1)	334.2
P_1	23.9 (28.4)	25.1 (30.0)	384.6
P_2	26.9 (30.6)	19.6 (26.2)	453.2
P_3	24.3 (29.0)	19.8 (26.3)	459.3
SE (m) ±	1.48	0.40	22.0
CD 5%	4.28	1.17	63.8

NB : Figures in parentheses are angular transformed values.

Table 5.4.3 Effect of management practices on bud fly infestation and seed yield of linseed at Nagpur

Agronomic practice / Sowing time	Plant protection				
	P_0	P_1	P_2	P_3	Mean
	Bud fly infestation (%)				
Farmers practice (A_1)	37.19	35.10	32.89	30.59	33.94
Improved practice (A_2)	30.40	28.82	27.91	26.74	28.47
Mean	33.80	31.97	30.40	28.67	
Optimum sowing (S_1)	31.96	30.94	28.57	27.18	22.64
Delayed sowing (S_2)	35.63	33.09	32.23	30.15	32.77
Mean	33.80	31.97	30.40	28.67	
	Seed yield (kg/ha)				
Formers practice (A_1)	262.83	302.41	385.89	390.84	335.80
Improved practice (A_2)	434.13	468.15	500.92	555.35	489.79
Mean	349.41	385.28	443.41	473.71	
Optimum sowing (S_1)	350.64	388.99	444.65	462.58	411.87
Delayed sowing (S_2)	348.79	382.18	442.17	484.22	414.34
Mean	349.41	385.28	443.41	473.71	
Factor	**Bud fly infestation (%)**		**Seed yield (kg/ha)**		
	S.E. (m) ±	**C.D. 5%**	**S.E. (m) ±**	**C.D. 5%**	
Agronomic practice (A)	0.45	1.30	14.71	42.05	
Sowing time (S)	0.45	1.30	14.71	42.05	
Plant protection (P)	0.64	1.83	20.77	59.99	

5.5 Effect of intercropping on bud fly infestation in linseed

The experiment was allotted to Kanpur (P.C. Unit), Mauranipur, Raipur and Nagpur locations, but it could not be executed at Mauranipur. Linseed was intercropped with wheat, chickpea and lentil at Kanpur and Raipur, whereas lentil was not included at Nagpur. All the crop combinations were in 2 : 2, 4 : 4 and 6 : 4 row ratio along with sole crops. But fly infestation (%) was recorded at dough stage on randomly selected 5 plants / replication. Yield was recorded after harvesting of both the crops and linseed equivalent yield (LEY) was calculated based on the market price. Net monetary return (NMR) was calculated to find out the best crop combination. Centre-wise results are being doscribed as under :

Kanpur (P.C. Unit)

Significantly lowest bud fly infestation being 24.5% was observed on linseed + lentil (6 : 4), which had no significant difference with all other intercrop combinations except wheat + linseed (2 : 2). Gram + linseed in different row ratio provided higher net monetary return ranging Rs. 43593-43150/ha, which can be adopted for cultivation of linseed particularly in rain fed areas (Table 5.5.1).

Raipur

Non-significant differences in bud fly infestation were noticed in different combinations (Table 5.5.2). However, numerically lowest bud fly infestation being 18.47% was recorded in wheat + linseed (6 : 4), against the maximum of 24.68% bud infestation in sole linseed.

Table 5.5.1 Effect of intercropping on bud fly infestation and economics of linseed at Kanpur

Treatment		Bud fly infestation (%)	LEY (kg/ha)	GMR (Rs./ha)	Cost of cultivation (Rs./ha)	NMR (Rs./ha)
No.	Combination					
T_1	Wheat + linseed (2 : 2)	35.4 (36.5)	1988	51688	19750	31938
T_2	Wheat + linseed (4 : 4)	31.5 (34.1)	2006	52156	19750	32406
T_3	Wheat + linseed (6 : 4)	28.9 (32.5)	1914	49764	20300	29464
T_4	Gram + linseed (2 : 2)	29.3 (32.8)	2392	62192	18600	43593
T_5	Gram + linseed (4 : 4)	27.8 (31.8)	2375	61750	18600	43150
T_6	Gram + linseed (6 : 4)	25.7 (30.5)	2411	62686	19250	43436
T_7	Linseed + lentil (2 : 2)	25.1 (30.1)	1912	49712	16000	33712
T_8	Linseed + lentil (4 : 4)	24.9 (29.9)	1915	49790	16000	33790
T_9	Linseed + lentil (6 : 4)	24.5 (29.7)	1965	51090	16800	34290
T_{10}	Sole linseed	46.8 (43.2)	2283	59358	17700	41658
T_{11}	Sole wheat	-	1966	51116	24000	27166
T_{12}	Sole gram	-	2293	59618	20000	39618
T_{13}	Sole lentil	-	1670	43420	15000	28420
	SE (m) ±	1.52	72.51		-	1885.2
	CD at 5%	4.42	211		-	5484

NB : Figures in parentheses are angular transformed values.

Table 5.5.2 Effect of inter cropping on bud fly infestation in linseed at Raipur

Treatment		Bud fly infestation %
T_1	Wheat : Linseed (2 : 2)	21.37 (27.30)
T_2	Wheat : Linseed (4 : 4)	20.44 (26.85)
T_3	Wheat : Linseed (6 : 4)	18.47 (25.44)
T_4	Gram : Linseed (2 : 2)	20.08 (26.37)
T_5	Gram : Linseed (4 : 4)	20.33 (26.77)
T_6	Gram : Linseed (6 : 4)	22.23 (28.06)
T_7	Lentil : Linseed (2 : 2)	21.03 (27.28)
T_8	Lentil : Linseed (4 : 4)	20.53 (26.75)
T_9	Lentil : Linseed (6 : 4)	22.73 (28.35)
T_{10}	Sole Linseed crop	24.68 (29.76)
T_{11}	Sole wheat crop	-
T_{12}	Sole Gram crop	-
T_{13}	Sole Lentil crop	-
	SE (m) ±	1.57
	CD (at 5%)	NS

Figures in parentheses are angular transformed values.

Table 5.5.3 Effect of intercropping on bud fly infestation in linseed and yield of crop at Nagpur

Treatments	Bud fly infestation (%)	Yield of linseed (kg/ha)	Yield of wheat/gram (kg/ha)	LEY (kg/ha)	Yield of linseed with intercrop (Rs./ha)	Gross return (Rs./ha)
T_1 Wheat + Linseed - (2 : 2)	12.28 (3.50)	313	1533	1009	10016	26879
T_2 Wheat + Linseed - (4 : 4)	18.62 (4.31)	416	1871	1268	20581	33893
T_3 Wheat + Linseed - (6 : 4)	20.84 (4.56)	499	2194	1505	24134	40102
T_4 Gram + Linseed - (2 : 2)	10.92 (3.30)	427	1336	1615	29392	43056
T_5 Gram + Linseed - (4 : 4)	13.25 (3.64)	580	1538	1961	33836	52396
T_6 Gram + Linseed - (6 : 4)	10.56 (3.25)	670	1752	2251	38544	59984
T_7 Sole Wheat	-	-	3844	1050	42284	42284
T_8 Sole Gram	-	-	2256	4613	49632	49632
T_9 Sole Linseed	11.24 (3.35)	874	-	2707	27968	27968
S.E. (m) ±	0.12	158	158	158		
C.D. at 5%	0.36	467	467	467		

Figures in ( ) indicates square root value.
N.B. : Price of Wheat @ Rs. 1100/- per quintal, Gram @ Rs. 2200/- per quintal, Linseed @ Rs. 3200/- per quintal.

Nagpur

Linseed variety NL-97 was intercropped with wheat cv AKW-1071 and chickpea cv Jacky-9218. Lowest bud fly being 10.56% was recorded in chickpea + linseed (6 : 4) combination against maximum 18.62% infestation noticed on wheat + linseed (4 : 4). Sole linseed had 11.24% bud infestation (Table 5.5.3). Maximum gross monetary returns of Rs. 59984/ha was realized from chickpea + linseed (6 : 4), which had lowest bud fly infestation.

It can be concluded that intercropping of linseed with gram (6:4) found suitable combinatino at Kanpur and Nagpur, while wheat + linseed (6:4) at Raipur was better over other combinations.

5.6 Evaluation of neem based formulations against bud fly in linseed

The trial was allotted to Kanpur (P.C. Unit), Mauranipur, Raipur and Nagpur location, but it could not be executed at Mauranipur centre. Ten treatments comprising indegenous neem based formulations were replicated thrice in RBD. Bud infestation due to bud fly were noticed at dough stage and yield after harvest of the crop. Results obtained from different locations are being discussed here :

Kanpur (P.C. Unit)

Application of different formulations reduced bud fly infestation significantly in comparison to the untreated plots, which resulted in enhancement plots, which resulted in enhancement in seed yield (Table 5.6.1). Higher dosage in each treatment were superior in respect of bud fly infestation as well as yield. Commercial formulation nimbicidine containing azadirachtin 300 ppm (0.5%) treated crop received significantly minimum bud infestation being 16.5% and maximum seed yield of 1478.3 kg/ha, which were at par with 17.5% bud infestation and 1422.7 kg/ha yield obtained in neem seed extract (5%) treated linseed. Untreated crop produced lowest yield (836.1 kg/ha) with highest bud infestation (42.7%).

Raipur

Bud fly infestation varied between 16.4-26.0 per cent in different treatments, against 30.7% in untreated crop (Table 5.6.1). Significantly lowest bud fly infestation of 14.1% was recorded in NSKE @ 5% treated linseed crop without showing superiority over 16.3, 16.4, and 16.7% bud infestation recorded in NSKE (2%), nimbolin (0.5%) and NSE (5%) applied crop, respectively. Crop treated with NSKE @ 5% produced statistically superior yield of 1229.3 kg/ha at par with 1165.3, 1146.7 and 1229.9 kg/ha from NSKE (2%), nimbolin and NSE (5%) treatments, respectively. Significantly highest bud fly infestation (30.7%) and lowest yield (735.5 kg/ha) were recorded in untreated plots.

Nagpur

Significantly lowest bud fly infestation being 24.1% was noticed on azadirachtin 300 ppm (0.5%) treated linseed crop without showing statistical superiority over 24.5% bud infestation in neem seed coat extract (NSCE) @ 5% (Table 5.6.2). and similar pattern in seed yield was observed being 859 and 844 kg/ha seed yield in respective treatments. Untreated linseed crop produced lowest yield (516 kg/ha) due to highest bud fly infestation (44.6%). Maximum net monetary return of Rs. 9686/ha was realized from linseed treated with azadirachtin followed by Rs. 6870/ha from NSKE (2%) treated crop.

It can be concluded from the results cited above for different location that two fortnightly application of neem seed extract (5%), NSKE (5%) and azadirachtin (0.5%) provided maximum seed yield at Kanpur, Raipur and Nagpur locations, respectively, with highest net monetary return at Nagpur.

Table 5.6.1 Effect of neem based formulations on bud fly infestation and seed yield in linseed

Treatment	Dosage (%)	Kanpur		Raipur	
		Bud fly infestation (%)	Seed yield (kg/ha)	Bud fly infestation (%)	Seed yield (kg/ha)
T_1 Neem leaf extract	2	30.5 (33.5)	920.5	26.0 (30.6)	870.5
T_2 Neem leaf extract	5	25.3 (30.2)	1275.6	18.2 (25.3)	1091.0
T_3 NSKE	2	28.1 (32.0)	1084.7	16.3 (23.7)	1165.3
T_4 NSKE	5	24.6 (29.7)	1378.9	14.1 (22.0)	1229.3
T_5 Neem seed extract	2	21.7 (27.8)	1103.4	19.0 (25.8)	1065.9
T_6 Neem seed extract	5	17.5 (24.7)	1422.7	16.7 (24.1)	1129.9
T_7 Neem seed coat extract	2	28.3 (32.1)	1056.1	24.8 (29.9)	907.0
T_8 Neem seed coat extract	5	23.2 (28.8)	1304.8	21.6 (27.7)	1000.4
T_9 Nimbolin	0.5	-	-	16.4 (23.8)	1146.7
Nimbicidin	0.5	16.5 (24.0)	1478.3	-	
T_{10} Untreated	-	42.7 (40.8)	836.1	30.7 (33.6)	753.5
SE (m) ±		0.87	53.7	0.63	24.5
CD 5%		3.53	217.9	2.60	99.4

NB : Figures in parentheses are angular transformed values.

Table 5.6.2 Evaluation of neem based formulations against bud fly in linseed at Nagpur

Sr. No.	Treatments	No. of spray	Bud fly infestation (%) Seed	Seed yield (kg/ha)	Yield increased over control (kg/ha)	Cost of increased yield (Rs./ha)	Cost of treat ment (Rs./ha)	NMR (Rs./ha)	ICBR
1.	Neem leaf extract 2%	2	38.1 (38.2)	578	62	1984	610	1374	2.25
2.	Neem leaf extract 5%	2	34.8 (36.1)	750	234	7488	790	6698	8.48
3.	Neem seed kernel extract 2%	2	36.6 (37.2)	766	250	8000	1130	6870	6.08
4.	Neem seed kernel extract 5%	2	27.4 (31.5)	797	281	8992	2090	6802	3.25
5.	Neem seed extract 2%	2	35.8 (36.7)	781	265	8480	1770	6710	3.79
6.	Neem seed extract 5%	2	26.9 (31.2)	828	312	9984	3690	6294	1.70
7.	Neem seed coat extract 2%	2	28.1 (32.0)	812	296	9472	3250	6222	1.91
8.	Neem seed coat extract 5%	2	24.5 (29.6)	844	328	10496	7390	3106	0.42
9.	Azadirachtin 300 ppm @ 5 ml/lit	2	24.1 (29.3)	859	343	10976	1290	9686	7.51
10.	Untreated control	-	44.6 (41.9)	516	-	-	-	-	-
	S.E. (m) ±	-	0.66	31.24	-	-	-	-	-
	C.D. (P = 0.05)	-	1.98	83.00	-	-	-	-	-

Figures in ( ) Arcsine transformed values.

6. BIO-CHEMISTRY

The biochemical work was under taken as per technical programme formulated on August 23-25, 2007. The effect of different treatments comprised of agronomical, pathological, newly developed breeding materials, and promising lines under testing, were studied in respect of oil content, fatty acids components and linolenic acid through spot test. The results are illustrated experiment-wise to draw definite conclusion.

6.1 Estimation of oil content in breeding, Agronomy, Pathology and Entomology co-ordinated trials conducted at AICRP, Kanpur and P.C. Unit, Kanpur

6.1.1 Effect of moisture conservation practices on oil content of Linseed

The seed sample were received from Faizabad, Mauranipur and Sagar, the oil content was analysed through NMR at P.C. Unit. The results are presented in Table 6.1.1. The results showed that there is no markable differences in oil content among all seven treatments, though incorporation of FYM decreased the oil content by 3.93% over no mulching. However, maximum oil content (41.33%) was observed with treatment of soil mulching at 30 DAS after first rain.

Table 6.1.1 Effect of moisture conservation practices on oil content of Linseed

Sl. No.	Treatments	Oil content (%)			
		Faizabad	Mauranipur	Sagar	Mean
1.	No mulching	41.17	43.30	39.15	41.21
2.	Straw mulching @ 10 t/ha	37.68	41.93	40.84	40.15
3.	Spreading FYM @ 10 t/ha	41.04	39.44	40.86	40.45
4.	Incorporation of FYM in the soil @ 10 t/ha	38.44	39.76	40.57	39.59
5.	Soil mulching at 30 DAS	39.39	41.89	40.05	40.44
6.	Soil mulching @ at 30 DAS after first rain	41.00	41.86	41.14	41.33
7.	Hand weeding without removal of weeds from field	40.32	43.16	40.45	41.31

6.1.2 Effect of sowing dates on oil content of newly released varieties of linseed under double cropping system

The seed samples were received from Faizabad Center only consisted of three varieties in combination of three sowing dates. The results pertaining to oil content are tabulated in Table 6.1.2. It revealed from table that out of four tested varieties Shubhra gave maximum oil content of 38.92% followed by Garima (37.67%). The first date of sowing *i.e.*, second week of November are more effective for achieving maximum oil content (37.70%). Delay in sowing after IInd week of Nov. the oil content decreased markedly, as minimum oil content 35.33% was recorded with sowing on IInd week of December.

Table 6.1.2 Effect of sowing dates on oil content (%) of Newly released varieties of linseed under double cropping system at Faizabad

Sl. No.	Sowing dates	Varieties				
		Garima	Shubhra	Shekhar	T397	Mean
1.	Nov. II[nd] week	39.42	39.92	37.96	33.48	37.70
2.	Nov. last week	37.79	38.83	37.32	33.05	36.75
3.	Dec. II[nd] week	35.81	38.00	36.10	31.40	35.33
	Mean	**37.67**	**38.92**	**37.13**	**32.64**	

6.1.3 Impact of intercorpping of *rabi* crops with linseed on oil content of linseed

Seed samples for its oil analysis were received from P.C. Unit and Sagar and results there of are presented in Table 6.1.3. Both centres were sown wheat, Gram and lentil as inter crops. Oil content was observed minimum with wheat compared with other intercrop as well as sole linseed. Other two intercrop were legumenous where oil content was more. Between Gram and Lentil, Lentil was found encouraging for enhanceing oil content. It is also clear from table that row ratio of 2 : 2 have more oil content than any other row ratio of either of inter crop. The row ratio grater than 2:2 was found negative effect on oil content of linseed.

Table 6.1.3 Impact of intercropping of *rabi* crops with linseed on oil content of linseed

Sl. No.	Treatments	Oil content (%)		
		P.C. Unit	Sagar	Mean
1.	Wheat + Linseed (2 : 2)	35.72	38.40	37.06
2.	Wheat + Linseed (4 : 4)	33.94	38.23	36.08
3.	Wheat + Linseed (6 : 4)	33.81	38.10	35.95
4.	Gram + Linseed (2 : 2)	37.96	39.74	38.85
5.	Gram + Linseed (4 : 4)	37.44	38.77	38.11
6.	Gram + Linseed (6 : 4)	36.57	38.35	37.46
7.	Linseed + Lentil (2 : 2)	37.58	39.75	38.67
8.	Linseed + Lentil (4 : 4)	37.43	39.45	38.44
9.	Linseed + Lentil (6 : 4)	36.54	38.91	37.73
10.	Sole Linseed	37.12	39.26	38.19
	SE (m) ±	0.69	-	
	CD 5%	2.79**	-	

6.1.4 Influence of new herbicides used for weed management on oil content and fatty acid profile of linseed

Seed samples of trials conducted at Palampur, Faizabad, Mauranipur and P.C. Unit, were received and analysed for its oil and fatty acids profile at P.C. Unit. The results are presented in Table 6.1.4. It revealed from table that use of herbicides reduced the oil content as maximum oil content was noted where only hand weeding was done for removing of weeds. Comparing among weedicids, clodinofop has responded well for higher oil content. Out of three doses of clodinafop maximum dose *i.e.,* 100 g/ha gained maximum oil content. It was also noted that use of 2, 4-D either with Isoproturon or clodinafop increased the oil content subsistentially.

Table 6.1.4 Influence of new herbicides used for weed management in irrigated-Linseed on oil content and fatty acids profile of linseed

Sl. No.	Treatment	Oil Content (%)					Fatty acid (%) and iodine value					
		Palam pur	Faizabad	Maurani pur	P.C. Unit	Mean	P.C. Unit					
							Palmitic	Stearic	Oleic	Linoleic	Linolenic	Iodine value
1.	Two Handweeding	39.23	39.71	38.93	39.90	39.44	7.41	5.46	22.38	11.76	53.00	178.55
2.	Isoproturon @ 1.0 kg (Post Emergence)	37.71	36.37	37.83	38.51	37.61	6.91	6.74	26.44	11.54	48.38	169.56
3.	Isoproturon @ 1.0 kg + 2, 4 D @ 0.5 kg (PE)	37.88	36.85	38.61	39.66	38.25	7.04	7.22	26.89	11.03	47.82	167.59
4.	Snlfo-Sulfuron 10 g/ha (PE)	38.66	36.89	37.50	39.83	38.22	6.95	6.79	24.69	11.93	49.64	172.03
5.	Sulfo-Sulfuron 20 g/ha (PE)	38.64	36.97	36.58	39.09	37.82	7.01	5.47	25.96	10.76	50.82	174.18
6.	Sulfo-Sulfuron 30 g/ha (PE)	38.07	37.30	36.33	38.90	37.65	6.69	8.49	28.46	11.57	44.80	161.97
7.	Clodinafop 60 g/ha (PE)	39.80	37.95	37.65	37.89	38.32	7.06	6.89	25.89	11.79	48.37	169.49
8.	Clodinafop 80 g/ha (PE)	39.95	36.87	37.26	38.52	38.15	6.29	7.68	26.04	11.68	45.83	162.77
9.	Clodinafop 100 g/ha (PE)	40.02	36.52	38.81	38.85	38.55	6.79	7.54	25.02	11.73	48.93	170.10
10.	Clodinafop 60 g/ha + 2, 4-D @ 0.5 kg/ha (PE)	39.88	38.41	39.24	38.68	39.05	7.02	6.65	24.93	11.52	49.86	172.09
11.	Clodinafop 80 g/ha + 2, 4-D @ 0.5 kg/ha (PE)	38.82	38.56	39.73	38.85	38.99	6.27	8.44	29.68	12.18	43.44	160.59
12.	Weedy check	39.49	39.15	38.33	39.45	39.10	6.74	5.64	23.10	11.57	52.95	178.70
	SE (m) ±	-	-	-	0.59	-	-	-	-	-	-	-
	CD at 5%	-	-	-	1.72*	-	-	-	-	-	-	-

Unlike to clodinafop, use of higher doses of sulfo-sulfuron decreased the oil content as maximum oil conten (38.22%) was recorded with lowest dose i.e. 10 g/ha sulfo-sulfuron.

The influence of herbicides on fatty acids were also studied. Between saturated fatty acids, stearic acids wa found higher with application of herbicides in comparison to hand weeding. Among unsaturated fatty acids more effect were observed on oleic and linolenic acid, but linoleic was not much influenced. The use o herbicides increased the value of oleic acid markedly. However, maximum value of oleic acid *i.e.,* 29.68% was noted with application of clodinafop 80 g/ha + 2, 4-D @ 0.5 kg/ha. On other hand linolenic acid go reduced with the application of herbicides over no herbicides. The minimum value of linolenic acid wa recorded with clodinafop 80 g + 2, 4-D @0.5 kg/ha. Among herbicides treatments maximum value o linolenic *i.e.,* 50.82 was noted with sulfo-sulfuron 20 g/ha and this is near to value of no herbicides treatment Iodine value is a factor which decides the degree of saturation, was also influenced with herbicides application The iodine value decreased markedly with herbicides application. Maximum decreased in iodine value wa noticed with the application of clodinafop 80 g + 2, 4-D @0.5 kg/ha followed by sulfo-sulfuron @30 g/ha

6.1.5 Response of EEMT entries of linseed to oil content as influence by seed rate and fertilize dose

The seed samples recived from Sagar and Mauranipur were estimated for their oil content and results ar summerised in Table 6.1.5. Among tested entries, JLS-9 gave maximum oil content of 39.85% followed b SLS-67 (39.51%). Application of seed @ 30 kg/ha was found effective for enhancing the oil content, beyon this rate oil content got reduced. Application of RDF was found discouraging in term of oil content. A maximum oil content 39.84% was observed with application of 50% RDF, thereafter doses decreased the oi content markedly, irrespective of all the varieties and centers as well.

Table 6.1.5 Response of EEMT entries with seed rate and fertilizer on oil content of linseed

Seed rate	SLS-67			JLS-9			T-397			General Mean
	Sagar	Maurani	Mean	Sagar	Maurani	Mean	Sagar	Maurani	Mean	
25 kg/ha	38.71	39.67	39.19	40.71	37.83	39.27	38.64	37.49	38.07	38.84
30 kg/ha	39.65	39.78	39.72	41.08	39.80	40.44	39.31	38.00	38.66	39.60
35 kg/ha	39.14	40.09	39.62	40.13	39.55	39.84	37.68	36.70	37.19	38.88
Mean	39.17	39.85	39.51	40.64	39.06	39.85	38.54	37.40	37.97	-
Fertilizer										
50% RDF	39.47	41.14	40.31	40.54	41.59	41.07	38.38	37.91	38.15	39.84
100% RDF	39.24	37.16	38.20	40.20	39.62	39.91	38.26	37.75	38.01	38.71
150% RDF	39.09	33.92	36.51	39.64	37.68	38.66	38.23	37.74	37.99	37.72
Mean	39.27	37.41	38.34	40.13	39.63	39.88	38.29	37.80	38.05	-

6.1.6 Response of fertilizer and sowing dates on oil content of AVT (I) Entries

The seed samples were received from Mauranipur centre only. Hence, the result on oil content of Mauranipur center is only presented in Table 6.1.6. Out of three tested entries, namely; NDL-2004-05, SLS-61 and T-397, SLS-61 gave maximum oil content either due to fertilizer application or due to sowing dates. Application of only 50% RDF gave about 1.0% higher oil content over 100% RDF. Maximum decrease in oil content was recorded due to application of 150% RDF. The First date of sowing of linseed *i.e.*, IVth week of Nov. was found more favorable for maximum oil content, be yond this date remarkable decrease in oil content was observed.

Table 6.1.6 Response of fertilizer and sowing dates on oil content (%) of AVT (I) entries at Mauranipur

Entries	Recommended doses of fertilizer				Sowing dates			
	50% RDF	100% RDF	150% RDF	Mean	Oct. IV week	Nov. II week	Nov. IIIrd week	Mean
NDL-2004-05	40.23	39.74	35.72	38.56	37.70	37.74	37.68	37.71
SLS-61	40.46	40.03	40.00	40.16	38.64	38.12	37.53	38.09
T-397	37.36	37.17	36.72	37.08	39.03	36.99	34.91	36.98
Mean	**39.35**	**38.98**	**37.48**		**38.46**	**37.62**	**36.71**	

6.1.7 Response of sowing dates and recommended dose of fertilizers on oil content of AVT (DP) entries of linseed

The experimental seed samples were received from Palampur, Kanpur and Faizabad for their oil analysis, the results there of are depicted in Table 6.1.7. The data of Palampur shows that maximum oil content (38.64%) was recorded with entry LMS-95-4, followed by LCK-5021. Second date of sowing was found more pronounced in the term of oil content beyond to this, oil content declined notably. Among treatments of recommended doses of fertilizer, maximum oil content was noticed with 50% RDF, addition of any dose of RDF declined the oil content markedly. At Kanpur and Faizabad maximum oil content was recorded with

entry LCK 5021. At Kanpur, First sowing of linseed, proved to be better in the term of oil content. Like Palampur, Kanpur and Faizabad too found highest oil content with application of 50% RDF and addition of any dose of RDF decreased oil content noticeable.

Table 6.1.7 Response of sowing dates and RDF on oil content (%) of AVT (DP) Entries of Linseed

Sl. No.	Entries	Sowing dates				Recommended dose of fertilizer			
		I sowing	II sowing	III sowing	Mean	50% RDF	100% RDF	150% RDF	Mean
Palampur									
1.	LMS-95-4	38.31	39.95	39.32	39.19	38.84	38.70	38.38	38.64
2.	LCK-5021	39.23	39.27	38.95	39.15	38.85	37.86	37.13	37.95
3.	Nagarkot (ZC)	39.76	38.59	37.78	38.71	37.98	37.61	36.27	37.29
4.	Shikha (ZC)	38.52	38.26	38.13	38.30	37.15	36.94	35.48	36.52
	Mean	**38.96**	**39.02**	**38.55**	-	**38.21**	**37.78**	**36.82**	-
Kanpur									
1.	LCK-5021	37.09	36.83	35.97	36.63	37.92	36.78	36.03	36.91
2.	Parvati (ZC)	37.49	36.43	34.68	36.20	36.73	36.11	37.37	36.74
3.	Shikha (ZC)	34.68	34.53	33.74	34.32	35.11	34.13	33.05	34.09
	Mean	**36.42**	**35.93**	**34.79**	-	**36.59**	**35.67**	**35.48**	-
Faizabad									
1.	LCK-5021	-	-	-	-	40.06	38.99	38.30	39.12
2.	Parvati (ZC)	-	-	-	-	38.29	38.00	37.59	37.96
3.	Shikha (ZC)	-	-	-	-	36.41	35.04	35.00	36.90
	Mean	-	-	-	-	**38.25**	**37.34**	**36.96**	-

6.2 Evaluation of germplasm for oil content grown under rainfed situation at different locations

One hundred germplasm excluding three checks, namely, NL-97, JLS-9 and T397 were grown at different locations in augmented design out of tested locations, seed samples for oil analysis were received from Jashipur, Nagpur and Sagar centres only. The results on oil content are presented in Table 6.2.1. At Jashipur all lines were not harvested successfully, hence less number of lines were received for its oil analysis. The result of Jashipur showed that first blocks entries namely CP-43, CI-2052, EC-523B and CI-20 were found among top non significant group, in second block, entry CI-2231 gained maximum oil, whereas in block third entry CI-2056 stood first and in block IV entry CI-2206 recorded maximum oil content. It was found significant difference among treatments when treatments were compared across the block and entry CI-2231 gave maximum oil content. At Nagpur location significant differences in oil content within block and across the block were observed and maximum oil content (40.20%) was noticed with entry Chitarpur. The Chitarpur gave significantly higher oil content over best check JLS-9 (38.72%). At Sagar, differences in oil Content within block, across the block as well as comparison with checks were found significant. Maximum oil content of 43.17% was observed with entry Chitarpur and this is only entry which gave significantly higher oil content over the best check JLS-9 (40.45%). The entries CI-2229, CI-2007, CI-1972, EC-421, CI-1904 and DAK-105 were found at par with Chitarpur in term of oil content.

On overall mean basis, maximum oil content (41.69%) was estimated in entry Chitrapur. Consistence performance in oil content across the locations was observed with entries CI-2055 and CP-White. However, the entries Chitarpur, DAK-102 and CI-1972 contained more than 40% oil.

Table 6.2.1 Oil Content (%) in germplasm screened under rainfed condition

Sl. No.	Entries	Jashipur		Nagpur		Sagar		Mean
1.	CP-43	39.80	(39.90)	37.37	(37.21)	39.67	(40.24)	38.95
2.	Cross-4/29	34.17	(34.27)	33.16	(33.00)	34.95	(35.52)	34.09
3.	CI-1928	-	-	35.14	(34.98)	39.99	(40.56)	37.57
4.	CI-2052	39.54	(39.44)	37.03	(36.87)	39.48	(40.05)	38.68
5.	EC-513A	35.94	(36.04)	37.49	(37.33)	39.80	(40.37)	37.74
6.	EC-523B	40.31	(40.41)	37.07	(36.91)	39.77	(40.34)	39.05
7.	EC-522	-	-	36.26	(36.20)	39.08	(39.65)	37.67
8.	CI-2048	39.02	(39.12)	36.00	(35.84)	39.27	(39.84)	38.10
9.	EC-500	34.99	(35.09)	36.16	(36.00)	38.38	(38.95)	36.51
10.	CI-1971	-	-	34.18	(34.02)	37.10	(37.67)	35.64
11.	CI-2204	35.82	(35.92)	34.68	(34.52)	36.76	(37.33)	35.75
12.	CI-15635	-	-	37.55	(37.39)	40.13	(40.70)	38.84
13.	CI-1983	-	-	32.60	(32.44)	37.85	(38.42)	35.23
14.	Chitarpur	-	-	40.20	(40.04)	43.17	(43.74)	41.69
15.	CI-1974	-	-	34.79	(34.63)	38.40	(38.97)	36.60
16.	CI-1956	-	-	-	-	37.74	(38.31)	-
17.	Dhar	-	-	37.12	(35.82)	40.59	(41.16)	38.86
18.	Deep purple petal	36.07	(36.17)	-	-	38.55	(39.12)	37.31
19.	CI-2006	-	-	35.98	(35.19)	39.43	(40.00)	37.71
20.	Detal-1	-	-	35.35	(34.82)	37.35	(37.92)	36.35
21.	CI-2059	-	-	34.98	(37.19)	37.88	(38.45)	36.43
22.	EC-531	-	-	37.35	(35.73)	38.58	(39.15)	37.97
23.	CI-2073	-	-	35.89	(34.37)	37.06	(37.63)	36.48
24.	CI-1894	-	-	34.53	(34.09)	37.25	(37.82)	35.89
25.	Chitara Sagar	-	-	34.25	(35.50)	35.35	(35.92)	34.80
26.	EC-388	-	-	35.50	(37.65)	38.74	(38.55)	37.12
27.	CI-2203	-	-	37.65	(38.21)	39.51	(39.32)	38.58
28.	CI-2055	38.28	(38.75)	38.21	(36.20)	40.04	(39.85)	38.84
29.	CI-2200	38.35	(38.82)	36.20	(36.75)	39.01	(38.82)	37.85
30.	CI-2231	40.27	(40.74)	36.75	(34.31)	39.64	(39.45)	38.89
31.	CI-2109	-	-	34.31	(33.77)	37.98	(37.79)	36.15
32.	CI-1892	-	-	33.77	(31.87)	36.36	(36.17)	35.07
33.	CI-1998	-	-	31.87	(33.18)	37.48	(37.29)	34.68
34.	CI-1916	-	-	33.18	(34.98)	36.37	(36.18)	34.78

Table 6.2.1 Contd....

Sl. No.	Entries	Jashipur		Nagpur		Sagar		Mean
35.	DUK-101	-	-	34.98	(36.88)	37.29	(37.10)	36.14
36.	DPR-Petal	-	-	36.88	(38.67)	37.36	(37.17)	37.12
37.	EC-429	-	-	38.67	(37.51)	40.43	(40.24)	39.55
38.	CR-M-6×RR-9	-	-	37.51	(35.90)	38.67	(38.48)	38.09
39.	CI-2060	38.63	(39.10)	35.90	(39.15)	38.96	(38.77)	37.83
40.	DAK-102	-	-	39.15	(38.76)	41.50	(41.31)	40.33
41.	CI-2229	-	-	-	-	41.97	(41.78)	-
42.	CI-2201	-	-	38.76	(35.57)	39.74	(39.55)	39.25
43.	CI-2205	39.68	(40.15)	35.57	(34.41)	38.31	(38.12)	37.85
44.	EC-481	-	-	-	-	39.92	(39.73)	-
45.	CI-1924	-	-	34.41	(34.70)	36.67	(36.48)	35.54
46.	CI-1984	-	-	34.70	(35.52)	38.08	(37.79)	36.39
47.	EC-553	-	-	35.52	(35.63)	39.93	(39.74)	37.73
48.	EC-511	-	-	35.63	(34.70)	38.10	(37.91)	36.87
49.	Canyart	-	-	34.70	(36.19)	37.07	(36.88)	35.89
50.	CI-2260	-	-	36.19	(37.07)	37.84	(37.65)	37.02
51.	CI-1900	37.77	(36.89)	36.89	(36.17)	39.43	(39.10)	38.03
52.	CP-33	-	-	35.99	(37.76)	39.03	(38.70)	37.51
53.	CI-2007	-	-	37.58	(35.05)	40.90	(40.57)	39.24
54.	CR-55×RR-9	37.99	(37.11)	34.87	(37.13)	37.23	(36.90)	36.70
55.	Clasepetal	-	-	36.95	(35.77)	38.73	(38.40)	37.84
56.	Dhar Local	-	-	35.59	(36.52)	39.48	(39.15)	37.54
57.	CI-2049	39.28	(38.40)	36.34	(33.98)	39.16	(38.83)	38.26
58.	CI-1977	-	-	33.80	(34.33)	37.96	(37.63)	35.88
59.	CI-1897	-	-	34.15	(37.86)	37.70	(37.37)	35.93
60.	CI-2005	-	-	-	-	39.98	(39.65)	-
61.	CI-2056	40.43	(39.55)	37.68	(33.37)	40.00	(39.67)	39.37
62.	EC-534	-	-	33.19	(36.19)	37.32	(36.99)	35.26
63.	CI-1900	-	-	36.01	(36.29)	37.51	(37.18)	36.76
64.	CI-2010	37.69	(36.81)	36.11	(33.36)	38.50	(38.17)	37.43
65.	Dingoachi	-	-	33.18	(38.35)	37.42	(37.09)	35.30
66.	EC-100	-	-	38.17	(38.79)	40.08	(39.75)	39.13
67.	CI-1972	-	-	38.61	(35.52)	41.99	(41.66)	40.30
68.	Chihidwara	-	-	35.34	(34.27)	39.42	(39.09)	37.38
69.	CI-1968	-	-	34.09	(35.60)	42.20	(41.87)	38.15
70.	CS-9	-	-	35.42	(36.29)	39.20	(38.87)	37.31
71.	CI-1958	39.05	(38.17)	36.11	(37.16)	40.77	(40.44)	38.64
72.	CI-1901	36.85	(35.97)	36.98	(36.51)	37.06	(36.73)	36.96

Table 6.2.1 Contd....

Sl. No.	Entries	Jashipur		Nagpur		Sagar		Mean
73.	CI-2067	-	-	36.33	(35.75)	38.67	(38.34)	37.50
74.	Check	-	-	35.57	(35.49)	37.54	(37.21)	36.56
75.	CI-1954	-	-	35.31	(36.44)	39.29	(38.96)	37.30
76.	CI-1970	-	-	36.46	(35.40)	38.55	(38.51)	37.51
77.	EC-519A	34.38	(34.70)	35.42	(37.87)	35.52	(35.48)	35.11
78.	EC-421	-	-	-	-	41.40	(41.36)	-
79.	CI-2230	37.50	(37.82)	37.89	(35.05)	39.45	(39.41)	38.28
80.	CI-1978	-	-	35.07	(37.43)	39.13	(39.09)	37.10
81.	CP-white	38.88	(39.20)	37.45	(38.16)	38.13	(38.09)	38.15
82.	CF-white	-	-	38.18	(35.61)	40.24	(40.20)	39.24
83.	EC-519K	37.67	(37.99)	35.63	(35.68)	38.75	(38.71)	37.35
84.	EC-524	39.85	(40.17)	35.70	(36.72)	39.40	(39.36)	38.32
85.	CI-2053	36.98	(37.30)	36.74	(38.56)	39.08	(39.04)	37.60
86.	CI-1904	-	-	38.58	(35.90)	41.28	(41.24)	39.93
87.	CI-2208	39.45	(39.77)	35.92	(33.67)	39.12	(39.08)	38.16
88.	EC-12	-	-	-	-	37.39	(37.35)	-
89.	EC-536	-	-	33.69	(36.33)	36.00	(35.96)	34.85
90.	CI-2063	39.16	(39.48)	36.35	(34.00)	39.20	(39.16)	38.24
91.	CI-1908	-	-	34.02	(36.29)	35.40	(35.36)	34.71
92.	CI-2066	39.44	(39.76)	36.31	(34.32)	38.79	(38.75)	38.18
93.	EC-415	-	-	34.34	(35.67)	37.99	(37.95)	36.17
94.	CI-2206	40.11	(40.43)	35.69	(35.58)	37.35	(37.31)	37.72
95.	CI-2057	-	-	35.60	(37.38)	39.71	(39.67)	37.66
96.	DAK-105	-	-	37.40	(35.97)	40.59	(40.55)	38.99
97.	EC-533-15	-	-	35.99	(36.32)	38.55	(38.51)	37.27
98.	EC-541	-	-	36.34	(34.58)	38.19	(38.15)	37.27
99.	CI-2236	38.65	(38.97)	34.60	(33.99)	38.12	(38.08)	37.12
100.	EC-521 M	-	-	34.01	(37.31)	37.80	(37.76)	35.91
A	NL-97 (Ch)	-	-	38.20	(38.20)	40.44	(40.44)	39.32
B	JLS-9 (Ch)	39.52	(39.52)	38.72	(38.72)	40.45	(40.45)	39.56
C	T397 (Ch)	37.98	(37.98)	36.75	(36.75)	37.94	(37.94)	37.56
	Treatment comparison	**SE (m) ±**	**CD 5%**	**SE (m) ±**	**CD 5%**	**SE (m) ±**	**CD 5%**	
	Unrep. Tr. same block	0.94	2.99	0.51	1.24	0.87	2.12	
	Unrep. Tr. different block	1.15	3.66	0.59	1.44	1.00	2.45	
	Unrep Tr. VS Check	0.85	2.67	0.44	1.08	0.75	1.83	
	CV %	1.71		0.95		1.54		

* Value in parentheses are adjusted mean.

6.3. Evaluation of oil content in co-ordinated breeding trials conducted at AICRP Centres

The seed samples of following breeding trials conducted at different locations were analysed for its oil content through NMR and results are presented in Tables 6.3.1 to 6.3.9.

6.3.1 Initial Varietal Trial – Rainfed

6.3.2 Initial Varietal Trial – Irrigated

6.3.3 Initial Varietal Trial – Double purpose

6.3.4 Initial Varietal Trial – *Utera*

6.3.5 Advanced Varietal Trial – Rainfed

6.3.6 Advanced varietal Trial – Irrigated

6.3.7 Advanced Varietal Trial – Double Purpose

6.3.8 Advanced varietal Trial – *Utera*

6.3.9 Special Trial on Extra Early Maturing Genotypes - Rainfed

6.3.1 Initial Varietal Trial – Rainfed

Seed samples were received from all four zones, however, from Zone I the samples received from Palampur only. The sample could not received from the centers of Zone II *viz.* Kanpur, Madhubani, Sabour, Patna, Gossaigaon and Jharnapani; Zone III centers Kota, Rewa and Durgapura, and Zone IV center Latur. The results are presented zone-wise in Table 6.3.1.

Among tested entries of Zone I, LMS-P-3 gave maximum 40.11% oil content followed by SLS-71 (39.58%) However, Padmini tested as additional check recorded maximum oil content of 41.51%. Like to Zone I, in Zone II and III too, LMS-P-3 recorded maximum oil content followed by SLS-71 but it were less than Padmini. In Zone IV, among tested entries SLS-71 gave maximum oil content (38.90%) followed. by LMS-P-3 (38.84%). Like to Zone I, II, III in Zone IV too, Padmini gained maximum oil content (41.01%). on over all mean basis. Among tested entries oil content veried between 35.51% (PCL-1-06) to 41.56% (Padmini).

6.3.2 Initial Varietal Trial – Irrigated

Seed samples for oil analysis were received from all four zones however, Kaul, Patna, Nagina, Jharnapani, Jabalpur centres did not send the samples. The results on oil content are presented in Table 6.3.2. The oil content in Zone I varied between 35.21% (NDL-2005-24) to 40.26% (SLS-72). The maximum oil content was achieved by SLS-72 followed by PKDL-71. In Zone II that was ranged from 35.45% (BAU-06-5) to 42.65% (SLS-72). Maximum oil content was gained by SLS-72 followed by PKDL-71 (40.91%) followed by LMS-63-6 (39.52%). Between checks Shekhar performed better to T-397. In Zone III, Oil content was observed between 41.43% (SLS-72) and 36.08%. (BAU-06-5). In Zone IV the oil content varied from 35.13% (RL-26018) to 40.83% (SLS-72). The maximum oil content was observed in entry SLS-72 followed by LMS-63-6 (39.13%).

On over all mean basis as well as across the zones, the entry SLS-72 recorded maximum oil content *i.e.*, 41.73% followed by PKDL-71 (40.27%).

Table 6.3.1 Oil content (%) in Initial varietal Trial (Rainfed) - IVT (R)

Sl. No.	Entries	Zone-I	Zone-II					Zonal Mean & Rank	Zone-III		Zonal Mean & Rank	Zone-IV									Zonal Mean & Rank	Overall Mean & Rank
		Palam pur	Kanke	Faiza bad	Shillon gani	Berham pore	Varanasi		Sagar	Maurani pur		Nagpur	Jashi pur	Raipur	Jagdal pur	Badna pur	Latur	Somnath pur	Bijapur	Raichur		
1.	PCL-1-06	35.09	36.33	38.38	31.76	34.28	38.47	35.84	35.38	37.42	36.40	33.39	-	36.14	34.08	38.26	34.85	-	34.19	34.19	35.01	35.51
2.	LCK-7036	38.34	39.47	39.37	32.58	36.91	40.40	37.75	39.00	39.36	39.18	38.77	38.81	39.49	36.89	40.70	39.12	35.06	38.65	36.72	38.25	38.22
3.	NL-260	36.06	37.22	41.56	34.73	35.25	37.90	37.33	38.69	34.23	36.46	36.43	-	37.66	35.14	38.81	38.15	34.18	37.67	35.28	36.67	36.81
4.	PKDL-74	38.78	41.20	39.50	35.27	38.83	40.31	39.02	39.44	36.36	37.90	36.49	39.52	40.28	37.67	40.26	40.46	36.15	38.74	37.56	38.57	38.64
5.	NDL-2005-34	-	36.93	38.21	33.34	34.82	38.02	36.26	37.20	37.16	37.18	34.59	36.47	36.62	34.92	38.81	36.41	34.00	36.50	34.18	35.83	36.13
6.	LMS-P-3	40.11	40.95	41.56	38.71	38.92	40.16	40.06	40.72	41.76	41.24	37.33	39.67	40.86	37.58	41.40	40.67	35.30	40.06	36.66	38.84	39.56
7.	BAU-06-8	36.63	37.62	38.56	33.01	33.54	38.98	36:34	38.60	36.75	37.68	34.13	38.10	36.54	35.50	39.10	36.82	-	35.90	33.25	36.17	36.53
8.	SLS-71	39.58	40.43	40.63	38.00	39.51	40.20	39.75	40.18	39.13	39.66	38.33	39.31	39.84	37.05	40.86	40.77	37.20	40.09	36.69	38.90	39.28
9.	KL-219	37.48	37.02	38.68	35.19	35.37	38.44	36.94	37.92	35.85	36.89	34.53	38.87	37.61	33.83	38.80	36.44	32.80	36.36	33.34	35.84	36.38
10.	RLC-117	35.75	36.77	37.88	30.32	41.75	37.33	36.81	36.96	37.10	37.03	34.82	37.30	38.14	35.16	38.08	37.81	33.59	42.33	34.42	36.85	36.79
11.	Padmini (AC)	41.51 **I**	42.40	42.64	39.73	41.69	42.50	41.79 **I**	43.34	43.68	43.51 **I**	38.80	42.46	42.37	39.11	43.06	42.45	38.99	42.30	39.57	41.01	41.56 **I**
12.	Sheela (ZC I)/ Shekhar (ZC II)/ R-552 (ZC III & IV)	37.22	39.65	39.25	35.85	37.91	41.05	38.74	37.77	33.41	35.59	34.60	36.41	37.00	34.25	38.10	36.77	34.19	37.10	33.91	35.81	-
13.	T-397 (NC)	**35.60**	**38.24**	**39.12**	**34.31**	**36.49**	**38.56**	37.34	**37.74**	**37.19**	**37.47**	35.31	36.18	37.77	36.50	38.95	37.43	33.56	37.47	33.77	**36.33**	**36.72**
14.	Local											38.04 (NL-97)								34.75		
	SE (m) ±													0.13		0.07	0.28	0.34	0.32			
	CD 5%													0.52		0.29	1.12	1.38	1.27			
	CV%													0.59		0.32	1.27	1.69	1.46			

Table 6.3.2 Oil Content (%) in Initial Varietal Trial (Irrigated) - IVT (I)

Sl. No.	Entries	Zone-I		Zonal Mean	Zone II									Zonal Mean	Zone III						Zonal Mean	Zone IV				Zonal Mean	Overall Mean
		Palam pur	Ludhi ana		Kanke	Kan pur	Faiza bad	Main puri	Berham pur	Maso dha	Dholi	Vara nasi	Ujhani		Kota	Hoshan gabad	Sagar	Maura nipur	Tikam garh	Udai pur		Rai pur	Bija pur	Raic hur	Nag pur		
1.	LCP-146	35.48	36.00	35.74	38.08	37.01	36.91	37.08	34.78	37.51	35.88	38.14	36.67	36.90	37.16	35.85	35.62	37.71	37.88	35.13	36.56	37.21	36.54	-	35.75	36.50	36.63
2.	PCL-12-3-06	38.34	34.80	36.57	34.06	38.42	37.73	37.53	34.76	37.73	36.68	36.94	38.81	36.96	37.34	37.12	35.22	38.56	35.09	37.56	36.82	37.31	35.53	35.73	36.60	36.29	36.75
3.	PKDL-71	40.54	38.00	39.27	40.30	40.72	41.79	42.56	40.76	39.28	41.16	43.53	38.72	40.91	41.86	42.46	37.01	42.80	42.51	41.37	41.34	37.77	40.09	35.93	37.17	37.74	40.27
4.	LCK-7035	37.94	38.00	37.97	39.58	39.25	38.86	39.26	36.25	38.01	32.64	38.58	37.48	37.77	37.46	40.32	35.55	38.90	38.09	41.10	38.57	36.33	37.62	36.20	37.48	36.91	37.85
5.	BAU-06-5	36.44	34.00	35.22	37.55	35.64	37.36	35.83	32.81	33.46	34.06	35.66	36.68	35.45	35.33	36.13	34.62	39.26	35.76	35.39	36.08	35.92	34.56	34.13	34.76	34.84	35.49
6.	NDL-2005-24	36.61	33.80	35.21	37.72	38.00	37.86	37.92	34.87	34.55	33.07	38.02	37.76	36.64	36.18	37.29	36.14	37.43	35.43	38.40	36.81	37.38	36.11	-	35.59	36.36	36.51
7.	LMS-63-6	40.12	35.80	37.96	41.30	41.35	39.84	39.51	37.23	37.86	37.58	41.20	39.83	39.52	39.17	41.86	35.67	42.04	37.90	39.63	39.38	39.87	39.66	-	37.85	39.13	39.13
8.	RL-26018	37.88	35.60	36.74	38.16	37.70	37.49	38.98	35.43	37.85	37.07	38.41	35.57	37.41	33.18	37.90	34.24	38.82	37.30	37.65	36.52	38.94	35.39	32.15	34.03	35.13	36.66
9.	KL-248	38.56	37.40	37.98	39.13	34.35	38.68	41.86	36.43	38.09	-	37.75	36.89	37.90	39.14	39.03	38.66	39.24	39.65	38.33	39.01	36.85	35.63	33.57	37.73	35.95	37.85
10.	NL-260	35.94	36.00	35.97	37.37	35.98	36.86	38.13	34.70	36.39	35.53	37.20	37.21	36.60	36.18	39.21	34.54	37.65	37.54	38.53	37.28	38.48	36.41	35.88	36.99	36.94	36.79
11.	SLS-72	41.51	39.00	40.26	43.17	43.13	42.16	43.72	41.22	42.59	42.58	42.49	42.77	42.65	41.59	44.13	35.40	42.40	42.84	42.23	41.43	41.27	40.51	39.48	42.05	40.83	41.73
12.	LBR-6	39.32	34.80	37.06	38.58	37.79	37.70	38.12	34.12	36.62	36.42	37.16	37.85	37.15	36.09	37.18	34.18	36.60	38.46	38.48	36.83	36.93	36.80	36.41	36.50	36.66	36.96
13.	RLC-116	35.48	36.80	36.14	36.16	36.26	38.06	38.64	34.35	-	35.67	37.42	36.79	36.67	36.29	38.28	38.68	40.59	37.16	37.18	38.03	36.38	36.79	35.01	35.99	36.04	36.90
14.	LC-54 (ZC-I)/	37.93	34.00	35.97	39.63	39.85	39.95	41.48	36.34	38.40	36.58	39.10	36.79	38.68	38.54	38.63	36.31	40.29	37.99	39.07	38.47	37.92	37.52	34.63	36.66	36.68	-
	Shekhar (ZC-II)/																										
	Suyog (ZC III & IV)																										
15.	T-397 (NC)	36.57	36.00	36.29	38.55	38.17	38.07	38.57	32.40	37.08	34.68	38.33	37.95	37.09	36.35	37.44	35.63	38.35	37.10	39.75	37.44	37.56	36.94	35.52	36.05	36.52	37.00
	Local					42.38			3416							40.39		39.98							38.05 (NL-97)		
	SE (m) ±																					0.19	2.54				
	CD 5%																					0.75	NS				
	CV%																					0.88	11.66				

6.3.3. Initial varietal trial - Double purpose

Seed samples were received from the centres of Zone I, II and III for their oil estimation and results are presented in Table 6.3.3.

It is obvious from table that the oil content varied from 33.98% (NDL-2005-26) to 37.92% (LMS-23-6), 37.09% (KL-232) to 39.37% (Meera), 36.94% (KL-232) to 39.48% (LMS-23-6) in Zone I, II and III, respectively. In general, the entry. The entry LMS-23-6 contained maximum oil on zone as well as over all mean basis. In order of merit, respective zonal checks stood second in term of oil content.

Table 6.3.3 Oil Content (%) in Initial Varietal Trial (Double Purpose) - IVT (DP)

Sl. No.	Entries	Zone I			Zone II							Zone III				Zone II & III Mean
		Palam pur	Ludh iana	Zonal Mean	Kan ke	Kan pur	Faiza bad	Main puri	Berham pore	Dholi	Ujhani	Zonal Mean	Kota	Hoshan gabad	Maura nipur	Zonal Mean	
1.	LCK-7002	39.03	36.00	37.52	39.64	37.89	39.97	41.02	36.66	38.30	38.46	38.85	39.48	38.75	40.36	39.53	39.05
2.	NDL-2005-26	33.95	34.00	33.98	37.07	37.57	37.67	41.32	35.33	36.33	36.28	37.37	38.23	38.36	37.20	37.93	37.54
3.	PKDL-72	37.03	34.40	35.72	38.61	37.49	39.30	38.68	34.42	-	36.79	37.55	38.37	36.43	40.81	38.54	37.88
4.	LCP-147	36.93	33.00	34.97	38.45	37.88	38.73	38.68	35.03	36.43	37.86	37.58	38.44	39.62	38.12	38.73	37.93
5.	RL-26016	37.98	35.20	36.59	38.63	37.61	38.16	39.01	36.02	35.76	37.27	37.49	39.26	37.28	37.46	38.00	37.64
6.	LMS-23-6	38.63	37.20	37.92	39.84	40.30	40.53	39.52	37.36	37.36	39.97	39.27	39.18	39.53	41.20	39.97	39.48
7.	KL-232	36.02	33.20	34.61	37.15	37.19	38.09	40.17	34.77	36.28	35.99	37.09	37.89	35.67	36.19	36.58	36.94
8.	Nagarkot (ZC-I)/	37.57	34.00	35.79	-	-	-	-	-	-	-	-	-	-	-	-	-
9.	Meera (ZC II & III)/	-	-	-	40.04	40.36	40.98	40.18	36.78	38.23	39.03	39.37	40.75	38.50	39.44	39.56	39.43
10.	Parvati (ZC-II & III)	-	-	-	40.01	40.33	41.09	38.10	36.68	38.41	38.12	38.96	40.57	-	39.00	39.79	39.14

6.3.4 Initial varietal trial - *Utera*

Seed for their oil analysis were received from centres of Zone I, II, III and IV and results are presented in Table 6.3.4. It is clear from table that none entry gave higher oil content than the check, Surabhi (41.34%) in Zone I. In the case of Zone II, III and IV, the tested entry 'LMS-P-5' recorded maximum oil on zone basis as well as pooled mean basis (39.85%).

Table 6.3.4 Oil Content (%) in Initial Varietal Trial *(Utera)* - IVT (U)

Sl. No.	Entries	Zone I				Zone II			Zone III	Zone IV	Mean
		Palampur	Kangra	Malan	Zonal Mean	Ujhani	PRDF (Gorakhpur)	Zonal Mean	Jashipur	Raipur	Zone II, III & IV
1.	NL-119	38.98	38.46	40.30	39.25	39.31	34.54	36.92	35.05	38.68	36.90
2.	PKDL-75	39.22	37.75	39.00	38.65	-	30.01	30.01	35.58	39.31	34.97
3.	BAU-06-17	37.51	36.82	39.05	37.79	-	-	-	-	39.33	-
4.	NDL-2005-34	38.14	34.50	40.01	37.55	38.31	33.51	35.91	-	34.64	35.49
5.	RLC-121	39.10	39.47	40.80	39.79	38.87	37.80	38.33	37.32	-	38.00
6.	LMS-P-5	39.39	39.39	41.08	39.95	40.24	38.12	39.18	41.06	39.99	39.85
7.	Baner (ZC)	36.88	35.34	38.48	36.90	-	-	-	-	-	-
8.	Surabhi (ZC-I)/	-	-	-	-	-	-	-	-	-	-
	R-552 (ZC-II, III & IV)	41.63	39.83	42.58	41.34	-	35.20	35.20	33.71	34.89	34.60
9.	T-397 (NC)	37.78	36.42	38.35	37.52	37.08	32.00	34.54	37.44	36.47	35.75
10.	Local	-	-	-	-	-	31.46	-	-	-	-
	SE (m) ±	-	-	-	-	-	-	-	-	0.21	-
	CD 5%	-	-	-	-	-	-	-	-	0.89	-
	CV%	-	-	-	-	-	-	-	-	0.95	-

6.3.5 Advanced varietal Trial - Rainfed

The seed of five tested entries including checks from trial conducted at the centers of Zone III and IV were received for its oil analysis and results are presented in Table 6.3.5. It is clear from table that in Zone III the tested entry LMS-149-4 stood next to Padmini in term of oil content. However, LMS-149-4 gave more oil content than either of checks i.e., R-552 and T397. Similar to Zone III the entry LMS-149-4 gave maximum oil content i.e. 39.15% but less than Padmini in Zone IV. However, both the tested entries *viz.*, LMS-149-4 and SLS-68 gave higher oil content against checks R-552 and T-397.

Table 6.3.5 Oil Content (%) in Advanced Varietal Trial (Rainfed) - AVT (R)

Sl. No.	Entries	Zone-III			Zonal Mean	Zone-IV								Zonal Mean
		Sagar	Maurani pur	Tikam garh		Nagpur	Jashi pur	Raipur	Jagdal pur	Latur	Somnath pur	Badna pur	Raichur	
						FIRST YEAR TESTING								
1.	LMS-149-4	38.63	40.77	40.32	39.91	37.62	40.49	40.64	37.02	41.23	37.08	40.11	39.01	39.15
2.	SLS-68	-	-	-	-	36.35	38.37	37.45	34.31	38.80	34.75	39.30	36.54	36.98
3.	Padmini (AC)	43.05	42.27	41.70	42.34	40.75	42.09	41.27	38.52	42.55	38.75	43.11	38.41	40.68
4.	R-552 (ZC)	37.13	37.18	35.53	36.61	34.41	36.48	37.20	34.17	36.91	33.57	36.50	33.97	35.40
5.	T-397 (NC)	38.54	37.48	36.87	37.63	35.85	34.98	38.09	34.86	37.16	34.00	38.78	34.50	36.03
	Local Check	-	-	39.31	-	38.97	-	-	-	-	-	-	34.49	-
	SE (m) ±	-	-	-	-	-	-	0.12	-	-	0.26	0.10	-	-
	CD 5%	-	-	-	-	-	-	0.53	-	-	1.24	0.44	-	-
	CV%	-	-	-	-	-	-	0.64	-	-	1.27	0.51	-	-

6.3.6 Advanced varietal Trial - Irrigated

Oil content were estimated from tested entries of trials conducted at centers of Zone III and IV consisting first and second year testing entries, consequently results are summarized in Table 6.3.6. In Zone III, both entries of first year testing gave higher oil estimate than best check J-23 (38.59%) but none entries of second year testing gave higher oil content than best check. In Zone IV, both tested entries of first year gave higher oil value than best check, but among second year tested entries only NDL-2004-05 recorded higher oil content (37.96%) than best check J-23 (37.48%).

Table 6.3.6 Oil Content (%) in Advanced Varietal Trial (Irrigated) - AVT (I)

Sl. No.	Entries	Zone-III						Zonal mean	Zone-IV				Zonal Mean
		Kota	Mauranipur	Hoshangabad	Sagar	Tikamgarh	Udaipur		Nagpur	Raipur	Raichur	Jashipur	
						FIRST YEAR TESTING							
1.	RLC-115	37.11	41.40	40.12	36.40	39.67	39.79	39.08	37.91	39.09	36.57	37.42	37.75
2.	JLT-204	40.93	41.90	38.82	38.86	40.31	40.52	40.22	37.61	39.85	36.86	37.15	37.87
						SECOND YEAR TESTING							
3.	NDL-2004-05	36.19	36.57	35.53	34.53	34.05	36.61	35.58	37.78	38.77	36.19	39.08	37.96
4.	SLS-61	38.86	41.41	39.23	34.03	38.00	39.78	38.55	-	-	-	-	-
5.	LC-2279-4	-	-	-	-	-	-	-	36.18	37.16	34.62	36.00	35.99
6.	PKDL-52	-	-	-	-	-	-	-	36.53	38.30	33.94	36.19	36.24
7.	J-23 (ZC)	37.63	40.32	39.32	37.70	38.92	37.63	38.59	36.08	39.07	36.37	38.39	37.48
8.	T-397 (NC)	37.62	39.79	37.93	35.57	37.00	37.09	37.50	35.68	38.89	34.46	35.21	36.06
	Local	-	-	-	-	38.30	-	38.30	39.51	-	38.06	-	-
	SE (m) ±	-	-	-	-	-	-	-	-	0.10	-	-	-
	CD 5%	-	-	-	-	-	-	-	-	0.41	-	-	-
	CV %	-	-	-	-	-	-	-	-	0.52	-	-	-

6.3.7 Advanced varietal Trial - Double Purpose

Seed samples of four tested entries from Zone I and five tested entries from Zone-II centres were received for their oil estimation and results there of presented in Table 6.3.7A and 6.3.7 B. In Zone I, both tested entries, namely; LMS-95-4 and LCK-5021 gave higher oil content than Zonal check-Nagarkot (35.75%) and out of two LCK-5021 stood first (37.25%). In Zone II, PKDL-62 from first year tested entries and LCK-5021 from second yest tested entries gave maximum oil content i.e., 40.12 and 39.95%, respectively. These entries were also found superior to best check-Meera (38.83%).

Table 6.3.7 A Oil Content (%) in Advanced Varietal Trial - Double Purpose (Zone-I)

Sl. No.	Entries	Palampur	Ludhiana	Zonal Mean
	SECOND YEAR TESTING			
1.	LMS-95-4	39.35	34.60	36.98
2.	LCK-5021	39.49	35.00	37.25
3.	Filler (Rashmi)	37.50	34.60	36.05
4.	Nagarkot (ZC)	37.45	34.00	35.73

Table 6.3.7 B Oil Content (%) in Advanced Varietal Trial - Double Purpose (Zone-II)

Sl. No.	Entries	Kanke	Kanpur	Faizabad	Berhampore	Dholi	Zonal Mean
	FIRST YEAR TESTING						
1.	LCK-6028	39.65	37.55	40.38	35.88	37.39	38.17
2.	PKDL-62	41.98	38.97	41.48	38.88	39.30	40.12
	SECOND YEAR TESTING						
3.	LCK-5021	41.44	39.22	41.19	38.08	39.84	39.95
4.	Meera (ZC)	40.01	38.29	40.46	37.23	38.17	38.83
5.	Parvati (ZC)	40.09	40.02	39.61	35.83	37.82	38.67

6.3.8 Advanced Varietal Trial - *Utera*

Seed samples for oil estimation were received from Malan, Palampur and Kangra centers of Zone I and results are summarized in Table 6.3.8. Two entries, namely; PKDL-65 and RLC-112 were tested against two checks viz., Shrabhi and T-397. None entries superseded the best check Shrabhi (41.64%). However, between tested entries PKDL-65 stood first (38.97%) in the term of oil content, which gave only 6.39% less oil content than check Shrabhi.

Table 6.3.8 Oil Content (%) in Advanced Varietal Trial *Utera* (AVT-U) under assured Moisture condition - Zone-I

Sl. No.	Entries	Malan	Palampur	Kangra	Zonal Mean
	FIRST YEAR TESTING				
1.	PKDL-65	39.96	39.86	37.10	38.97
2.	RLC-112	38.74	38.26	36.46	37.82
3.	Filler (Sweta)	42.55	44.35	38.41	41.77
4.	Surbhi	42.27	42.50	40.15	41.64
5.	T-397	38.99	37.25	36.67	37.64

6.3.9 Extra Early Maturing Trial - Rain fed

Seed samples of 11 entries from centres of Zone III and 10 entries from centers of Zone IV were received for oil analysis and their results are presented in Table 6.3.9. These entries were under first, second and third years of testing. In Zone III, among first year tested entries, SLS-73 recorded maximum oil content of 41.34% followed by OLC-99-57 (38.26%) and found superior to best check-JLS-9 (40.72%). None entries from second year as well as third year of testing gave higher oil content than best check JLS-9 (40.72%). However, SLS-66 from third year testing gave only 1.72% less oil content than best check JLS-9. In Zone IV none entries from either of testing year gave higher oil content than best check JLS-9 (39.83%). However, among first year tested entries SLS-73 recorded maximum oil content of 39.56% followed by OLC-99-57 (38.36%) and between second year testing entries, JLT-215 stood first with respect to oil content.

Table 6.3.9 Oil Content (%) in Extra Early Maturing Trial - Rainfed-EEMT (R)

Sl. No.	Entries	Zone-III			Zonal Mean	Zone IV					Zonal Mean
		Sagar	Mauranipur	Hoshangabad		Raipur	Nagpur	Jashipur	Raichur	Jagdalpur	
					FIRST YEAR TESTING						
1.	PCL-35-06	36.56	36.10	35.83	36.16	39.53	36.19	36.52	35.10	36.32	36.73
2.	SLS-73	41.72	41.63	40.66	41.34	41.91	38.29	-	38.39	39.65	39.56
3.	PKDL-73	38.15	38.44	37.43	38.01	39.66	37.05	40.14	36.88	37.15	38.18
4.	OLC-99-57	38.18	38.34	38.25	38.26	41.41	36.99	39.51	36.56	37.65	38.36
5.	RLC-116	36.60	38.05	35.50	36.72	39.27	35.23	38.20	35.06	35.55	36.66
					SECOND YEAR TESTING						
6.	JLT-215	37.22	40.17	39.35	38.91	39.73	36.10	-	36.40	-	37.41
7.	RLC-114	-	-	-	-	39.49	36.19	37.51	34.13	-	36.83
					THIRD YEAR TESTING						
8.	SLS-67	38.44	40.26	38.73	39.14	-	-	-	-	-	-
9.	SLS-66	-	40.69	40.60	40.65	-	-	-	-	-	-
10.	JLS-9 (ZC)	39.70	42.71	39.75	40.72	42.21	38.58	40.20	38.91	39.23	39.83
11.	NL-97 (ZC)	37.95	36.27	39.27	37.83	41.40	37.76	37.94	38.08	38.87	38.81
12.	T-397 (NC)	36.60	37.79	36.38	36.92	39.82	35.87	36.84	34.54	37.29	36.87
13.	Local	-	-	39.07	-	-	38.82	-	38.50	-	-
	SE (m) ±					0.11					
	CD 5%					0.45					
	CV%					0.47					

6.4 Linseed nursery under salinity/alkalinity condition

A total number 19 entries tested at Daleep Nagar and Kumarganj Faizabad were evaluated for their oil content as seed samples from Lucknow was not received, and results there of presented in Table 6.4.1 and 6.4.2. Out of 19 entries, 9 consisted of first year testing and 10 including check of second year of testing. At Daleepnagar, significant differences in oil content was observed and oil content varied from 32.52% (NDL-2005-26) to 34.76% (Flax-16) and from 32.40% (EC-41706) to 35.07% (EC-41689) of their first and second year of testing, respectively. At Faizabad the oil content varried from 33.90% (GS-436) to 39.46% (Flax-16) and from 34.76% (EC-41706) to 39.46% (EC-41537) of their first and second year of testing, respectively. On mean basis, among first year of testing entries Flax-16 recorded maximum oil content (37.11%), whereas among second year of testing entries EC-41537 gained maximum oil content (37.26%)

While comparing first year tested entries with best check-T-397 (35.18%), the entries Flax-16, EC-99007, and NDL-2005-29 were found superior, among second year tested entries EC-41537, and EC-41573 were observed superior to the best check *i.e.,* T-397 in term of oil content.

Besides oil content, the fatty acid profile of entries tested at Daleepnagar under linseed nursery sown under saline condition were also studied. The result pertaining to this are depicted in Table 6.4.2. The harvested seed from Daleepnagar were studied. All major fatty acids of linseed were present in all the tested entries. It has been observed that linolenic acid content decreased drastically, whereas oleic acid content improved markedly. The effect of linolenic acid was also observed on value of iodine.

Table 6.4.1 Oil Content (%) in Linseed Nursery under Saline / Alkaline soils

Sl. No.	Entries	Daleepnagar	Faizabad	Zonal Mean	Sl. No.	Entries	Daleepnagar	Faizabad	Zonal Mean
	FIRST YEART TESTING					SECOND YEAR TESTING			
1.	FR-3	33.57	35.68	34.63	10.	EC-41690	32.70	35.31	34.00
2.	FR-11	33.13	36.24	34.68	11.	EC-41706	32.40	34.76	33.58
3.	Flax-16	34.76	39.46	37.11	12.	EC-41687	33.77	36.43	35.10
4.	EC-99007	34.63	36.23	35.43	13.	EC-41689	34.35	36.56	35.45
5.	EC-98866	33.44	36.47	34.95	14.	EC-41537	35.07	39.46	37.26
6.	GS-436	34.50	33.90	34.20	15.	EC-41525	33.66	36.44	35.05
7.	NDL-2005-17	32.57	36.40	34.48	16.	EC-41573	34.64	37.81	36.22
8.	NDL-2005-29	34.53	36.62	35.57	17.	Mukta (Check)	32.62	36.40	34.51
9.	NDL-2005-26	32.52	35.55	34.03	18.	Hira (Check)	32.67	36.97	34.82
					19.	T-397 (Check)	33.43	36.93	35.18
	SE (m) ±						0.48	-	
	CD 5%						1.86	-	
	CV %						2.48	-	

Besides salinity effect, varietals differences were also noticed. It is clear from table that linolenic acid varied from 32.97% (NDL-2005-26) to 47.34% (EC-41573) and oleic acid ranged from 27.25% (Flax-16) to 35.72% (EC-98866). The iodine value ranged from 142.58 (NDL-200-26) to 173.87 (T-397). On mean basis the plamitic, stearic, oleic, linoleic and linolenic acid were found 6.80, 6.44, 31.98, 15.14 and 39.82%, respectively. The ratio of omega-3 and omega-6 was observed narrow i.e. 2.63:1. This low ratio is because of low value of linolenic acid (Omega-3) contribution of linolenic acid for iodine value was found major, whereas, oleic and linolenic were in negative association.

Table 6.4.2 Fatty acids profile of entries tested under salinity sown at Daleepnagar

Sl. No.	Entry	Fatty acids (%)					Iodine value
		Palmitic	Stearic	Oleic	Linoleic	Linolenic	
First Year							
1	FR-3	4.60	5.29	34.43	19.35	36.34	158.43
2	FR-11	6.91	6.36	34.21	16.76	35.77	152.26
3	Flax-16	6.17	6.76	27.25	15.94	43.88	166.09
4	EC-99007	7.40	6.63	30.61	15.78	39.57	157.41
5	EC-98886	6.42	7.15	35.72	12.44	38.27	152.61
6	GS-436	6.34	7.77	35.40	12.11	38.38	152.05
7	NDL-2005-17	12.95	5.58	28.63	12.74	40.10	151.83
8	NDL-2005.29	6.66	5.64	34.81	13.79	39.09	156.32
9	NDL-2005-26	6.54	6.01	43.80	10.74	32.97	142.58
Second Year							
10	EC-41690	3.86	4.75	29.38	21.72	40.30	168.57
11	EC-41706	11.52	6.74	29.67	15.20	36.87	148.52
12	EC-41687	6.52	7.49	28.30	15.27	42.42	162.01
13	EC-41689	6.81	6.41	30.21	15.07	41.50	160.89
14	EC-41537	0.68	9.00	33.65	16.27	41.01	164.65
15	EC-41525	6.47	5.60	34.56	18.91	34.47	152.88
16	EC-41573	4.79	4.92	29.22	13.43	47.34	172.50
17	Mukta (Ch)	7.12	8.19	34.43	15.08	38.18	153.26
18	Hira (Ch)	8.08	6.67	30.96	15.64	38.65	155.06
19	T397 (Ch)	9.38	5.39	22.38	11.42	51.44	173.87
	Mean	6.80	6.44	31.98	15.14	39.82	149.73

6.5 Screening of germplasm for oil content grown under saline condition

The experiment was conducted at Daleep Nagar, Faizabad and Lucknow, but seed samples for oil analysis was received from Daleep Nagar only.

About one hundred germplasm excluding cheeks namely; Hira, Mukta and T 397 were analyzed for its oil content, and the results are depicted in Table 6.5.1. In first block of treatments five entries *viz.*, Hy-126-2, Kanpur-2/1, IC/54, JBP-Star II, Hamirpur; in second block entries ILS-150, ILS-79, Jaishri-1-3, ILS-60 ; in third block entries IC-16350, KL-169, IC-16382, KL-37, KP-13, Kota-2, Hanuman Sagar, HY-276, KL-1, ICAR-7, HP, K-29, and Fourth block entries *viz.* IC-15888, 1/276, Kanpur local, NDL-2005-23, ILS-293, KP-8, NDL-2005-32, ILS-264 were exhibited in top non significant group in term of oil content. Sixteen entries were found in top non-significant group in terms of oil content, when compared among all the treatments. The entries, namely; Jaishri-1-3, ILS-60, IC-15888, were recorded significantly higher oil content over the best check Mukta (34.96%). However, entries, ILS-60 (38.08%), Jaishri-1-3 (38.15%), IC-15888 (37.47%), ILS-150 (37.28%), IPS-42 (36.26%) ranked in that order in the term of their oil content under this stress condition.

Table 6.5.1 Oil content (%) in germplasm Screened under salinity at Daleep Nagar

Sl. No.	Entries	Oil Content		Sl. No.	Entries	Oil Content		Sl. No.	Entries	Oil Content	
1	JLT-84-5-1	33.31	(32.68)	28	ILS-169	32.49	(32.14)	55	JRF-1	-	-
2	Jashi-21	-	-	29	ICAR-6	33.74	(33.39)	56	Janlargi-1-5	-	-
3	Hy-126-2 (IC-4948)	33.37	(32.74)	30	ILS-150	37.28	(36.93)	57	KL-169	34.36	(34.43)
4	ICAR-3	31.66	(31.03)	31	IPI-10	35.73	(35.38)	58	ICAR-2	33.09	(33.16)
5	KP-13A	-	-	32	ILS-79	36.44	(36.09)	59	IC-16392	33.24	(33.31)
6	NDL-2005-22	-	-	33	H-49	31.08	(30.73)	60	H-660	31.21	(31.28)
7	Kanpur 2/1	35.89	(35.26)	34	IC-16380	33.92	(33.57)	61	IC-16382	33.26	(33.33)
8	ICAR-1	31.48	(30.85)	35	HY-38	34.94	(34.59)	62	ILS-60	32.95	(33.02)
9	KP-10	32.03	(31.40)	36	Jabalpur Local	31.51	(31.16)	63	NDL-2005-31	-	-
10	HYB-603-2	-	-	37	JRF-4	35.25	(34.90)	64	ICAR-3	32.83	(32.90)
11	ILS-154	-	-	38	KP-5	35.71	(35.36)	65	KL-37	34.90	(34.97)
12	Inslar Local	-	-	39	Jaishri L-3	38.15	(37.80)	66	KP-13	33.30	(33.37)
13	IC/54	35.77	(35.14)	40	ILS-60	38.88	(38.53)	67	Kota-2	36.08	(38.15)
14	JBP-Star II	34.08	(33.45)	41	Jabalpur 1986	32.98	(32.63)	68	Hanuman Sagar	34.21	(34.28)
15	K-2X (R-4/29)	31.73	(31.10)	42	IPI-6	32.71	(32.36)	69	KB-96-10	-	-
16	Hamirpur	33.48	(32.85)	43	ILS-153	33.98	(33.63)	70	HY-276	33.45	(33.52)
17	HY-262	33.09	(32.46)	44	ILS-252	34.16	(33.81)	71	KL-1	35.59	(35.66)
18	IPS-42	36.26	(35.63)	45	KL-31	33.04	(32.69)	72	ICAR-7	33.50	(33.57)
19	Jakauli	31.23	(30.60)	46	HY-66	33.61	(33.26)	73	H.P.	34.18	(34.25)
20	Hy-52XRR-9	30.27	(29.64)	47	IC-47936	33.58	(33.23)	74	ILS-73	-	-
21	Jaishri-2	32.50	(31.87)	48	NDL-2005-26	27.83	(27.48)	75	K-29	34.90	(34.97)
22	ILS-56	32.41	(31.78)	49	ILS-169	33.76	(33.41)	76	HY-126-2	-	-
23	NDL-2005-24	32.54	(31.91)	50	Jathari Local	-	-	77	HY-397	32.95	(33.87)
24	ILS-77	32.95	(32.32)	51	Ireland	-	-	78	HY-614-1	-	-
25	H-104-V/7	29.64	(29.01)	52	H-10416-5	32.76	(32.83)	79	IC-15888	37.47	(38.39)
26	Jawargi-1-11	35.25	(34.90)	53	JLST-1	31.48	(31.55)	80	IPI-8	32.20	(33.12)
27	Kota-8	35.03	(34.68)	54	IC-16350	33.52	(33.59)	81	I/276	35.90	(36.82)

Table 6.5.1 Contd.....

Sl. No.	Entries	Oil Content		Sl. No.	Entries	Oil Content		Sl. No.	Entries	Oil Content	
82	IC-59202	32.03	(32.95)	91	Kanpur Local	-	-	100	NDL-2005-29	34.33	(35.25)
83	JRF-5	31.32	(32.24)	92	NDL-2005-34	32.37	(33.29)		Hira (Ch)	32.24	(32.24)
84	Kanpur Local	34.97	(35.89)	93	ILS-61	33.55	(34.47)		Mukta (Ch)	34.96	(34.96)
85	NDL-2005-23	33.86	(34.78)	94	HY-31	33.48	(34.40)		T-397 (Ch)	34.09	(34.09)
86	ICAR-4	31.89	(32.81)	95	ILS-65	33.84	(34.76)		Treatment comparison	SE (m) ±	CD 5%
87	Holden	31.61	(32.53)	96	Kota-13	32.24	(33.16)		Unrep. tr.-same block	1.20	2.94
88	ILS-293	34.84	(35.76)	97	ILS-264	35.08	(36.50)		Unrep. tr.-diff block	1.39	3.39
89	KP-8	34.92	(35.84)	98	ICI-14577	33.85	(34.77)		Unrep. tr. vs check	1.04	2.54
90	NDL-2005-32	35.00	(35.92)	99	Jabalpur-367	33.03	(33.95)				

6.6 Identification of linolenic acid (Low & High) in IVT and AVT Ist year entries of breeding trials through spot test

The spot test for categorization of entries into low, medium or high in linolenic acid was executed at P.C. Unit Kanpur. Trial and entries wise remark pertaining to linolenic acid are summarized in Table 6.6.1. It is obvious from table 6.6.1 that all tested entries for linolenic acid content fell in to the category of high in linolenic acid. The actual amount of linolenic acid alongwith other fatty acids will work out after their promotion in AVT level, in coming year.

Table 6.6.1 Spot test results of Initial varietal trial's entries

Sl. No.	Entry	Remark	Sl. No.	Entry	Remark	Sl. No.	Entry	Remark
IVT (R)							**EEMT (R)**	
1	PCL-1-06	high	17	LMS-63-6	high			
2	LCK-7034	high	18	RL-26018	high	33	PCL-35-06	High
3	NL-260	high	19	NL-260	high	34	SLS-73	high
4	PKDL-74	high	20	RLC-116	high	35	PKDL-73	high
5	NDL-2005-34	high	**IVT (DP)**			36	OLC-99-57	high
6	LMS-P-3	high	21	LCK-7002	high	37	RLC-116	high
7	BAU-06-8	high	22	NDL-2005-26	high	**Checks**		
8	SLS-71	high	23	PKDL-72	high	38	Sheela	high
9	KL-219	high	24	LCP-147	high	39	Shekhar	high
10	RLC-117	high	25	RL-26016	high	40	R-552	high
IVT (I)			26	LMS-23-6	high	41	T-397	high
11	LCP-146	high	**IVT (U)**			42	Padmini	high
12	LCK-7035	high	27	NL-119	high	43	Nagarkot	high
13	BA-06-5	high	28	PKDL-75	high	44	Meera	high
14	PKDL-71	high	29	BAU-06-17	high	45	Parvati	high
15	NDL-2005-24	high	30	NDL-2005-34	high	46	Surabhi	high
16	KL-248	high	31	RLC-121	high	47	Baner	high
			32	LMS-P-5	high			

6.7 Estimation of fatty acids and Iodine value in AVT entries

The fatty acids, namely ; Plamitic, stearic, oleic, linoleic and linolenic acid were estimated in AVT entreis of breeding trials through GLC at P.C. Unit Kanpur. Besides fatty acids, the iodine value was also estimated there of. Fatty acids profile along with iodine value of different entreis are illustrated in Table 6.7.1.

In general, fatty acids were found from tested entries in the order of linolenic acid > oleic acid > linoleic acid > Palmitic acid > Stearic acid. The linolenic acid is an important fatty acid, decides the utility of linseed oil, were showed a variation from 29.67% (NDL-2004-05) to 62.30% (SLS-61) among tested entries. The iodine value is another factor for deciding dryness of oil varied from 140.51 (NDL-2004-05) to 195.71 (JLS-9) among tested entries of linseed.

Table 6.7.1 Fatty acids composition and iodine value of different AVT entries

Sl. No.	Name of Entry	Fatty acids (%)					Iodine value
		Palmitic	Stearic	Oleic	Linoleic	Linolenic	
AVT (R)							
1	LMS-149-4	8.35	5.83	22.24	13.33	50.24	173.84
2	SLS-68	7.08	5.81	24.21	12.48	50.42	174.61
AVT (I)							
3	RLC-115	7.21	5.53	27.58	14.51	45.18	167.30
4	SLS-61	6.48	6.48	24.55	0.20	62.30	184.74
5	NDL-2004-05	3.84	8.12	44.01	14.34	29.67	140.51
6	LC-2279-4	8.17	6.78	29.14	0.27	55.65	171.38
7	PKDL-52	10.69	6.91	26.33	0.20	58.88	177.31
8	JLS-23	8.37	6.20	25.60	0.20	59.63	178.64
AVT (U)							
9	RLC-112	7.31	6.46	24.52	12.70	49.02	171.59
10	PKDL-65	7.45	4.13	19.44	14.28	54.70	184.84
AVT (DP)							
11	LCK-5021	7.40	4.83	24.49	10.99	52.30	177.19
12	LMS-95-4	6.46	5.66	25.32	11.03	51.53	175.96
13	PKDL-62	7.99	5.07	23.46	13.80	49.68	174.32
14	LCK-6028	7.50	6.71	25.12	10.11	50.56	171.65
EEMT (R)							
15	SLS-67	7.67	7.04	29.83	12.80	42.66	159.67
16	SLS-66	7.43	4.94	22.38	13.93	51.31	177.88
17	JLT-215	6.10	5.66	25.71	13.57	48.97	173.99
Checks							
18	R-552	7.76	5.53	22.56	12.36	51.79	176.57
19	Surabhi	6.91	4.32	22.73	11.90	54.14	182.08
20	JLS-9	5.82	5.66	25.12	11.47	58.84	195.71
21	NL-97	3.18	4.46	26.59	14.76	51.00	182.13
22	Nagarkot	7.01	6.76	26.33	10.94	48.95	169.91
23	Rashmi	6.97	6.07	23.24	12.74	50.98	175.69

6.8 Effect of Agro-climatic condition on oil content and its quality

This experiment was assigned for its sowing at P.C. Unit, Plampur, Jashipur and Raichur and for its analysis at P.C. Unit and Kanpur centre. This trial was not sown at Raichur and analysis part was done at P.C. Unit only. All ten varieties were grown at three centers and analysed at P.C. Unit. The brief weather record of the centres are illustrated in Table 6.8.1, however detail weather information are appended in Table 1.

Table 6.8.1 Weather record during crop season (Oct.-May)

Centre	Total Rainfall (mm)	Rainy days	Range of Temperature ^{0}C		Range of Relative Humidity (%)
			Maxi.	Mini.	
Palampur	533.9	36	13.5-29.2	4.2-17.4	35.75-91.60
Kanpur	13.9	5	21.9-33.3	7.4-20.0	35.90-66.50
Jnshipur	320.8	13	23.7-33.3	14.0-21.2	

Maximum rainfall took place at Palampur followed by Jashipur based upon Cumulative result of 36 and 13 rainy days in that order. Maximum temperature was observed higher at Jashipur followed by Kanpur and that was lowest at Palampur. On another hand minimum temperature was also found higher at Jashipur followed by Kanpur and it was lowest at Palampur. Among reported data on relative humidity. Palampur received maximum humidity. Jashipur could not reported relative humidity, though it can be concluded that Jashipur had higher relative humidity than Kanpur as total rainfall and its frequency of distribution was higher at Jashipur in comparison to Kanpur.

The results pertaining to oil content, fatty acid composition and iodine value of all studied varieties location-wise are given on Table 6.8.2. It is clear from table that Palampur had highest value of oil, while very little difference was observed between Kanpur and Jashipur location, where, days temperature had not much difference between Kanpur and Jashipur. The varietal differences in the term of oil content was also observed being maximum recorded in Shubhra followed by Shurabhi. Palmitic acid was observed higher at Jashipur followed by Kanpur, like Palmitic acid, stearic was also observed higher at Jashipur followed by Kanpur.

All unsaturated fatty acids namely oleic, linoleic and linolenic acids were also influence with locations where, weather value were also different. Maximum Oleic acid was observed at Kanpur, where rainfall as well as relative humidity was less and night temperature was observed between Palampur and Jashipur. The linolenic acid was observed maximum at Palampur and lowest at Jashipur location where night temperature was noted lowest and highest, respectively. Linolenic acid, decides the several uses of linseed oil, was estimated higher at Palampur and lowest at Kanpur and at Jashipur it stood in between. At Palampur Average temperature was observed lowest with maximum rainfall in more rainy days. At Kanpur the rainfall was minimum with mild humidity and days temperature exhibited between Jashipur and Palampur.

It is also clear from table that with increases the linolenic acid decreases the oleic acid content or vice versa. As maximum linolenic was recorded at Palampur with minimum oleic acid content and value at Kanpur observed in between. In general, components of fatty acids was found in the order of stearic < Palmitic < Linoleic < Oleic < Linolenic. The iodine value, decides the saturation of oil, was estimated maximum at Palampur where temperature was coldest and number of rains and total rain fall was maximum. At Jashipur the iodine value was found next to Palampur where days temperature was maximum and number of rains and total rainfall was also next to Palampur. It is clear from table that variation of average temperatures of Jashipur and Kanpur had not much difference, hence the result on oil content ; fatty acids and iodine value had little difference at these two locations. The oil content, fatty acids and iodine value had much difference when compared the data of Plampur with Kanpur and Jashipur.

Table 6.8.2 Location wise oil content, fatty acid composition and iodine value

Sl. No.	Entry	Oil content %				Palmitic acid (16:0)				Stearic acid (18:0)				Oleic acid (18:1)			
		Palampur	Kanpur	Jashipur	Mean	Palampur	Kanpur	Jashipur	Mean	Palampur	Kanpur	Jashipur	Mean	Palampur	Kanpur	Jashipur	Mean
1.	Kiran	37.63	37.28	38.11	37.67	6.35	7.12	7.11	6.86	5.19	5.54	5.27	5.33	26.67	36.02	38.78	30.49
2.	Garima	38.62	35.57	36.74	36.97	6.54	7.17	5.45	6.39	4.61	7.79	5.47	5.96	17.58	27.53	22.68	22.60
3.	LC-185	38.64	35.72	36.56	36.97	6.41	6.95	11.04	8.13	2.95	4.08	5.14	4.06	17.16	21.27	24.12	20.85
4.	Surabhi	39.86	39.25	38.96	39.36	5.99	5.69	6.99	6.22	3.68	5.96	4.26	4.63	20.20	35.36	30.50	28.69
5.	J-23	38.89	38.00	37.32	38.07	6.08	4.45	6.66	5.73	2.15	3.40	6.35	3.97	21.74	39.21	29.02	29.99
6.	Sheela	37.78	36.66	38.14	37.53	1.96	2.60	7.23	3.93	2.19	3.87	2.53	2.86	25.49	35.16	26.36	29.00
7.	Gaurav	38.25	39.67	38.85	38.92	3.00	6.95	6.96	5.64	3.56	6.58	6.24	5.46	28.45	35.16	29.78	31.13
8.	Shubhra	41.05	38.45	38.86	39.45	5.50	7.05	7.56	6.69	3.99	3.09	5.50	4.19	18.56	30.86	28.89	26.10
9.	SLS-27	38.78	37.96	36.30	37.68	6.39	5.11	6.20	5.90	4.45	5.26	7.74	5.82	21.48	34.43	36.78	30.89
10.	T-397	36.12	34.20	35.38	35.23	5.50	6.60	6.95	6.35	4.77	4.36	5.16	4.76	24.27	31.93	31.24	29.15
	Mean	**38.56**	**37.28**	**37.52**	-	**5.37**	**5.97**	**7.22**	**6.19**	**3.75**	**4.99**	**5.37**	**4.70**	**22.16**	**32.69**	**28.82**	**27.89**

Sl. No.	Entry	Linoleic acid (18:2)				Linolenic acid (18:3)				Iodine Value			
		Palampur	Kanpur	Jashipur	Mean	Palampur	Kanpur	Jashipur	Mean	Palampur	Kanpur	Jashipur	Mean
1.	Kiran	14.56	15.44	13.21	14.40	47.23	35.89	45.64	42.92	171.98	151.84	167.29	163.70
2.	Garima	13.45	12.87	10.39	12.24	57.82	44.64	56.01	52.82	189.98	162.99	184.83	179.27
3.	LC-185	10.91	10.43	11.04	10.79	62.57	57.27	48.66	56.17	197.66	186.47	167.42	183.85
4.	Surabhi	11.72	15.85	12.01	13.19	58.41	37.13	46.24	47.26	190.78	155.23	168.26	171.42
5.	J-23	12.09	7.74	13.00	10.94	57.95	45.20	44.97	49.37	191.54	165.63	165.37	174.18
6.	Sheela	20.75	14.78	12.34	15.96	49.61	43.59	51.54	48.25	187.93	170.13	179.15	179.07
7.	Gaurav	12.56	15.45	15.68	14.56	52.44	35.86	41.34	43.21	185.69	151.04	161.66	166.13
8.	Shubhra	13.34	15.11	13.02	13.82	59.10	43.97	45.04	49.37	193.13	167.84	165.48	175.48
9.	SLS-27	17.37	11.16	9.72	12.75	50.31	44.04	39.56	44.64	180.45	164.40	152.19	165.68
10.	T-397	13.34	13.37	13.50	13.40	52.12	43.75	43.15	46.34	180.61	165.32	163.38	169.77
	Mean	**14.01**	**13.22**	**12.39**	**13.21**	**54.76**	**43.13**	**46.22**	**48.04**	**186.98**	**164.09**	**167.50**	**172.86**

Station Trial

Sl. No.	Entry	Oil (%)	Sl. No.	Entry	Oil (%)	Sl. No.	Entry	Oil (%)
Tikamgarh								
				SVT				
1.	JLT-204 B	38.51	11.	JLT-27-40 KR	40.94	21.	JLT-27-120 KR	39.13
2.	JLT-27-10	40.75	12.	J-23-20 KR	40.24	22.	SVT-401	38.23
3.	JLT-27-120-OKR	38.85	13.	JLT-27-120	40.85	23.	JLT-27-B	38.61
4.	JLT-27-50-KR	40.47	14.	SVT-405	39.31	24.	JLT-27-120	40.11
5.	SVT-406	37.62	15.	J-23-10 KR	40.04	25.	JLT-204-41	37.91
6.	SVT-403	39.44	16.	JLT-27-120-30 KR	38.63	26.	JLT-23-30 KR	40.99
7.	JLT-23-50 KR	41.10	17.	JLT-27-120-10 KR	39.36	27.	SVT-909	40.70
8.	J-23-OKR	39.88	18.	SVT-404	38.67	28.	JLT-27-20 KR	39.82
9.	JLT-27-W	37.97	19.	J-23-40 KR	40.84			
10.	JLT-27-OKR	40.40	20.	JLT-27-30 KR	41.19			
				BFT-08				
1.	JLT-84-5-1	37.44	9.	LMH-43 B	38.91	17.	Neela	35.81
2.	JLT-84-12-1	37.82	10.	JLT-24	36.83	18.	JRF-4	36.51
3.	5610	31.87	11.	LCK-93-24	36.72	19.	NL-97	37.93
4.	JLT-28	37.40	12.	JLT-98	38.51	20.	EC-1424	37.18
5.	LMH-91-24	37.85	13.	JLT-90	38.27	21.	IVT-030206	39.97
6.	LMH-16-5	39.50	14.	LCK-9211	39.18	22.	LMH-91-24	37.37
7.	EC-1393	35.53	15.	LMS-5-38	38.63			
8.	LMH-43 W	37.56	16.	Neelum	36.67			
				SVT-108				
1.	JLT-26	39.84	6.	JLT-119	38.03	11.	JLT-397	38.47
2.	JLT-62	38.88	7.	JLT-202	41.34	12.	JLT-206	40.04
3.	JLT-102	38.13	8.	JLT-203	35.90	13.	J-23	40.02
4.	JLT-110	40.16	9.	JLT-204	38.65	14.	JLS-9	38.86
5.	JLT-118	40.78	10.	JLT-215	39.28			
KANKE								
				SVT (I)				
1.		38.57	5.		39.74	9.		38.15
2.		39.82	6.		41.67	10.		38.07
3.		37.78	7.		43.25			
4.		43.68	8.		41.66			

Sl. No.	Entry	Oil (%)	Sl. No.	Entry	Oil (%)	Sl. No.	Entry	Oil (%)
Nagpur								
				PYT				
1.	NL-249	37.06	11.	NL-279	36.48	21.	NL-289	33.35
2.	NL-250	37.06	12.	NL-280	35.91	22.	NL-290	35.58
3.	NL-	38.36	13.	NL-281	38.77	23.	NL-291	35.74
4.	NL-	36.55	14.	NL-282	36.94	24.	NL-292	33.98
5.	NL-	35.77	15.	NL-283	36.86	25.	NL-293	35.14
6.	NL-	35.81	16.	NL-284	38.47	26.	NL-97 (C)	38.04
7.	NL-	33.94	17.	NL-285	35.28	27.	Kiran (C)	36.14
8.	NL-	36.68	18.	NL-286	37.46	28.	Padmini (C)	40.05
9.	NL-	32.65	19.	NL-287	37.76			
10.	NL-	36.21	20.	NL-288	36.81			
				MVT				
1.	NL-	38.77	6.	NL-276	37.58	11.	NL-271	33.36
2.	NL-	37.47	7.	NL-247	35.80	12.	NL-258	38.64
3.	NL-	36.47	8.	NL-251	39.18	13.	NL-263	33.12
4.	NL-	40.09	9.	NL-261	37.06	14.	NL-97(C)	36.91
5.	NL-	35.59	10.	NL-264	34.30	15.	Kiran (C)	36.73
Hoshang								
				SVT (I)				
1.	V1	39.58	4.	V4	42.04	7.	V7	42.04
2.	V2	39.62	5	V5	40.66	8.	V8	39.45
3.	V3	41.98	6.	V6	41.00	9.	V9	41.35
Sagar								
				V X SR-I				
1.	220	41.38	5.	224	38.26	9.	288	41.54
2.	221	42.35	6.	225	39.98	10.	229	39.00
3.	222	41.56	7.	226	41.06	11.	230	38.09
4.	223	40.37	8.	227	41.12	12.	231	38.38
				V X F-II				
1.	232	40.97	5.	236	38.21	9.	240	40.64
2.	233	40.61	6.	237	39.06	10.	241	38.74
3.	234	41.13	7.	238	39.72	11.	242	39.06
4.	235	39.91	8.	239	40.21	12.	243	39.16

Sl. No.	Entry	Oil (%)	Sl. No.	Entry	Oil (%)	Sl. No.	Entry	Oil (%)
				SVT (R)				
1.	49	38.75	4.	52	-	7.	55	32.46
2.	50	40.59	5.	53	41.00	8.	56	39.75
3.	51	36.11	6.	54	38.03			
				SVT (I)				
1.	57	35.97	5.	61	38.48	9.	65	38.56
2.	58	34.98	6.	62	35.29	10.	66	38.93
3.	59	35.88	7.	63	39.14	11.	67	36.11
4.	60	36.69	8.	64	41.00	12.	68	38.69
Raichur								
				MLT (L)				
1.	070-01	37.43	5.	070-05	37.84	9.	07(	38.41
2.	070-02	37.15	6.	070-06	37.53	10.	070-10	38.27
3.	070-03	37.11	7	070-07	36.60	11.	S-36	35.28
4.	070-04	35.06	8.	070-08	37.48			
Jagdalpur								
				RST (DP)				
1.	RL-25101	40.42	5.	RL-26015	42.03	9.	RL-27118	37.08
2.	RL-25107	41.37	6.	RL-26021	38.99	10.	RL-27119	40.96
3.	RL-25135	38.09	7.	RL-27034	40.03	11.	RL-26018	37.86
4.	RL-26004	36.79	8.	RL-27101	40.47			
Jagdalpur								
				RST (I)				
1.	RL-26016	40.58	10.	RL-27007	40.15	19.	RL-27120	35.80
2.	RL-26017	39.40	11.	RL-27010	42.56	20.	RL-27121	38.54
3.	RL-26018	40.34	12.	RL-27011	40.48	21.	RL-27122	37.70
4.	RL-26020	41.21	13.	RL-27030	38.20	22.	Triveni	41.18
5.	RL-26022	40.31	14.	RL-27032	38.65	23.	RL-914	39.82
6.	RL-26024	39.29	15.	RL-27038	39.79	24.	Meera	40.09
7.	RL-26031	41.39	16.	RL-24115	41.07	25.	RLU-6	39.94
8.	RL-26032	40.25	17.	RL-27103	42.21	26.	RL-26116	40.83
9.	RL-27005	42.28	18.	RL-27110	42.10			

Sl. No.	Entry	Oil (%)	Sl. No.	Entry	Oil (%)	Sl. No.	Entry	Oil (%)
Palampur								
				SST IF				
1.	070101	35.27	8.	070108	35.57	15.	070115	37.13
2.	102	35.07	9.	109	36.77	16.	116	35.96
3.	103	34.58	10.	110	36.47	17.	117	36.81
4.	104	31.99	11.	111	36.80	18.	118	37.09
5.	105	36.58	12	112	35.01	19.	119	34.90
6.	106	35.53	13.	113	35.29			
7.	107	33.18	14.	114	37.86			

Fatty acid profile of linseed's lines developed at Palampur

Sl. No.	Entry	Palmitic	Stearic	Oleic	Linoleic	Linolenic	Iodine value
1.	KL-227	6.69	7.19	25.24	11.02	49.85	171.47
2.	KL-215	6.44	5.32	23.39	10.70	54.15	180.59
3.	KL-249	2.43	3.63	19.58	12.50	61.85	200.61
4.	KL-213	1.45	4.75	22.05	16.06	55.69	192.77
5.	KL-237	9.14	5.97	30.24	7.71	46.94	162.41
6.	KL-231	6.02	6.40	26.92	10.04	50.62	173.24
7.	KL-221	5.03	5.17	16.92	12.34	60.55	194.64
8.	KL-235	6.22	7.09	30.57	8.28	47.84	166.04
9.	KL-212	7.75	6.70	22.68	12.81	50.07	172.95
10.	KL-236	6.45	6.22	24.78	9.90	52.65	176.47
11.	KL-225	6.97	6.32	23.61	11.85	51.25	175.18
12.	KL-229	6.59	5.64	25.01	11.18	51.58	176.08
13.	KL-244	6.42	6.46	25.24	11.67	49.70	172.64
14.	KL-228	6.24	7.22	27.15	10.17	49.21	169.97
15.	KL-240	2.76	10.25	52.72	3.42	30.85	132.17
16.	KL-216	6.37	6.31	27.39	8.10	51.82	173.42
17.	KL-218	6.35	6.65	27.49	10.35	49.15	170.40
18.	KL-219	6.06	6.54	22.29	12.13	52.98	179.06
19.	KL-217	6.42	5.99	21.15	8.31	49.12	161.34
20.	KL-243	12.16	8.14	21.09	12.93	52.68	178.63
21.	KL-204	8.47	7.14	25.67	10.66	48.07	166.55
22.	KL-245	9.60	5.59	22.73	10.32	51.76	173.10
23.	KL-238	6.26	6.13	23.25	11.18	53.17	160.65

Sl. No.	Entry	Palmitic	Stearic	Oleic	Linoleic	Linolenic	Iodine value
24.	KL-248	10.50	4.55	24.35	12.34	48.26	168.83
25.	KL-241	10.60	6.04	22.75	11.45	49.16	168.27
26.	KL-236	9.50	7.40	28.27	10.79	44.03	158.43
27.	KL-239	9.47	5.71	22.48	11.82	50.52	172.24
28.	KL-242	8.16	5.89	23.43	12.20	50.32	173.19
29.	KL-214	10.10	4.90	20.16	10.29	54.56	178.17
30.	KL-246	9.54	6.45	31.08	8.52	44.40	157.88
31.	KL-247	9.97	5.01	25.17	11.70	48.15	168.14
32.	KL-226	8.87	5.80	24.86	10.92	49.55	170.19
33.	KL-232	12.16	4.58	19.14	11.42	52.70	174.38
34.	KL-220	7.45	6.16	18.73	12.79	54.87	182.09
35.	KL-233	9.98	4.87	19.87	10.84	54.44	178.56

P.C. Unit

Variation in oil content of main shoot and secondary branches of linseed varieties

Sl. No.	Entry	Main branch	Secondary branch	Sl. No.	Entry	Main branch	Secondary branch	Sl. No.	Entry	Main branch	Secondary branch
1.	Gaurav	41.37	42.10	7.	Garima	39.62	39.92	13.	Pusa-2	34.79	36.08
2.	Rashmi	39.97	40.57	8.	NL-97	41.81	41.93	14.	LC-185	36.08	37.80
3.	Meera	34.88	35.14	9.	Sheela	37.24	38.09	15.	RL-76	39.06	39.42
4.	Parvati	40.02	40.31	10.	Surabhi	40.21	40.65		Mean	38.65	39.31
5.	Neelum	38.84	39.02	11.	T-397	38.04	38.50				
6.	LC-54	38.03	39.26	12.	Mukta	39.76	40.82				

Linolenic status of newly developed material of linseed at P.C. Unit through spot test

Cross	Single Plant Selection Number									
	1	2	3	4	5	6	7	8	9	10
TL11 × EC-3183										
1 F 1	High	Med.	High	High	High	High	Low	Low	High	High
IP1	Low	High	High	Low	Low	-	-	-	-	-
1P2	High	High	High	High	High	-	-	-	-	-
1BC1	Low	High	High	High	High	High	High	High	High	Low
1BC2	High	High	High	High	High	High	High	High	High	High
1F2	High	High	High	High	High	High	High	High	High	High

Cross	Single Plant Selection Number									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
TL-11×ACC No. 2251										
2F1	High	High	High	Med	High	High	High	High	High	High
2P1	Med	Med	Med	Low	-	-	-	-	-	-
2P2	High	High	High	High	-	-	-	-	-	-
2BC1	High	High	High	High	High	High	High	High	High	High
2BC2	High	High	High	High	High	High	High	High	High	High
2F2	High	High	High	High	High	High	High	High	High	High
TL-27×EC-3183										
3F'	High	High	High	High	High	High	High	High	High	High
3P	Med	Low	High	Med	Med	-	-	-	-	-
3P	High	Med	High	High	High	-	-	-	-	-
3BC1	High	High	High	High	High	High	Med	High	High	High
3BC2	High	High	High	High	High	High	Med	High	High	High
3F2	High	High	High	High	High	High	High	High	High	High
TL-27×ACC No. 2251										
4F1	High	High	High	High	High	High	High	High	High	High
4P1	High	High	High	Med	Med	-	-	-	-	-
4P2	High	High	High	High	High	-	-	-	-	-
4BC1	High	High	High	High	High	High	High	High	High	High
4BC2	High	High	High	High	High	High	High	High	High	High
4F2	High	High	High	High	High	High	Med	Med	High	High
TL-37×EC-3183										
5F1	High	High	High	High	High	High	High	High	High	High
5P1	Med	High	High	High	Med	-	-	-	-	-
5P2	High	High	High	High	High	-	-	-	-	-
5BC1	High	High	High	High	High	High	High	Med	Med	Med
5BC2	High	High	High	High	High	High	High	High	High	High
5F2	High	High	High	High	High	High	High	High	High	High
TL-37×ACC No. 22										
6F1	High	High	High	High	High	High	Med	High	High	High
6P1	Med	High	High	High	High	-	-	-	-	-
6P2	High	High	High	High	High	-	-	-	-	-
6BC1	High	Low	Med	High	High	High	Low	High	High	Low
6BC2	High	High	High	High	High	High	High	High	High	High
6F2	High	High	High	High	High	High	High	High	High	High

7. FRONT LINE DEMONSTRATION

The front line demonstration provides an unique opportunity to demonstrate under real farm situations. It includes demonstrations on productivity potential and profitability of latest improved technologies intercropping system and component technologies. Front line demonstrations in oilseeds were initiated, from *kharif* 1991 with a view to bridge the vast unexploited yield gaps in linseed through popularization of newly developed varieties along with productions and protection technologies among the farmers.

A total of 700 demonstrations (0.40 each) were allotted to 35 locations spread in 14 states (Table 7.1.1). There were nine centres, *viz.* Tikamgarh, Jagdalpur, Bilaspur, Dharwar, Jashipur, Mudhol (KIAAR), Kaul, Waraseoni and Khudwani, who could not execute the programme. Few centres like Kanpur, Mauranipur, Faizabad, Madhubani, Patna, Dholi, Hoshangabad, Rewa, Kota and Raichur could not achieve their assigned targets whereas, centres like Gorakhpur, Palampur and Shellongani have conducted more than target.

A total of 535 front line demonstrations were conducted out of 700 assigned having 76.43% rate of execution. Eight front line demonstrations out of 39 conducted at Mauranipur were failed. A brief information about the target assigned as well as achieved and the category of farmers are given in Table 7.1.2 while the results of 507 front line demonstrations are indicated in Table 7.2 to 7.6.

Table 7.1.1 Proposed and conducted front line demonstrations in linseed

Sl. No.	States	Centres	Assigned demon.	District wise execution		Total	Type of demonstrations conducted
1.	UP	Kanpur	30	Kanpur Nagar	4	21	WP-I : 6, IC : 12, Var : 3
				Kanpur Dehat	14		
				Sitapur	1		
				Kannoj	1		
				Unnao	1		
2.	UP	Mauranipur	40	Hamirpur	11	39	WP-I : 5, WP-R : 5, Var. : 3, FM : 2, IC : 16 + 8 Failed
				Jhansi	20		
3.	UP	Faizabad	20	Faizabad	2	14	WP-I : 7, IC : 7
				Sultanpur	11		
				Basti	1		
4.	UP	PRDF, Gorakhpur	40	Deoria	25	42	WP-I : 15, WP-R : 11, IC : 6, U : 6, Var : 4
				Sant Kabir Nagar	4		
				Maharajganj	7		
				Gorakhpur	6		
5.	UP	SDJSSC, Azamgarh	40	Mau	20	40	WP-I : 40
				Azamgarh	20		
6.	UP	STAR & RD, Fatehpur	30	Fatehpur	10	30	WP-I : 10, WP-R : 10, IC : 10
				Unnao	10		
				Banda	10		
7.	UP	BHU. Varanasi	10	Vanaras	1	10	Var : 10
				Mau	1		
				Mirzapur	2		
				Deoria	1		
				Sonbhadra	1		
				Rohatas	1		
				Azamgarh	1		

Sl. No.	States	Centres	Assigned demon.	District wise execution		Total	Type of demonstrations conducted
8.	Bihar	Madhubani	20	Madhubani	15	15	WP-R : 15
9.	Bihar	Patna	20	Nalanda	3	12	WP-I : 12
				Patna	9		
10.	Bihar	Dholi	20	Samastipur	3	10	WP-I : 6, IC : 4
				Mujaffarpur	7		
11.	MP	Hoshangabad	15	Hoshangabad	8	8	WP-I : 3, Var : 1, IC : 4
12.	MP	Sagar	40	Sagar	39	40	WP-I : 8, WP-R : 7, IC : 25
				Narsinghpur	01		
13.	MP	Rewa	15	Not Reported		7	WP-R : 7
14.	MP	Tikamgarh	10	Not Conducted			
15.	Bihar	Jhanjharpur	10	Madhubani	10	10	WP-R : 5, U : 5
16.	MH	Nagpur	50	Chandrapur	30	50	WP-I : 10, WP-R : 15, Var-R : 2, Var-I : 7, FM : 7, DM : 7, IC : 2
				Akola	10		
				Nagpur	3		
				Yavotmal	7		
17.	CG	Raipur	40	Raipur	1	40	WP-I : 9, WP-R : 6, IC : 10, Var : 5, FM : 5, U : 1, WM : 2, IPM : 2
				Dhamtori	2		
				Durg	37		
18.	CG	Jagdalpur	20	Not	Conducted		
19.	CG	Bilaspur	10	Not	Conducted		
20.	Raj.	Kota	15	Kota	10	10	WP-I : 10
21.	Raj.	RRS Durgapura, Jaipur	15			20	WP-I : 8, Var : 8, IC : 4
22.	Kart.	Dharwad	10	Not Conducted			
23.	Orrisa	Jashipur	20	Not Conducted			
24.	HP	Palampur	30	Mandi	5	31	WP-I : 5, WP-R : 5, U : 5, FM : 3, Var.-R : 3, Var.-U : 3, WM-I : 2, IC : 5
				Kangra	19		
				Dharmshala	1		
				Palampur	4		
25.	Kart.	Raichur	10	Raichur	6	6	Var : 6
26.	WB	Berhampore	15	Nadia	15	15	WP-I : 7, WP-R : 8
27.	Haryana	Kaul	15	Not Conducted			
28.	MH	Latur	10	Osmanabad	9	10	WP-R : 10
				Latur	1		
29.	MP	Waraseoni	15	Not Conducted			
30.	J&K	Khudwani	10	Not Conducted	-	-	
31.	Karnatka	Mudhol (KIAAR)	5	Not Conducted	-	-	
32.	Assam	Shellongani	5	Morigaon	10	10	WP-R : 10
33.	Assam	Chariali	5	Sonitpur	5	5	WP-I : 5
34.	Nagaland	Jharnapani	20	NR	NR	20	VC : 20
35.	Nagaland	Deempur, Mokok-chung & wokha	20	conducted but not reported		20	WP : 15
		Total	700			535	WP (I : 166 + R : 114 + U : 17 = 297), IC (I : 77 + R : 28 = 105) Var. (I : 38 + R : 14 + U : 3 = 55), FM : 17, VC : 20, WM : 2, WC : 2, IPM : 9, Failed : 8, NR : 20

WP : Whole package, IC : Intercropping, Var. varietal, FM : Fertilizer management WM : Water management, WC : Weed control, IPM : Insect-pest and disease management, VC : Vermi composting, NR : Not reported

Table 7.1.2 Conductance of Front line demonstrations as per Gender and Socio-economic conditions of the farmers

Sl. No.	Name of Centres	Demon. allotted	Demon. conduct.	Gender wise cond.		Category wise conduct				Land holding wise conductance			
				Male	Female	Gen.	OBC	SC/ST		Large	Medium	Small	Marginal
1.	Kanpur	30	21	20	1	NOT REPORTED							
2.	Mauranipur	40	31	31	-	NOT REPORTED				21	10	-	-
3.	Faizabad	20	14	14	-	NOT REPORTED				10	4	-	-
4.	Kota	15	10	10	-	NOT REPORTED				-	1	9	-
5.	Jaipur	15	20	20	-	NOT REPORTED							
6.	Nagpur	50	50	47	3	4	35	5	6	-	-	-	50
7.	Raipur	40	40	39	1	12	22	5	1	40	-	-	-
8.	Gorakhpur	40	42	42	-	15	21	-	-	40	1	-	1
9.	Fatehpur	30	30	30	-	24	2	4	-	17	12	1	-
10.	Latur	10	10	10	-	10	-	-	-	10	-	-	-
11.	Azamgar	40	40	40	-	NOT REPORTED				31	8	1	-
12.	Varanasi BHU	10	10	10	-	NOT REPORTED				5	-	-	-
13.	Madhubani	20	15	15	-	NOT REPORTED				15	-	-	-
14.	Patna	20	12	12	-	4	7	1	-	-	-	-	12
15.	Dholi	20	10	10	-	NOT REPORTED							
16.	Hoshangabad	15	8	8	-	2	6	-	-	6	2	-	-
17.	Sagar	40	40	29	11	18	14	8	0	29	9	2	-
18.	Rewa	15	7	7	-	NOT REPORTED							
19.	Chariali (Assam)	5	5	5	-	NOT REPORTED				1	3	1	-
20.	Jhanjharpur	10	10	10	-	NOT REPORTED				5	1	3	1
21.	Palampur	30	31	22	8								
22.	Raichur	10	6	6	-	NOT REPORTED				-	-	-	6
23.	Berhampore	15	15	14	1	NOT REPORTED				-	-	15	-
24.	Shillongani (Assam)	10	10	10	-	NOT REPORTED							
25.	Jharnapani	20	20	15	5	NOT REPORTED							

7.2 Whole Package Demonstrations

A total of 297 demonstrations were reported to P.C. Unit, which were laid out under irrigated (166), rainfed (114) and *utera* (17) situations. The situation-wise information is discussed here as under:

Irrigated

Seventeen centres conducted the demonstrations under this situation (Table 7.2). The highest yield in improved technology was reported by Sagar (2050 kg/ha) against 1200 kg/ha of farmers' practices, but it was lowest at Nagpur (1000 kg/ha) under improved technology and Gorakhpur (350 kg/ha) under farmers' practices. The mean seed yield under improved technology (1783 kg/ha) and farmers' practices (1075 kg/ha) were recorded higher at Kanpur. The magnitude of increase in the yield due to improved technology over farmers' practices was observed maximum at Gorakhpur (431.87%) and minimum at Kota (19.27%). The average cost of cultivation was recorded maximum at Kota under improved (Rs. 19187/ha) and farmers' (Rs. 17957/ ha) practices. The minimum average cost, of cultivation under improved condition was lowest at Berhampore (Rs. 7253/ha) while under fermers practices it was minimum at Palampur (Rs. 3722/ha). The average net monetary return under improved technology was observed maximum (Rs. 37593/ha) at Sagar and lowest at Berhampore (Rs. 10964/ha). Kanpur centre recorded highest IBCR (10.67) while at Palampur it was lowest (1.58). On an average, the improved technology increased 114.71% yield which needed Rs. 5790/ha additional investment over farmers' practices. An additional expenditure of Rs. 5790/ha gave an additional net monetary return of Rs. 12834/ha with 2.22 IBCR.

Rainfed

Twelve centres laid out front line demonstrations under rainfed situations (Table 7.2). Latur centre recorded the highest yield (1320 kg/ha) under improved technology, and 950 kg/ha under farmers' practices. The mean yield under improved technology 1084 kg/ha) and farmers' practices (720 kg/ha) were observed superior at Latur. The magnitude of increase in seed yield due improved technology over farmers' practices was recorded highest at Palampur (469.53%) and lowest at Berhampore (23.68%). The average cost of cultivation was observed higher at Latur (Rs. 10,600/ha) under improved technology while under farmers' practices it was highest at Mauranipur (Rs. 9798/ha). The highest net monetary returns were recorded at Sagar (Rs. 22130/ha) under improved technology and under farmers' practices (Rs. 13765/ha). Fatehpur centre recorded highest additional income (Rs. 12778/ha) but IBCR was maximum at Sagar (8.56) because of the lowest additional expenditure (Rs. 977/ha) over farmers' practices. On an average, improved technology increased 78.10% yield over farmers' practices. The improved technology required Rs. 2400/ha additional money to give Rs. 6839/ha additional income with 2.85 IBCR over farmers' practices.

***Utera* situation**

Gorakhpur, Palampur, Jhanjharpur and Raipur centres laid out front line demonstrations under this system (Table 7.2). Gorakhpur superseded all with respect highest yiled (1150 kg/ha) under improved technology, but highest yield under farmers' practices was recorded maximum at Jhanjharpur (550 kg/ha). The mean yield under improved technologies was highest at Gorakhpur (1063 kg/ha) and under farmers' practices it was highest at Jhanjharpur (368 kg/ha). The magnitude of increase in seed yield under improved technology over farmers' practices was found highest at Palampur (313.67%) and lowest at Jhanjharpur (64.95%). The average cost of cultivation under improved technology (Rs. 5713/ha) and farmers' practices (Rs. 3532/ha) were recorded highest at Gorakhpur and Jhanjharpur, respectively. Additional cost in improved technology as compared to farmers' practices was recorded more at Palampur (Rs. 3139/ha) against the lowest of Raipur (Rs. 1650/ha). The average net return was recorded higher at Gorakhpur (Rs. 14137/ha) under improved technology and Raipur (Rs. 4198/ha) under farmers' practices. The Gorakhpur centre recorded maximum additional income (Rs. 13254/ha) due to improved technology over farmers' practices with 5.99 IBCR. On an average, the improved technology was observed to increase linseed yield by 182.26% with Rs. 2348/ha additional expenditure and fetched Rs. 7482/ha additional income over farmers' practices with 3.19 IBCR.

Table 7.2 Impact of improved technolgies in whole package on Productivity potential and Economics of linseed under real farm situations

Sl. No.	State/Centres	Demonstration conducted	Highest yield (kg/ha)		Mean yield (kg/ha)		% yield increase IT over FP	Av. cost of cultiv. (Rs./ha)		Add. cost over FP (Rs./ha)	Av. net return (Rs./ha)		Add. return over FP (Rs./ha)	IBCR
			IT	FP	IT	FP		IT	FP		IT	FP		
A. Irrigated														
	Kanpur	6	1850	1150	1783	1075	65.86	15199	13407	1792	34734	15618	19116	10.67
	Mauranipur	5	1280	890	1212	842	43.94	13494	11277	2217	23823	11652	12171	5.49
	Faizabad	7	1542	694	1485	603	146.27	11931	6169	5762	25201	8917	16284	2.83
	Gorakhpur	15	1600	350	1452	273	431.87	12082	4200	7882	14698	-42	14740	1.87
	Fatehpur	10	1280	530	1223	447	173.60	9986	5067	4919	26705	7446	19259	3.92
	Patna	12	1556	870	1254	878	42.82	16323	11417	4906	22027	5224	16803	3.43
	Dholi	6	1485	770	1045	623	67.74	8635	7203	1432	12266	4017	8249	5.76
	Palampur	5	1013	400	948	312	203.85	8648	3722	4926	10308	2526	7782	1.58
	Berhampore	7	1250	920	1139	826	37.89	7253	5788	1465	10964	7424	3540	2.42
	Sagar	8	2050	1200	1578	984	60.37	9751	7860	1891	37593	22047	15546	8.22
	Durgapura	8	1540	1370	1305	1069	22.08	NR	NR	-	15115	11415	3700	-
	Hoshangabad	3	1350	800	1267	783	61.81	10272	6483	3789	22028	11892	10136	2.68
	Kota	10	1346	1242	1238	1038	19.27	19187	17957	1230	17962	13074	4888	3.97
	Nagpur	10	1000	545	966	514	87.94	11179	8850	2329	25282	9665	15617	6.71
	Chariali	5	1175	735	1020	683	49.34	11033	9337	1696	11403	6208	5195	3.06
	Azamgarh	40	1900	450	1548	382	305.24	18213	6100	12113	16452	1195	15257	1.26
	Raipur	9	1225	575	942	464	103.01	8827	5739	3088	16598	6962	9636	3.12
	Total A	**166**	**23452**	**13491**	**219498**	**102226**	**-**	**2140580**	**1225763**	**-**	**3242319**	**1111865**	**-**	**-**
	Mean A		**1380**	**793**	**1322**	**616**	**114.61**	**13548**	**7758**	**5790**	**19532**	**6698**	**12834**	**2.22**
B. Rainfed														
	Mauranipur	5	760	520	672	452	48.67	10375	9798	577	8503	2321	6182	10.71
	Gorakhpur	11	1275	350	949	350	171.14	7888	4250	3638	9790	893	8897	2.45
	Fatehpur	10	985	410	926	343	169.97	9891	5014	4877	17374	4596	12778	2.62
	Palampur	5	850	186	729	128	469.53	7684	2556	5128	6900	469	6431	1.25
	Berhampore	8	860	690	820	663	23.68	4712	4154	558	8408	6446	1962	3.52
	Jhanjharpur	5	850	425	722	378	91.00	7127	5537	1590	6805	6090	715	0.45
	Sagar	7	1250	800	980	654	49.85	6841	5864	977	22130	13765	8365	8.56
	Latur	10	1320	950	1084	720	50.56	10600	7940	2660	21905	13660	8245	3.09
	Nagpur	15	580	275	514	232	121.55	6736	4666	2870	12795	3690	9105	3.17
	Rewa	7	1015	810	920	701	31.24	NR	NR	-	- NR -	-	-	-
	Raipur	6	650	400	596	342	74.27	6537	4257	2280	9551	4968	4583	2.01
	Madhubani	15	830	485	798	455	75.39	7215	4910	2305	11558	5750	5808	2.52
	Shillongani	10	800	525	686	475	44.42	5492	4055	1437	10283	7125	3158	2.20
	Total B	**114**	**12025**	**6826**	**91130**	**51166**	**-**	**806598**	**549757**	**-**	**1359125**	**627364**	**-**	**-**
	Mean B		**925**	**525.08**	**799.38**	**448.82**	**78.10**	**7538**	**5138**	**2400**	**12702**	**5863**	**6839**	**2.85**
C. *Utera*														
	Gorakhpur	6	1150	300	1063	288	269.09	5713	3500	2213	14137	883	13254	5.99
	Palampur	5	601	180	575	139	313.67	5377	2238	3139	6129	554	5575	1.78
	Jhanjharpur	5	760	550	607	368	64.95	5391	3532	1859	6116	2761	3355	1.80
	Raipur	1	425	250	425	250	70.00	4242	2592	1650	7233	4198	3035	1.84
	Total C	**17**	**2936**	**1280**	**12713**	**4513**	**-**	**92360**	**52442**	**-**	**153280**	**26071**	**-**	**-**
	Mean C		**734**	**320**	**748**	**265**	**182.26**	**5433**	**3085**	**2348**	**9016**	**1534**	**7482**	**3.19**

7.3 Intercropping system

The front line demonstrations on this aspect were conducted under irrigated (77) and rainfed (28) both situations. The data generated at Dholi (seed yield) and Durgapura (NMR) were not included for over all averages (Table 7.3). The situation-wise report is given here as under :

Irrigated situation

Under improved technology, the highest (2204 kg/ha) and mean (1983 kg/ha) linseed equivalent yields were recorded higher in linseed + mustard (5:1) at Kanpur but these were highest at Sagar with linseed + grams (4:2) under farmers' practices (Table 7.3). Linseed + mustard (5 :1) gave higher LEY than linseed + gram (4:2) under irrigated situation. The average cost of cultivation (Rs. 15266/ha), average net monetary return (Rs. 40257/ha) and additional income (Rs. 18512/ha) over farmers' practices were also observed maximum at Kanpur in linseed + mustard (5 :1) under improved technology, whereas these were higher at Mauranipur and Sagar under farmers' practices, respectively. On over all basis, the intercropping system (IT) recorded 71.40% higher LEY than farmers' practices and attracted Rs. 3004/ha additional money to fetch Rs. 8605/ ha additional income @ 2.86 IBCR.

Rainfed Situation

Intercropping association of pulse and linseed was demonstrated under this situation (Table 7.3). Linseed + gram (2 : 2) intercropping system (IT) demonstrated at Gorakhpur was observed superior to all with regard to highest as well as mean LEY (2050 kg/ha) and increase in in the LEY of IT over FP (694.57%). The average cost of cultivation under improved (Rs. 20998/ha) and farmers' (Rs. 10955/ha) technologies were recorded highest at Nagpur but net monetary return under improved (Rs. 28300/ha) and farmers' (Rs. 14006/ha) technologies were observed higher at Gorakhpur and Sagar, respectively. Additional cost of cultivation (Rs. 10043/ha), additional net return (Rs. 26125/ha) were higher at Nagpur and Gorakhpur, respectively. Gorakhpur centre recorded maximum IBCR of 6.69. On an average, the improved technology increased the LEY by 78.5% over farmers' practices which required Rs. 2547/ha additional money to fetch Rs. 9750/ha additional income @ 3.83 IBCR.

7.4 Varietial impact

A total of 54 FLDs were laid out to demonstrate the impact of newly developed varieties at farmers' field (Table 7.4). The results of varietal impact are given here as under ;

Irrigated situation

A total of 38 demonstrations were laid out under irrigated situation. The highest yield under improved vr Garima and under farmers' (1550 kg/ha) technologies were recorded maximum at Varanasi. (2200 kg/ha) The mean yield under improved vr. Shekhar (2000 kg/ha) and farmers' (1250 kg/ha) technologies were recorded higher at Kanpur. The average cost of cultivation and net monetary returns were also recorded higher at Kanpur under both the technologies. On an average, newly developed varieties increased the linseed yield by 40.28% and required Rs. 1937/ha additional money to fetch Rs. 11816/ha additional income over local varieties with 6.1 IBCR.

Rainfed

A total of 14 demonstrations were laid out. The Palampur centre was observed to achieve highest yield (926 kg/ha) and mean yield (888 kg/ha) both under IT. The magnitude of increase in seed yield of new variety (Him Alsi-2) was also recorded maximum at Palampur (441.46%). The average cost of cultivation under improved

Table 7.3 Productivity potential and Economics of intercropping systems involving linseed Under real farm situations

Sl. No.	Centres	Demon. Conducted	Intercropping System	Highest LEY (kg/ha)		Mean LEY (kg/ha)		% increase of IT over FP	Av. cost of cultivation (Rs./ha)		Add. cost (Rs./ha)	Av. net return (Rs./ha)		Add. income over FP (Rs./ha)	IBCR
				IT	FP	IT	FP		IT	FP		IT	FP		
Irrigated															
	Kanpur	12	L + M (5:1)	2204	1474	1983	1289	53.84	15266	13051	2215	40257	12745	18512	8.36
	Mauranipur	6	L + M (4:2)	1109	748	1024	682	50.73	15133	14378	755	14244	5454	8790	11.64
		6	L + M (5:1)	1133	823	1062	793	33.92	12413	11885	528	15445	7889	7556	14.31
		4	L + M (4:2)	973	720	890	673	32.24	11713	11017	696	12307	6488	5819	8.36
	Fatehpur	5	L + G (3 :1)	1570	658	1542	623	1221.69	11452	5961	5491	34808	11880	22928	4.18
		5	L + M (5 :1)	1557	645	1492	606	146.20	10162	5135	5027	34617	12090	22527	4.48
	**Dholi	4	L + S. cane (1:3)	880*	**	784*	-	-	NR	NR	-	NR	NR	-	-
	Palampur	5	L + M	896	215	844	182	363.74	6782	2042	4740	10108	1590	8518	1.79
	Durgapura	4	G + L (4:2)	920	725	835	658	26.90	NR	NR	-	8155*	5945*	2210*	-
	Hoshangabad	2	W + L (6:4)	1413	1133	1376	968	42.15	8949	7195	1754	21312	11825	9487	5.58
		2	W + L (4:4)	1410	997	1382	958	44.26	8924	6496	2428	18706	10627	8079	3.33
	Sagar	5	L + G (4:2)	1900	1500	1644	1181	39.20	10512	8202	2310	39008	27228	11780	5.09
	Raipur	10	L + G	889	485	803	433	85.45	9510	6174	3336	12175	4898	7277	2.18
	Faizabad	1	L + G	1504	624	1504	624	141.02	11965	5783	6182	25630	9827	15803	2.56
		6	L + M (5:1)	1607	793	1571	689	128.01	12063	6318	5745	27211	10904	16307	2.84
	Total	77		**19085**	**11540**	**95298**	**55542**	-	**805049**	**597771**	-	**1393833**	**800028**	-	-
				1363	**824**	**1305**	**761**	**71.40**	**11667**	**8663**	**3004**	**20200**	**11595**	**8605**	**2.86**
Rain fed															
	Gorakhpur	1	L + G (2 :2)	2050	258	2050	258	694.57	8300	4400	3900	28300	2175	26125	6.69
		5	L + Lt (3:1)	1714	553	1568	497	215.49	8300	4400	3900	20798	3900	16898	4.33
	Sagar	20	(L + G) (4 :2)	1502	1140	959	672	42.71	7538	6146	1392	21269	14006	7263	5.22
	Nagpur	2	L + G (4:2)	600	386	589	380	55.00	20998	10955	10043	10877	2316	8516	0.85
	Total	**28**		**5866**	**2337**	**30248**	**16943**	-	**242556**	**171236**	-	**579424**	**306427**	-	-
				1467	**584**	**1080**	**605**	**78.5**	**8663**	**6116**	**2547**	**20694**	**10944**	**9750**	**3.83**

Note : L - Linseed, W - Wheat, G - Gram, M- Mustard

Table 7.4 Impact of Varieties Under Real Farm Situations

Sl. No.	Centres	Demon Conducted	Varieties	Highest yield (kg/ha)		Mean yield (kg/ha)		% increase of IT over FP	Av. cost of cultivation (Rs./ha)		Add. cost (Rs./ha)	Av. net return (Rs./ha)		Add. income over FP (Rs./ha)	IBCR
				IT	FP	IT	FP		IT	FP		IT	FP		
1.	**Seed type**														
A	**Irrigated**														
	Kanpur	2	Shekhar	2150	1300	2000	1250	60.00	15662	14008	1654	40338	19743	20595	12.45
		1	T-397	1450	850	1450	850	70.59	14777	12968	1809	25823	9982	15841	8.76
	Gorakhpur	1	Padmini	1500	175	1500	175	757.14	12082	4200	7882	14918	-1525	16443	2.09
		2	Garima	1700	350	1688	325	419.38	12082	4200	7882	18893	588	18305	2.32
		1	Parvati	1150	300	1150	300	283.33	12082	4200	7882	10368	450	9918	1.26
	Varanasi	10	Garima	2200	1550	1513	1115	35.70	12633	12412	221	24127	10790	13337	60.35
	Durgapura	4	Parvati	1488	1175	1266	1064	18.99	NR	NR	-	14409*	11445*	2964*	-
		4	Meera	1250	1080	1188	1016	16.93	NR	NR	-	13000*	10685*	2315*	-
	Hoshangabad	1	Kiran	1300	850	1300	850	52.94	10182	6359	3823	22318	10641	11677	3.05
	Nagpur	7	NL-142 × NL-97	1100	900	1020	840	21.43	12446	11749	697	25708	19082	6626	9.51
	Raipur	1	Kartika	1050	550	1050	550	90.91	8158	6046	2112	20192	8804	11388	5.39
		2	Dipika	1100	500	925	475	94.74	8158	6046	2112	16817	6779	10038	4.75
		2	R-552	850	450	775	425	82.35	8158	6046	2112	12767	5429	7338	3.47
	Total	**38**		**18288**	**10030**	**46312**	**33025**	-	**358853**	**300736**	-	**692475**	**38028**	-	-
	Mean			**2613**	**1433**	**1219**	**869**	**40.28**	**11962**	**10025**	**1937**	**23083**	**11267**	**11816**	**6.1**
	Rain fed														
	Mauranipur	1	T-397	670	410	670	410	63.41	10940	10256	684	8155	639	7516	10.98
		2	Padmini	830	560	760	480	58.33	10740	10107	633	10540	2653	7887	12.46
	Raichur	6	R-552	650	490	575	460	25.00	6638	6300	338	11750	7989	3761	11.13
	Palampur	3	Him Alsi-2	926	210	888	164	441.46	8233	2242	5991	9547	1031	8516	1.42
	Nagpur	2	Padmini × C-429	520	300	490	300	63.33	8348	7790	558	10272	3009	7263	13.02
	Total	**14**		**3596**	**1970**	**9284**	**5222**	-	**113643**	**90576**	-	**148920**	**62990**	-	-
	Mean			**899**	**493**	**663**	**373**	**77.75**	**8117**	**6470**	**1647**	**10637**	**4499**	**6138**	**3.73**
	Utera														
	Palampur	3	Baner	**850**	155	818	137	497.08	8098	2136	5962	8257	597	7660	1.85

(Rs. 10940/ha) and farmers' (Rs. 10256/ha) technologies were higher at Mauranipur (T397). Whereas, net monetary returns were highest at Raichur under both the situations which was Rs. 11750/ha under IT and Rs. 7989/ha under FP respectively with variety R-552. The additional cost (Rs. 5991/ha) and net return (Rs. 8516/ha) both were observed highest at Palampur but IBCR was recorded higher at Nagpur (13.02). On over all mean basis, the newly developed varieties increased the seed yield by 77.75% which required Rs. 1647/ha more money to fetch Rs. 6138/ha more income having 3.73 IBCR.

Utera

Only Palampur centre demonstrated the newly developed variety (Baner) in this situation. The newly developed variety Baner gave a highest yield of 850 kg/ha whose mean yield was 818 kg/ha (Table 7.4).

This variety brought an increase of 497.08% in yield over local one and required Rs. 5962/ha additional money to fetch Rs. 7660/ha additional income @ 1.85 IBCR.

7.5 Impact of agronomic inputs

7.5.1 Impact of fertilizer management

A total of 17 demonstrations were laid out under real farm situation to show the impact of fertilizer (Table 7.5). The highest (1200 kg/ha) and mean (1105 kg/ha) seed yields were recorded superior to all at Raipur under improved technology while these were higher at Mauranipur under farmers' technologies. The average cost of cultivation (Rs. 11948/ha) and net monetary return (Rs. 20,364/ha) were higher at Mauranipur and Raipur respectively under IT. These were also recorded higher at the same centres under farmers' technologies. The additional cost (Rs. 5186/ha) and income (Rs. 12192/ha) in improved technology over local were recorded superior at Palampur and Raipur respectively, however IBCR was higher at Mauranipur (7.46). On over all mean basis, fertilizer management brought increase in seed yield by 95.68% with Rs. 2776/ha additional expenditure fetching Rs. 10178/ha additional income @ 3.67 IBCR.

7.5.2 Impact of vermi compost

This demonstration was conducted by Jharnapani (Nagaland) centre only. This centre recorded a highest

Table 7.5 Response of linseed to agronomic inputs under real farm situations.

Sl. No.	Centres	Demon Conducted	Highest yield (kg/ha)		Mean yield (kg/ha)		% increase of IT over FP	Av. cost of cultivation (Rs./ha)		Add. cost (Rs./ha)	Av. net return (Rs./ha)		Add. income over FP (Rs./ha)	IBCR
			IT	FP	IT	FP		IT	FP		IT	FP		
1. Impact of Fertilizer Application														
	Mauranipur	2	980	710	955	705	35.46	11948	10954	994	14792	7376	7416	7.46
	Palampur	3	875	253	859	221	288.69	7509	2323	5186	9665	2137	7528	1.46
	Nagpur	7	810	480	771	457	68.71	10616	8917	1699	18305	7555	10750	6.33
	Raipur	5	1200	550	1105	520	112.50	9471	5922	3549	20364	8172	12192	3.44
	Total	**17**	**3865**	**1993**	**15409**	**7872**	-	**168090**	**120906**	-	**288534**	**114908**	-	-
	Mean		**966**	**498**	**906**	**463**	**95.68**	**9888**	**7112**	**2776**	**16973**	**6759**	**10178**	**3.67**
2. Impact of vermicompost														
	Jharnapani	20	1300	678	1108	578	91.70	9000	4500	4500	13130	7065	6065	1.35
3. Impact of Water Management														
	CSKHPKV Palampur	2	638	115	594	105	465.7	6466	1580	4886	5414	950	4464	0.91
4. Impact of Weed Management														
	Raipur	2	850	625	813	563	44.41	6570	6271	299	15368	8917	6451	21.58

yield of 1300 kg/ha under improved technology against the farmer's highest yiled of 678 kg/ha. The improved technology recorded an average yield of 1108 kg/ha against the average of local practices (578 kg/ha). The improved technology registered an increase of 91.70% in yield over local. The improved technology required an additional money of Rs. 4500/ha and fetched an additional income of Rs. 6065/ha @ 1.35 IBCR (Table 7.5).

7.5.3 Impact of water management

It was demonstrated only by Palampur (Table 7.5). Water management practices incresed the linseed yield by 465.70% and required Rs. 4886/ha additional money which fetched Rs. 4464/ha additional income over rainfed @ 0.91 IBCR, which is not very encouraging.

7.5.4 Impact of weed control

It was demonstrated only by Raipur (Table 7.5). Weed control increased the linseed yield by 44.41% over no weeding. Weeding required Rs. 299/ha additional money under real farm situation and fetched Rs. 6451/ ha additional income @ 21.58 IBCR.

7.6 Impact of insect-pest and disease management

These demonstrations were laid out by Nagpur and Raipur centres (Table 7.6). The highest yield (700 kg/ha) and mean yield (675 kg/ha) under improved technology were recorded higher at Raipur. The Raipur centre recorded maximum yields under farmers' technologies too. Though magnitude of increase in seed yield (91.67%), additional cost of cultivation (Rs. 1897/ha) and additional NMR (Rs. 7073/ha) were higher at Nagpur but IBCR (11.40) was recorded higher at Raipur. On over all mean basis, the linseed yield was increased by 77.00% due the management of insect-pest and diseases under real farm situation. This operation required Rs. 1584/ha additional money over no management and fetched Rs. 6742/ha additional income @ 4.26 IBCR.

Table 7.6 Response of linseed to insect-pests and disease management under real farm situations

Sl. No.	Centres	Demon Conducted	Highest yield (kg/ha)		Mean yield (kg/ha)		% increase of IT over FP	Av. cost of cultivation (Rs./ha)		Add. cost (Rs./ha)	Av. net return (Rs./ha)		Add. income over FP (Rs./ha)	IBCR
			IT	FP	IT	FP		IT	FP		IT	FP		
1	Nagpur	7	500	280	460	240	91.67	7409	5512	1897	10214	3141	7073	3.73
2	Raipur	2	700	450	675	450	50.00	5539	5049	490	12686	7101	5585	11.40
	Total	**9**	**1200**	**730**	**4570**	**2580**	**-**	**62941**	**48682**	**-**	**96870**	**36189**	**-**	**-**
	Mean		**600**	**365**	**508**	**287**	**77.00**	**6993**	**5409**	**1584**	**10763**	**4021**	**6742**	**4.26**

Conclusion

On the basis of the results reported by different centres, it may be concluded that ;

1. A total of 535 front line demonstrations were conducted out of 700 assigned but results of 50 7 FLDs only were reported to P.C. Unit.

2. The improved technologies of whole package demonstration increased the yield of linseed by 114.61%, 78.10% and 182.26% over local practices under irrigated, rainfed and *utera* situations, which fetched an additional income of Rs. 12834/ha, Rs. 6839/ha and Rs. 7482/ha, respectively.

3. The intercropping system (I.T.) brought an increase in linseed equivalent yield by 71.40% under irrigated situation and 78.5% under rainfed situation which attributed an additional income of Rs. 8605/ha and Rs. 9750/ha over farmers' practices, respectively.

4. The newly developed varieties of irrigated, rainfed and *utera* situations out yielded by 40.28%, 77.75% and 497.08% higher than local varieties and recorded Rs. 11816/ha, Rs. 7263/ha and Rs. 7660/ha additional income, respectively.

5. The linseed crop responded well to agronomic inputs, *viz.,* fertilizer application, vermi-composting, water management and weed management which increased the linseed yield by 95.68%, 91.70%, 465.7% and 44.41% over farmers' practices and fetched an additional income of Rs. 10178/ha, Rs. 6065/ha, Rs,. 4464/ha and Rs. 6451/ha, respectively.

6. The insect-pest and disease management in linseed brought and increase in seed yield by 77.00% over no management and fetched an additional income of Rs. 6742/ha.

On over all mean basis, the front line demonstrations conducted under different agro-climatic conditions envisaged the distinct superiority of improved technologies over local one in all the zones. These technologies should be transferred among the linseed growers through proper and accurate extension mechanism

I. MONITORING REPORT

The AICRP (Linseed) trials, hybridization programme, seed production and Frontline demonstrations conducted at different centres were monitored by 11 teams including scientists of different centres and the P.C.Unit. The teams visited centres including AICRP (Linseed) centres, the cooperating centres and a few NGOs. The salient observations are given as under :

1. Nagpur (30-31.1.2008)

All the trials in Breeding, Agronomy, Pathology and Entomology as well as Frontline Demonstrations were conducted in nice manner. The trials were conducted as per Technical programme, the maintenance and general performance of the trials as well as FLDs were good. The desciplinewise observations are given as under :

A. Breeding

All the assigned (6) experiments were conducted properly as per Technical programme at Nagpur except IVT (U), which was laid out at Sakoli. Infestation of alternaria blight and bud fly was observed in almost all entries and infection of powdery mildew had just initiated. The observations are given experimentwise.

(i) **IVT (R) :** Fourteen test entries were sown on 7.11.07. Entry nos 7 (BAU-06-8) and 9 (K2-219) were very late, not fit for rainfed situation. Entry no. 3 (NL-260) was found most promising as it was tolerent to AB and bud fly but initiation of PM was observed. Entries 6 (LMS-P-3) and 8 (SLS-71) were also good.

(ii) **IVT (I) :** Sixteen entries were planted on 3.11.07. Poor germination of entry no 8 (RL-26018) was observed in all replications. The performance of entry no 10 (NL-260) was observed better followed by 4 (LCK-7035) 6 (NDL-2005-14), 13 (RLC-116), and 14 (Suyog). Entries 2 (PCL-12-3-06) and 5 (BAU-06-5) were DP type with very late flowering. Entry no 4 (LCK-7035) was susceptible to powdery mildew.

(iii) **AVT (R) :** Six entries were sown on 13.11.07. Entry nos. 2 (Padmini) and 4 (SLS-68) were segregating or mixture. Entry no. 5 (LMS-149-4) appeared promising followed by entry no. 1 (T-397) although all entries were susceptible to AB, PM and bud fly.

(iv) **AVT (I) :** Seven entries including NL-97 were sown on 12.11.07. Entry no. 1 (RLC-11) Looked promissing for seed yield, followed by 7 (RLC-115) and 3 (NDL-2004-5) though infection of AB and bud fly was observed in most of the entries.

(v) **EEMT (R) :** Eleven entries including local check NL-97 were sown on 6.11.07. Entry nos. 2 (SLS-73) 5 (RLC-116) and 3 (PKDL-73) appeared promising for seed yield and earliness. Entry no. 4 (OLC-99-57) was found susceptible to wilt and PM was observed in entries 1 (PCL-35-6) 6 (JLS-9), 8 (T-397) and 10 (SLS-67).

Besides coordinated trials, two station trials were conducted. 112 germplasm were also raised and breeding material from F_1 to F_2 generations were also planted.

B. Agronomy

All allotted experiments were laid out as per Technical programme. The experimentwise observations are given below :

(i) **Studies on moisture conservation practices for linseed under rainfed situation (Expt No. 3)**

The experiment was laid out on 30.10.07 with linseed variety NL-97. Treatment with FYM was expected to give maximum yield (8-10 Q/ha) followed by straw mulching. The mulching was not found to effect days to maturity of the crop at the time of monitoring.

(ii) **Intercropping studies in seed drill sown rabi crops in association with linseed (Expt No. 5)**

The experiment was sown on 30.10.07 as per technical programme using linseed variety NL-97, gram 9218 and wheat AKW 1071. The management of the experiment was very good. Gram + Linseed was expected to provide higher LEY.

(iii) **Studies on the response of AVT (I) 2nd year entries to fertilizer application and sowing schedule (Expt No. 10)**

(a) **Entries X Fertilizer application (10.1)**

The experiment was sown on 30.10.07 including AVT (I) 2nd year entries. The fertilizer doses *viz,* 50% RDF (30 : 15 : 0), 100% RDF (60 : 30 : 0) and 150% RDF (90 : 45 : 0) were applied as per technical programme to see the performance of AVT (I) entries LC-2279-4, PKDL-52, NDL-2004-05 and T-397 as check. Plant stand was better in F_3 as compared to F_1 and F_2 in one replication only. The teratment effect was not very clear due to rainfall immediately after sowing.

(b) **Entries X date of sowing (10.2)**

Experiment was sown on 30th Oct, 15 Nov and 30 Nov, 07 as per treatments in technical programme. Heavy infestation of AB and BF was observed in entries SLS-61 and NDL 2004-05.

C. Pathology

All allotted trials (4) *viz,* Screening of germplasm for major diseases, UDN (Natural and artificial) against PM, Evaluation of promising entries/elite material against PM and IDSN were conducted as per programme. Powdery mildew had just initiated at the time of monitoring therefore, detailed observations were not recorded. Overall performance of the trials were good.

D. Entomology

All allotted trials (8) were conducted as per programme. The detailed observations are given below :

Trial No. 5.3 Economic injury level of linseed bud fly was sown on 5.11.07.

Variety Neelum was tested. High bud fly infestation was observed in all the treatments, approximately in the rang of 50 to 80 per cent. Lowest bud fly infestation was observed in T_2 *i.e.,,* six sprays of monocrotophos 36 SL (@ 0.04%).

Trial No. 5.4 IPM against linseed bud fly in rainfed agro ecosystem. In this trial two varieties *i.e.,,* Kiran and Shekhar were sown at optimum time (1.11.07) and two weeks delayed (16.11.07) respectively with four plant protection measures. Plant population of variety Shekhar was poor due to wilting and delayed sowing. Lowest bud infestation was observed in C_3 (first spray of confidor 200 SL @100 ml/ha).

Trial No. 5.1 Population dynamics of major insect pests of linseed. Two varieties *i.e.,,* Neelum and Kiran were sown on 5.11.07. Several insect pests like Jassid, thrips, white fly, linseed caterpillar and bud fly were noticed in both varieties.

Trial No. 5.2.1 Screening of linseed germplasm against bud fly. Total 100 entries were sown on 22.11.07. Entries NPRR-470, NPRR-482, NPRR-485 and NPRR-126 were found to have low infestation of bud fly.

Trial No. 5.2.2. UPN for bud fly resistance.

Thirty test entries were planted on 22.11.07. Out of 30, entries, namely; IC-15888, NDL-2005-16, SLS-66, RLC-95 and NP-85 had lowest bud fly infestation.

Trial No. 5.2.3. Testing of advance breeding material against bud fly

Seventy entries were sown on 22.11.07. Among seventy lowest bud infestation was observed in BAU-06-16, LMS-P-5, LMS-P-3, LMS-63-6, LCK-7035, NL-260 and OLC-10.

D. Frontline Demonstrations

The centre had conducted all the 50 FLDs. The team visited 10 FLDs only. The performance of all FLDs were good with about 9-12 Q/ha expected yield. The farmers were very much impressed with the technology demonstrated by the centre. They were willing to increase the linseed area in next cropping season.

2. Powarkheda (1 & 2 Feb. 2008)

All the allotted trials in Breeding and Agronomy disciplines as well as Front line demonstratios were well managed with proper labelling. The disciplinewise report are given below :

A. Breeding

All the assigned (4) coordinated and one station trial were conducted as per technical programme. The performance of the trials was good. There was no incidence of disease or insect pest at the station.

(i) **IVT (I) :** Sixteen entries with Kiran as local check were sown on 26.11.07. Poor germination was observed in entry no. 9 (KL-248) and fair in entry nos. 1 (LCP-146) and 10 (NL-260) in all replications. Entry no. 4 (LCK-7035) appeared promising followed by entry no. 11 (SLS-72) and 7 (LMS-63-6). Entry nos. 2 (PCL-12-3-06), 5 (BAU-06-5) and 13 (RLC-116) were late maturing.

(ii) **IVT (DP) :** Included nine entries sown on 26.11.07. Entry no. 2 (NDL-2005-26) seemed promising for DP characters followed by entry no. 5 (RL-26016) and 9 (Meera ZC). Entry no. 1 (LCK-7002) was not synchronic.

(iii) **AVT (I) :** Six entries were sown on 23.11.07. Entry no. 3 (NDL-2004-05) had fair germination in 3 replications and poor in one. Some off plants were found in entry no. 4 (SLS-61), which appeared promising followed by entry no. 2 (JLT-204).

(iv) **EEMT (R) :** Twelve entries including Kiran as local check were sown on 23.11.07. Mixture was observed in entry no. 2 (SLS-73). Entry nos. 4 (OLC-99-57), 9 (JLT-215) and 10 (SLS-67) were comparatively early maturing. Entry no 10 (SLS-67) looked promising for yield folowed by entry no. 9 (JL-215).

Hybridization Programme : Segregating generations from F_1 to F_8 were planted for multiplication and selection.

B. Agronomy

All the assigned trials were conducted properly. However, two trials viz., Studies on phosphorus management and INM in double cropping system will start from ensuing Kharif (2008) season. The experimentwise observations are given below :

(i) **Studies on sowing time double cropping system (Expt No. 4)**

The experiment was sown on 31 Oct., 15 Nov. and 30 Nov. using JLS-9 (V1) JLT-26 (V2), Kartika (V3) and J-23 (V4). Performance of JLT-26 and Kartika were found best in all sowing dates.

(ii) **Intercropping studies in seed drill sown rabi crops (Expt No. 5)**

The experiment was sown on 3.11.2007 using wheat (JWS-17), Linseed (Kiran), Gram (JG-130) and safflower (JSF-99). Plant stand of linseed in linseed + safflower was poor because the plots were at upland.

(iii) Studies on bio-efficacy of new herbicides (Expt No. 6)

The experiment was sown on 8.11.2007 using linseed variety Kiran. There was less weed in sulfosulfuron treated plots but yield may also be poor as these treatments had bad impact on growth of linseed after its application.

(iv) **Studies on AVT (I) 2nd year entries (Expt No. 10)**

10.1 Entries X Fertilizer application

The experiment was sown on 2.11.2007 using 80 : 40 : 20 NPK as 100% RDF. Plant stand in V3 was poor in all replications. However VL and V2 were at par in performance.

10.2 Entries X date of sowing

The sowing dates were 30 Oct, 15 Nov. and 30 Nov. The plant stand in V3 was very poor in D1 and D2 in all replications. Variety V2 was superior in D1 followed by V1 whereas V1 was best in D2 and D3 although it had mixture.

C. Frontline Demonstrations

All the assigned FLDs (15) were conducted. The team could visit eight locations. The performance of all FLDs were good with 12-15 Q/ha expected yields.

IGKVV Raipur

All trials in the discipline of Breeding (6) Agronomy (5), Pathology (7) and Frontline demonstrations were executed. The overall performance was good. The disciplinewise report is given as under :

A. Breeding :

All the trials allotted to the centre were conducted. The general performance of the trials was good. In *IVT (R)* entry no. 070107 (BAU-06-8) was easly maturing, whereas 113 (T-397 NC) was better in yield attributes. In *IVT (I)* entry nos. 201 (LCP-146) 3 (PKDL-71), 4 (LCK-7035), 8 (RL-26018), 10 (NL-260) showed poor germination. Here again the National check *i.e.,* 070215 (T-397) was better in performance. In IVT (U) entry no. 408 (LMS-P-5) was better under Utera situation. In *AVT (R)* the entry no. 507 (T-397) was excellent, whereas in *AVT (I)* also the genotype 609 (T-397) was good in yield attributes. In *EEMT (R)* the entry no. 913 JLT-215 was early maturing. Hundred germplasm were also raised for testing. Among them entry no. CI-1998 was found better and CI-3199 was early type. Besides coordinated trials six station trials were also conducted. The breeding material sown in the trials were promissing.

B. Agronomy

Five allotted trials were properly conducted. The crop condition was good.

(i) **Studies on moisture conservation practices for linseed grown under rainfed situation :** Performance of T_3 and T_4 treatments were good.

(ii) **Studies on sowing time in relation to newly released linseed varieties for double cropping system :** The second date of sowing (15 Nov.) was better. The varieties RLC-76 and NL-97 were better over other varieties on the second date of sowing.

(iii) **Intercropping studies, in seed drill sown *rabi* crop in association with linseed :** Treatments with gram-linseed (2 : 2) and wheat-linseed (4 : 2) were better over other combinations.

(iv) **Studies on Bio-efficacy of new herbicides for weed management in irrigated linseed :** The major weed was *chenopodium album* (Bathua). Weedicide sulfo-sulfuran was better but higher doses (20 g and 30 g) has shown phytotoxic effect on crop.

(v) **Studies of the response of AVT (I) 2nd year entries (Expt No. 10)**

10.1. **Entries X fertilizer doses**

The variety V1 gave better performance with 150 RDF

10.2. **Entries X sowing date**

The performance of variety V1 was better in second sowing date (15th Nov.).

C. Pathology

All the experiments allotted to the centre were properly conducted. The overall performance of experiments was good at the time of monitoring except for IDSN in which germination was poor. The severity of Alternaria blight was mild to moderate at the time of monitoring. Initiation of powdery mildew disease was noticed on variety Shekhar. In Uniform disease nursery trial (UDN) initiation of powdery mildew as observed in entry nos. UDN3, 4 and 5 In artificial screening against Alternaria blight ES-44 was not true type and H-34 was affected with phyllody.

D. Breeder seed production

The seed production programme of Deepika, Indira Alsi-32 and Kartika were taken in 3.3 ha. The performance of the varieties were satisfactory as there were no mixture in the field. The crop was clean to pests and diseases.

E. Frontline Demonstrations

Forty (40) demonstrations allotted to the centre were conducted as per norm. However, the team could visit 16 FLDs conducted at different villages in block Bemtera in district Durg. In varietal demonstrations the varieties Kartika, Deepika and R-552 were used. The performance of all varieties were satisfactory in respective area. In intercropping system demonstrations, linseed + gram was found better than other combinations.

Jagdalpur

Trials in Breeding (3) and Frontline demonstrations were allotted to the centre.

A. Breeding

Three coordinated trials *viz.,* IVT (R), AVT (R) and EEMT allotted to the centre were conducted properly. The performance of the trials was good. A life saving irrigation was given to save the crop. In

IVT (R) the entry no. 111 (RLC-117) was excellent, genotype 101 (PCL-1-06) was late in flowering not fit for rainfed situation. In *AVT (R)* the genotype 509 (LMS-149-4) was good followed by 506 (Padmini zc). In *EEMT* experiment entries 909 and 913 (JLT-215) was extra early type whereas entries 902 (SLS-73) and 904 (OLC-99-57) showed poor germination. The crop was good and clean from diseases and pests. A state Varietal Trial *(SVT)* was also conducted, which was satisfactory.

B. Frontline Demonstrations

Twenty (20) demonstrations were allotted to the centre, out of which only 10 were visited by the scientists. The performance of the demonstrations were not satisfactory. The scientists need to pay more attention.

Bilaspur

Three breeding trials and 20 FLDs were allotted to the centre. Breeding trials were conducted properly but no FLD was conducted.

A. Breeding

Three allotted trials were conducted. Overall performance of the trials and crop condition was good. Plant populations were maintained. In *IVT (R)* the entry no. 110 (Padmini AZ) was earliest followed by 103 (NL-260). Appearance of Alternaria blight was observed in few lines and powdery mildew in entry no. 113 (T-397 NC). *In AVT (R)*, out of five entries tested performance of 509 (LMS-149-4) was better. Infection of powdery mildew was noticed in 506 (Padmini) and Alternaria blight in 508 (SLS-68). In *EEMT* entry no. 913 (JLT-215) was extra early maturing type. The overall performance of entry no. 904 (OLC-99-57) was good. Entry no. 905 (RLC-116) appeared to be segregating, 901 (PCL-35-06) and 902 (SLS-73) were susceptible to both Alternaria blight and powdery mildew. Besides above, a multilocational trial was also conducted. Segregating populations were also maintained. Attack of *cuscuta* in cultivar kiran was observed in state varietal trial.

Rewa (12.2.08–13.2.08)

Trials were conducted in the disciplines of Plant Breeding, Entomology along with Frontline Demonstrations as per Technical programme. The observations are given discipline wise as under :

A. Breeding

Two trials *viz.,* IVT (R) and AVT (R) were conducted as per programme. The trials were conducted under total rainfed condition as per mandate of dryland forming. Even presowing irrigation was not given. Hence plant population was very low due to acute moisture stress.

(i) **IVT (R) :** Thirteen entries were sown on 14.10.07 after blackgram (*Kharif* crop) without presowing irrigation with residual moisture. Hence poor plant population was observed in most of the entries because no rains were received after sowing. Visually entry nos. 070110 (Padmini) 111 (RLC-117) and 113 (T-397 ZC) appeared better in performance under acute moisture stress. Entries 102 (LCK-7034) and 103 (NL-260) were also good having bold capsule. Entries 101 (PCL-1-06) and 109 (KL-219) were late maturing, not suitable for rainfed situation. No disease problem except wilt (1-2%). Infestation of Dasyneura (2.0%) and Heliothis were observed. As there was almost 25% plant population in all replications the trial may be considered vitiated.

(ii) **AVT (R) :** In this trial also no presowing irrigation was provided hence the entires only germinated and established. The crop stand was very poor, therefore, the trial may be considered as vitiated.

B. Entomology

Two trials *viz.*, 5.2.2 (UPN) and 5.2.3 *i.e.*, Testing of advance breeding lines against lineseed bud fly were conducted as per programme. The observations are given as under :

5.2.2. Uniform Pest Nursery (U.P.N.)

Thirty two entries were planted on 17.11.07 in two rows. Infestor rows were planted after every set of 10 test entries. The execution and overall performance of the experiment was good. The infestation of bud fly had just started at monitoring period. However, entries EC-1424, JL-1, JLS-9, GS-234 and NDL-2004-5 appeared tolerant (less than 10%). As per local scientist seeds of some entries *viz.*, CI-1365, J-1, JLS-9 were insufficient.

5.2.3 Testing of Advance breeding lines against linseed bud fly

A total of 72 entries were sown on 17.11.07 in double rows. Infestor rows were planted after every set of 10 rows. The overall performance of the trial was good. Infestation of Dasyneura had just initiated. No other pest or diseases were observed.

C. Frontline Demonstrations

The centre was allotted 15 FLDs but they had conducted only 12 as per previous years allotment. The centre was not informed about the new Technical programme. Out of 12 FLDs conducted, the team visited seven. All the seven FLDs were on newly released varieties like JLS-9 and JLS-27 with whole package sown between 6th to 27 November 2007. the conductance and overall performance of FLDs were very good with 12-15 q/ha expected yield. The farmers were very much encouraged and willing to repeat the crop on account of less water requirement. No major disease or pest were observed except for wilt and bud fly in the range of 1-2 per cent.

Jabalpur

Two Breeding trials *viz.*, IVT (I), AVT (I) and Breeder seed production were taken up as per technical, programme.

(i) **IVT (I) :** Fifteen test entries and a local check (JLS-9) were sown on 17.11.07 with 3 replication in 2 tier system after palewa (presowing irrigation). It was observed that entry nos. 070210 (NL-260) and 211 (SLS-72) were earliest flowering whereas 202 (PCL-12-3-06) was last to flower. Conductance of the trial was good and all entries had given good expression.

(ii) **AVT (I) :** Six entries with 4 replication were sown on 17.11.07 with one presowing irrigation (Palewa). One irrigation was given 45 days after sowing Entry nos. 601 (RLC-115) and 602 (JLT-204) were earliest to flower while 603 (NDL-2004-05) was the last to flower. The conductance and overall performance of the trials were good.

Breeder seed production

Linseed varieties J-23-10, JLS-9 and JLS-27 were taken up in 0.2 ha each. Sowing was done between 8-15 Nov. 2007 after palewa. One irrigation was given 30-45 days after sowing. All plots were well maintained and purity of varieties was achieved by timely rogueing and removal of off plants. The crops were uniform.

Waraseoni

Only one Breeding trial was conducted. The FLDs could not be conducted.

IVT (U) : Seven entries plus a local check (JLS-9) were laid out. The conductance of the trial was average. Performance of the entry nos. 407 (RLC-121), 403 (NL-119) and 404 (PKDL-75) was good in same order.

Kota

As per Technical programme coordinated trials in Plant Breeding (5), Pathology (1) and Entomology (1) were conducted by the centre. Besides above trials hybridization programme including 10 varieties for earliness, seed and fibre yield, resistance to diseases were undertaken. The observations are given discipline-wise.

A. Breeding

Five coordinated trials *viz.*, IVT (R), IVT (I), IVT (DP), AVT (R) and AVT (I) were conducted as per programme.

(i) **IVT (R) :** Included 13 entries sown on 12.10.07. The experimentation and overall performance of the trial was very good. Entry nos. 070103 (NL-260), 105 (NDL-2005-34) and 109 (KL-219) appeared promising. Segregation/off plants were observed in entry nos. 103 (NL-260), 108 (SLS-71), and 112 (R-552). Crop was free from disease and insect pests. However infection of AB was reported in entry nos 102 (LCK-7034) and 109 (KL-219).

(ii) **IVT (I) :** The trial included 15 entries. The crop condition and overall performance of the trial was good. The crop was pure and free from diseases and pests entry nos. 211 (SLS-72), 212 (LBR-6) and RLC (116) were expected to give normal yield.

(iii) **IVT (DP) :** Ten entries were raised on 20.11.08. The overall performance of the experiment was very good. The crop was from discase and pests. Entry nos 707 (LCK-5021) and 709 (Parvati) were not pure, having off plants.

(iv) **AVT (R) :** Four entries were planted on 12.10.07. The overall performacne of the trial was good. Entry nos. 502 (Padmini AC) and 504 (LMS-149-4) appeared better in performance.

(v) **AVT (I) :** Including six entries were planted on 21.11.07. The plant stand and overall performance was very good, free of diseases and pests. Entry nos. 602 (JLT-204). 604 (SLS-61) and 605 (J-23) included off plants. Besides above coordinated trials 3 station trials *viz.*, RST (DP), RST (I) and RST (R) including 25, 26 and 21 entries were successfully conducted. These trials included some promising entries for dual purpose, seed and rainfed condition.

Hybridization Programme

Twenty new crosses were attempted involving 10 varieties for earliness, fibre and seed yield and resistane to diseases. SPS of F_1–F_6 *viz.*, F_1 (40), F_2 (26), F_3 (32), F_4 (35), F_5 (20), F_6 (40) were also raised for advancement.

Seed Production Programme

Breeder seed production programme of variety Meera was taken in 0.3 ha area. The target was 1 qtl but expected yield was 3 qtls. The crop met the specific standards of breeder seed. The nucleus seed programme of Meera, RLU (6) and RL-914 were taken in 2 stages *i.e.*, stage I in 288 M^2 area for each including 200 progenies in 5 m rows. In stage II the nucleus seed of each variety including 36 progenies were raised in 216 m^2 each. The crop met all specification standards and fit for nucleus seed.

In Pathology and Entomology disciplines one trial in each *viz.*, UDN and UPN were conducted. The crop was free for disease and pests at the time of monitoring.

Frontline Demonstrations

The centre was allotted 15 FLDs, out of which only 10 were conducted. All the FLDs conducted were on whole package in which two varieties *viz.,* RLU (6) (5) and Meera (7) were demonstrated under irrigated condition. The overall performance of the FLDs were good.

Kanpur

Trials in Breeding (4), Agronomy (3) and Plant Pathology (5) were conducted as per Technical programme. The execution and overall performance of the trials were good. The report is given disciplinewise as under :

A. Breeding

Four trials *viz.,* IVT (R), IVT (I), IVT (DP) and AVT (OP) were conducted as per allotment. The crop condition and overall performance of the trials were good except for IVT (R) in which plant population was very poor.

(i) **IVT (R) :** Thirteen entries were sown on 19.11.07. The overall performance of the trial was poor. The plant population was very poor in 2 replications and only one replication was good. The reason for poor plant population was delayed sowing and improper presowing irrigation. The trial was considered and vitiated.

(ii) **IVT (I) :** Fifteen entries and a local check Shubhra were planted on 18.11.07. The crop condition and overall performance of the trial was good. The crop was pure except for entry no. 212 (LBR-6), which appeared to be segregating.

(iii) **IVT (DP) :** The trial included 9 genotypes and one local check Gaurav, planted on 18.11.07. All entries except for 304 (LCP-147) were tall having characters of DP type. There were no infestation of disease and pests, overall performance of the trial was good.

(iv) **AVT (DP) :** Five genotypes including checks were raised on 18.11.07. All entries were pure, the plant stand was good except in 708 (Meera). However, entry no. 709 (Parvati ZC) was better in performance with respect to yield. The crop was free of diseases and pests.

Besides coordinated trials two PVT *i.e.,* PVT I & PVT II including 18 entries in each were evaluated for rainfed and double purpose respectively one station trial including 6 entries planted on 18.11.07 in 4 replication were also under evaluation.

Hybridization Programme

20 fresh crosses were made for resistance against Alternaria blight and bud fly resistance. The segregating generations included F_2 progeny of 7 crosses, F_3 (365 SPS), F_4 (179 SPS), F_5 (401 SPS) and F_6 (56 SPS) 36 bulks were grown in 2 Preliminary varietal trials (PVT I, PVT II) as described earlier.

B. Agronomy

Four trials *viz.,* Intercropping studies in weed management in irrigated linseed (Expt No. 6), studies on the response of AVT (DP) entries to sowing schedule (11.1) and response of AVT (DP) entries to fertility levels (11.2) were allotted to the centre. However, the first two trials no. 5, and 6 were not conducted.

11.1 Studies on the response of AVT (DP) entries to sowing schedule

The trial included nine treatments comprising of three test entries sown on 3 dates *i.e.,* last week of October (D_1), second week of November (D_2) and last week of November (D_3) Visual observation showed that the crop stand and plant population was poor in first sowing (D_1). The second date of sowing (D_2) was found to

be better with respect to crop stand, vigour, good bearing of bolder capsules, expected to give better yield. However in E_3 (LC 5021) the plant stand was poor under late sown condition. Under late sown condition performance of E_1 (Nagarkot) was better and E_2 (LMS 95-04) showed delayed flowering.

11.2 Studies on response of AVT (DP) entries to fertility levels

The same three entries *i.e.*, E_1 (Nagarkot), E_2 (LMS 95-04) and E_3 (LC 5021) were tested at three fertility levels F_1 (50% RDF), F_2 (100% RDF) and F_3 (150% RDF). The visual observation should good response of all entries to F_2 fertility level with respect of growth, vigour, number of capsules/plant. Entry no. E_3 (LC 5021) had only 80% capsule formation on account of early maturity. Better yield was expected at F_2 whereas poor in F1 and medium in F_3 fertility level.

C. Pathology : No observations were reported.

Frontline Demonstrations

Total 30 demonstrations were allotted to the centre of which 4 were visited by the team. All were on intercropping linseed + mustard (2 : 4) under irrigated condition. All FLDs were good.

Fatehpur

Thirty FLDs allotted to an NGO *i.e.*, Society for transfer of Agricultural research and Rural development were conducted. The FLDs were on whole package under rainfed as well as irrigated situation and 1-2 on intercropping. The performance reported were very good, good, medium to poor. The constraint was non availability of irrigation water and delayed sowing.

Jashipur (25.2.2008)

Trials were conducted in the discipline of Plant breeding and Pathology as per Technical programme In addition to this 20 Frontline demonstrations were allotted to the centre, which could not be conducted. The observations are given discipline wise as under :

A. Breeding

All allotted coordinated trials (6) *viz.*, IVT (R) ; IVT (U), AVT (R), AVT (I), EEMT and Screening of germplasm under rainfed condition were conducted as per Technical programme. Station trials, generation of breeding material and seed multiplication of variety JLSJ-9 were also undertaken. The observations are given as under :

(i) IVT (R)

Out of 13 entries evaluated in RBD in 3 replications entry no. 0.70110 (Padmini) was visually looking better. Severe incidence of wilt in entry nos. 101 (PCL-1-06), 103 (NL-260) and partial wilting in 112 (R-552) and incidence of PM in 105 (NDL-2005-34) and 113 (T-397) was observed. Entry no. 107 (BAU-06-8) was very late not fit for rainfed situation.

(ii) IVT (U)

Seven entries were evaluated in RBD in 3 replications. Among them Entry nos. 407 (RLC-121) and 408 (LMS-P-5) visually appeared better. Sever incidence of wilt in entry nos. 402 (R-552), 403 (NL-119) and 406 (NDL-2005-34) were observed.

ii) AVT (R)

ive entries were evaluated in 4 replications. Entry no. 509 (LMS-149-4) was visually looking good. In entry ɔ. 505 (R-552) severe wilting was observed.

v) AVT (I)

ɛven entries were evaluated in 4 replications as per technical programme. Visually entry no. 607 (RLC-115) ɔpeared earliest and entry nos. 611 (LC-2279-4) and 612 (NDL-2004-5) were late maturing. Plant stand 612 (NDL-2004-5) was poor due to poor germination.

) EEMT

ut of 10 entries evaluated entry no. 908 (T-397 NC) was looking better in spite of incidence of AB and M. Severe incidence of wilt in entry nos. 902 (SLS-79) and 913 (JLT-215), Alternaria blight in 901 (PCL-)-06) and 912 (RLC-114), PM in entry no. 908 (T-397) were observed.

i) Screening of germplasm under rainfed condition

)0 germplasm along with checks were evaluated in augmented design in 3 M single rows. Out of total tries CI 2044, 2048, 2052, 2060, 2063, 2066, 2205, 2206, 2208, 2231 and 2236 were visually looking od. The national check T-397 also appeared good but incidence of PM was observed.

Pathology

l allotted 4 trial *viz.*, Screening of germplasm against major diseases, UDN, UDNA and screening under gh inoculum pressure against AB were conducted as per technical programme. The crop condition and nt population were good. Other details are given below :

Screening of germplasm against major diseases

/o hundred germplasm were evaluated against Alternaria blight in single rows. The disease pressure was ɔderate to susceptible level. Entries 5/3, NP (RR)-401, A-16-1-1, A-32-2 and EC-256 showed resistant ɪction while other entries showed MR to HS reaction.

UDN (Natural)

venty two entries were evaluated against wilt as the disease pressure was too high. Under this condition)N nos. 6, 8, 15, 18, 29, 31, 40, 47, 55, 60, 66, 70, 71 and 72 showed resistant reaction. The susceptible ɛck chambal showed HS reaction.

) UDN artificial (UDNA)

/enty three entries were evaluated against Alternaria blight. The disease severity was moderate as susceptible ɛck chambal showed MR reaction. Under this condition entry nos. UDNA 11 (LCK 6028) and UDNA 22 DL 2005-17) showed moderately resistant reaction.

) Evaluation of elite material under high inoculum pressure against Alternaria blight

/enty four entries were evaluated against Alternaria blight. Entry nos. LC-2002, H-34, ES-44 and JRF1 ɔwed resistant reaction while susceptible check chambal showed susceptible reaction.

Frontline Demonstration

/enty FLDs on whole parkage under rainfed condition were allotted to the centre but none could be ɪducted due to non availability of seeds as per Scientist of Jashipur Dr. B.S. Naik.

Berhampore (27.2.2008)

All coordinated trials in the discipline of Plant Breeding, Pathology and Entomology were conducted as per technical programme. The observations are given disciplinewise as under :

A. Breeding

All allotted coordinated trials (4) *viz.,* IVT (R), IVT (I), IVT (DP) and AVT (DP) were conducted as per technical programme. The observations are given below :

(i) IVT (R)

Out of 14 entries evaluated entry no. 070106 (LMS-P-3) was looking better in visual observation. Entry no. 108 (SLS-71) was earliest maturing and entry nos. 101 (PCL-1-06), 107 (BAU-06-8) and 109 (KL-219) were late maturing, not suitable for rainfed situation.

(ii) IVT (I)

Sixteen entries were sown on 28.11.07. Entry no. 207 (LMS-63-6) was visually looking better. Entry no. 204 (LCK-7035) was earliest and entry no. 202 (PCL-12-3-06) was late maturing.

(iii) IVT (DP)

Out of 9 entries evaluated entry nos. 306 (LMS-23-6) and 307 (KL-232) appeared better in performance. Entry no 301 (LCK-7002) was late flax type.

(iv) AVT (DP)

Four entries were evaluated in RBD in 4 replications. Out of them entry no. 709 (Parvati ZC) appeared better visually. Entry no. 706 (PKDL-62) was earliest while 709 (Parvati) was late in maturity.

Evaluation and maintenance of germplasm

Evaluation and maintenance of 107 station germplasm was in progress. The crop condition was satisfactory.

Breeder seed production programme

Breeder seed production programme of variety Neela (B-67) was carried out in 0.2 acre area and approximately one quintal yield was expected. The crop condition was good and pure.

B. Pathology

All allotted (3) experiments were conducted nicely as per technical programme. The observations are given below :

(i) UDN (Natural)

Seventy two entries were tested against Alternaria blight under natural condition and the entries *viz.,* UDN 6 (KL-232), 9 (LCP-146), 15 (LMS-95-4), 52 (SLS-71), 53 (SLS-72) and 72 (KL-219) showed resistant reaction.

(ii) UDN artificial (UDNA)

Twenty three entries were tested against Alternaria blight. The entry nos. UDNA-10 (PKDL-62), 13 (RLC-115), 19 (Padmini) and 20 (Parvati) were found promising.

(iii) Evaluation of resistant/elite lines under high inoculum pressure against Alternaria blight :

Twenty four entries were screened against Alternaria blight. Among them entries *viz.,* ES-44, Polf-15, Polf-19 and Polf-22 showed resistant reaction.

C. Entomology

Two allotted trials were conducted as per programme. The observations are given experimentwise.

5.2.2 Uniform Pest Nursery trial for Bud fly resistance (UPN) :

All allotted entries were planted as per programme. The bud fly incidence was in the range of 25-30%. Entry nos. (JLS 9), (NDL 2005-16), (NL-119), (NP-5K) and (NP42) showed 5-10% infestation.

5.2.3 Testing of advance breeding material for bud fly resistance

The entire set was sown as per technical programme. The bud fly incidence was in range of 20-25%. Entry (BAU-06-14), (JLT-204), (LMS 63-6), (NDL 2004-05) and (OLC-10) showed below 10% bud fly infestation.

D. Frontline Demonstrations

Fifteen FLDs were conducted by the centre as per programme. The team visited a few randomly. All FLDs visited were in good condition. In some of the demonstration the yield expected was 10 q/ha. The farmers were very much impressed with the crop and wiling to grow linseed during coming crop season. Linseed rust (30-50%) was observed in some demonstrations. The reason may be high humidity because the FLD field was just adjascent to rice field.

Kanke (29.2.08)

The trials were conducted in the discipline of Breeding (6), Agronomy (2) and Pathology (6) disciplines as per allotment. No trial in Entomology and FLDs were allotted to the centre.

A. Breeding

All allotted trials *viz.,* IVT (R), IVT (I), IVT (U), IVT (DP), AVT (DP) and screening of germplasm under rainfed condition were conducted as per technical programme. Station trial (SVT), generation of breeding material and maintenance of germplasm (199) were also conducted. The details are given below :

(i) IVT (R)

Out of 13 entries planted on 24.11.07, 110 (Padmini AZ) and 113 (T-397) visually appeared good. Entry no. 103 (NL-260) was found earliest and 109 (KL-219) was late maturing.

(ii) IVT (I)

Out of 15 entries under evaluation 214 (Suyog) was visually looking good. Entry no. 204 (LCK-7035) was earliest and entry nos. 202 (PCL-12-3-06) and 209 (KL-248) were late maturing. Wilting was observed in 206 (NDL-2005-24) and 210 (NL-260).

(iii) IVT (U)

The experiment was conducted with 7 entries as per technical programme but due to cattle grazing the experiment completely failed.

(iv) IVT (DP)

Eight entries were evaluated in RBD in 3 replications sown on 15.11.07. Entry no. 070305 (RL-26016) visually appeared better. Entry no. 309 (Meera) was late. The technical height of all genotypes was low at Kanke.

(v) AVT (DP)

Five entries were raised on 13.11.07 in RBD in 4 replications. Out of them entry no. 070705 (LCK-6028) was visually looking good and earliest. Entry no. 708 (Meera) was late, 706 (PKDL-62) was not suitable for DP. The technical height of all genotypes was low at Kanke.

(vi) Screening of germplasm under rainfed condition :

100 germplasm entries were planted on 27.11.2007 along with 4 checks as per technical programme. The crop condition was satisfactory.

Evaluation and maintenance of station germplasm

199 germplasm were planted on 10.12.2007 for screening and evaluation. The crop condition was satisfactory.

Station varietal trials (SVT-I)

Twelve entries were sown on 5.12.2007 in RBD with 3 replications for evaluation. The crop conditi satisfactory and good.

B. Agronomy

All allotted agronomical trials were conducted as per technical programme. Details are given below :

1. **Experiment no. 1** *i.e.*, Effect of zinc with and without FYM in linseed based cropping sequence was conducted as per technical programme. The trial was sown on 8.11.2007 with variety Sweta, germination was satisfactory visually treatment nos. T_1, T_4 and T_7 were at par.

2. Experiment no. 4.

The trial was sown on 3.12.2007 with variety T-397 in 5×3 m plots. No clear cut treatment effect was visually observed in this experiment.

C. Pathology

All six trials were conducted as per technical programme. The diseases had not appeared at the time of monitoring. Wilt was observed in UDN trial in UDN 6 (KL-232), 10 (LCK-5021), 22 (NDL-2005-17) and 25 (NDL-2005-29) in the range of 5-10 per cent. The conductance of the trials was good with good plant population.

Faizabad (3 & 4-3-2008)

The trials were conducted in Plant breeding (T), Agronomy (5), Pathology (5), Entomology disciplines besides 20 FLDs were also taken up as per technical programme.

A. Breeding

All allotted varietal trial *viz.*, IVT (R), IVT (I), IVT (DP) and AVT (DP) were conducted at CRS, Masodha and IVT (I), Screening of linseed nursery under saline alkaline soil were conducted at GPB Farm, Kumarganj. The details are given below :

(i) IVT (R)

Out of 13 entries evaluated entry nos. 070101 (PCL-1-06), 103 (NL-260), 108 (SLS-71) and 113 (T-397) were visually looking better in performance. Entry no. 110 (Padmini AZ) appeared earliest. Entry Nos. 107 (BAU-06-8), 109 (KL-219) were late and 101 (PCL-1-06), 104 (PKDL-74) were very late, unfit for rainfed situation.

(ii) IVT (I) at Masodha

Out of 15 entries avaluated 070202 (PCL-12-3-06), 204 (LCK-7035), 205 (BAU-06-5), 206 (NDL-2005-24), 207 (LMS-63-6) and 215 (T-397) showed better performance. 204 (LCK-7035) and 205 (BAU-06-5) were earliest and, entry nos 202 (PCL-12-3-06), 203 (PCL-71), 209 (KL-248) and 213 (RLC-116) were tall type.

(iii) IVT (I) Kumarganj

Out of 15 entries tested entry no. 215 (T-397) was showing better performance under saline/alkaline soil condition. Entry nos. 201 (LCP-146), 202 (PCL-12-3-06) and 205 (BAU-06-5) were DP type.

(iv) IVT (DP)

A total of 10 entries were evaluated as per technical programme. The crop condition and overall performance of the trial was good. Entry nos. 070305 (RL-26016) and 310 (Parvati) were visually looking good.

(v) AVT (DP)

Five entries were evaluated in RBD in 4 replications. Entry no. 706 (PKDL-62) appeared better in performance. About 25% off plants were observed in 708 (Meera). Tip burning was observed in entry nos 707 (LCK-5021), 708 (Meera) and 709 (Parvati).

(vi) Screening of linseed nursery under saline/alkaline soils

Nineteen entries, including checks were evaluated in RBD under saline alkaline soil condition. Entry no. 071008 (NDL-2005-29) was visually looking good suitable for aline/alkaline situation.

(vii) Screening of germplasm under saline/alkaline condition

One hundred germplasm were planted along with check in 3 M single rows in Augmented design. The crop condition was satisfactory. Entry nos. JLT-84-5-1 and check entry Mukta were visually looking good.

Station varietal Trial-Rainfed (SVT-R)

Fourteen entries were evaluated in RBD in 3 replication. The crop condition was satisfactory.

Station varietal Trial-Irrigated (SVT-I)

Fourteen entries were planted in RBD in 3 replications. The crop condition was good.

B. Agronomy

All five allotted trials were conducted as per technical programme.

(i) **Expt No. 4** was sown on 20.10.2007. The variety Garima was taken in the experiment. Plant stand was not proper. In corporation of FYM 10 t/ha with $ZnSO_4$ performed better than other treatements.

(ii) **Expt No. 6.** Sowing time in relation to newly released varieties was conducted as per technical programme. The performance of variety Garima was best in D1 (Last week of October and D_2 (IInd

week of November), Shekhar variety performed better in D_3 (Last week of Nov.) in visual observation. Effect of salinity was observed in the experment.

(iii) **Expt No. 8**

The experimentation and over all performance was satisfactory. The dominating weeds were *P. minor* and *Chenopodium album*. In higher doses of Sulfosulfuron there was phytotoxic effect and stagnant growth. Use of Isoproturon controlled chenopodium.

(iv) **Experiment no. 11.1** AVT (DP) entries x date of sowing. Salinity effect was observed in the trial with the result technical height was not up to the mark. Visually the experiment was not satisfactory.

(v) **Experiment no 11.2** AVT (DP) entry X fertility level, visually entry no. V1 was best and 100% RDF and 150% RDF were at par and showed better effect.

C. Pathology

All allotted trials were conducted as per technical programme. The conductance and plant population were good. The details are given below :

(i) **Screening of germplasm against major diseases.** Two hundred germplasm were evaluated against Alternaria blight. The disease pressure was moderate to susceptible level. Entries *viz.*, 5/3, NP (RR) 401, A-16-1-1, A-32-2 and EC-256 showed resistant reaction.

(ii) **UDN (Natural) -** Seventy two entries were evaluated against AB disease and entries *viz.*, KL-232, LC-2279-4, LMS-95-4, LMS-63-6, OLC-99-57, PCL-35-06, PKDL-95, RLC-121, Baner, Nagarkot, Shekhar, LCP-147, RLC-112 and KL-219 showed resistant reaction.

(iii) **UDN artificial (UDNA) -** Twenty three entries were evaluated against Alternaria blight. Entries UDNA 11 (PKDL-65), UDNA-22 (Surabhi) showed moderately resistant reaction.

(iv) **Evaluation of elite material under high inoculum pressure against Alternaria blight**

Twenty four entries were included in the trial. The entries showing resistant reaction were LC-2002, H-34, ES-44 and JRF-1 while susceptible check chambal showed susceptible reaction.

D. Entomology

All allotted trials were conducted as per technical programme. The crop condition of the trials were satisfactory to good.

E. Frontline Demonstrations

Twenty FLDs were allotted to the centre and all were conducted. Due to time shortage only few could be visited. All visited demonstrations were satisfactory and good in condition. The FLDs on intercropping mustard with linseed taken by Sh. Devamani Yadav, village-Devra and Sri Shankar Tiwari were, good. The germination and plant stand was satisfactory.

Azamgarh

A total of 40 demonstrations were allotted to an NGO Monitoring was done in different villages of Azamgarh district on 5.3.08 and Main district on 6.3.08. During monitoring of FLDs following observations were recorded by the team.

1. Variety Garima was given to the farmers for demonstration but it was observed that the variety was not pure and mixture was seen.
2. In some FLDs plant population was poor and in some sowing was late. The impact of the demonstrations were not up to the mark.

3. In some FLDs sowing time, germination, plant population and purity of variety was satisfactory and good.

Gorakhpur (PRDF)

One coordinated varietal trial *i.e.,* IVT (U) 40 demonstrations were conducted by the NGO PRDF, Gorakhpur. The details are given below :

(i) Initial varietal Trial - Utera (IVT-U)

The trial was conducted at Mithaura block, Maharajganj. Eight entries were evaluated in RBD with three replications sown on 26.10.2007. The crop condition was satisfactory. All the entries were moderate to highly susceptible to Alternaria blight.

(ii) Frontline Demonstrations

Out of 40 FLDs only few could be visited by the team in different villages of Maharajganj, Deoria district and the following observations were recorded :

1. Germination and plant growth in all visited FLDs were satisfactory.
2. Incidence of Alternaria blight was observed in some demonstrations.
3. Demonstration on Utera system was satisfactory and impact of demonstration was good.
4. The demonstrations under irrigated system were satisfactory and overall impact of the demonstrations was satisfactory and good.

Kaul (10.3.08)

The centre had conducted all allotted trials in Plant Breeding (4) and Pathology (1) disciplines as per Technical Programme. The conductance of the trials were very good. The performance of the crop was excellent. No major disease or pest was observed at the time of visit except initiation of AB, PM and BF. However the FLDs allotted to the centre were not conducted.

I. Plant Breeding

Four allotted trials *viz.,* IVT (R), IVT (I), IVT (DP) and AVT (DP) were conducted as per technical programme. The execution and overall performance of the trials was very good. The observations are given experimentwise as under :

(i) IVT (R)

Thirteen entries were planted on 13.11.07. The execution and overall performance of the trial was very good. Visually performance of the entries 108 (SLS-71) and 113 (T-397) appeared better. Entries 110 (Padmini), 111 (RLC-117) and 112 (Sheela) were also good. Entries 105 (NDL-2005-4) and 107 (BAU-06-8) were not synchronic, 105 (NDL-2005-4) was susceptible to PM. Entry nos. 107 (BAU-06-8) and 109 (KL-219) were tall, late maturing, not suitable for rainfed situation.

(ii) IVT (I)

Fifteen entries were sown on 13.11.07. Out of total entries tested 203 (PKDL-71), 204 (LCK-7035), 206 (NDL-2005-24), 2007 (LMS-63-6), 2008 (RL-26018) and 214 (LC-54) appeared better. Entry nos. 204 (LCK-7035) and 214 (LC-54) and 207 (LMS-63-6) had bold capsules, However, 204 was not synchronic and in 214 there were off plants, 203 (PKDL-71) and 208 (RL-26018) were tall DP type, 202 (PCL-12-3-06) was susceptible to PM. Entry no 211 (SLS-72) was susceptible to AB.

(iii) IVT (DP)

Included eight entries planted on 13.11.07. The performance of the trial was very good. Entry nos. 303 (PKDL-72) and 305 (RL-26016) were very good. Entry no. 301 (LCK-7002) was real DP type *i.e.,* good in height as well as fruiting. Entry nos. 307 (KL-232) and 308 (Nagarkot) were not synchronic, 306 (LMS-23-6) had lodging problem, Entry no. 304 (LCK-147) wall tall suitable for fibre.

(iv) AVT (DP)

Four entries were planted on 13.11.07 in 5 replications. Performance of the trial was good Entry no. 703 (LMS-95-4) appeared better visually, 701 (Naqarkot) was also good and tall but not synchronic, 704 (LCK-5021) was also not synchronic and no required height. Entry no. 702 (Rashmi) was poor in germination.

II. Pathology

One allotted trial *i.e.,* UDN including 69 entries was planted along with checks on 13.11.07. The conductance and overall performance of the trial was very good. No major disease except PM was observed in majority of entries. The entries which were clean were UDN no 7, 8, 11, 16, 18, 22, 24, 27, 28, 30, 32, 34, 35, 36, 37, 39, 40, 41, 44, 45, 47, 48, 49, 50, 51, 52, 53, 54, 55, 57, 59, 63, 64, 65, 66, 67, 68 and 69. The scientist was interested in continuing the tiral in future.

III. FLD

Fifteen FLDs were allotted but none could be conducted.

Ludhiana (11-12.3.08)

The centre had conducted 4 trials in in Plant Breeding ; 5 in Plant Pathology and one station trial in Agronomy discipline. The conductance and overal performance of the trials were good. There were no major disease-pest problem except for initiation of Alternaria blight and powdery mildew. The observations are given disciplinewise as under :

I. Plant Breeding

Three trials *viz.,* IVT (I), IVT (DP) and AVT (DP) were conducted as per technical programme. The conductance and overall performance of the trials was good.

(i) IVT (I)

The trial included 15 entries planted on 10.11.07. The overall performance of the trial was good. Among the entries tested 207 (LMS-63-6) appeared better. Entry no. 204 (LCK-7035) was early with good fruiting. Entry no. 211 (SLS-72) was also early type, 205 (BAU-06-5) and 210 were (NL-260) were also good. Entry no. 214 (LC-54) was DP type and 209 (KL-248) was late, 213 (RLC-116) was not synchronic. No major disease was observed except for initiation of PM in some entries.

(ii) IVT (DP)

Including 12 entries sown on 10.11.07. Entries 303 (PKDL-72) and 305 (RL-26016) were good DP type ; 301 (LCK-7002), 304 (LCP-147) and 310 (Parvati) were tall flax type. In 301 (LCK-7002) and 304 (LCP-147) lodging problem was observed. Entry nos. 307 (KL-232), 308 (Nagarkot) were also good, 309 (Meera) included some off plants and 312 (Local) had gappy population. The overall performance was good.

(iii) AVT (DP)

Included 4 entries sown in 4 replication. One replication was less than the technical programme, Entries 703 (LMS-95-4) and 704 (LCK-5021) appeared better DP type, 701 (Nagarkot) was late flax type and 702 (Rashmi) was not synchronic. Overall trial was good and no disease and pest was observed at the time of visit.

II. Agronomy

No Agronomy trial was allotted. The centre had conducted one station trial on "Performance of linseed genotypes at varying nitrogen levels and seed rate. The conductance of the trial was good. No visual difference was observed at various N levels as well as amongst seed rates variety LC-2279-4 (V2) had shown poor germination.

III. Pathology

Five trials were conducted (5.11.07) as per technical programme. In general the conductance and overall performance was good. No disease had appeared till the time of monitoring. The experimentwise observations were as under :

1. Screening of germplasm against diseases

A total of 200 were planted along with checks. The conductance of the trial was good but plant population was low in some entries due to poor soil quality. No disease was observed till visit.

2. Uniform Disease Nursery (UDN natural)

Seventy-two entries of breeding trials were sown for testing against major diseases. The performance of trial was average and no disease was observed.

3. UDNA (UDN artifical)

Included 42 entries. conductance and overall performance was good. No disease was observed.

4. Screening of elite material against Alternaria blight and rust.

The crop stand was poor. No disease had appeared till visit.

5. Integrated disease Management

The trial constituted by 10 treatments was planted on 5.12.07 in 3 replications Although the disease had not appeared fully but vusually treatment including ST with Topsin M and spray of mancozeb appeared better followed by ST with TV (Trichoderma viride) and spray of neem leaf extract.

IV. Generation of material

No hybridization programme was taken up. However a lot of material was raised for molecular studies.

V. Frontline Demonstration

No FLD was takenup.

Palampur, Malan, Kangra

The trials in Plant Breeding and Agronomy disciplines were conducted at Palampur. The technical programme was fully executed. The observations are given discplinewise as under :

I. Plant Breeding

All allotted (7) trials including, IVT (R) IVT (I), IVT (DP), AVT (I), AVT (dP) IVT (U) and were conducted at Palampur and Utera trials *viz.*, IVT (U) and AVT (U) were conducted at Malan as per Technical Programme. The conductance and overall performance of the trials was good. No disease had appeared till time of visit.

(i) IVT (R)

Included 13 entries sown on 13.11.07 in 5 row plots. Entry no. 104 (PKDL-74) appeared better; (NDL-2005-34), 110 (Padmini), 113 9T-397) were early maturing sustable for rainfed situation. Entries 105 (LMS-P-3), 106 (NL 260), 109 (KL-219) and 112 (Sheela) were also good. 101 (PCL-1-06), 102 (LCK-7034) and 103 (NL-260) were susceptible to wilt and 107 (BAU-068), 108 (SLS-71) were gappy.

(ii) IVT (I)

Included 15 entries of entry nos. 202 (PCL-12-3-06) and 204 (LCK-7035) appeared better. Entry no. 205 (BAU-06-5) was not synchronic the performance of trial was good.

(iii) IVT (DP)

Eight entries were tested in the trial. Out of them entry no. 305 (RL-26016) appeared better, truely DP type. Entries 307 (KL-232) and 308 (Nagarkot) were also good. Entry no. 301 (LCK-7002) had good height but 302 (NDL-2005-26) was not DP type having low height.

(iv) AVT (DP)

Four entries were tested in 5 replications Entry no. 702 (Rashmi) had poor germinability, early and no height.

(v) IVT (U)

Included 9 entries sown in 3 replications. Out of these entry nos. 401 (T-397) and 402 (Surbhi) were good. 408 (LMS-P-5) was early but patchy growth while 409 (Baner) was late type. The overall performance of the trial was very good.

(vi) AVT (U)

Included 5 entries raised in 4 replications. Entry no. 802 (Surabhi) was good, 803 (PKDL-65) was medium 801 (T-397) was early but gappy growth and 804 (RLC-112), 805 (Sweta) were poor in performance. The overall performance of the trial was very good.

Hybridization Programme

The crossing programme for low linolini acid were takenup. A large number of SPS from F_4 by bulk pedgree method were raised.

Station Trials

Two station trials including 49 entries of seed type and 19 entries DP type were evaluated. The performance of the trials were good.

Seed Production Programme

Breeder seed programme on Nagarkot, Janki and Jeevan were takenup. Massive Multiplication of Binwar and Baner was takenup.

II. Agronomy

Five trials *viz.*, 5, 6, 7, 8, and 11 were conducted as per technical programme. Out of the trial nos 6,11.1 and 11.2 were monitored. Trial no. 5 could not be monitored as it was conducted at Bara-KVK. The conductance and overall performance of the trials were good. The details are given in the report of Agronomist.

III. Plant Pathology

The Plant Pathological trials were conducted at Kangra station. A tital of 6 experiments were conducted as per technical programme. The conductance and overall performance of the trials were good. The centre is a hot spot location for rust. However, at the time of monitoring rust had just started appearing, therefore, the score on disease incidence and severity may not be reliable. The experimental fields have turned into wilt sick field and there was heavy incidence of wilt.

The observations are given experimentwise as under :

1. Screening of germplasm against diseases.

Two hundred germplasm accessors were planted in single room along with cleck for screening against rust but appearance of disease was at initial stage. However entries namely, LMH-43, LMH-90-7 and NL-93 appeared good and clean. Entry nos. 2131 to 2138 were susceptible to wilt, NL-62 showed 100 per cent mortality. Genotype RLC-47 appeared resistant to wilt. In accession 2102 (LCK-9414) there was no germination.

2. Uniform Disease Nursery Trial (UDN natural)

Seventy two entries were planted in single row along with checks for screening against rust. However, the rust had just appeared and observed in very few lines like susceptible check and UDN-69. there was hevay incidence of wilt and UDN nos. 4, 10, 21-26, 29, 30, 32, 40-42 and 63 were found highly susceptible.

3. UDN artificial (UDNA)

Included 23 entries, tested against rust under artificial inoculation. Rust was observed only in susceptible check and UDNA 7 (LMS-149-4) and 20 (Parvati) were highly susceptible to wilt.

4. Screening of elite material against rust

Fortynine selected elite lines were planted along with checks. Rust was at very initial stage and observed in susceptible check chambal. H-40 was good entry free of rust and resistant to milt. Entries LCK-89512 and LCK-9303 were susceptiable to wilt and LCK-9312 and 9313 were susceptible to AB.

5. Screening of elite material against wilt

Thirty one elite lines were sown along with check for screening against wilt. Out of the entries *viz.*, RLC-52, S-91-3, NP (RR) 65, BAU-9906, LC-2021, LC-2027, LC-2045, NP-47, PKDL-43, Polf-5, Polf-23, No 15 36, 12JBP-1986, 12 Jabalpur local, H-22 and LCK-9303 were good lines.

6. Initial Disease Nursery Trial (IDSN)

Included 84 entries. Rust had just appeared and most of the entries were diseases free at the time of unit. Entry nos. IDSN 10, 37, 51, 60, 75 and 77 were good lines. Entries susceptible to rust were IDSN-14, IDSN-22, IDSN-35, 36, 38 and 39.

IV. Frontline Demonstrations (FLDs)

Although the centre was allotted 30 FLDs but they had conducted 31 at farmers field at various location. In two days programme the team could visit about 17 demonstrations. The conductance and overall performance of the FLDs were good. The improved varieties *viz.*, Binwa, Baner, Jeevan, Him Alsi-1, Him Also-2 were demonstrated at farmers field. Performance of Utera fields at certain locations was very good. The performance of seed and dual type was better at lower altitudes while flax type varieties were performing better at higher altitude.

Mauranipur (17&18.02.2008)

The centre had conducted Trials in Breeding, 4 in Agronomy disciplines as per Technical programme.

1. Breeding :-

All alloted co-ordinated varietal trials on linseed *viz.*, IVT (R), IVT (1) IVT (D.P.), AVT (R) AVT (1), EEMT (R) and Two station varietal Trials, breeding materials and nucleus seed multiplication of variety Parvati, Padmini and Sharda were also conducted. Some details of co-ordined varietal trials are given below.

1. IVT (R) :

Thirteen entries were sown on 7.11.07. Entry PCL-1-06, BHU-06 and Padmini were tall and DP type. Entries No. NL-260, PKDL-74 and LMS-P-3 was found promising for yield.

2. IVT (1)

Sixteen entries were Planted on 8.11.07. Entries LCP-146, PCL 12-3-06 and BAU-06-5 good for Dual purpose and entries No 4 and 14 were found for seed yield.

3. IVT (D.P.)

Nine entries were sown on 14.11.07. Entries PKDL-72 was fit for seed purpose and entries no. NDL-2005-06, LMS-23-6 and Meera 9 promising for dual purepose.

4. AVT (R) :

For entries were sown on 7.11.07 Eentries Padmini and LMS 149-4 promising for seed yield. Where as entry 4 found early type.

5. AVT (1)

Six entries were sown on 8.11.07 visually performance of the entries RLC-115 Bold capsule size and entry SLS-61 is segregating. Entries JLT-204 and T397 promising for seed yield.

6. EEMT (R)

Eleven entries were sown on 4.11.07. Entries SLS-73 and JLT 215 were found early maturing and JLS-9 and SLS 66 promising for yield propose.

II. Agronomical Trials :

All agronomical trials were conducted as per tehnical programme. The visual observation were as under :

1. Studies on moisture conservation practices for linseed under rainfed situation (Expt. No. 3)

The treatment No. 3 *i.e.*, spreading FYM @ 10 t/ha performed better followed by T4, in corporation of FYM @ 10 t/ha in the soil and T6 soil mulching at 30 DAS after First rain.

2. Studies on Bio-effeciency of new herbicides for weed management in irrigated linseed. (Expt. No. 6)

Treatment No. 1 - Hand weeding twice (20-25 & 40-45 DAS) observed best for higher praductivity of linseed. Crop damaged recorded by application of sulfosu furon @ 30 g/ha followed by 20 g/ha.

3. Studies on the respo of EEMT entries of III to seed rate and fertilizer application.

Entry 'A0793' (V3) maximum seed rat (35 kg/ha) permormed better than 30 or 25 kg seed / ha. Entry A0793 (V3) found good crop growth use 150% RDF for filizer dose than lower furtilizer dose.

4. Studies on the response of AVT (1) IInd year entries to fertilizer application and sowing schedule.

Entry Vi (A07102) found best per formance followen by V1 (A07101) with 150% RDF followed by 100% RDF and 50% RDF. Variety V1 showed some mixture in each replication. Crop were sown on 30th October performed better than late seedling. As regards crop condition entry A07102 (V2) performed best followed by entry A07101 (V1).

III F.L.Ds.

Although the centre was allotted 40 Front line demonstrations. 11 have rainfed, 5 irrigated, 11 intter crop for muaranipur and 9 for rainfed and 4 for irrigated at Hamirpur district. The team could visit about 6 demonstrations.

Tikamgarh. (19.02.2008)

Two experiment namely IVT (1) and AVT (R) were conducted at Tikamgarh centre

1. IVT (1)

Sixteen entries including check were sown on 17.11.07. Plant population was very good. Entry LCP 146, PCL 12-3-06 and SLS-72 observed dual type. Entry NL-260, SLS-72 and T 397 were observed medium height good branching and entry LCK 7035, LC-54 were observed promising for yield.

2. AVT (R)

Four entries were sown on 16.11.07 including local check. Entry T 397 found some mixture. Plant stand was observed very well. Entries T 397 and LMS 149-4 promising for seed yield.

Sagar (21-22.02.2008)

Breeding - six co-ordinated and two station varietal trials were conducted during Rabi 07-08. The observation are given experimentwise as under.

1. IVT (R)

Thirteen entries were planted on 3.11.07. The conductance of the Trials were good and no biotic and abiotic stress were observed.

Entries PCL-1-06, LCK 7034 and BAU-06-8 were visuall of looking better dual pourpose performance. Entries NL-260, Padmini and T397 were earliest and entry LMS-P-3 size of capsules were midum.

2. IVT (1)

Out of 15 entries tested. Entry NL-260 RLC-116 found frost effected and entry RL-248 showed poor capsul size.

3. AVT (R)

Four entreis were planted on 4.11.07 with five replications. Entry No. LMS-149-4 found bold capsule size, good plant stand and expected yield were good.

4. Extra Early Maturity Trial (R) : (EEMT)

Ten entries were sown on 4.11.07 with three replications. Entries PCL 35-06, SLS-73 and JLS-9 appeared promising for seed yield and earliness. Besides co-ordindted trials, two station trials like SVT (R) with 8 enties and SVT-1 with 12 entries were conducted and breeding material from F_2 to F_7 gene rations were also planted.

Conclusion :

On the basis of the average performance of the tested entries in the respective trials over locations, its is concluded that following entries are not pure as they have shown consistant variation in their population with regards to plant stature, days to flowering, days to maturity, flower colour, plant types, leaf shape and size, etc. Hence, such entries could not be promoted in next stage of testing.

Trials		Entries
IVT (R)	=	BAU 06-8, KL-219, PCL 1-06, PKDL-74, NDL 2005-04
IVT (I)	=	LBR-6, KL 248, RLC 116, BAU 06-5
IVT (DP)	=	LCK 7002, LCK 5021, LCP 147, KL 232, NDL 2005-06
AVT (R)	=	SLS-68
AVT (I)	=	JLT-204, SLS-61
AVT (DP)	=	PKDL-62, LCK 5021
EEMT	=	SLS-73, RLC-116

II Late Arrivals

Breeding Trials

Reporting Centre KVK Chandpura, Basaith, Madhubani (Bihar)

(a) Initial Varietal Trial (R)

Sl. No.	Entry	Seed yield (kg/ha)	Plant stand (000/ha)	Days to Flowering	Days to Maturity	No. of Capsules/pt	No. of Seeds/Cap	1000 Seeds wt (g)
1.	PCL 1-06	443	1042	89	134	37	6	8.0
2.	LCK 7034	292	1010	83	135	24	5	6.0
3.	NL 126	167	798	76	125	24	5	4.0
4.	PKDL 74	144	405	88	137	11	5	4.0
5.	NDL 2005-34	279	1795	84	125	36	5	7.0
6.	LMSP-3	333	882	78	133	36	5	8.0
7.	BAU 06-8	239	859	88	136	32	6	6.0
8.	SLS-71	306	1480	84	128	42	4	7.0
9.	KL 219	333	916	90	137	76	5	8.0
10.	RLC-117	361	2027	84	130	42	4	8.0
11.	Padmini (AZ)	339	1166	79	131	102	4	7.0
12.	Sheela (ZC-I)/	-	-	-	-	-	-	-
	Shekhar (Z-II)/	222	855	79	129	15	6	5.0
	R-552 (Z-III & IV)	-	-	-	-	-	-	-
13.	T-397 (NC)	472	2726	78	118	44	4	9.0
	GM	302	1228					
	SE (M) ±	18.71	38.10					
	CD	73.99**	150.70**					
	CV %	10.72	5.38					

Reporting Centre Gossaigaon (AAU, Assam)

(B) Initial Varietal Trial (Rainfed)

Sl. No.	Entry	Seed yield (kg/ha)	Plant stand (000/ha)	No. of Cap/pt.	Plant height (cm)	1000 seeds wt (g)
1.	PCL 1-06	219	131	9	58	4.7
2.	LCK 7034	216	116	9	56	6.3
3.	NL 126	139	155	11	59	7.3
4.	PKDL 74	200	189	12	68	5.3
5.	NDL 2005-34	227	253	17	58	4.7
6.	LMSP-3	285	220	10	60	6.7
7.	BAU 06-8	135	175	13	58	6.3
8.	SLS-71	253	265	11	62	5.3
9.	KL 219	183	142	7	54	6.7
10.	RLC-117	236	177	16	61	6.0
11.	Padmini (AZ)	273	238	14	53	7.7
12.	Sheela (ZC-I)/	-	-	-	-	-
	Shekhar (ZC-II)/	210	193	12	53	5.0
	R-552 (Z-III & IV)	-	-	-	-	-
13.	T-397 (NC)	330	286	15	63	6.0
	Local	350	315	21	67	6.7
	GM	233	204			
	SE (M) ±	19.8	7.51			
	CD Value	77.8**	29.53**			
	CV %	14.14	6.38			

III Area, Production and Yield of Linseed *(Rabi)* From 2002-03 To 2006-07 (Final) **Appendices**

A = Area in Lakh ha, P = Production in Lakh Tonnes and Y = Yield in kg/ha

Sl. No.	State		2002-03	2003-04	2004-05	2005-06	2006-07	% increase/decrease in 2006-07 over 2002-03 in APY
1	Madhya Pradesh	A	1.425	1.435	1.332	1.358	1.198	(–) 15.93
		P	0.503	0.617	0.524	0.559	0.492	(–) 2.19
		Y	353	430	393	412	411	(+) 16.43
2	Maharashtra	A	0.540	0.630	0.500	0.650	0.680	(+) 25.92
		P	0.120	0.150	0.110	0.180	0.160	(+) 33.33
		Y	222	238	220	277	235	(+) 5.85
3	Chhattisgarh	A	0.676	0.750	0.746	0.722	0.675	(–) 0.14
		P	0.197	0.231	0.165	0.179	0.169	(–) 14.21
		Y	291	308	221	248	250	(–) 14.08
4	Uttar Pradesh	A	0.810	0.787	0.784	0.534	0.515	(–) 36.41
		P	0.369	0.398	0.329	0.221	0.192	(–) 47.96
		Y	456	506	420	414	373	(–) 18.20
5	Jharkhand	A	0.080	0.180	0.160	0.144	0.311	(+) 288.75
		P	0.040	0.050	0.040	0.048	0.121	(+) 202.50
		Y	500	278	250	333	389	(–) 22.20
6	Bihar	A	0.292	0.347	0.276	0.295	0.286	(–) 2.05
		P	0.222	0.272	0.232	0.264	0.243	(+) 9.45
		Y	760	784	841	895	850	(+) 11.84
7	Orissa	A	0.165	0.182	0.224	0.231	0.249	(+) 50.90
		P	0.054	0.072	0.085	0.097	0.105	(+) 94.44
		Y	327	396	379	420	422	(+) 29.05
8	Karnataka	A	0.174	0.129	0.140	0.130	0.120	(–) 31.03
		P	0.061	0.010	0.030	0.040	0.040	(–) 34.42
		Y	351	78	214	308	333	(–) 5.13
9	Nagaland	A	0.080	0.067	0.073	0.080	0.088	(+) 10.00
		P	0.090	0.050	0.056	0.048	0.057	(–) 36.66
		Y	1125	746	767	600	648	(–) 42.40
10	Assam	A	0.100	0.100	0.093	0.082	0.080	(–) 20.00
		P	0.050	0.050	0.048	0.041	0.040	(–) 20.00
		Y	500	500	516	500	500	0.00
11	Jammu & Kashmir	A	0.003	0.002	0.006	0.005	0.054	(+) 1700.00
		P	0.002	0.001	0.003	0.002	0.023	(+) 1050.00
		Y	667	500	500	400	426	(–) 36.13
12	West Bengal	A	0.089	0.060	0.050	0.067	0.050	(–) 42.82
		P	0.037	0.019	0.020	0.019	0.012	(–) 67.56
		Y	416	317	400	284	240	(–) 42.30
13	Andhra Pradesh	A	0.040	0.050	0.040	0.040	0.030	(–) 25.00
		P	0.010	0.010	0.010	0.010	0.010	0.00
		Y	250	200	250	250	333	(+) 33.20
14	Himachal Pradesh	A	0.016	0.020	0.030	0.010	0.015	(–) 6.25
		P	0.004	0.010	0.020	0.001	0.004	0.00
		Y	250	500	667	100	267	(+) 6.80
15	Rajasthan	A	0.009	0.023	0.030	0.018	0.012	(+) 33.33
		P	0.006	0.023	0.023	0.015	0.010	(+) 66.66
		Y	667	1000	767	833	833	(+) 24.88
16	Punjab	A	0.002	0.003	0.003	0.002	0.002	0.00
		P	0.002	0.002	0.002	0.001	0.001	(–) 50.00
		Y	1000	667	667	500	500	(–) 50.00
	Total	**A**	**4.501**	**4.765**	**4.487**	**4.368**	**4.365**	**(–) 3.02**
		P	**1.767**	**1.965**	**1.697**	**1.725**	**1.679**	**(–) 4.98**
		Y	**393**	**412**	**378**	**395**	**385**	**(–) 2.03**

Source : Directorate of Economics & Statistics, New Delhi

IV. Staff Position

IV a. Position of sanctioned and filled posts in AICRP (Linseed) centres (June, 2008)

Centre	Scientific		Technical		Others		Total		Vacant Percentage
	Sanctioned	Filled	Sanctioned	Filled	Sanctioned	Filled	Sanctioned	Filled	
P.C. Unit (including PC (L)]	7	7	6	6	5	5	18	18	00.00
Kanpur	5	5	6	4	1	1	12	10	17.00
Mauranipur	3	3	2	2	1	1	6	6	00.00
Raipur	4	4	5	4	1	1	10	9	10.00
Sagar	2	1	2	2	-	-	4	3	25.00
Faizabad	3	3	3	3	-	-	6	6	00.00
Nagpur	4	4	4	4	-	-	8	8	00.00
Kota	1	1	3	2	-	-	4	3	25.00
Kanke	2	2	2	2	1	1	5	5	00.00
Jashipur	1	1	1	1	-	-	2	2	00.00
Hoshangabad	(2)	(2)	(2)	(2)	-	-	(4)	(4)	00.00
Raichur	1	1	1	1	-	-	2	2	00.00
Palampur	3	3	4	4	-	-	7	7	00.00
Patna	2	2	2	2	-	-	4	4	00.00
Total	38	37	41	37	9	9	88	83	5.68
Per cent	-	97.37	-	90.24	-	100.00	-	94.32	-

N.B. : Staff positions given in parantheses at Hoshangabad provided for seasame component from IX plan will also work for linseed component with the facilities of working contingency

IV b. Scientific Staff position in AICRP on Linseed centres (June, 2008)

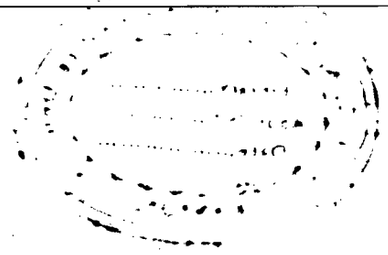
Sl. No.	Name of the Centre	Name of the Post	Name of Incumbent
1.	Project Coordinating & Germplasm	Project Coordinator	Dr. R.L. Srivastava
	Management Unit (Linseed)	Geneticist	Dr. P.K. Singh
	Kanpur (U.P.)	Jr. Statistician	Dr. Ram Chandra
		Jr. Pathologist	Dr. (Mrs.) Jyoti Singh/Dr. U.K. Tripathi
		Jr. Agronomist	Dr. Karam Husain
		Jr. Entomologist	Dr. Yash Pal Malik
		Jr. Agril. Biochemist	Dr. S.D. Dubey
2.	Kanpur (U.P.)	Breeder	Dr. Brahm Singh
		Jr. Breeder	Dr. Sarvendra Gupta
		Jr. Agronomist	Dr. O.P. Mathuria
		Jr. Pathlogist	Dr. Narendra Singh Sachan
		Jr. Biochemist	Dr. Rakesh Babu
3.	Mauranipur (U.P.)	Jr. Breeder	Dr. V.P. Nagaich/Dr. R.K. Singh
		Jr. Pathologist	Dr. Ramanand
		Jr. Entomologist	Dr. R.K. Pal
		Jr. Agronomist*	Dr. P.K. Soni
4.	Raipur (C.G.)	Breeder	Dr. M.K. Singh
		Jr. Entomologist	Dr. A.K. Gupta
		Jr. Agronomist	Dr. Santosh Kr. Jha
		Jr. Pathologist	Dr. K.P. Verma
5.	Sagar (M.P.)	Jr. Breeder	Vacant
		Jr. Agronomist	Dr. M.P. Dubey
6.	Faizabad (UP)	Jr. Breeder	Dr. M.P. Chauhan
		Jr. Pathologist	Dr. R.B. Singh
		Jr. Agronomist	Dr. D.P. Singh
		Entomologist*	Dr. Shamshad Ali
7.	Nagpur (MS)	Jr. Breeder	Dr. P.B. Ghorpade
		Jr. Pathologist	Dr. R.T. Gohokar
		Jr. Agronomist	Sri R.R. Nikam
		Entomologist	Dr. A.Y. Thakare
8.	Kota (Rajasthan)	Jr. Breeder	Dr. (Mrs.) Veena Bhatnagar
		Pathologist*	Dr. Ashok Kumar Jain
		Entomologist*	Dr. H.R. Chowdhary
9.	Kanke (Jharkhand)	Breeder	Dr. Sohan Ram
		Jr. Pathologist	Dr. U. Choudhary
		Agronomist*	Sri Shyam Deo Ram/ Sri Sant Prasad
10.	Jashipur (Orissa)	Jr. Breeder	Dr. B.S. Naik
11.	Hoshangabad (MP)	Breeder	Dr. V.S.N. Rao
		Jr. Agronomist	Dr. G.L. Thakur
12.	Raichur (Karnataka)	Jr. Breeder	Dr. B.S. Golosangi
13.	Palampur (HP)	Breeder	Dr. (Mrs.) S. Bhateria
		Jr. Agronomist	Dr. Dinesh Badiyala
		Jr. Pathologist	Dr. Ashok Kumar
14.	Patna (Bihar)	Jr. Agronomist	Dr. (Mrs.) Sunita Kumari
		Jr. Breeder	Dr. Ram Balak Pd. Nirala
		Sr. Scientist*	Dr. Pawan Kumar

* Cooperating Scientist dealt with AICRP (linseed) experiments at respective centres.

IV c. Scientists looking after the research programme of linseed at Voluntary/Cooperating Centres

Sl. No.	Centre	Parent University/Dept.	Name of the Post	Name of Scientist
1.	Ludhiana	Dept. GPB, PAU	Scientist (OS) Pl, Breeding Scientist (OS) Pl. Pathology	Dr. (Ms) Chhaya Atri Dr. (MS) Sarbjeet Kaur
2.	Berhampore	Dept. of Agril. (WB)	Incharge JDA Breeder Pathologist Entomologist	Dr. D.P. Chandra Dr. S.K. Sinha Dr. A. Biswas Dr. Santosh Kr. Ray
3.	Tikamgarh	JNKVV, Jabalpur	Sr. Breeder (OS)	Dr. G.K. Satpute
4.	Jabalpur	-do-	Head (PBG)	Dr. S.K. Rao
5.	Shillongani	Assam, Agril. Univ.	Breeder (OS)	Dr. D.P. Baruah
6.	Gossaigoan	-do-	Chief Scientist	Dr. Prasad
7.	Chariali	-do-	Asso. Dean	Dr. Prahlad Baruah
8.	Bilaspur	IGKV, Jabalpur	Breeder/I/C Scientist	Dr. D.J. Sharma
9.	Mainpuri	CSAU, Kanpur	Breeder (GN)	Dr. A.B. Singh
10.	Kaul	CSS HAU, RRS	Sr. Scientists (OP)	Dr. V.P. Singh
11.	Jharnapani	ICAR Res. Complex NEH, Nagaland	Head (Agro)	Dr. B.P. Bhat
12.	Varanasi	BHU	Chief Scientist	Dr. J.P. Lal
13.	Rewa	JNKV, Jabalpur	Chief Scientist/ Entomologist	Dr. D.P. Dubey Dr. M.A. Alam
14.	Solapur	MAU	Chief Scientist	-
15.	Sabour	Bihar Agri. College	Scientist	Dr. A.K. Roy
16.	Lucknow	IISR	Director	Dr. R.L. Yadav
17.	Lucknow	CSSRI	Director I/C Senior Scientist	Dr. D.K. Sharma Dr. Y.P. Singh
18.	Srinagar	Sher-E-Kashmir USA	ADR (Research)	Dr. S.A. Wani
19.	Khudwani (Anantnag)	Sher-E-Kashmir USA	Scientist (OS)	Dr. Ashif B. Shikari
20.	Larnoo	SKUA & T (J&K)	Sr. Scientist (PB)	Dr. G.A. Parray
21.	Dhaulakuan	HAREC	Assoc. Director	Dr. H.L. Thakur
22.	Waraseoni	JNKV, Jabalpur	Sr. Scientist	Dr. V.N. Tiwari
23.	Meerut (Modipuram)	SBPUA & T, Meerut	Prof. (Pl. Br.)	Dr. S.A. Kerkhi
24.	Parbhani	MAU	Sr. Research Officer	Dr. D.M. Sheta
25.	Kohima (Nagaland)	Dept. of Agriculture	Director	Dr. Supong Keitzer
26.	Kadegaon	College of Agriculture	Asso. Dean & Principal	Dr. Kheespe
27.	Padegaon	Agril. Res. Stn.	Sugarcane Specialist	-

Sl. No.	Centre	Parent University/Dept.	Name of the Post	Name of Scientist
28.	Malan	CSK HPKV	Breeder (OP)	Dr. (Mrs.) S. Bhateria
29.	Kangra	"	Jr. Pathologist	Dr. Ashok Kumar
30.	Latur	MAU, Latur	Breeder (OS)	Dr. M.K. Ghodke
31.	Jagdalpur	Shaheed Gundadhur	Scientist (OS)	Dr. Santosh Kumar
32.	Badnapur	MAU, Badnapur	Research Officer (OS)	-
33.	Dharwad	USA, Dharwad	Sr. Scientist (OS)	Dr. P.V. Kanchanagudar
34.	Bijapur	-do-	Scientist (PB)	Dr. D. Lakshmana
35.	Belgaum	UAS Dharwad	Head	Dr. S.N. Kambar
36.	Agartala	ICAR Res. Complex	Jt. Director	Dr. N.P. Singh
37.	Jhanjharpur	RAU, Pusa	Agronomist	Dr. D.K. Rai
38.	Ambajogai	MAU, Latur	Agri. Res. Officer	-
39.	Dholi	RAU	reeder (OS)	Dr. Anil Pandey
40.	Wellington	IARI Regl. Station	Principal Scientist	Dr. R.N. Brahma
41.	BARC, Trombay	NABTD, BARC	Scientist	Sri U.J. Vaidya
42.	Nagina	SVB Patel, Meerut	Scientist I/C	Dr. L.R. Singh
43.	Ujhani	-do-	Scientist I/C	Dr. S.B. Singh
44.	Durgapura	RAU, Bikaner	Breeder	Dr. S.J. Singh
45.	Udaipur	MPUA&T, Udaipur	HOD (GPB)	Dr. S.R. Maloo
IV d.	**Non-Government Organisatons (NGO's)**			
46.	Madhubani	KVK, Madhubani	President	Dr. S.K. Chaudhary
47.	Gorakhpur	PRDF, Shivpur	Chairman	Dr. R.C. Chaudhary
48.	Bahraich	SATF	Chairman	Dr. S.K. Singh
49.	Fatehpur	STARRD	President	Dr. S.S. Chauhan
50.	Azamgarh	SDJSSC	Secretary	Dr. Santosh Kumar
51.	Pune	IRSHA	Scientific Advisor	Dr. M.V. Hegde
52.	Bagalkot	KHAAR	Director	Dr. G. Hunsigi



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