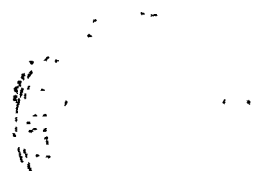


PO864-T14991

**EVALUATION OF EARLY GENERATION LINES IN PIGEONPEA  
(*Cajanus cajan* (L.) Millsp.) UNDER SOLE  
AND INTERCROPPING SYSTEMS**

BY  
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B. Sc. (Agri)



A DISSERTATION SUBMITTED TO THE MARATHWADA AGRICULTURAL  
UNIVERSITY IN PARTIAL FULFILMENT OF THE  
REQUIREMENT FOR THE DEGREE OF  
**MASTER OF SCIENCE (Agriculture)**  
IN  
(GENETICS AND PLANT BREEDING)

T 991

DEPARTMENT OF BOTANY (GENETICS AND PLANT BREEDING)  
MARATHWADA AGRICULTURAL UNIVERSITY  
PARBHANI

1981

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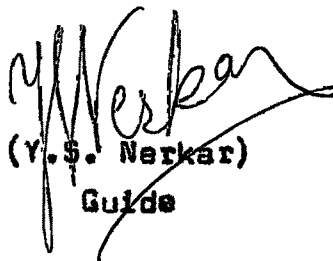
  
(N.G. Dashpande)

Date : 7 / 6 / 1981

CERTIFICATE I

Shri Naresh Govindrao Deshpande has satisfactorily prosecuted his research programme for a period of not less than one year and that the dissertation entitled " Evaluation of early generation lines in pigeonpea ( Cajanus cajan (L.) Millsp.) under sole and intercropping systems ", submitted by him is the result of original research work and is of sufficiently high standard to warrant its presentation to the examination. I also certify that the dissertation or part thereof has not been previously submitted by him for a degree of any University.


Date: 7 / 6 / 1981 .


  
(Y. S. Nerkar)  
Guide

CERTIFICATE II

This is to certify that the dissertation entitled " Evaluation of early generation lines in pigeonpea ( Cajanus cajan (L.) Millsp.) under sole and intercropping systems " submitted by Naresh Govindrao Deshpande, to the Marathwada Agricultural University in partial fulfillment of the requirements for the degree of Master of Science (Agriculture) in the subject of Botany (Genetics and Plant Breeding) has been approved by the student's advisory committee after oral examination in collaboration with the external examiner.

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## ACKNOWLEDGEMENT

I wish to express my deep sense of gratitude and sincere thanks to Dr. Y.S. Nerkar, Head, Department of Genetics and Plant Breeding, Marathwada Agricultural University, Parbhani and Chairman of my Advisory Committee for suggesting this problem, guidance and constant encouragement throughout the course of this study.

I am grateful to the advisory committee members, Dr. V.D. Patil, Professor, Department of Genetics and Plant Breeding, and Dr. A.L. Ballal, Professor, Department of Horticulture, M.A.U. Parbhani.

I am grateful to Dr. S.T. Borikar, Reader, Department of Genetics and Plant Breeding and Dr. N.D. Jambhale Reader, Department of Genetics and Plant Breeding for their constructive criticisms and review of the manuscript.

My thanks are due to the staff and post-graduate students of this department, S/shri Prof. M.B. Misal, and K.B. Birajdar.

My thanks are also due to S/shri B.M. Joshi, Pardiker R.D., Joshi M.R., Patskar, G.M., Deshmukh R.W., Shende S.B., and Deshmukh D.D. for their liberal help and co-operation during the period of investigation.

I shall be failing in my duties if I do not express my sincere thanks due to Prof. P.R. Waghmare, Department of Agril. Economics for his liberal help and co-operation during the study of statistical analysis.

I am also thankful to Associate Dean and Principal,  
College of Agriculture, Parbhani for awarding merit scholarship  
during the period of study.

Finally I take this opportunity to express my deep  
sense of gratitude and profound regard to my parents, my  
family members and relatives for their affection and moral  
support.

  
(N.G. Deshpande)

Date : 7 / 6 / 1981

## CONTENTS

Chapter		Page
1	INTRODUCTION	1
2	REVIEW OF LITERATURE	4
3	MATERIAL AND METHODS	15
4	EXPERIMENTAL RESULTS	27
5	DISCUSSION	45
6	SUMMARY	55
	LITERATURE CITED	i - vi
	APPENDIX	I - XX

LIST OF APPENDIX

Appendix No.	Title	Table No.
I	Days required for 50% flowering under sole and inter cropping systems	2
II	Days required for maturity under sole and intercropping systems	3
III	Plant height (cm)	4
IV	Plant spread (cm <sup>2</sup> )	5
V	Number of primary branches	6
VI	Number of secondary branches	7
VII	Number of pods/plant	8
VIII	Number of seeds/pod	9
IX	100-seed weight	10
X	Grain yield/plant	11
XI	Total dry matter	12
XII	Harvest index	13
XIII	ANOVA for 12 characters under sole cropping systems	14
XIV	ANOVA for 12 characters under intercropping systems	15
XV	Test of homogeneity	16
XVI	Test of heterogeneity	17
XVII	Range, Mean, Phenotypic and Genotypic variances and coefficients under sole cropping systems	18
XVIII	Range, Mean, Phenotypic and Genotypic variances and coefficients under intercropping systems	19
XIX	Estimates of heritability and genetic advance under sole and intercropping	20
XX	Correlation coefficient between different characters in sole and intercropping	21

**CHAPTER I**

**INTRODUCTION**

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Pigeonpea (Cajanus cajan (L.) Millsp.) is the second most widely grown legume in India which provides a very good and liberal source of protein. In India pigeonpea was grown on an area of 2259 thousand hectares during 1979-80 (Anonymous, 1980). Maharashtra ranked first (600 thousand hectares) followed by U.P., M.P., Karnataka, Gujrat and A.P. In 1978-79 the All India figures of pigeonpea area and production were 2662 thousand hectares and 1914 thousand tonnes respectively (Anonymous, 1979). The low productivity of pigeonpea in Maharashtra is evident from the fact that during that year Maharashtra and U.P. had 676 and 499 thousand hectares respectively under pigeonpea cultivation but produced 399 and 700 thousand tonnes respectively. Thus it is an urgent need to improve the genetic yield potential of the current pigeonpea varieties in the State.

Intercropping of pigeonpea has long been an important practice in many parts of the world as well as in India. Research had established that intercropping can give high yields than growing sole crops. Sorghum-pigeonpea is a common combination in the drier parts of India. Natrajan and Willey (1980) reported that the combination of pigeonpea and sorghum could satisfy the farmers primary objective of producing a 'full' yield of sorghum (i.e., as much as sole crop), while giving 'additional' yields of pigeonpea upto

73% of a sole pigeonpea yield.

In the arid and semiarid regions of Maharashtra State, pigeonpea is normally grown as an intercrop with sorghum. However, in the pigeonpea breeding programme selection and evaluation are made under sole crop conditions assuming that the genotypes which do well under sole cropping will also have superior companionship under intercropping. Preliminary studies by Laxman Singh *et al.* (1978) indicated that for intercropping system the yield of pigeonpea cultivars may depend on the genetic yield potential as well as on the competitive ability with the millet. Studies by Nerkar (1980) have indicated that early generation plant progenies perform differentially under sole cropping and intercropping with sorghum. Those selections which gave the highest yield under intercropping were average yielders under sole cropping. Thus the early generation breeding lines of pigeonpea differs in their ability of companionship in intercropping with sorghum. Pigeonpea lines selected in early generation in intercropping system are more likely to give better performance under intercropping than the selections made in sole cropping.

The present investigation was undertaken to test this hypothesis further. A total of 55 selections made under sole cropping and 25 selections made under intercropping were tested under both the cropping systems alongwith standard

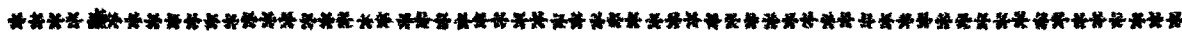
check varieties. The objectives can broadly be enumerated as :

1. To study yield performance of early generation selections in pigeonpea under sole and intercropping systems.
2. To study the effect of sole and intercropping on growth characteristics of early generation selections of pigeonpea in relation to grain yield.
3. To estimate variability, heritability and genetic advance under the two cropping systems.
4. To find out correlations between grain yield and different yield contributing characters.

Findings emerged from this experiment are presented and discussed in this thesis.

CHAPTER II

REVIEW OF LITERATURE



The literature in Pigeonpea crop (Cajanus cajan (L.) Millisp.) pertaining to genetic aspects has been briefly reviewed.

## 2.1 Genetic parameters

### 2.1.1 Genotypic and phenotypic variability

Ganguli and Shrivastava (1969) in a study of ten pigeonpea cultivars observed a wide range of phenotypic variability for number of leaves, number of pods, seeds/pod, plant height and yield/plant. Narrow range of variability was observed for number of fruiting branches, pod length and 100-seed weight. However, the environmental factors had the greatest influence on the seed yield. Hiramath and Talwar (1971) reported that the coefficient of variability at both genotypic and phenotypic level for plant height, number of branches and number of pods/plant do not vary much indicating there by that the characters were not influenced by environment.

Munoz and Abrams (1971) in a study of five hybrid populations of Pigeonpea, reported that extent of variability for number of seeds/pod was very little. Kumar and Haque (1973) in studies of  $F_2$  population, reported that extent of variability was more for number of pods, number of days to maturity, number of seeds and number of leaves/plant. The trait, number of seeds/pod gave the highest estimate for genotypic coefficient of variation followed by number of

leaves, seed yield and number of pods/plant.

In the study of 21 cultivars of Pigeonpea Rathnaswamy et al. (1973) reported that there was a wide phenotypic variation for plant height, stem girth, days to flowering and maturity, number of branches, pods, seeds and yield/plant. Gupta et al. (1975) reported the highest variability for pod clusters/plant, pods/plant and seed yield with high variation for plant height, days to maturity, 100-seed weight, seeds/pod, pod length in 65 cultivars of Pigeonpea. Chandra et al. (1975) in the investigation on 23 strains of arhar observed a wide range of phenotypic variability in all quantitative characters except pod length and number of seeds/pod. The highest amount of genotypic coefficient of variation was exhibited by yield/plant, number of primary and secondary branches and number of days to flowering.

Malhotra and Sodhi (1977) observed significant differences among the varieties for all characters under study and reported the highest estimates as genotypic coefficient of variation for branches/plant followed by grain weight, clusters/plant and pod number. Godwat (1980) reported that grain yield/plant and number of primary branches/plant had high genotypic and phenotypic coefficient of variation.

#### 2.1.2 Genotypic and phenotypic correlations

Grain yield is a complex character and is determined by many component characters. Selection for specific

characteristics is known to result invariably in correlated response for some other characters (Falconer 1960). Phenotypic correlation between different pairs of traits might be genetically controlled or brought about by environmental influences. There might be a direct influence of one variable on the other or through correlation of common values. A brief review on the correlation of yield with various other quantitative characters is presented below.:

Vedpathak (1952) reported that the seed yield in Pigeonpea was dependent on floral and seed characters while the vegetative characters like height, number of leaves, number of branches and leaf length had no relations with seed yield. Thorat (1955) worked out the correlations in six quantitative characters of pigeonpea and reported highly significant negative correlation between habit and maturity of crop and moderately significant negative correlations between habit, yield, frost resistance and height, while moderately positive correlations were obtained between yield and maturity, height of the plant number of branches/plant.

Mukharjee (1956) reported that yield in Pigeonpea was mainly influenced by number of Tertiary branches, number of pods/plant, number of seeds/plant, 100-seed weight. However, yield had negative correlation with maturity. Seed yield in Pigeonpea was dependent upon number of pods/plant and spread of plant (Deseappa and Mahadevappa 1970).

Munoz and Abrams (1971) reported that seed yield was highly and positively correlated with number of pods/plant, plant height and 100-seed weight was negatively correlated with days to flowering.

Singh et al. (1972) reported that seed yield in arhar was positively correlated with plant height while seed yield had negative correlation with days to flowering. Beohar and Nigam (1972) observed that seed yield in Pigeonpea was positively correlated with number of primary and secondary branches/plant while number of branches had a positive correlation with number of pods/plant. Kumar and Haque (1973) on studies in  $F_2$  population found that seed yield in Pigeonpea was significantly and positively correlated with number of leaves, number of branches, plant height, number of pods and number of seeds/pod while yield was strongly but negatively correlated with days to first flowering and days to maturity.

Rathnaswamy et al. (1973) on studies in 21 cultivars, reported that seed yield in Pigeonpea was highly and positively correlated with number of branches, number of clusters and number of pods/plant. Mukewar and Muley (1975) on studies in 60 Pigeonpea cultivars reported that seed yield in Pigeonpea was positively correlated with number and weight of pods/plant while pod length was negatively correlated with plant height, 100-seed weight, days to flowering and maturity. Pankaj Reddy et al. (1975) reported that seed yield in Pigeonpea was positively correlated with number of days to maturity and showed that

pod number and seed size were the most important yield contributing character in Pigeonpea.

Ram and Singh (1976) reported that number of primary branches had positive correlation with clusters/plant, pods/cluster, harvest index and yield at both genotypic and phenotypic levels. While number of clusters/plant had positive and significant correlation with number of pods harvest index and grain yield at genotypic level. At phenotypic level it was significant only with number of pods/cluster. Sharma and Asawa (1977) on studies in  $F_2$  population showed that yield in Pigeonpea was positively and strongly correlated with secondary branches and pods/plant while it was strongly but non significantly correlated with days to flowering, primary branches, plant spread and height of the plant. Godwat (1980), reported that grain yield/plant showed significant positive correlation with number of primary branches/plant, 100-seed weight, number of pods/plant and pod length.

### 2.1.3 Heritability

The success of phenotypic selection depends on the accuracy with which we can recognise the breeding value of a genotype from its phenotypic expression. Lush (1940) defined heritability in both narrow and broad sense. In broad sense, heritability refers to the ratio of genotypic variance to the total variance in percentage term. Heritability in narrow sense is the ratio of additive genetic

variance to the total variance.

### 2.1.3.1 Yield

Munoz and Abrams (1971) reported that the heritability estimates in narrow sense for yield were variable from 36 to 75 % in several hybrids of pigeonpea. Khan and Rachle (1972) reported a range of narrow sense heritability from 43 to 87 % for dry grain yield while Pandey (1972) recorded 76.4 % heritability for grain yield. Kumar and Haque (1973) and Gupta et al. (1975) observed moderate heritability in broad sense for seed yield while Singh and Shrivastava (1977) found high heritability (81.12 %). Rubaihayo and Onim (1975), Dahiya and Brar (1977) and Chaudhari et al. (1979) recorded quite low heritability in narrow sense. However, Dahiya and Satija (1978) reported moderate to high heritability in narrow sense in two crosses of pigeonpea.

### 2.1.3.2 Days to flowering and maturity

High range of heritability (60-86%) for days to flowering in Pigeonpea was recorded by Munoz and Abrams (1971). Similar results (70-90%) were also reported by Khan and Rachle (1972) while 95.2% heritability was reported by Pandey (1972). Sharma et al. (1973) estimated narrow sense heritability of maturity to be high (79%) in  $F_1$  and  $F_2$  of 10 varieties. Similar results on heritability of maturity were recorded by Gupta et al. (1975). Rubaihayo and Onim (1975) reported 72 and 53 % narrow sense heritability for days to flowering and maturity respectively.

Dahiya and Brar (1977) reported that heritability in narrow sense for flowering time was 66 % while Saxena and Sharma (1977) reported heritability ranged from low ( 5% ) to high (84%) for days to flowering. However, Dahiya and Satija (1978) reported high heritability (58 to 63%) for maturity. Similar results of high heritability (85%) for days to flowering was reported by Chaudhari et al. (1979).

### 2.1.3.3 Yield components

Munoz and Abrams (1971) recorded moderate to high narrow sense heritability of plant height and low to moderate (13.47%) for plant width in different crosses. Singh (1972) in  $F_2$  recorded moderate heritability in broad for number of seeds/pod and pod length. Similar result was noticed by Khan and Rachis (1972). High heritability had been reported for 100-seed weight (82%) by Sharma et al. (1972). Gupta et al. (1975) for pod number. Kumar and Haque (1973) and Rathnaswamy et al. (1973) for seeds/pod and Pandey (1972) and Gupta et al. (1975) for plant height. Rubaihayo and Onim (1975) reported high heritability in narrow sense (82%) for plant height while number of branches and number of pods had very low heritability (13 and 12%).

Low heritability was noticed by Dahiya and Brar (1977) for 100-seed weight and pod number. Saxena and Sharma (1977) observed that heritability estimates ranged from low (21%) to high (78%) for seed size in various crosses. In  $F_2$  population of Pigeonpea Singh and Shrivastava (1977) recorded high heritability in broad sense for plant spread (79.91%),

number of primary branches (89.33%), number of secondary branches (83.50%), number of pods/plant (63.42%) but moderate heritability for 100-seed weight (40.68%) and plant height (34%). Low heritability in narrow sense was reported by Chaudhari et al. (1979) for number of primary branches, number of secondary branches and pods/plant in  $F_1$  crosses of four varieties. Godwat (1980) reported high heritability for number of primary branches.

#### 2.1.4 Genetic advance

Hiremath and Talwar (1971) reported lower response of genetic advance coupled with high heritability for number of primary branches, seeds/pod and 100-seed weight. However, genetic advance was high for plant height. Kumar and Haque (1973) reported that number of seeds/pod and seed yield had high genetic advance while Gupta et al. (1975) reported the high estimates of genetic advance for plant height, number of branches/plant, pods/plant and pod clusters/plant.

Chandra et al. (1975), on studies in 23 Pigeonpea type observed the genetic advance was high for all characters except number of seeds/pod, number of primary and secondary branches and days to flowering. Malhotra and Sodhi (1977) reported high genetic advance for grain yield and number of branches in Pigeonpea. The pod number had average genetic advance.

## 2.2 Pigeonpea selection under intercropping

In India 80 to 90 % Pigeonpea is intercropped Aiyer (1949). Pigeonpea/sorghum intercropping is most commonest of all intercropping systems in India.

### 2.2.1 Yield

Enyi (1973) reported that intercropping of sorghum with Pigeonpea decreased total grain yield/ha due to shading effect of legume crop on sorghum. Singh et al. (1973) reported that dwarf variety of sorghum had shown superiority over tall under Pigeonpea/sorghum intercropping. Anonymous (1974) the highest returns was obtained from Pigeonpea/sorghum intercropping than sole cropping.

Laxmansingh et al. (1978) reported that ranking condition of Pigeonpea genotypes under sole and intercropping remained same but yield is reduced under intercropping.

Anonymous (1978) in the trial of Pigeonpea, few varieties of Pigeonpea gave more or less the same yield under sole and intercropping and in few varieties yield was reduced under intercropping, however, out of 13 entries five actually gave a higher yield under intercropping than sole cropping. The short high yielding genotypes of sorghum selected for efficient sole cropping had given better performance under Pigeonpea/cereal intercropping system (Jodha, 1979).

Rao and Willey (1980) reported high yield and high yield stability under intercropping of Pigeonpea with earlier

maturity crops, than sole cropping.

Natarajan and Willey (1980) reported that the initial growth of Pigeonpea was very much suppressed by the presence of sorghum but growth after sorghum harvest gave a higher ratio of seed yield.

Rao and Willey (1980) reported that in intercropping of sorghum and Pigeonpea and sole sorghum, intercropping gave a marked response to environmental changes and the goodness of fit of the regression was just as good as that of sole sorghum. Thus response of intercropping to environmental changes was just as stable as sole sorghum despite of presence of more variables in Pigeonpea.

Tarhalkar and Rao (1980) examined genotype x density interaction and their role in optimizing the cropping system by using sorghum genotype, CSH 6 planted in paired rows. They found that sorghum yield was little affected by changes in planting patterns but the highest total and net returns were obtained when sorghum rows were paired and intercropping with Pigeonpea. They also observed appreciable genotype x cropping system interaction and also genetic component in the adaptation of Pigeonpea to intercropping with sorghum.

#### 2.2.2 Yield components

Laxmansingh et al. (1977) tested three Pigeonpea genotypes of differing maturity in different planting patterns.

In respect of plant height and primary branches most genotypes respond similarly under sole and intercropping. Number of secondary branches increased under sole cropping while decreased under intercropping. Number of pods/plant and seeds/pod were also more under sole cropping.

Sundarrajan and Palaniappan (1979) reported that under rainfed condition intercropping suppressed the growth and branching of red gram and reduction was more pronounced with bajra. Black gram extended a favourable influence on the yield components of red gram such as pod number and pod weight/plant while bajra and sorghum adversely affected these parameters. Pod length, number of seeds/pod and 100-seed weight were not influenced by intercropping.



### 3.1 Experimental material

The experimental material comprised of 80 selections of Pigeonpea Cajanus cajan (L.). Millsp. in the  $F_4$ ,  $F_5$  and  $BC_1F_3$  generations and 4 released cultivars viz. C11, No.148, BDN1 and BDN2. These selections were derived as follows :

During kharif, 1978  $F_2$ ,  $F_3$  and  $BC_1F_1$  population originating from single crosses involving 23 diverse parents were raised as a sole crop. From these population selections were made on the basis of agronomic traits in the field and finally on the basis of grain yield. These single plant selections (about 300) were grown in replicated progeny rows as  $F_3$ ,  $F_4$  and  $BC_1F_2$  generations under sole cropping as well as under intercropping with sorghum cv CSH 6 in kharif, 1979. Under both the cropping systems selections were made on the basis of yield (line yield as well as plant yield), maturity and grain type. A total of 55 such selections made under sole cropping and 25 selections under intercropping were used in the present study. Their origin is presented in Table 1.

Table 1 : Origin of the selections used for the investigations

Sr. No.	Cross	Genera- tion	Sole crop (SC) selection entries	Intercrop (IC) sele- ction entries
1	2	3	4	5
1.	C11xHy 3A	F <sub>4</sub>	1,2,3,4,5,6,7	9,11
	C11xHy 3A	F <sub>5</sub>	8	10
2.	C11xHy1	F <sub>4</sub>	41	51
3.	C11xICP6997	F <sub>4</sub>	12,13	46
	C11xICP6997	F <sub>5</sub>	14	-
4.	C11xKaki	F <sub>4</sub>	15,16,17,18	49
5.	C11xPL8796	F <sub>4</sub>	19,20,21,22,23	47
6.	C11xNo.148	F <sub>4</sub>	24,25,28	48
7.	C11xDwarf	F <sub>4</sub>	26	50
8.	C11xNo.134	F <sub>4</sub>	40	53
9.	C11xMadras 37	F <sub>4</sub>	42	52
10.	C11xPrabhatxC11	BC <sub>1</sub> F <sub>3</sub>	27	-
11.	No.148xHy 3A	F <sub>4</sub>	30,31,32,36	55
	No.148xHy 3A	F <sub>5</sub>	29,	54
12.	No.148xBDM1	F <sub>4</sub>	33,34	56
13.	No.148xHy1	F <sub>4</sub>	35	57
14.	No.148xICP1	F <sub>4</sub>	37	-
	No.148xICP1	F <sub>5</sub>	-	58
15.	No.148xPL8796	F <sub>4</sub>	38	-
16.	No.148xMadras 37	F <sub>4</sub>	39	-
17.	No.148xPusa ageti	F <sub>4</sub>	43	-
18.	No.148xPrabhat	F <sub>4</sub>	44	-

Table 1 Contd ..

1.	2.	3.	4.	5.
19.	No.148xSongolabold	F <sub>4</sub>	45	-
20.	No.148xICP6997	F <sub>4</sub>	-	59
21.	Hy1x4785-2V <sub>2</sub>	F <sub>4</sub>	-	60
22.	Hy1xPusa ageti	F <sub>4</sub>	-	67
23.	Hy1xICP6997	F <sub>4</sub>	68	-
24.	Pusa agetixNo.148	F <sub>4</sub>	-	61,66
25.	Pusa agetixICP6997	F <sub>4</sub>	77	-
26.	PL8796xKaki	F <sub>4</sub>	79,80	62,63
27.	134xKakixKaki	BC <sub>1</sub> F <sub>3</sub>	74	64,65
28.	PrabhatxKaki	F <sub>4</sub>	69,78	-
29.	PrabhatxICP1	F <sub>4</sub>	70	-
30.	ICP6997xPL8796	F <sub>4</sub>	71	-
31.	DwarfxKaki	F <sub>4</sub>	72,76	-
32.	DwarfxPL8796	F <sub>4</sub>	75	-
33.	Songolaboldxfinyleaf	F <sub>4</sub>	73	-

The inter crop of Pigeonpea was grown in between paired rows of sorghum cv CSH 6.

For each entry, the experimental plot consisted of a single row of 4.8 meter length. Under sole cropping between row spacing was 75 cm; between plant spacing, 30 cm. Under inter cropping, the sorghum paired (30 cm spaced) rows were 60 cm apart; thus the Pigeonpea row spacing was 90 cm with plant to plant spacing of 30 cm. The sole crop of Pigeonpea was given a basally applied fertilizer dose of 20 kg N and 50 kg  $P_2O_5$ /ha. The inter crop experiment was supplied with 80 kg N and 40 kg  $P_2O_5$ /ha. This was the recommended fertilizer dose for sorghum. For the inter crop all of the  $P_2O_5$  and half of the N were applied as a basal dose and the remaining N was applied one month after sowing. Interculture and plant protection operations were done uniformly under both systems.

### 3.2.2 Observations

Observations on the following characters were recorded.

1. Days to 50% flowering
2. Days to maturity
3. Plant height (cm)
4. Plant spread ( $cm^2$ )
5. Number of primary branches
6. Number of secondary branches
7. Number of pods/plant
8. Number of seeds/pod

9. 100-seed weight (g)
10. Total dry matter (g)
11. Yield/plant (g)
12. Harvest index
13. Grain yield of sorghum

Five plants were selected randomly for observational purpose from each entry in each replication.

1. Days to 50% flowering:- Days required from sowing to flowering of 50% plants in a plot were recorded.
2. Days to maturity :- Days required from sowing to maturity of all the plants were recorded.
3. Height of plant (cm):- Height of the plants from ground level to the tip of the plant was recorded at the time of maturity.
4. Plant spread ( $\text{cm}^2$ ) :- The maximum width of the plant was measured, at the time of maturity in the north-south ( $S_1$ ) and east-west ( $S_2$ ) directions and plant spread was expressed as  $S_1 \times S_2$ .
5. Number of primary branches :- The total number of branches growing on main shoot were noted.
6. Number of secondary branches :- Total number of branches grown on each of the primary branches were noted.
7. Number of pods/plant :- The effective number of pods/plant were counted at the time of harvest.

8. Number of seeds/pod :- The seed from five randomly selected pods/plant were counted and average seed number was calculated.
9. 100-seed weight :- 100-seeds from each of the selected plants were taken, weighed in g and average was worked out.
10. Total dry matter :- Total weight of the plant alongwith pods was taken after drying the uprooted plants.
11. Yield/plant :- The total harvested seeds from a plant were weighed in g.
12. Harvest index :- Harvest index was calculated with the help of the formula

$$\frac{\text{Economic yield}}{\text{Biological yield}}$$

13. Grain yield of sorghum :- Grain yield of sorghum in the intercropping experiment was recorded for the entire plot and yield/ha was calculated.

### 3.2.3 Statistical methods

The following statistical methods were followed for analysis of the data.

#### 3.2.3.1 Analysis of variance

Analysis of variances were worked out on the basis of Randomized block design analysis in respect to all the

characters. The standard procedure was followed (Panse and Sukhatme, 1978). Critical differences (CD) was calculated as follows :

$$SE = \sqrt{\frac{\text{M.S. for error}}{\text{No. of replications}}}$$

$$CD = \text{Standard error } \sqrt{2} \times 't' \text{ at 5\% level}$$

Where,

t = Table value 't' at 5% level for error degree of freedom.

3.2.3.2 The genotypic and phenotypic variances were calculated by following expected mean squares as follows :

Source of variation	D.F.	S.S.	M.S.	Expectation of M.S.
Replication	(r-1) = 1	-	S <sub>1</sub>	- -
Treatments	(t-1) = 83	-	S <sub>2</sub>	$\sigma^2_e + r\sigma^2_g$
Error	(r-1)(t-1) = 83	-	S <sub>3</sub>	$\sigma^2_e$
Total	(rt-1) = 167	-	-	-

Where,

t = Number of treatments

r = Number of replications

S<sub>1</sub> = Replication mean squares.

$S_2$	=	Treatment mean squares
$S_3$	=	Error mean squares
$\sigma^2_e$	=	Environmental variance
$\sigma^2_g$	=	Genotypic variance

$$\text{Genotypic variance } (\sigma^2_g) = \frac{T.R.M.S. - E.M.S.}{r}$$

$$\text{Phenotypic variance } (\sigma^2_p) = \text{Genotypic variance} + \text{Error variance}$$

Genotypic and phenotypic coefficients of variation were calculated according to Burton (1951).

$$\text{Genotypic coefficient of variation} = \frac{\sigma_g}{\bar{x}} \times 100$$

$$\text{Phenotypic coefficient of variation} = \frac{\sigma_p}{\bar{x}} \times 100$$

Where,

$\sigma_g$	=	Genotypic standard deviation
$\sigma_p$	=	Phenotypic standard deviation
$\bar{x}$	=	General mean of character

The standard deviations were calculated by taking the root of respective variances.

### 3.2.3.3 Heritability and genetic advance

The heritability, in broad sense estimates were calculated according to the method suggested by Lush (1940).

$$\text{Heritability (H)} = \frac{\sigma^2_g}{\sigma^2_p} \times 100$$

Where,

$\sigma^2_g$	=	Genotypic variance
$\sigma^2_p$	=	Phenotypic variance

The expected genetic advance was calculated for each of the characters by the formula suggested by Lush (1949).

$$\text{Genetic advance (G.A.)} = \frac{\sigma^2_g}{\sigma^2_p} \times K$$

Where,

K = Selection differential at 5% level  
i.e. 2.06

$\sigma^2_g$  = Genotypic variance

$\sigma^2_p$  = Phenotypic standard deviation

Genetic advance in percentage expressed in terms of mean.

$$\frac{\text{G.A.}}{\bar{x}} \times 100$$

Where,

G.A. = Genetic advance

$\bar{x}$  = General mean of character

#### 3.2.3.4 Simple correlations

By using formula suggested by Johansson et al. (1955) the correlation coefficient (r) were calculated.

$$r = \frac{\text{Cov. (X,Y.)}}{\sqrt{\sigma^2_x \cdot \sigma^2_y}}$$

Where,

r = Correlation coefficient between X and Y

$\sigma^2_x$  = Variance of x

$\sigma^2_y$  = Variance of y

### 3.2.3.5 Test of homogeneity and interactions

The homogeneity of error variances was tested by using Bartlett's test (Panse and Sukhatme, 1978).

$$1. \text{ Pooled estimates of variance } (s^2) = \frac{1}{n} \sum nsr^2$$

Where,

$n$  = Number of environments/locations  
 $sr^2$  =  $r$  times the joint estimates of error variances

$$2. \text{ Quantity } (X^2) = K \left( n \log s^2 - \sum_1^n \log sr^2 \right)$$

Where,

$K$  = Treatment d.f. x environment d.f.

$$3. \text{ Correction factor } (C) = 1 + \frac{n + 1}{3 nK}$$

$$4. \text{ } X^2 \text{ (1. d.f.)} = \frac{X^2}{C}$$

This was compared from  $X^2$  table at 5% and 1% level of significance

When the variances were homogenous, 'F' values were calculated as follows :

$$F_1 = \frac{\text{E.M.S. for genotype x environment}}{\text{Pooled error}}$$

Where,

$F_1$  = Ratio for interaction

E.M.S. = Error mean squares

$$F_2 = \frac{\text{Genotype mean squares}}{\sigma_e^2}$$

Where,

$F_2$  = Average genotypic differences over systems

$\sigma_e^2$  = Pooled error based on 249 degrees of freedom

$$F_3 = \frac{\text{Genotype mean squares}}{G \times E.M.S.}$$

Where,

$F_3$  = F ratio for genotypes

G x E.M.S. = Genotype x environment mean squares

#### Heterogeneity of interactions

When the variances were heterogenous, the following calculations were made.

Weighted analysis of variance

$$W_i = \frac{r}{S_i^2}$$

Where,

$W_i$  = Weight

$r$  = Number of replications

$S_i^2$  = Corresponding error mean squares on/  
plot basis

$W_i P_i$  where,  $P_i$  = Systems total

$W_i t_i$  where,  $t_i$  = Means for each strain at each system

$G$  = Sum of  $W_i t_i$  over all the strains

$S_i$  = Columnwise crude sum of squares obtained in each column

$$\text{Total S.S.} = \sum W_i S_i - C$$

Where,

$$C = \frac{G^2}{t \sum W_i}$$

$t$  = Number of treatments

$$\text{S.S. for places} = \frac{1}{t} \left\{ \sum (W_i P_i^2) - C \right\}$$

$$\text{S.S. for treatments} = \frac{\sum (\sum W_i t_i)^2 - C}{\sum W_i}$$

S.S. for interaction (I) = Total S.S. - Place S.S. - Treatment S.S.

$$F \times^2 = \frac{(n-4) (n-2)}{n(n+t-3)} (I)$$

Where,

$n$  is the number of degrees of freedom on which the error mean square is based in each experiment = 166

$t$  = Number of treatments = 84

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CHAPTER IV

EXPERIMENTAL RESULTS

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The experimental results recorded on various characters in both sole and intercropping systems are presented below under different headings.

1. Mean performance
2. Analysis of variance
3. Homogeneity and Heterogeneity test
4. Phenotypic and Genotypic variation
5. Heritability and genetic advance
6. Simple correlations

#### 4.1 Mean performance

Results on mean performance are presented in Table 2 to 13.

##### 4.1.1 Days to 50% flowering

Days required for 50% flowering under the two cropping systems were at par.

Days required for 50% flowering for SC selections were more or less similar to overall mean under the sole and intercropping systems. Days required for 50% flowering for IC selections were less than the overall mean under sole cropping but were similar to overall mean under intercropping.

The standard check BDN 1 required 124 days to 50% flowering under sole crop, and 135 under intercrop. Out of

55 SC selections, under sole cropping, 12 SC selections required more number of days to 50% flowering than check while none was earlier than the check. Under intercropping 28 SC selections were earlier than the check and the rest were at par.

Out of 25 IC selections, under solecropping only two IC selections were late in flowering than check and rest were at par. Under intercropping 14 IC selections were earlier than the check and the rest were at par.

#### 4.1.2 Days to maturity

Days required for maturity under the two cropping systems were at par.

Days required for maturity of SC selections under sole and intercropping were more than overall mean. Days required for maturity for IC selections were less than the overall mean under both the cropping systems.

The standard check BDN 1 required 197 days for maturity under sole cropping and 195 days under intercropping. Out of 55 SC selections, under sole cropping, 11 matured earlier than the check and rest were at par. Under intercropping also 11 SC selections matured earlier than check and rest were at par.

Out of 25 IC selections, under sole cropping 6 IC selections matured earlier than the check and rest were at

at par, whereas under intercropping 8 IC selections had early maturity than check and rest were at par.

#### 4.1.3 Plant height

The difference in mean height in the two cropping was nonsignificant.

The mean height of SC selections under sole cropping was less than over all mean, whereas under intercropping it was more or less similar to over all mean. The mean height of IC selection was greater than overall mean under sole cropping and more or less similar to overall mean under intercropping.

The check variety BDN 1 had mean height of 133 cm for sole crop and 160 cm for intercrop. Out of 55 SC selections, under sole cropping, only one SC selection had less height and rest were at par. Under intercropping two SC selection had more height than check and 3 IC selections had less height than check.

All 25 IC selections, under sole as well as intercropping were at par with BDN 1.

#### 4.1.4 Plant spread

The difference in plant spread in the two cropping systems was nonsignificant.

The mean spread of SC selections was more or less similar to overall mean under both the cropping systems. The mean spread for IC selections was also more or less similar to overall mean under both the cropping systems.

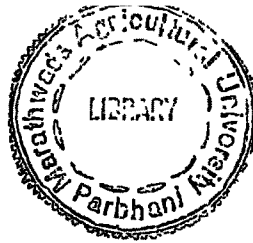
The standard check BDN 1 had mean spread of 3282 cm<sup>2</sup> for sole crop and 3165 cm<sup>2</sup> for intercrop. Out of 55 SC selections, under sole cropping, two SC selections had more spread than check and rest were at par. Under intercropping only one SC selection had more spread than check and rest were at par.

Under sole cropping all 25 IC selections were at par with check, while under intercropping one IC selection was found with less spread than check and rest were at par.

#### 4.1.5 Number of primary branches

The difference in number of primary branches in the two cropping systems was nonsignificant.

The mean number of primary branches for SC selections was more or less similar to overall mean under both the cropping systems. More or less similar results were obtained for mean number of primary branches for IC selections. The standard check BDN 1 had 16.30 mean number of primary branches in sole crop and 18.40 under intercrop. Out of 55 SC selections, under sole cropping, 4 SC selections were with less number of primary branches than check and rest were at par, under intercropping 18 SC selections were with



T991

less number of primary branches than check and rest were at par.

Out of 25 IC selections, under sole cropping, 7 IC selections were with less number of primary branches than check and rest were at par. Under intercropping 11 IC selections were with less number of primary branches than check and rest were at par.

#### 4.1.6 Number of secondary branches

Under sole cropping the mean number of secondary branches was significantly higher than intercropping.

The mean number of secondary branches for SC selections, under sole and intercropping was more or less similar to overall mean. The same results were obtained for mean number of secondary branches for IC selections.

The standard variety BDN 1 had 37 secondary branches under sole cropping and 11.5 under intercropping. Out of 55 SC selections, under sole cropping, 8 SC selections were with less number of secondary branches than check and one SC selection were with more number of secondary branches than check. Under intercropping 4 SC selections were with more number of secondary branches than check and rest were at par.

Out of 25 IC selections, under sole cropping 6 IC selections were with less number of secondary branches than check and rest were at par, while under intercropping all were at par with the check.

#### 4.1.7 Number of pods/plant

The difference in number of pods/plant in the two cropping systems was nonsignificant.

The mean number of pods/plant for SC selections was more or less similar to overall mean under both the cropping systems. The mean number of pods/plant for IC selections, under sole cropping was less than overall mean and under intercropping, more or less similar to overall mean.

The variety BDN 1 had 234 pods/plant under sole crop and 176 under intercrop. Out of 55 SC selections, under sole cropping, only two SC selections were with more pods than check and one SC selection was with less pods/plant than check. Under intercropping 8 SC selections were with less pods than check and rest were at par.

Under sole cropping all 25 IC selections were at par with check and under intercropping 4 IC selections were with less pods than check and rest were at par.

#### 4.1.8 Number of seeds/pod

The difference in number of seeds/pod in the two cropping systems was nonsignificant.

The mean number of seeds/pod for SC selections was more or less similar to over all mean under both the cropping systems. The mean number of seeds/pod for IC selections under sole crop was greater than overall mean and under intercrop it was less than overall mean.

The variety BDN 1 had 4.08 seeds/pod under sole crop and 3.82 under intercrop. Out of 55 SC selections, under sole cropping, only two had more seeds/pod and rest were at par while under intercropping 10 SC selections were with more number of seeds/pod and rest were at par.

Out of 25 IC selections, under sole cropping only one IC selection was with more seeds/pod and rest were at par. Under intercropping only two IC selections were with more seeds/pod and rest were at par.

#### 4.1.9 100-seed weight

The difference in 100-seed weight in the two cropping systems was nonsignificant.

The mean 100-seed weight for SC selections as well as IC selections was more or less similar to overall mean under both the cropping systems.

The standard check BDN 1 had 100-seed weight of 9.63 g under sole crop and 10.91 under intercrop. Out of 55 SC selections, under sole cropping, only one had higher 100-seed weight than check and rest were at par. Under intercropping 11 SC selections were with more 100-seed weight than t check and rest were at par.

Out of 25 IC selections, under sole crop only one IC selection was with more 100-seed weight than check and the rest were at par, while under intercropping 4 IC selections were with more 100-seed weight than check and rest were at par.

#### 4.1.10 Grain yield/plant

The difference in grain yield/plant in the two cropping systems was nonsignificant, although in general, yield was higher under sole cropping.

The mean grain yield/plant for SC selections and IC selections was more or less similar to overall mean under both the cropping systems.

The standard check BDN 1 produced 29.17 g grain yield/plant under sole cropping and 37.09 g under intercropping. Out of 55 SC selections, under sole cropping, only 3 yielded more than check and rest were at par. Under intercropping only one yielded more than check and 11 SC selections yielded less than check.

Out of 25 IC selections under sole cropping all were at par and under intercropping 9 IC selections yielded less than the check and rest were at par.

#### 4.1.11 Total dry matter

The difference in total dry matter in two cropping systems was nonsignificant.

Mean total dry matter for SC selections was greater than the overall mean under both the cropping systems whereas mean total dry matter for IC selections was less than the overall mean under both the cropping systems.

The standard variety BDN 1 had the total dry matter of 215 g under sole cropping and 145.5 g under intercropping. Out of 55 SC selections, under sole cropping, only two SC selections produced more total dry matter and only one SC selection produced less total dry matter than check. Under intercropping 9 SC selections produced more total dry matter than check and rest were at par.

Out of 25 IC selections, under sole cropping all IC selections were at par with the check. Under intercropping only one IC selection had more total dry matter and only one IC selection had less total dry matter than check.

#### 4.1.12 Harvest index

The difference in harvest index in two cropping systems was nonsignificant.

The mean harvest index for SC selections and IC selections was more or less similar to overall mean under both the cropping systems.

The standard variety BDN 1 had the harvest index of 0.2250 under sole crop and 0.2104 under intercrop. Out of 55 SC selections, under sole cropping, only one was with greater harvest index and 8 were with lower harvest index than check. Under intercropping only one was with greater harvest index and 3 were with lower harvest index than check.

Out of 25 IC selections, under sole cropping only one IC selection was with lower harvest index than check and rest were at par and under intercropping only one IC selection was with lower harvest index than check and rest were at par.

#### 4.2 Analysis of variance

Analysis of variance was done to assess the variation in the population for 12 characters and is presented in Table 14 and 15.

Analysis of variance shows that the treatment differences were significant at 5% level in respect of all the characters studied and at 1% level in respect of days to 50% flowering, days to maturity, number of seeds/pod, grain yield/plant and harvest index under sole as well as intercropping systems. In intercropping the characters

plant height, number of primary branches, number of pods/plant, 100-seed weight and total dry matter were also significant at 1% level. Thus a wide range of variability was present in the material for yield and its contributing characters.

Under sole cropping, out of 55 SC selections entry numbers 27 and 76 for grain yield/plant, entry number 2 for 100-seed weight, entry number 17 and 76 for number of seeds/pod, and entry number 14 and 25 for pods/plant showed superiority over the check BDN 1. Under intercropping entry number 4 for grain yield/plant, entry number 18 and 74 for 100-seed weight and entry number 1 and 80 for number of seeds/pod were significantly superior over the check BDN 1.

Under sole cropping, from the IC selections entry number 9 for number of seeds/pod was superior over the check BDN 1. Under intercropping entry numbers 9 and 63 for 100-seed weight and entry number 52 for number of seeds/pod were significantly superior over the check BDN 1.

#### 4.3 Homogeneity and Heterogeneity test

##### 4.3.1 Test of homogeneity

To test homogeneity of the error variances for two different cropping systems Bartlett's test was carried out. Results are presented in Table 16.

Out of 12 characters, only 4 characters viz. days to 50% flowering, days to maturity, plant height and plant

spread showed homogeneity of error. Pooled analysis for these four characters indicated significant differences between genotypes. However, cropping systems and genotypes x systems interactions were nonsignificant.

#### 4.3.2 Test of heterogeneity

Error variances for the remaining 8 characters were heterogeneous. Significance of these 8 characters was tested by weighted mean analysis. Results are presented in Table 17.

Genotypes x systems interactions for the characters number of primary branches, number of pods/plant, number of seeds/pod, grain yield/plant and harvest index were nonsignificant. Interaction for the characters secondary branches, 100-seed weight and total dry matter were found to be significant.

#### 4.4 Phenotypic and Genotypic variation

Phenotypic and genotypic variances and phenotypic and genotypic coefficients of variation were estimated by the formula given by Burton (1952). Results are presented in Table 18 and 19.

##### 4.4.1 Days to 50% flowering

The range and mean for days to 50% flowering were more or less similar under sole and intercropping. However, the variances and coefficient of variation, both phenotypic and genotypic were higher under intercropping systems.

#### 4.4.2 Days to maturity

The range and mean for days to maturity were also more or less similar under the two cropping systems. However, there was, in general, slight delay in maturity ( 5 to 6 days) in the sole crop as compared to intercrop. The phenotypic and genotypic variances as well as coefficients of variation were higher in sole crop than in the intercrop.

#### 4.4.3 Plant height

The plant height ranged from 100.8 to 159.2 (mean 134.52) cm in sole crop and from 130.2 to 200.9 (mean 157.67) cm in intercropping, thus plant height increased under intercropping. Phenotypic and genotypic variances and genotypic coefficient of variation were higher under intercropping.

#### 4.4.4 Plant spread

The range of plant spread was 1414.0 to 5830.0 cm<sup>2</sup> under sole crop and 1457.0 to 5222.7 cm<sup>2</sup> under intercropping. The phenotypic and genotypic variances and phenotypic coefficients of variation were much higher under sole cropping as compared to intercropping.

#### 4.4.5 Number of primary branches

The range and mean of number of primary branches were more or less similar under the two cropping systems. However, the variances and coefficients of variation were higher under intercropping as compared to sole cropping.

#### 4.4.6 Number of secondary branches

The range of number of secondary branches was very wider in the sole crop (12.8 to 51.5) than in the intercrop (4.4 to 22.4). Although the variances were higher under sole cropping than under intercropping, the coefficients of variation were more or less similar under the two systems.

#### 4.4.7 Number of pods/plant

The range and mean of pods/plant were higher under sole cropping as compared to intercropping. This was also reflected by the greater variances and coefficients of variation observed in sole crop than in intercrop.

#### 4.4.8 Number of seeds/pod

The range and mean of seeds/pod were more or less similar in the two cropping systems. However, the variances and coefficients of variation were higher in the intercrop.

#### 4.4.9 100-seed weight

Although the range of 100-seed weight was higher under sole crop, the mean was slightly higher in the intercrop. The genotypic variances and coefficients of variation were higher under sole crop as compared to intercropping.

#### 4.4.10 Grain yield/plant

The range and mean of grain yield/plant were higher under sole cropping than under intercropping. The phenotypic variance and coefficient of variation were higher at the phenotypic level under sole cropping, while at the genotypic level these parameters were higher under intercropping.

#### 4.4.11 Total dry matter

The range and mean of total dry matter were higher under sole cropping as compared to intercropping. Phenotypic and genotypic variances and phenotypic coefficients of variation were greater under sole cropping.

#### 4.4.12 Harvest index

Although the mean of harvest index was slightly higher under intercropping, the range was wider under sole cropping. The variance and coefficients of variation were higher under sole cropping at the phenotypic level, but at the genotypic level these parameters were similar under the two cropping systems.

### 4.5 Heritability and genetic advance

The results on heritability and genetic advance are presented in Table 20.

#### 4.5.1 Heritability

In sole crop, days to maturity had the highest heritability estimates (61.63%) followed by days to 50%

flowering (43.65%) and number of seeds/pod (33.08%).

In intercrop grain yield/plant had the highest heritability (62.12%) followed by days to 50% flowering (55.65%), total dry matter (51.00%), 100-seed weight (50.89%) and number of seeds/pod (50.50%).

The characters number of primary and secondary branches, number of pods/plant, plant spread and plant height had low heritability estimates under sole cropping while number of secondary branches, plant spread and pods/plant had low heritability estimates under intercropping.

#### 4.5.2 Genetic advance

In sole crop the highest genetic advance was found for grain yield/plant (18.23%) followed by number of secondary branches (14.84%) and harvest index (14.84%).

In intercrop the highest genetic advance was found for grain yield/plant (35.98%) followed by number of primary branches (27.95%), total dry matter (23.19%) and harvest index (19.86%). In general, in case of most of the characters studied more genetic advance was expected under intercropping than under sole cropping.

#### 4.6 Correlation studies

Results of correlation studies are presented in Table 21.

#### 4.6.1 Grain yield/plant with other characters

In sole crop, yield showed positive and significant correlations with number of secondary branches, number of seeds/pod and harvest index.

In intercrop yield had positive and significant correlations with number of primary branches, number of pods/plant, total dry matter and harvest index.

#### 4.6.2 Number of primary branches with other characters

In sole crop, secondary branches and total dry matter showed positive and significant correlations with primary branches. In intercrop, positive and highly significant correlation was noted between number of primary branches on one hand and number of secondary branches, number of pods/plant and grain yield/plant on the other.

#### 4.6.3 Number of secondary branches with other characters

In sole crop, total dry matter was positively and significantly correlated with secondary branches.

In intercrop, number of pods/plant had positive and significant correlation with secondary branches.

#### 4.6.4 Number of pods/plant with other characters

In sole crop, the correlation of number of pods/plant with the other characters was insignificant.

In intercrop association between number of pods/plant on one hand and total dry matter and grain yield/plant on the other hand was significantly positive while the association with 100-seed weight was significantly negative.

#### 4.6.5 Number of seeds/pod with remaining characters

Association of seeds/pod with yield/plant was positive and significant in sole crop while it was positive but nonsignificant in the intercrop. Correlation of seeds/pod with the other characters was nonsignificant.

#### 4.6.6 100-seed weight with remaining characters

Association of 100-seed weight with other characters in both the cropping systems was nonsignificant except with number of pods/plant in intercrop. The character 100-seed weight had negative but nonsignificant association with yield/plant and harvest index in both cropping systems.

#### 4.6.7 Total dry matter with remaining characters

In intercrop, total dry matter was positively associated with all the characters except harvest index. However, in intercrop only the correlation with pods/plant and grain yield/plant were significant. In sole crop, the association of total dry matter with number of primary and secondary branches was significantly positive.



The present investigation was undertaken with the object of studying performance of early generation selections of pigeonpea made under sole and intercropping systems. A total of 55 sole crop (SC) selections and 25 intercrop (IC) selections were evaluated alongwith 4 check varieties under the two cropping systems.

Phenotypic and genotypic variances and their coefficients of variation, heritability and genetic advance were studied under sole and intercropping systems. Correlation study was made to asses the association between two characters under the two cropping systems.

#### 5.1 Mean performance of SC and IC selections under the two cropping systems

Differences in the mean values for sole and intercropping systems were nonsignificant for almost all the characters studied except secondary branch number. Although the mean number of days required for 50% flowering and maturity were at par in the two cropping systems, the comparison of the selection with the standard check BDN 1 indicated that the flowering behaviour of the SC selections was different from that of the IC selections under sole cropping. The behaviour of SC and IC selections with regard to maturity did

not differ in the two cropping systems when compared with BDN 1.

In general, plant height increased in the intercropping. With regard to plant height, the SC selections had different behaviour in the two cropping systems while IC selections were at par with BDN 1 in the two cropping systems. In general plant spread was more under sole cropping. The SC and IC selections had more or less similar behaviour under the two cropping systems with respect to plant spread when compared to BDN 1.

Although the mean number of primary branches in the two cropping systems were more or less similar for the two types of selections, it was evident that when compared with BDN 1, more number of IC selections had relatively less primary branches than SC selections.

Under sole cropping the pigeonpea plant produced significantly more secondary branches than under intercropping. The behaviour of the SC and IC selections with regard to secondary branch number was differential in the two cropping systems when compared to BDN 1.

In general more number of pods were borne/plant under sole cropping than under intercropping. When compared with BDN 1, the SC and IC selections differed only under sole cropping

For number of seeds/pod the SC and IC selections differed under intercropping. More number of SC selections had

higher seed number/pod than IC selections. In general, 100-seed weight was higher under intercropping than under sole cropping. However, the behaviour of SC and IC selections was more or less similar in the two systems.

Grain yield/plant did not differ significantly in the two cropping systems, although sole crop yield was higher than intercrop yield. It was evident that some SC selections proved better than BDN 1 under sole cropping. IC selections were not superior to BDN 1 under sole cropping. However, under intercropping many IC and SC selections were poor yielder than BDN 1. BDN 1, thus, seems to have better competitive ability under intercropping and hence is suitable for this cropping system.

In general, more total dry matter was produced under sole cropping than under intercropping. When compared with the checks BDN 1, the SC selections produced relatively more dry matter than IC selection under both cropping systems. Harvest index did not differ significantly in the two cropping systems. However, more number SC selections had low harvest index than BDN 1 as compared to IC selections.

Thus, it can be concluded that the behaviour of SC and IC selections was significantly different for days to 50% flowering under sole cropping and for plant height, secondary branches and number of seeds/pod under both the

cropping systems. Selections made under both the cropping systems for grain yield and other traits on the basis of plant performance. For the selection to be effective, it is necessary to select and evaluate on unit plot basis rather than on individual plant basis.

## 5.2 Significance of interaction

According to Bartlett's test the homogeneity of experimental error and test of interaction was carried out for all the characters. From the test it was revealed that among the characters studied error variances were homogeneous for days to 50% flowering, days to maturity, plant height and plant spread. Pooled analysis for these four characters indicated significant differences between genotypes. However, cropping systems and genotypes x systems interactions were nonsignificant.

The characters which showed heterogeneity of error were analysed with the help of weighted analysis of variance and it was revealed that genotypes x systems interaction for the characters number of primary branches, number of pods/plant number of seeds/pod, grain yield/plants and harvest index were nonsignificant. Interaction for the characters secondary branches 100-seed weight and total dry matter were found to be significant. Nerkar (1980) and Tarhalkar and Rao (1980) observed appreciable genotype x cropping system interaction and also genetic component in the adaptation of pigeonpea to intercropping with sorghum.

### 5.3 Phenotypic and genotypic coefficients of variation

The amount of variation in quantitative characters is measured and expressed as variances. The phenotypic variance present in the character does not give a true account about variation which is fixable in succeeding generations, while genotypic variation is the amount of fixable index from one generation to another.

For most of the characters under phenotypic variances were greater under sole cropping than under intercropping. High phenotypic coefficient of variation was observed for character like days to maturity, plant height, plant g spread, number of pods per plant, 100-seed weight, grain yield/plant, total dry matter and harvest index under sole cropping than under intercropping. For rest of characters, phenotypic coefficient of variation was high under intercropping.

Ganguli and Shrivastava (1969) reported wide range of phenotypic variability for number of pods/plant, plant height and yield. Rathnaswamy et al. (1973) reported wide range of phenotypic variability for plant height, days to maturity, 100-seed weight and grain yield. Gupta et al. (1975) reported high variability for pods/plant, plant height, days to maturity and 100-seed weight.

The genotypic variances were greater under sole cropping than under intercropping for days to maturity, plant spread, 100-seed weight and total dry matter. For rest of the

characters it was greater under intercropping.

In general, the genotypic coefficients of variations were greater under intercropping. For plant height and harvest index the genotypic coefficients of variation were more or less similar in both cropping systems but more variation was present for the character number of primary branches and grain yield/plant.

Chandra et al. (1975) reported high genotypic coefficients of variation for yield/plant and number of primary branches. Malhotra and Sodhi (1977) reported high genotypic coefficients of variation for primary and secondary branches. Godawat (1980) reported high genotypic coefficients of variation for number of primary branches and grain yield/plant

#### 5.4 Heritability and genetic advance

Heritability in broad sense refers to the ratio of genotypic variation to the total observed variation. As heritability is the measurement of transmission of an attribute from one generation to the other, the estimates of heritability for different quantitative characters assume greater importance in selection programme. The characters having high heritability coupled with high genetic advance are of great importance than those having low heritability and low genetic advance.

Among the characters studied under sole cropping, days to maturity had the highest heritability and rest had moderate to low heritability. Under intercropping days to

flowering, number of seeds/pod, grain yield/plant, 100-seed weight and total dry matter had high heritability. Pandey (1972) reported the highest heritability for grain yield/plant. Similar results were obtained by Munoz and Abrams (1971) and Khan and Rachis (1972). Kumar and Haque (1973) reported the highest heritability for seeds/pod.

Under sole cropping, grain yield/plant, harvest index, number of secondary branches and pods/plant had the highest genetic advance whereas under intercropping number of primary branches and grain yield/plant had the highest genetic advance. Kumar and Haque (1973) reported the highest genetic advance for grain yield/plant. Gupta et al. (1975) reported the highest genetic advance for number of branches and pods/plant. Similar results were obtained by Malhotra and Sodhi (1977).

Among the characters studied, under intercropping, grain yield/plant had the high heritability coupled with high genetic advance indicating suitability of selection for further improvement. Under sole cropping days to maturity and under intercropping days to 50% flowering, number of seeds/pod and 100-seed weight had high heritability coupled with lower genetic advance. Hiramath and Talwar (1971) observed high heritability estimates coupled with low genetic advance for number of seeds/pod and 100-seed weight. Under sole cropping the characters plant height and number of primary branches had

low heritability coupled with lower genetic advance indicating that they are much influenced by nongenetic factors. Under sole cropping harvest index and under intercropping number of primary branches had moderate heritability coupled with high genetic advance.

Under sole cropping the characters number of secondary branches, number of pods/plant and grain yield/plant had low heritability coupled with high genetic advance. These characters can be improved by selection.

#### 5.5 Correlations

The correlation coefficient is used as a measure of the degree of association between two characters. Under intercropping grain yield was positively and significantly correlated with primary branches. Thoyat (1955), Beohar and Nigam (1972), Veeraswamy et al. (1973) and Godawat (1980) reported that grain yield was positively correlated with number of primary branches.

Under sole and intercropping grain yield was positively and significantly correlated with secondary branches and harvest index. Beohar and Nigam (1972), Rathnaswamy, et al. (1973), Sharma and Asawa (1977) reported that grain yield was positively correlated with secondary branches. Positive and significant correlation was noted between primary branches on one hand and on the other hand secondary branches and pods/plant under intercropping. Under sole cropping total dry matter

while under intercropping pods/plant had positive and significant correlation with secondary branches. Beohar and Nigam (1972) reported that pods/plant had positive correlation with number of secondary branches.

Association of seeds/pod with yield/plant was positive and significant under sole cropping whereas it was positive but nonsignificant under intercropping. The character 100-seed weight had negative but nonsignificant association with yield/plant and harvest index under both cropping systems.

Under intercropping, total dry matter was positively associated with all the characters except harvest index. However, only the correlations with pods/plant and grain yield were significant. Under sole cropping the association of total dry matter with number of primary and secondary branches was significantly positive.

The present studies have thus indicated that there was tremendous variability for yield and yield contributing characters in the sole and intercrop selections evaluated under the two cropping systems. The observations made on single plant basis revealed that for some characters genotype x cropping system interactions were significant. However, evaluation of performance on unit plot basis would throw more light on such interactions. Association of yield with other characters

differed in the two cropping systems, thus indicating the importance of selecting for different parameters while making pigeonpea selections for the two cropping systems. Comparison of performance of the SC selections with the best check variety, i.e., BDN 1 revealed that there are some selections which are superior to the check and hence, need further testing.



A total of 55 sole crop selections and 25 intercrop selections were tested alongwith standard check varieties under sole and intercropping systems with the object of determining whether selections made under two cropping systems behave differentially.

Study was made under following headings viz, mean performance, test of interaction, phenotypic, genotypic variances and their coefficients of variation, heritability, genetic advance and correlations.

6.1 Performance of SC selections and IC selections was compared with BDN 1 check under sole and intercropping systems, overall mean of two cropping systems was compared.

Differences in the mean values for sole and intercropping systems were nonsignificant for almost all the characters studied except secondary branches.

In general more number of pods were borne/plant under sole cropping than under intercropping. When compared with BDN 1, the SC and IC selections differed only under sole cropping.

Grain yield/plant did not differ significantly in the two cropping systems, although sole crop yield was higher than intercrop yield. It was evident that some SC

selections proved better than BDN 1 a under sole cropping. IC selections were not superior to BDN 1 under sole cropping. However, under intercropping many IC and SC selections were poor yielded than BDN 1. BDN 1 thus seems to have better competitive ability under intercropping and hence is suitable for this cropping systems. More number of SC selections had low harvest index than BDN 1 as compare to IC selections.

6.2 According to Bartlett's test the homogeneity of experimental error and test of interaction was carried out for all the characters. It was revealed that among the characters studied error variances, were homogenous for days to 50% flowering, days to maturity, plant height and plant spread. Cropping systems and genotypes x system interactions were nonsignificant.

The characters which showed heterogeneity of error were analysed with the help of weighted analysis of variance and it was revealed that genotypes x systems interaction for the characters number of primary branches, number of pods/plant, number of seeds/pod, grain yield/plant and harvest index were nonsignificant. Interaction for the characters number of secondary branches, 100-seed weight and total dry matter were found to be significant.

6.3 Analysis of variance had shown significant differences among all the characters studied under sole and intercropping systems.

6.4 High phenotypic coefficient of variation was observed for characters, days to maturity, plant height, plant spread, number of pods/plant, 100-seed weight, grain yield/plant and harvest index under sole cropping than under intercropping. For rest of the characters it was greater under intercropping.

In general, the genotypic coefficients were greater under intercropping than under sole cropping. For plant height and harvest index the genotypic coefficient of variation was more or less similar under both cropping systems. More variation was present for the characters number of primary branches and grain yield/plant.

6.5 Under sole cropping days to maturity had the highest heritability and under intercropping 50% flowering, number of seeds/pod, grain yield/plant, 100-seed weight and total dry matter had the highest heritability.

6.6 Under sole cropping grain yield/plant, harvest index, number of secondary branches, number of pods/plant had the highest genetic advance.

Under intercropping number of primary branches and grain yield/plant had the highest genetic advance.

6.7 Under sole and intercropping systems yield had positive and significant correlation with branches and harvest index. Under sole crop total dry matter, while under intercrop

Pods/plant had positive and significant correlation with secondary branches.

Association of seeds/pod with grain yield/plant was positive and significant under sole crop while it was positive and nonsignificant under intercrop.

The characters 100-seed weight had negative association with yield/plant and harvest index under both cropping systems. Under intercrop total dry matter was positively associated with all the characters except harvest index. However, only the correlations with pods/plant and grain yield/plant were significant. Under sole crop also similar trend was observed.

Under sole crop, the association of total dry matter with number of primary and secondary branches was significantly positive.

The SG and IC selections need further testing on unit plot basis arrive at a conclusion about the validity of selections made under the two cropping systems.



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\* Original not seen

APPENDIX I

**Table 2 : Days required for 50% flowering under sole and intercropping systems**

Sr. No.	Entry No.	Sole crop	Inter crop	Sr. No.	Entry No.	Sole crop	Inter crop
1	2	3	4	1	2	3	4
<u>SC selections</u>							
				23	20	133	124
1.	80	135	135	24	12	128	124
2.	3	121	127	25	1	126	124
3.	15	130	119	26	69	131	119
4.	37	122	130	27	39	130	126
5.	32	133	127	28	29	122	122
6.	27	121	127	29	74	127	132
7.	2	122	128	30	26	129	120
8.	71	134	122	31	78	129	118
9.	45	128	129	32	30	134	127
10.	68	125	120	33	19	133	115
11.	42	125	133	34	72	122	127
12.	24	120	131	35	76	122	125
13.	38	128	124	36	16	135	135
14	18	123	118	37	5	136	127
15.	70	126	126	38	22	128	132
16.	35	128	126	39	73	130	122
17	44	128	124	40	34	133	133
18	33	128	122	41	25	129	132
19	7	124	124	42	14	130	130
20	13	133	122	43	8	132	125
21	31	127	124	44	40	127	132
22	6	128	114				

Table 2 contd..

1	2	3	4	1	2	3	4
45	75	133	136	67	54	133	117
46	43	122	131	68	47	121	123
47	23	125	125	69	57	127	126
48	21	132	135	70	59	124	127
49	36	120	125	71	62	130	124
50	28	130	135	72	67	127	129
51	17	127	132	73	63	126	120
52	41	123	131	74	66	129	127
53	4	134	132	75	65	125	135
54	77	124	118	76	9	128	124
55	79	122	135	77	10	122	120
	<u>IC Selections</u>			78	11	133	128
56	52	116	132	79	61	122	127
57	64	127	133	80	46	120	122
58	55	126	130		<u>Checks</u>		
59	60	124	122	81	81	127	131
60	58	125	119	82	82	118	122
61	51	123	123	83	83	124	135
62	53	127	128	84	84	133	119
63	49	127	124		Mean for SC	128	126
64	56	125	115		selections		
65	48	129	124		Mean for IC	121	125
66	50	121	128		selections		
					Overall Mean	126	126
					SE ±	2.86	2.89
					CD at 5%	7.93	8.03
					System CD	10.00	

APPENDIX II

**Table 3 : Days required for maturity under sole and intercropping systems**

Sr. No.	Entry No.	Sole crop	Inter crop	Sr. No.	Entry No.	Sole crop	Inter crop
1	2	3	4	1	2	3	4
<u>SC selections</u>							
1	80	190	197	22	6	197	189
2	3	178	187	23	20	185	172
3	15	196	185	24	12	193	182
4	37	181	187	25	1	185	179
5	32	175	188	26	69	194	185
6	27	177	187	27	39	187	172
7	2	196	179	28	29	192	185
8	71	184	176	29	74	199	194
9	45	185	179	30	26	200	189
10	68	180	185	31	78	198	189
11	42	185	186	32	30	197	187
12	24	189	191	33	19	189	177
13	38	203	190	34	72	189	197
14	18	205	189	35	76	167	176
15	70	185	187	36	16	192	187
16	35	191	187	37	5	194	185
17	44	187	173	38	22	188	187
18	33	178	172	39	73	198	187
19	7	197	190	40	34	195	189
20	13	199	189	41	25	187	197
21	31	173	189	42	14	205	198

Table 3: Contd. .

1	2	3	4	1	2	3	4
43	8	195	189	65	48	200	189
44	40	203	195	66	50	191	181
45	75	201	197	67	54	194	181
46	43	180	188	68	47	188	179
47	23	189	191	69	57	194	187
48	21	196	200	70	59	169	189
49	36	175	182	71	62	181	189
50	28	184	192	72	67	189	198
51	17	190	195	73	63	189	194
52	41	187	192	74	66	184	187
53	4	184	193	75	65	185	196
54	77	181	181	76	9	187	179
55	79	187	192	77	10	187	175
	<u>IC selections</u>			78	11	197	182
56	52	179	189	79	61	183	188
57	64	198	200	80	46	187	182
58	55	169	189		<u>Checks</u>		
59	60	191	187	81	81	174	187
60	58	180	187	82	82	182	184
61	51	176	187	83	83	197	195
62	53	176	175	84	84	182	173
63	49	189	179				
64	56	182	190				
				Mean for SC selections		193	187
				Mean for IC selections		186	179
				Overall Mean		189	184
				SE ±		5.46	4.76
				CD at 5%		15.15	13.21
				System CD		13.25	

APPENDIX III

Table 4 : Plant height (cm)

Sr. No.	Entry No.	Sole crop	Inter crop	Sr. No.	Entry No.	Sole crop	Inter crop
1	2	3	4	1	2	3	4
<u>SC selections</u>							
1	80	122.10	150.10	23	20	126.00	151.40
2	3	130.40	146.40	24	12	124.16	177.00
3	15	138.10	160.50	25	1	129.80	201.00
4	37	156.30	159.70	26	69	129.30	146.00
5	32	155.30	171.30	27	39	140.10	138.35
6	27	133.00	170.60	28	29	124.70	171.00
7	2	117.63	142.53	29	74	138.90	164.00
8	71	126.60	156.60	30	26	121.75	139.50
9	45	119.50	162.00	31	78	124.10	134.50
10	68	129.00	140.40	32	30	132.26	171.00
11	42	119.80	159.60	33	19	112.60	132.00
12	24	127.60	162.30	34	72	118.80	148.00
13	38	117.10	151.50	35	76	142.60	153.20
14	18	105.16	162.40	36	16	121.40	178.30
15	70	121.30	165.10	37	5	119.80	157.40
16	35	111.60	159.60	38	22	111.85	157.00
17	44	116.75	156.30	39	73	100.80	134.00
18	33	113.50	163.80	40	34	117.75	130.00
19	7	130.40	173.30	41	25	122.33	150.00
20	13	105.30	189.90	42	14	131.40	163.00
21	31	112.50	185.32	43	8	120.60	157.00
22	6	153.80	148.00	44	40	136.30	150.00

Table 4 Contd.,

1	2	3	4	1	2	3	4
45	75	144.80	151.40	68	47	119.37	142.00
46	43	122.75	144.00	69	57	151.00	149.40
47	23	141.90	164.00	70	59	130.10	169.50
48	21	147.90	168.00	71	62	133.40	162.00
49	36	151.20	182.00	72	67	133.30	175.00
50	28	137.00	181.00	73	63	138.00	179.40
51	17	153.20	156.00	74	66	126.80	148.20
52	41	139.30	155.00	75	65	136.90	139.00
53	4	135.10	147.20	76	9	131.70	153.00
54	77	129.20	171.00	77	10	126.90	165.50
55	79	159.20	155.00	78	11	117.70	138.50
	<u>IC selections</u>			79	61	151.40	163.00
56	52	122.20	159.00	80	46	114.30	155.40
57	64	134.40	166.00		<u>Checks</u>		
58	55	127.00	170.00	81	81	120.80	163.00
59	60	121.40	135.00	82	82	122.00	152.00
60	58	137.90	155.20	83	83	133.10	160.00
61	51	122.30	143.00	84	84	117.20	144.00
62	53	150.90	174.00				
63	49	129.40	161.00	Mean for SC		128.57	158.30
64	56	115.40	148.00	selections			
65	48	129.30	151.00	Mean for IC		149.41	156.75
66	50	122.00	166.00	selections			
67	54	119.25	156.00	Overall mean		134.52	157.67
				SE ±		10.44	9.64
				CD at 5%		28.96	26.73
				System CD		23.89	

APPENDIX IV

Table 5 : Plant spread (cm<sup>2</sup>)

Sr. No.	Entry No.	Sole crop	Inter crop	Sr. No.	Entry No.	Sole crop	Inter crop
1	2	3	4	1	2	3	4
<u>SC selections</u>							
1	80	2151.1	2325.0	23	20	3144.0	5223.0
2	3	3415.0	1910.0	24	12	5076.5	4325.0
3	15	3042.7	2866.5	25	1	2549.3	2137.0
4	37	4456.1	3378.6	26	69	2870.5	4074.5
5	32	3560.0	2693.7	27	39	3784.3	1917.4
6	27	5084.2	3005.0	28	29	2908.8	3414.0
7	2	4026.0	2750.0	29	74	3425.7	2679.5
8	71	1704.3	2537.0	30	26	2501.6	2498.0
9	45	2780.4	2577.4	31	78	5830.0	2372.0
10	68	3708.5	3032.0	32	30	2321.6	2823.7
11	42	4820.0	3206.0	33	19	2524.5	2473.0
12	24	3604.2	3701.0	34	72	5132.5	2283.5
13	38	4143.5	2505.0	35	76	4464.3	3071.0
14	18	2860.8	3248.0	36	16	3541.5	3181.6
15	70	4351.5	3389.0	37	5	4764.5	2440.4
16	35	2754.8	2552.5	38	22	2606.0	2903.0
17	44	4502.5	2995.0	39	73	2394.0	2225.0
18	33	2697.0	3604.0	40	34	3350.7	2558.0
19	7	2656.5	2425.0	41	25	4700.0	2766.0
20	13	2526.4	3483.0	42	14	5570.0	4613.0
21	31	3856.3	4744.3	43	8	2280.5	2152.5
22	6	2375.8	3458.0	44	40	4024.5	2720.0

Table 5 Contd. ..

1	2	3	4	1	2	3	4
45	75	3017.8	2870.5	68	47	3852.0	3326.0
46	43	2447.0	2042.5	69	57	4462.0	2756.0
47	23	2696.8	2182.5	70	59	2305.0	2062.5
48	21	2801.0	2440.0	71	62	4856.0	2063.0
49	36	2677.0	2300.0	72	67	2590.0	3014.0
50	28	3900.0	2422.5	73	63	2434.0	3175.0
51	7	2510.0	1732.5	74	66	2513.0	3039.0
52	41	2714.0	3060.0	75	65	2338.0	2930.0
53	4	3708.5	2515.5	76	9	2455.0	2002.5
54	77	3278.5	4002.5	77	10	2511.5	2401.0
55	79	1414.0	3184.0	78	11	4026.0	2750.0
	<u>IC selections</u>			79	61	2038.6	3326.0
56	52	3201.0	2645.0	80	46	2902.1	3624.5
57	64	4174.3	3703.0		<u>Checks</u>		
58	55	2562.0	3288.0	81	81	3033.3	3764.5
59	60	2046.4	1457.0	82	82	1764.6	2395.0
60	58	3888.3	3655.0	83	83	3082.0	3165.0
61	51	4796.4	2912.5	84	84	3853.0	3118.0
62	53	3315.0	4687.0				
63	49	3018.0	3115.0	Mean for SC Selections		3387.0	2974.0
64	56	3483.0	3605.0	Mean for IC selections		3385.5	2981.5
65	48	2373.0	3100.00	Overall mean		3364.8	2982.7
66	50	2769.5	4150.0	SE ±		873.4	597.6
67	54	2178.5	2752.5	CDat 5%		2321.1	1656.3
				System CD		1542.96	

APPENDIX V

**Table 6 : Number of primary branches**

Sr. No.	Entry No.	Sole crop	Inter crop	Sr. No.	Entry No.	Sole crop	Inter crop
1	2	3	4	1	2	3	4
<u>SC Selections</u>							
1	80	11.00	15.50	23	20	13.00	18.50
2	3	16.30	12.00	24	12	12.45	18.60
3	15	12.00	10.50	25	1	9.45	11.25
4	37	21.30	9.60	26	69	13.40	21.40
5	32	10.50	9.45	27	39	13.60	5.30
6	27	15.00	17.00	28	29	13.70	10.60
7	2	16.50	12.00	29	74	15.60	13.30
8	71	11.40	11.00	30	26	17.00	11.30
9	45	12.50	14.00	31	78	12.00	16.00
10	68	16.00	15.40	32	30	11.53	9.40
11	42	15.00	12.60	33	19	13.16	11.40
12	24	9.00	18.40	34	72	15.45	12.50
13	38	16.00	15.40	35	76	11.00	15.50
14	18	20.00	10.00	36	16	18.00	13.30
15	70	14.00	12.60	37	5	13.15	13.00
16	35	11.00	9.00	38	22	11.00	13.00
17	44	18.00	12.00	39	73	14.00	13.30
18	33	12.35	12.00	40	34	9.75	14.00
19	7	13.42	9.50	41	25	13.00	21.00
20	13	12.15	10.50	42	14	19.50	18.00
21	31	13.00	12.00	43	8	11.50	13.60
22	6	13.00	11.40	44	40	13.00	18.00

Table 6. Contd. ..

1	2	3	4	1	2	3	4
45	75	13.60	18.00	68	47	15.00	19.00
46	43	13.30	17.70	69	57	9.50	12.60
47	23	12.50	9.75	70	59	11.00	11.00
48	21	13.60	15.00	71	62	9.00	11.00
49	36	13.00	10.00	72	67	10.00	11.30
50	28	8.40	19.00	73	63	12.50	11.00
51	17	15.30	10.30	74	66	20.40	16.60
52	41	12.00	14.00	75	65	12.00	13.00
53	4	12.00	17.50	76	9	13.00	14.20
54	77	15.00	10.00	77	10	10.50	9.50
55	79	12.00	13.70	78	11	16.58	12.00
	<u>IC Selections</u>			79	61	15.00	13.00
56	52	12.00	12.00	80	46	16.00	13.30
57	64	13.40	15.25		<u>Checks</u>		
58	55	10.40	10.00	81	81	14.00	17.00
59	60	8.00	10.50	82	82	10.80	8.45
60	58	10.00	14.60	83	83	16.30	18.40
61	51	12.70	12.30	84	84	14.70	11.50
62	53	12.30	13.00				
63	49	15.30	11.00	Mean for		13.53	13.43
64	56	10.00	10.00	SC Selections			
65	48	17.00	13.30	Mean for		14.00	14.51
66	50	14.00	9.40	IC Selections			
67	54	13.00	8.60	Overall Mean		13.68	13.77
				SE ±		2.15	2.51
				CD at 5%		5.97	6.95
				System CD		5.33	

APPENDIX VI

Table 7 : Number of secondary branches

Sr. No.	Entry No.	Sole crop	Inter crop	Sr. No.	Entry No.	Sole crop	Inter crop
1	2	3	4	1	2	3	4
<u>SE Selections</u>							
1	80	26.00	10.00	23	20	34.30	22.00
2	3	26.00	8.70	24	12	40.50	22.00
3	15	26.00	10.00	25	1	15.00	11.00
4	37	34.40	14.30	26	69	24.40	22.40
5	32	21.50	8.45	27	39	24.60	17.00
6	27	40.00	16.60	28	29	32.40	13.70
7	2	37.50	6.20	29	74	33.00	14.00
8	71	29.00	8.00	30	26	18.75	14.60
9	45	28.00	16.00	31	78	26.00	8.80
10	68	17.00	14.00	32	30	24.00	14.30
11	42	38.00	14.40	33	19	20.50	13.00
12	24	27.50	16.00	34	72	30.00	14.00
13	38	23.00	7.00	35	76	16.00	10.50
14	18	33.00	7.50	36	16	32.40	13.00
15	70	35.00	8.50	37	6	23.00	11.00
16	35	33.00	4.40	38	22	27.55	10.00
17	44	27.75	10.00	39	73	25.00	13.00
18	33	19.00	11.00	40	34	21.60	17.20
19	7	27.40	8.30	41	25	35.30	22.00
20	13	33.00	9.00	42	14	58.50	18.00
21	31	23.00	11.00	43	8	31.60	17.60
22	6	25.00	12.00	44	40	39.45	11.30

Table 7 Contd. ..

1	2	3	4	1	2	3	4
45	75	35.60	13.30	68	47	34.60	7.00
46	42	23.00	16.40	69	57	27.50	14.40
47	23	14.20	15.00	70	59	33.60	12.40
48	21	23.40	12.30	71	62	23.00	16.30
49	36	28.00	6.80	72	67	14.30	9.00
50	28	33.35	14.00	73	63	23.60	11.00
51	17	36.00	10.80	74	66	28.40	15.00
52	41	33.00	11.50	75	65	24.00	18.50
53	4	28.00	10.00	76	9	32.00	12.00
54	77	20.00	6.80	77	10	18.60	9.50
55	79	25.40	10.40	78	11	37.50	6.00
	<u>IC Selections</u>			79	61	19.50	7.60
56	52	25.50	13.00	80	46	27.00	14.60
57	64	29.70	18.00		<u>Checks</u>		
58	55	13.00	12.00	81	81	25.00	17.40
59	60	18.00	11.25	82	82	21.50	11.45
60	58	19.30	16.40	83	83	37.00	11.50
61	51	29.70	15.00	84	84	38.70	10.80
62	53	40.00	15.50		Mean for SC	28.40	12.50
63	49	33.40	12.40		Selections		
64	56	27.60	9.50		Mean for IC	26.67	12.25
65	48	33.00	14.75		Selections		
66	50	31.00	11.70		Overall Mean	28.00	12.43
67	54	23.00	13.00		SE $\pm$	5.98	3.03
					CD at 5%	16.59	8.41
					System CD	10.84	

APPENDIX VII

Table 8 : Number of pods/plant

Sr. No.	Entry No.	Sole crop	Inter crop	Sr. No.	Entry No.	Sole crop	Inter crop
1	2	3	4	1	2	3	4
<u>SC Selections</u>							
1	80	215	157	23	20	217	158
2	3	178	98	24	12	149	136
3	15	224	147	25	1	165	189
4	37	239	148	26	69	149	185
5	32	289	130	27	39	190	120
6	27	320	186	28	29	231	166
7	2	350	83	29	74	154	130
8	71	168	120	30	26	137	131
9	45	172	194	31	78	140	105
10	68	161	161	32	30	208	123
11	42	230	150	33	19	135	142
12	24	336	181	34	72	216	127
13	38	134	133	35	76	199	138
14	18	118	80	36	16	173	149
15	70	340	122	37	5	274	102
16	35	289	140	38	22	86	110
17	44	189	161	39	73	176	174
18	33	220	137	40	34	211	130
19	7	207	151	41	25	389	178
20	13	145	127	42	14	391	143
21	31	214	178	43	8	126	135
22	6	233	155	44	40	257	168



APPENDIX VIII

Table 9 : Number of seeds/pod

Sr. No.	Entry No.	Sole crop	Inter crop	Sr. No.	Entry No.	Sole crop	Inter crop
1	2	3	4	1	2	3	4
<u>SC Selections</u>							
1	80	4.14	4.74	23	20	3.86	4.42
2	3	3.94	3.92	24	12	4.15	4.34
3	15	4.18	4.34	25	1	4.06	4.52
4	37	4.29	4.22	26	69	4.45	4.34
5	32	4.34	3.95	27	39	3.96	3.63
6	27	4.03	3.80	28	29	4.20	4.09
7	2	4.36	4.05	29	74	4.45	4.32
8	71	4.15	3.82	30	26	3.88	3.94
9	45	4.15	4.04	31	78	4.10	4.26
90	68	4.14	3.90	32	30	4.10	3.76
10	42	3.71	3.96	33	19	4.11	4.06
12	24	4.06	3.98	34	72	3.80	3.86
13	38	4.35	4.24	35	76	4.75	4.46
14	18	4.20	4.10	36	16	4.14	3.60
15	70	3.64	3.72	37	5	4.50	4.17
16	35	3.75	3.98	38	22	3.80	4.06
18	44	3.85	4.12	39	73	4.04	3.76
18	33	3.92	3.70	40	34	3.82	3.64
19	7	4.00	3.86	41	25	3.82	3.68
20	13	3.75	4.14	42	14	4.00	3.82
21	31	3.90	4.02	43	8	4.42	4.00
22	6	4.23	3.92	44	40	3.75	4.34

Table 9 Contd. ..

1	2	3	4	1	2	3	4
45	75	4.28	4.44	68	47	4.25	4.17
46	43	3.69	3.88	69	57	3.80	3.82
47	23	4.46	4.18	70	59	4.20	3.82
48	21	4.50	4.28	71	62	4.32	4.32
49	36	4.18	4.18	72	67	4.48	4.46
50	28	4.12	3.64	73	63	4.19	4.04
51	17	4.64	4.56	74	66	4.38	3.96
52	41	3.86	3.76	75	65	3.96	3.66
53	4	4.02	4.04	76	9	4.73	4.14
54	77	4.10	4.22	77	10	4.11	3.86
55	79	4.20	3.80	78	11	4.36	4.05
	<u>IC Selections</u>			79	61	4.34	3.90
56	52	4.10	4.34	80	46	4.16	4.08
57	64	4.30	4.02		<u>Checks</u>		
58	55	4.30	3.99	81	81	3.90	3.68
59	60	4.04	3.54	82	82	3.90	3.76
60	58	4.08	4.04	83	83	4.08	3.82
61	51	4.15	3.78	84	84	3.94	3.94
62	53	3.86	3.60				
63	49	4.14	4.06		Mean for SC	4.09	4.04
64	56	3.92	3.59		Selections		
65	48	3.88	3.82		Mean for IC	4.18	3.96
66	50	4.14	3.78		Selections		
67	54	4.12	4.40		Overall Mean	4.11	4.01
					SE ±	0.1641	0.1831
					CD at 5%	0.4550	0.5076
					System CD	0.4209	

APPENDIX IX

Table 10 : 100-seed weight

Sr. No.	Entry No.	Sole crop	Inter crop	Sr. No.	Entry No.	Sole crop	Inter crop
1	2	3	4	1	2	3	4
<u>SC Selections</u>							
1	80	10.64	10.64	23	20	9.62	10.54
2	3	10.12	11.95	24	12	10.33	12.07
3	15	11.50	12.08	25	1	11.09	10.96
4	37	8.94	10.26	26	69	11.00	11.47
5	31	10.43	12.59	27	39	11.62	11.45
6	27	9.74	11.34	28	29	10.13	11.31
7	2	13.79	12.20	29	74	11.52	13.02
8	71	12.08	11.73	30	26	11.35	12.35
9	45	10.04	10.99	31	78	10.70	11.06
10	68	10.97	11.39	32	30	10.90	11.65
11	42	9.58	11.18	33	19	9.67	11.19
12	24	8.90	9.97	34	72	11.73	11.15
13	38	9.86	9.65	35	76	9.88	11.49
14	18	11.49	13.25	36	16	10.58	13.19
15	70	11.42	11.03	37	5	11.15	11.29
16	35	10.20	10.67	38	22	12.84	12.56
17	44	8.21	9.98	39	73	10.60	9.69
18	33	10.53	10.55	40	34	11.02	12.15
19	7	10.45	11.53	41	25	9.21	9.89
20	13	11.55	11.56	42	14	11.35	10.89
21	31	10.81	9.53	43	8	11.15	12.72
22	6	10.65	9.95	44	40	11.01	12.31

Table 10 Contd. ..

1	2	3	4	1	2	3	4
45	75	8.08	10.56	68	47	10.60	10.81
46	43	10.22	11.08	69	57	9.75	11.26
47	23	10.23	11.03	70	59	9.03	12.36
48	21	10.17	13.35	71	62	10.84	11.55
49	36	10.00	12.72	72	67	10.46	11.29
50	28	10.66	12.54	73	63	10.51	13.91
51	17	11.99	12.61	74	66	9.84	10.57
52	41	9.89	11.41	75	65	11.78	11.87
53	4	10.49	10.71	76	9	12.27	12.61
54	77	11.16	13.00	77	10	9.93	10.87
55	79	10.04	11.62	78	11	13.79	12.20
	<u>IC Selections</u>			79	61	10.17	12.24
56	52	9.45	11.45	80	46	10.25	12.67
57	64	10.96	10.38		<u>Checks</u>		
58	55	10.95	11.71	81	81	10.52	11.39
59	60	9.01	11.01	82	82	9.75	11.91
60	58	8.92	9.61	83	83	9.63	10.91
61	51	10.45	10.78	84	84	9.16	9.68
62	53	9.96	11.05		<u>Mean ...</u>		
63	49	11.62	11.41		for SC	10.60	11.43
64	56	10.72	10.75		Selections		
65	48	10.45	10.89		Mean for	10.57	11.50
66	50	10.50	11.66		IC		
67	54	12.25	12.15		Selections		
					Overall Mean	10.55	11.42
					SE $\pm$	1.37	0.54
					CD at 5%	3.81	1.51
					System CD	1.42	

APPENDIX X

Table 11 : Grain yield/plant

Sr. No.	Entry No.	Sole crop	Inter crop.	Sr. No.	Entry No.	Sole crop	Inter crop
1	2	3	4	1	2	3	4
<u>SC Selections</u>							
1	80	30.90	34.42	23	20	32.63	37.18
2	3	36.16	28.61	24	12	29.09	33.41
3	15	34.50	24.66	25	1	26.45	36.15
4	37	48.70	28.39	26	69	32.21	41.08
5	32	34.03	23.24	27	39	41.81	30.61
6	27	68.67	41.65	28	29	38.91	33.17
7	2	31.83	26.61	29	74	35.25	30.97
8	71	32.05	41.22	30	26	31.29	31.24
9	45	28.81	38.07	31	78	36.58	24.15
10	68	33.57	30.12	32	30	30.60	39.01
11	42	41.12	32.26	33	19	33.23	26.64
12	24	38.49	34.54	34	72	33.70	33.89
13	38	25.00	25.22	35	76	62.77	33.42
14	18	29.74	25.26	36	16	37.97	39.08
15	70	48.50	24.40	37	5	35.30	21.68
16	35	51.54	21.05	38	22	24.39	35.48
17	43	27.78	31.38	39	73	43.87	32.39
18	33	44.26	32.46	40	34	41.40	32.05
19	7	42.88	32.64	41	25	47.65	34.79
20	13	35.90	35.17	42	14	43.08	40.23
21	31	46.01	38.14	43	8	57.00	26.00
22	6	31.23	36.31	44	40	42.57	41.22

Table 11 Contd. ..

1	2	3	4	1	2	3	4
45	75	43.18	39.26	68	47	36.61	40.83
46	43	38.30	23.93	69	57	25.26	24.06
47	23	36.61	26.60	70	59	39.54	24.18
48	21	33.11	32.78	71	62	35.44	22.68
49	36	48.43	25.88	72	67	28.00	25.47
50	28	44.87	30.40	73	63	33.56	31.76
51	17	33.28	30.96	74	66	42.28	37.58
52	41	31.79	27.41	75	65	35.89	35.65
53	4	36.89	49.03	76	9	38.93	32.93
54	77	45.74	32.03	77	10	28.13	27.19
55	79	29.75	40.79	78	11	31.83	26.61
	<u>IC Selections</u>			79	61	45.65	39.29
56	52	40.65	29.69	80	46	28.05	32.44
57	64	36.56	27.75		<u>Checks</u>		
58	55	41.53	27.32	81	81	48.61	29.63
59	60	30.51	25.82	82	82	34.27	21.74
60	58	39.42	23.30	83	83	29.17	37.09
61	51	41.89	29.75	84	84	43.56	27.76
62	53	49.37	25.72		<hr/>		
63	49	50.82	40.76		Mean for SC	38.06	32.33
64	56	39.61	20.43		Selections		
65	48	45.45	30.24		Mean for IC	37.91	30.13
66	50	48.08	46.86		Selections		
67	54	24.71	25.03		Overall Mean	38.40	31.51
					SE ±	8.52	3.85
					CD at 5%	23.61	10.68
					System CD	14.16	

APPENDIX XI

Table 12 : Total dry matter

Sr. No.	Entry No.	Sole crop	Inter crop	Sr. No.	Entry No.	Sole crop	Inter crop
1	2	3	4	1	2	3	4
<u>SC Selections</u>							
1	80	165.6	137.1	23	20	221.0	201.8
2	3	100.5	138.0	24	12	185.1	190.5
3	15	215.0	135.4	25	1	200.0	151.3
4	37	266.0	151.5	26	69	180.0	205.8
5	32	217.0	133.0	27	39	192.3	171.8
6	27	182.0	125.5	28	29	213.6	173.6
7	2	318.0	129.4	29	74	298.5	164.0
8	77	212.0	171.5	30	26	170.2	146.0
9	45	178.0	144.3	31	78	161.0	106.8
10	68	184.0	156.4	32	30	194.0	211.3
11	42	177.0	145.1	33	19	142.2	165.1
12	24	233.0	156.0	34	72	269.6	175.6
13	38	279.3	161.4	35	76	175.7	158.4
14	18	221.0	159.4	36	16	289.0	206.8
15	70	297.0	132.6	37	5	325.5	132.0
16	35	159.3	130.3	38	22	233.4	163.4
17	44	212.2	159.2	39	73	180.5	150.0
18	33	210.5	139.3	40	34	286.8	178.4
19	7	210.7	212.9	41	25	279.4	182.4
20	13	196.0	161.5	42	14	405.3	165.6
21	31	186.0	326.5	43	8	222.5	174.0
22	6	188.6	165.3	44	40	239.3	164.8

Table 12 Contd. ..

1	2	3	4	1	2	3	4
45	75	229.3	178.3	68	47	221.8	206.3
46	43	143.5	152.4	69	57	176.4	152.0
47	23	180.4	144.2	70	59	172.4	151.0
48	21	217.6	205.1	71	62	196.5	129.0
49	36	179.4	136.2	72	67	157.3	165.2
50	28	206.2	216.4	73	63	198.4	179.0
51	7	223.2	184.3	74	66	199.6	196.5
52	41	178.7	170.6	75	65	171.5	128.1
53	4	176.6	194.0	76	9	151.7	196.7
54	77	144.3	169.8	77	10	159.4	150.7
55	79	208.7	187.4	78	11	318.0	129.4
	<u>IC Selections</u>			79	61	220.8	163.6
56	52	215.1	176.0	80	46	170.1	169.6
57	64	231.4	144.3		<u>Checks</u>		
58	55	194.0	150.2	81	81	112.7	153.0
59	60	170.7	96.2	82	82	157.5	124.7
60	58	186.0	125.3	83	83	215.0	145.5
61	51	227.7	142.0	84	84	196.5	145.2
62	53	192.0	147.4				
63	49	269.0	170.0	Mean for SC	214.00	166.00	
64	56	176.0	134.3	Selections			
65	48	207.3	146.0	Mean for IC	200.00	154.40	
66	50	147.8	157.0	Selections			
67	54	169.2	154.0	Overall Mean	207.75	161.40	
				SE ±	37.98	17.50	
				CD at 5%	105.28	48.53	
				System CD	73.68		

APPENDIX XII

Table 13 : Harvest Index

Sr. No.	Entry No.	Sole crop	Inter crop	Sr. No.	Entry No.	Sole crop	Inter crop
1	2	3	4	1	2	3	4
<u>SC Selections</u>							
1	80	0.2022	0.2019	23	20	0.1676	0.2133
2	3	0.2204	0.2154	24	12	0.1191	0.1916
3	15	0.1670	0.1970	25	1	0.1363	0.2370
4	37	0.1835	0.1923	26	69	0.1889	0.1860
5	32	0.1460	0.1714	27	39	0.1926	0.1976
6	27	0.2491	0.2500	28	29	0.1850	0.1872
7	2	0.1799	0.2152	29	74	0.1275	0.1758
8	71	0.1299	0.2498	30	26	0.1745	0.2555
9	45	0.1503	0.2709	31	78	0.1844	0.2271
10	68	0.1857	0.1510	32	30	0.1640	0.1303
11	42	0.2746	0.2408	33	19	0.1815	0.1627
12	24	0.1342	0.1954	34	72	0.1744	0.2227
13	38	0.0851	0.2163	35	76	0.2157	0.2304
14	18	0.1380	0.1605	36	16	0.1298	0.1621
15	70	0.1920	0.2337	37	5	0.3434	0.2222
16	35	0.2903	0.1718	38	22	0.1826	0.2143
17	44	0.1403	0.1962	39	73	0.2737	0.2097
18	33	0.2138	0.2463	40	34	0.1602	0.1368
19	7	0.2293	0.1975	41	25	0.1905	0.1893
20	13	0.1821	0.1791	42	14	0.1500	0.2517
21	31	0.2315	0.1730	43	8	0.2028	0.1596
22	6	0.2395	0.1811	44	40	0.1899	0.2628

Table 13 Contd. ..

1	2	3	4	1	2	3	4
45	75	0.2024	0.2023	68	47	0.1647	0.1597
46	43	0.1932	0.1614	69	57	0.1422	0.1596
47	23	0.2104	0.1773	70	59	0.2465	0.2143
48	21	0.1349	0.1588	71	62	0.1871	0.1719
49	36	0.2606	0.1542	72	67	0.2184	0.1625
50	28	0.1699	0.1466	73	63	0.2133	0.1792
51	7	0.1550	0.1675	74	66	0.1593	0.1811
52	41	0.2082	0.1607	75	65	0.2206	0.2468
53	4	0.2086	0.2409	76	9	0.1723	0.1575
54	77	0.2375	0.2145	77	10	0.2028	0.1824
55	79	0.1625	0.1293	78	11	0.1739	0.2152
	<u>IC Selections</u>			79	61	0.2316	0.2503
56	52	0.1870	0.1644	80	46	0.1742	0.2332
57	64	0.1669	0.2054			<u>Checks</u>	
58	55	0.2190	0.1939	81	81	0.2199	0.1894
59	60	0.1900	0.0839	82	82	0.2238	0.1742
60	58	0.2290	0.2030	83	83	0.2250	0.2104
61	51	0.1540	0.2290	84	84	0.2610	0.1942
62	53	0.2031	0.1573				
63	49	0.2060	0.2438	Mean for SC		0.1863	0.1960
64	56	0.2227	0.1723	Selections			
65	48	0.2087	0.1923	Mean for IC		0.1980	0.1912
66	50	0.3203	0.2569	Selections			
67	54	0.1356	0.1657	Overall Mean		0.1919	0.1943
				SE +		0.0351	0.0234
				CD at 5%		0.0975	0.0648
				System CD		0.076	

APPENDIX XIII

Table 14 ANOVA for 12 characters under sole cropping system

Sr. No.	Name of characters	Mean sum of squares			SE	CD
		Replication	Treat-ment	Error		
1	Days to 50% flowering	23.62	41.80 <sup>**</sup>	16.39	2.86	7.93
2	Days to maturity	282.88	251.72 <sup>**</sup>	59.74	5.46	15.15
3	Plant height	587.55	321.11 <sup>*</sup>	218.32	10.44	28.96
4	Plant spread	146293.36	1862733.85 <sup>*</sup>	1525996.90	873.49	2421.18
5	Number of primary branches	155.86	12.94 <sup>*</sup>	9.28	2.15	5.97
6	Number of secondary branches	62.64	110.03 <sup>**</sup>	71.69	5.98	16.59
7	Number of pods/plant	25467.66	7562.57 <sup>*</sup>	5156.33	50.77	140.74
8	Number of seeds/pod	0.1371	0.1071 <sup>**</sup>	0.053	0.164	0.455
9	100-seed weight	4.53	1.88 <sup>*</sup>	3.78	1.37	3.81
10	Grain yield/plant	132.32	240.52 <sup>**</sup>	145.21	8.52	23.61
11	Total dry matter	12897.50	4377.42 <sup>*</sup>	2885.46	37.98	105.28
12	Harvest index	0.0098	0.0040 <sup>**</sup>	0.002	0.035	0.097

\* = Significant at 5% level

\*\* = Significant at 1% level

APPENDIX XIV

**Table : 15 ANOVA for 12 characters under inter cropping system**

Sr. No.	Name of characters	Repl- cation	Mean sum of squares Treat- ment	Error	SE	CD
1	Days to 50% flowering	14.88	58.95 <sup>**</sup>	16.79	2.89	8.03
2	Days to maturity	351.48	101.39 <sup>**</sup>	45.45	4.76	13.21
3	Plant height	61.96	381.83 <sup>**</sup>	186.04	0.64	26.73
4	Plant spread	2518042.29	1073883.19 <sup>*</sup>	714343.16	597.63	1656.55
5	Number of primary branches	64.56	20.82 <sup>**</sup>	12.60	2.51	6.95
6	Number of secondary branches	10.30	26.82 <sup>*</sup>	18.44	3.09	8.41
7	Number of pods/plant	24480.85	1795.80 <sup>**</sup>	1066.70	23.09	64.01
8	Number of seeds/pod	0.2825	0.1355 <sup>**</sup>	0.0670	0.183	0.507
9	100-seed weight	5.50	1.84 <sup>**</sup>	0.6012	0.548	1.579
10	Grain yield/plant	0.7891	78.50 <sup>**</sup>	29.73	3.85	10.68
11	Total drym matter	19556.01	1892.63 <sup>**</sup>	613.09	17.50	48.53
12	Harvest index	0.0029	0.0027 <sup>**</sup>	0.0010	0.023	0.064

\* = Significant at 5% level

\*\* = Significant at 1% level

APPENDIX XV

Table 16 : Test of homogeneity

Sr. No.	Characters	Genotypes (D.F.83)	Systems (D.F.1)	Genotype x systems (D.F.83)
1	Days to 50% flowering	8005.91 <sup>**</sup>	8903.14	8003.45
2	Days to maturity	148.44 <sup>**</sup>	0.6688	120.91
3	Plant height	13688.17 <sup>**</sup>	91954.04	13423.00
4	Plant spread	488858.98 <sup>**</sup>	489718.45	488885.17

\*\* = Significant at 1% level

APPENDIX XVI

Table 17 : Test of heterogeneity

Sr. No.	Characters	Replication M.S. (1 D.F.)	Genotypes M.S. (83 D.F.)	Interaction M.S.
1	Number of primary branches	5.72	131.62	89.98
2	Number of secondary branches	459.99	151.22	119.21 <sup>*</sup>
3	Number of pods/plant	103.79	151.18	99.79
4	Number of seeds/pod	1.026	164.20	21.26
5	100-seed weight	141.29	488.39	177.87 <sup>**</sup>
6	Grain yield/plant	48.90	214.89	97.45
7	Total dry matter	110.38	254.06	133.96 <sup>*</sup>
8	Harvest index	0.2611	194.33	82.96

\* = Significant at 5% level

\*\* = Significant at 1% level

Table 18 : Range, Mean, Phenotypic and Genotypic variances and coefficients under sole cropping systems.

Sl. No.	Name of characters	Range	Mean	Phenotypic variance	Genotypic variance	Phenotypic coefficient of variation	Genotypic coefficient of variation
1	Days to 50% flowering	115.50-135.00	126.00	29.09	12.70	4.28	2.83
2	Days to maturity	167.00-205.00	189.00	155.73	95.98	6.58	5.17
3	Plant height	100.80-159.20	134.52	269.72	51.39	12.20	5.32
4	Plant spread	141.00-5830.00	3364.80	1862733.80	336736.90	38.68	12.19
5	Number of primary branches	5.30-19.80	13.68	11.11	1.83	25.16	10.20
6	Number of secondary branches	12.80-51.50	28.00	98.86	19.17	34.16	15.69
7	Number of pods/plant	86.00-391.50	211.00	8359.45	1203.11	37.79	16.43
8	Number of seeds/pod	3.64-4.73	4.11	0.0804	0.0266	6.99	4.01
9	100-seed weight	8.08-13.79	10.55	1.1289	0.7511	10.07	8.21
10	Grain yield/plant	24.39-68.67	38.40	192.86	47.65	35.78	13.79
11	Total dry matter	100.56-485.35	207.75	3631.44	795.88	29.06	13.57
12	Harvest index	0.0851-0.3434	0.1919	0.0032	0.0008	29.61	14.63

Table 19 : Range, Mean, Phenotypic and Genotypic variances and coefficient under inter cropping systems

Sr. No.	Name of characters	Range	Mean	Phenotypic variance	Genotypic variance	Phenotypic coefficient of variation	Genotypic coefficient of variation
1	Days to 50% flowering	115.00-135.50	126.00	37.87	21.07	5.87	3.63
2	Days to maturity	172.00-200.50	184.00	73.42	27.96	4.64	2.86
3	Plant height	130.20-200.90	157.67	283.93	97.89	10.82	6.35
4	Plant spread	1457.00-5222.70	2982.70	894113.60	179770.00	31.70	14.21
5	Number of primary branches	5.30-19.20	13.77	20.82	8.22	34.38	21.60
6	Number of secondary branches	4.00-22.40	12.43	22.63	4.19	37.96	16.99
7	Number of pods/plant	68.20-202.40	142.98	1431.25	364.54	26.27	13.22
8	Number of seeds/pod	3.59-4.74	4.01	0.1355	0.068	9.17	6.51
9	100-seed weight	9.53-13.91	11.42	1.2200	0.623	9.68	6.90
10	Grain yield/plant	20.43-49.03	31.51	78.50	48.77	28.11	22.15
11	Total dry matter	96.28-326.50	161.40	1252.86	639.76	22.05	15.82
12	Harvest Index	0.0839-0.2819	0.1943	0.0019	0.0008	22.49	14.71

APPENDIX XIX

**Table 20 : Estimates of heritability and genetic advance  
under sole and intercropping**

Sr. No.	Name of character	Heritability		Genetic advance	
		Sole crop	Inter crop	Sole crop	Inter crop
1	Days to 50% flowering	43.65	55.65	4.85	5.58
2	Days to maturity	61.63	38.09	8.36	3.64
3	Plant height	19.05	34.47	4.79	7.68
4	Plant spread	18.07	20.10	11.37	13.13
5	Number of primary branches	16.47	39.84	8.54	27.95
6	Number of secondary branches	21.09	18.51	14.84	14.84
7	Number of pods/plant	18.91	25.47	14.72	13.78
8	Number of seeds/pod	33.08	50.50	4.76	9.54
9	Grain yield/plant	24.70	62.12	18.23	35.98
10	100-seed weight	26.54	50.89	13.80	10.15
11	Total dry matter	21.91	51.00	13.29	23.19
12	Harvest index	24.46	42.93	14.84	19.86

APPENDIX XX

Table 21 : Correlation, coefficient between different characters in sole and intercropping

Sr. No.	Name of characters	Number of primary branches	Number of secondary branches	Number of pods/plant	Number of seeds/pod	Weight of 100-seed weight	Total dry matter	Harvest index	Grain yield/plant
1	Number of primary branches	S	0.4291**	0.0387	0.0483	0.0037	0.3630**	-0.0917	0.1147**
		I	0.5169**	0.2342**	0.0423	-0.2310	0.1900	0.1879	0.3511**
2	Number of secondary branches	S	0.1751**	0.1751**	-0.1710	0.1165	0.4485**	-0.0990	0.3735**
		I	0.3612**	0.3612**	-0.1560	-0.1725	0.1413	-0.0431	0.2458*
3	Number of pods/plant	S	0.0488	0.0274	-0.0488	0.0274	0.0824	-0.0110	0.0550**
		I	-0.1532	-0.4220**	-0.1532	-0.4220**	0.2416*	0.1468	0.4106**
4	Number of seeds/pod	S	0.1113	0.1113	0.1113	0.1113	0.1272	-0.1040	0.2340*
		I	0.0827	0.0827	0.0827	0.0827	0.1275	0.1478	0.0761
5	100-seed weight	S	0.1397	0.1397	0.1397	0.1397	0.1397	-0.1274	-0.1079
		I	0.0445	0.0445	0.0445	0.0445	0.0445	-0.1243	-0.0970
6	Total dry matter	S	-0.2948	-0.2948	-0.2948	-0.2948	-0.2948	-0.2948	-0.1947**
		I	-0.1300	-0.1300	-0.1300	-0.1300	-0.1300	-0.1300	0.3813**
7	Harvest index	S	0.3236**	0.3236**	0.3236**	0.3236**	0.3236**	0.3236**	0.3236**
		I	0.4228**	0.4228**	0.4228**	0.4228**	0.4228**	0.4228**	0.4228**

\* = Significant at 5% level  
 \*\* = Significant at 1% level  
 S = Sole crop  
 I = Intercrop