

**“Performance Study of Different Cultivars
of onion (*Allium cepa* L.) Under
Jabalpur condition”**



THESIS

Submitted to the

Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur

**In partial fulfilment of the requirements for
the Degree of**

MASTER OF SCIENCE

In

**AGRICULTURE
(HORTICULTURE)**

By

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CERTIFICATE – I

This is to certify that the thesis entitled “**Performance study of different cultivars of Onion (*Allium cepa* L.) Under Jabalpur condition.**” submitted in partial fulfilment of the requirement for the degree of **MASTER OF SCIENCE in AGRICULTURE (Horticulture)** of Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur is a record of the bonafide research work carried out by **AVDHESH KUMAR PATEL** under my guidance and supervision. The subject of the thesis has been approved by the Student’s Advisory Committee and the Director of Instruction.

No part of the thesis has been submitted for any other degree or diploma (Certificate awarded etc.) or has been published/published part has been fully acknowledged. All the assistance and help received during the course of the investigation has been acknowledged by him.



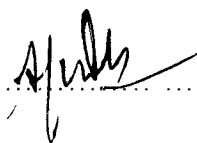
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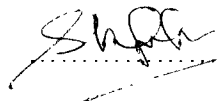
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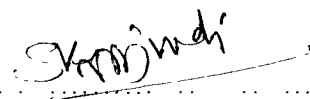
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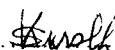
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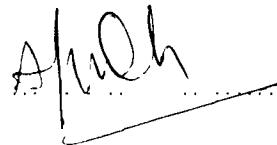

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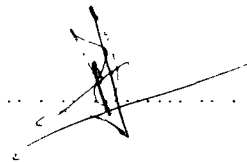
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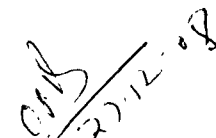
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Place: Jabalpur

Date: 22 August 2008

Bated
(AVDHESH KUMAR PATEL)

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LIST OF ABBREVIATION

<i>et al</i>	-	And others
%	-	percentage
/	-	per
⁰ B	-	⁰ Brix
⁰ C	-	Degree centigrade
SEm	-	Standard error of means
C D	-	Critical difference
MSS	-	Mean sum of squares
$\sqrt{\quad}$	-	Square root
\sum	-	summation
DAI	-	Days after transplanting
df	-	Degree of freedom
cm		centimeter
PH	-	Plant height
gm	-	gram
ha	-	hectare
Fig	-	Figure
cm	-	Centimeter
kg	-	kilogram
MB	-	Marketable bulb
DM	-	Dry matter
TSS	-	Total Soluble Solid
AWB	-	Average weight of bulb
BY	-	Bulb yield
WMB	-	Weight of marketable bulb

CHAPTER-I

INTRODUCTION

CHAPTER-I

INTRODUCTION

Onion is the most important vegetable crop cultivated in India for thousand of years. Apart from its importance for regular supply in domestic markets all over the country. It is mainly used for cuisine and culinary purpose, it also relished in raw form with meals as salad.

Onion is second only to tomato in their importance as a vegetable in the tropics. The demand for onions is worldwide. Onions are found in most of the markets of the world throughout the year and can be grown under wide range of agro-climatic conditions. Irrespective of price, the demand for onion remains almost constant in the market as it is primarily, used as seasoning for a wide variety of cuisines in many homes almost.

India ranks first in area in the world and second in production followed by China. In different states of India, Maharashtra is leading state accounting for more than 26.74% of area and 28.44% of production with an average yield 13.94 tonne/ha. Other major onion states are Gujrat, Orissa, Karnataka, Uttar Pradesh, Andhra Pradesh, Tamil Nadu and Rajasthan. In India per hectare yield are highest in Gujrat (28 tonnes/ha) followed by Haryana (20.49 tonne/ha), Andhra Pradesh (19.33 tonnes/ha) and Madhya Pradesh (15.13 tonnes/ha), respectively (2005-06).

Onion has many medicinal values and used for preparation of various Homeopathic, Unani and Ayurvedic medicines. Nutritive value of onion varies from variety to variety. Small size onion are more nutritive than big size, its major value is in flavour. Onion ranks medium in caloric, low in protein and very low in vitamins.

The pungency of onion is due to the presence of sulphur compound in very small quantity (about 0.005%) in volatile oil of the plant juice. The main compound is allylpropyl disulphide. The red colour of onion is due to the presence of quercetin.

Among the various factors which can boost the yield, use of improved varieties is of paramount importance. Selection of suitable variety is also an important factor in improving crop yield, so selection of variety should be made after studying their performance regarding growth, yield and quality. The productivity potential of any crop usually depends on its inherent capacity for photosynthetic leaf area developed and availability of photosynthetic within the canopy and its faster translocation towards the economic sink.

The studies on morphological parameters and their interrelationship with the sink potentiality are totally lacking and particularly in M P , India. These studies are very essential to determine the growth pattern of an efficient ideotype for medium bulb formation under agro climatic conditions of Jabalpur. Hence the present investigation on "performance study of different cultivars of onion (*Allium cepa* L.)" was carried out at Vegetable Research Farm, Department of Horticulture, JNKVV, Jabalpur (M.P.) during Rabi season 2007-08 with the following objectives:-

1. To study the growth and yield contributing parameters of different Onion cultivars.
- 2 To study the quality of Bulb of Onion cultivars.
- 3 Correlation study on yield and its contributing parameters
- 4 To isolate high yielding cultivars suitable for kymore plateau and satpura hills condition.

CHAPTER-II

**REVIEW OF
LITERATURE**

CHAPTER-II

REVIEW OF LITERATURE

A critical review of the work done in India and abroad related to the present investigation has been given as below :-

- (A) Effect of varieties on growth and yield
- (B) Effect of varieties on qualitative character
- (C) Correlation studies

(A) EFFECT OF VARIETIES ON GROWTH AND YIELD :-

Bhagchandani *et al.* (1980) found that Pusa White flat gave the highest yield followed by pusa white round. Pusa White flat had also topped in yield trials at many centres

Pathak and Deshpande (1984) reported that in a varietal trial of improved onion varieties, Arka Niketan produced maximum bulb yield followed by Arka Kalyan and Arka Pragati as compared to commercial varieties N-53 and Sel-780.

Chadha and Sidhu (1986) stated that the highest yielding cultivars were Verma's Giant Sel., PLRG Sel., Pb-48 and White Globe; they yielded 483.43, 455.57, 438.92 and 436.25 q/ha, respectively. Sel. 2-4-1 gave the lowest yield of 280.06 q/ha.

Savon and Ayala (1986) found that the Granex 33F1 gave the highest yield (36.8 t/ha) and highest average bulb weight (186.8 g).

Anonymous (1987) reported that the maximum gross yield was found in Arka Niketan followed by Pusa Red and minimum was found in Arka Kalyan. The maximum bulb diameter was noted in VL-3 followed by Arka Niketan while it was minimum in Arka Kalyan followed by VL-3.

Bolanos (1989) reported that the Marketable yields were highest in cv. Granex 33, followed by Granex 2000 (64.377 and 55.323 kg/ha, respectively)

Khan (1989) Among these cultivars Peshawar Local proved to be superior most as regards growth rate, plant height (62.36 cm) and leaf length (36.50 cm) whereas maximum number of leaves (17.70 per plant) and bulb size (8.56 cm) was recorded in Dark Red while maximum individual bulb weight (169.70 gm) was recorded in Swat Local and Swat Selection Gave maximum yield (28777.78 kg/ha)

Katwale and Saraf (1991) found that the A N-53 had the highest mean bulb yield (133 99 q/ha) and the highest percentage of medium size (25-50 mm) bulbs (76 1%)

Patil *et al* (1991) found that the highest yield (29.9 t/ha) was obtained from N-53, followed by FB-780 (24.4 t) and N-2-4-1 (22.8 t). Yields were lowest in Nabapur local (14 8 t) and Bellary Red (18.2 t) The heaviest bulbs (average 76 g) were obtained from N-53.

Singh and Korla (1991) reported that the later planting resulted in a decrease in the number of leaves, gross yield and net yield. Maximum number of leaves and yield were obtained with Poona Red and Nasik Red.

Singh *et al.* (1991) reported the Agrifound Dark Red and Pusa Red were the highest yielding in Kharif and Rabi, respectively.

Cerna and Ramirez (1992) suggested that the Granex 438, Granex 429 and Contessa produced the highest exportable (to the USA) yields (1664, 1496 and 1370 bags (24 kg)/ha, respectively) and the highest total yields (1794, 1541 and 1623 bags/ha, respectively). Red Comet produced the lowest exportable and total yields (598 and 683 bags/ha, respectively).

Deka *et al* (1994) foun that the Pusa Madhavi and Agrifound Light Red produced the largest, heaviest bulbs and the highest yields. Arka Kalyan, Arka Niketan and Agrifound Light Red were identified as short duration cultivars. N-53 had the highest TSS

Resende *et al* (1996) reported that Quality and marketable yield were highest in cv Roxa IPA-3 (12 0 and 19 2 t/ha in 1985/86 and 1987/88,

respectively) and cv. Pera IPA-4 (11.9 and 17.8 t/ha in 1985/86 and 1987/88, respectively).

Masthanareddy and Sulikeri (1998) reported that the N-53 also had a good bulb weight and bulb diameter. Arka Niketan had a highest TSS content (14.23%) while N-53 was moderate (11.14%).

Rajcumar (1998) concluded that the cultivars Linda Vista and Star 5504 produced the highest bulb yields (38.7 and 37.2 t/ha, respectively). Other cultivars namely Savannah Sweet, Chula Vista, Ha 950, Bronco and Red Bandana were not significantly different from the standard Yellow Dessex (34 t/ha). Earliness in production was noted in cultivars HA 944 and Savannah Sweet.

Awurum (1999) showed that the yields of the three cultivars were significantly different. Texas Early Grano cultivated under irrigation gave the best bulb yield of 16.8 t/ha, followed by Composite I, with bulb yield of 15 t/ha under irrigation. The least bulb yield of 12.8 t/ha was obtained from Red Creole cultivated under rainfed condition.

El Sayed and Atia (1999) reported that the highest marketable yields were obtained with cultivars Ori (Israel), G.6 M (Egypt) and Perla (USA) in both seasons.

Pramanick *et al.* (1999) found that the differences observed between the varieties/lines were highly significant for all the characters. Pusa Red gave the highest yield followed by SI 126. Pusa Red and SI 126 were best for yield.

Costa (2000) reported that the Texas Grano-PRR producing the highest yield (61.78 t/ha), followed by Granex-429 (58.28 t/ha), Texas Grano-438 (56.97 t/ha), Brownsville (55.38 t/ha), Texas Grano-502 (53.97 t/ha) and Houston (53.35 t/ha).

Mohanty (2001a) reported that the highest yields were obtained with planting of Agrifound Light Red (298.53 q/ha), Arka Niketan (295.77 q/ha), N 53

(281.03 q/ha), and Arka Kalyan (279.93 q/ha) on 16 November, and of Agrifound Light Red (286.00 q/ha) and Arka Niketan (284.47 q/ha) on 1 November.

Mohanty and Prusti (2001a) suggested that the highest number of leaves was recorded for Arka Kalyan (16.40), Pusa Red (16.10), Pusa Madhavi (15.60), Pusa Ratnar (13.80), N 53 (13.20), and Punjab Red Round (12.80). Pusa Madhavi, Arka Niketan, Punjab Red Round, Arka Pitamber, Agrifound Light Red, and Pusa Ratnar produced small-to-medium bulbs (4.70-5.20 cm in diameter). The highest yields (quintal/ha) were recorded for Arka Kalyan (205.60), N 53 (193.80), Nasik Red (192.80), Punjab Red Round (191.80), Agrifound Light Red (186.70), and Arka Niketan (186.40).

Mohanty (2002) reported that the N 53 showed maximum plant height, number of leaves per plant, neck thickness and bulb yield, while Agrifound Dark Red and Pusa Ratnar showed the highest bulb weight and diameter, respectively.

Mohanty and Prusti (2002a) reported that the varieties N 53 and Arka Kalyan recorded significantly higher bulb yield (228.54 and 220.60 q/ha, respectively) than other varieties. It was found that rabi varieties if grown in kharif season could also confer good bulb yield.

Mohanty and Prusti (2002b) revealed that Pusa Madhavi, Arka Niketan, Punjab Red Round, Agrifound Dark Red, Arka Pitamber and Agrifound Light Red produced small to medium sized bulb. The varieties N 53 and Arka Kalyan recorded significantly higher bulb yield (228.54 and 220.60 q/ha, respectively) than other varieties.

Mohanty *et al.* (2002) found that the Agrifound Dark Red and N 53 recorded significantly higher yield (280.40 and 270.52 q/ha, respectively) than other cultivars tested.

Mohanty *et al.* (2002) found that the Nasik Red had the highest plant height (49.72 cm) and number of leaves per plant (15.65 cm). Arka Niketan had the highest bulb diameter (6.18 cm) and bulb weight (75.11 g). Agrifound Light

Red and N 53 had the highest bulb yield (413.73 q/ha) and neck thickness (1.18 cm), respectively

Sarkar and Jain (2002) reported that the Plant height and number of leaves per plant were highest in Arka Niketan. The greatest bulb diameter (5.58 cm) was recorded in Arka Niketan and Agrifound Dark Red (5.26 cm). The highest bulb yield (174.39 q/ha) was recorded for Agrifound Dark Red, followed by Arka Niketan (156.40 q/ha), whereas the lowest bulb yield (81.11 q/ha) was recorded for Agrifound Light Red. The total soluble solid content was highest (11.4 degrees B) in Arka Niketan.

Seetohul (2002) reported that the highest yield was recorded with cultivar Star 5517 (101.5 t/ha). In the on-farm trials, the highest yield (116.2 t/ha) was obtained with cultivar Star 5517, followed by Sivan (96.0 t/ha) in the region of La Marie. Highest incidence of bolting was observed in Red Bombay (59.3%) at Pointe aux Piments, of split bulbs in Red Bandanah (46.5%) at Reduit and of thick necks in Sunshine (75.52%).

Shah *et al* (2002) reported that the number of leaves per plant was high in Swat-1 (11.53) with minimum days to harvesting (182.33). While minimum number of leaves per plant (7.67) and days to harvesting (149.33) were found in Contessa. Tallest plants (66.50 cm) were observed in Rio Corona [H], and dwarf plants (44.75 cm) were found in ORI. Variety Rio Zorro was noted as high yielding variety (86.44 tons/ha) and Maximum number of bulbs per kg (15.09) were found in Contessa, while minimum (5.55) were there in Chula Vista [H]. Large bulbs by weight (217.17 g) was recorded in Chula Vista [H], while smallest (113.58 g) bulbs were obtained from Contessa.

Singh and Brar (2002) reported that the highest bulb weights were recorded from the cultivar N-53 regardless of the bulb set grade. However, grade A bulb sets produced bulbs with the highest size and weight. Grade A bulb sets of N-53 recorded the highest bulb size (14.33 cm) and weight (54.03 g). PB-48 produced the highest yield with tops, whereas N-53 produced the highest yield without tops. N-53 also produced bulbs with the highest average weight and size,

whereas PB-48 produced bulbs with lowest weight and size. The lower bulb yield in PB-48 can be attributed to the increase in top production at the expense of underground bulb, while the opposite holds true in the case of N-53.

Cheema *et al* (2003) suggested that the highest number of leaves (14.17) and the lowest bolting percentage was observed in AC-383-I. Golden Globe had the highest yield (20 267 kg/ha) with a maximum plant stand (89.28%). Phulkara showed the highest leaf length (44.17 cm). Genotype 606 Cal showed maximum bulb weight (140 50 g) and bulb diameter (8.16 cm). AC-36-II showed the highest dry matter content (17.50%).

Qureshi *et al* (2004) found that the Swat-1 gave the highest number of bolted plants (8 50) Mansehra Local gave the highest number of leaves per plant (11 53) American Selection gave the maximum plant height (51 16 cm) and yield (41 75 t/ha).

Khandagale *et al.* (2005) indicated that the days required for maturity, weight of fresh bulb, diameter of bulb and marketable yield per hectare were maximum in the onion variety N-2-4-1. However, the weight of bolted onion was maximum in Agrifound Dark Red variety of onion. Whereas the total soluble solids were maximum in the onion variety Phule Suwarna

Anonymous (2007) Reported that percentage A grade bulbs were maximum (67 6 %) in B-780-5-2-2 which was followed by B-780-5-3-1. In best check variety (AFLR), percentage A grade bulbs was 51.8 %. Percentage doubles were lowest in B-780-5-2-2 (0 3 %), which was followed by B-780-5-3-1 (1 2 %) against the best check variety AFLR (26 4 %) percentage marketable yields were 99 1 % and 98 % in B-780-5-2-2 and B-780-5-3-1, respectively. Which were quite high over high both the checks i.e. AFLR (73.4 %) and Arka Niketan (86 1 %) entry RHR-O-S1 was earliest in maturity (98 days), which was followed by B-780-5-2-2(100 days), which was statistically at par and significantly earlier than the best check AFLR, which matured in 109 days Marketable yield was significantly superior in B-780-5-3-1, which yielded 390 q/ha.

Kabura *et al* (2008) Field studies to assess the effect of different onion/pepper intercrop spacings (additive effect) on yield and yield components of onion (*Allium cepa* L.) and pepper (*Capsicum annum* L) in the Sudan Savanna, Nigeria Eight different onion/pepper intercrop spacings and a sole each for the two crops were assigned to plots in a randomized complete block design with three replications. The results obtained for the two years were similar The sole for both crops produced significantly higher marketable bulbs and bulb yield/ha for onion and greater number of fruits/plant and fresh fruit yield/ha for pepper than the intercrops

(B) EFFECT OF VARIETIES ON QUALITATIVE CHARACTER :-

Patil *et al* (1991) reported that the juice TSS was highest (18.30%) in Nabapur local and lowest (12.73%) in N-53. Since there was a negative relationship between yield and % TSS, the cultivar N-2-4-1 appeared to be a suitable substitute for Bellary Red which is the dominant onion in this region.

Bhonde *et al* (1992) showed that the Agrifound Light Red had a good yield, and had the highest DM content and the lowest incidence and intensity of purple blotch of all cultivars.

Singh *et al* (1992) indicated that the Pusa White Round, Pusa White Flat and Hisar 2 had the highest yields (means of 295.4, 277.6 and 255.5, respectively) Total soluble solids content was highest in Hisar 2 and Arka Kalyan. the incidence of bolting was lowest in VL1, VL3 and Hisar 2

Diaz (1994) reported that the highest dry matter content was found in White Creole (14%), Primero (12.33%) and Deshidrator 3 (11%)

Saimbhi and Ball (1997) found that the cultivar PWO-1 had the highest TSS and dry matter contents and being also white in colour was judged the most suitable for processing

Pramanick *et al.* (1999) reported that the SI 126 has the highest total soluble solids, dry matter (%) and ascorbic acid contents, making it suitable for the table, for dehydration as well as for storage purposes

Verma *et al.* (1999) reported that based on data on yield, dry matter, drying ratio, total soluble solids (TSS), pungency and sugars, Punjab 48 was judged superior to the other varieties for dehydration quality, followed by Pusa White Flat. The importance of different constituents in onions on their quality for dehydration is discussed.

Abhayawick *et al.* (2002) reported that the three onion varieties (Sweet Vidalia, Spirit and Niz) were selected for this study based on their dry matter amounts ranging from 7% to 18%.

Singh *et al.* (2003) found that the significantly lowest moisture content (MC, 78.32%) and highest total soluble solids (TSS, 19.50%) and dry matter (21.68%) were recorded in Agrifound Red.

(C) CORRELATION STUDIES :-

Suthanthira Pandian and Muthukrishnan (1982) reported that number of leaves, number of bulbs and weight of plant exhibited significant positive association with yield as well as between themselves.

Anonymous (1983) reported that the bulb diameter recorded at random did not show any correlation with the yield in four white Onion varieties.

Sidhu *et al.* (1986) reported the high heritability estimates for these 2 characters and bulb diameter were found. Bulb yield was positively associated with bulb diameter and 10-bulb weight. The highest mean yield was for Sel 102-1 (36.8 t/ha) and the highest 10-bulb weight was for PB48 (633g).

Netra Pal *et al.* (1988) evaluated various morphological and biochemical characters of *Allium cepa* and 28 F1 hybrids. Yield was positively correlated with bulb weight and diameter, and plant height. Dry matter content was positively correlated with total soluble solids.

Singh *et al.* (1995) found that the Bulb weight, bulb yield/ha and dry leaves/plant had high genotypic coefficients of variation (21.95, 20.72 and 20.28, respectively), heritability (97.88, 96.95 and 95.92%, respectively) and genetic

advance (44.80, 42.05 and 40.96%, respectively). Bulb yield showed strong positive correlation with bulb weight and neck girth.

Thakur *et al.* (1997) evaluated that 53 genotypes of garlic (*Allium sativum*) were evaluated for 7 yield and morphological traits at Ludhiana. Yields ranged from 7.69 to 16.71 t/ha and bulb weights ranged from 9.9 to 20.8 g. Yield was significantly and positively correlated with weight per bulb, plant height, leaves per plant, and leaf length and width.

Mohammed *et al.* (2000) reported that the bulb production was significantly and highly correlated with equatorial bulb diameter, quantity of marketable bulbs and polar bulb diameter. It also had a positive relationship with the number of rings per bulb and bulb neck thickness. The equatorial bulb diameter was significantly correlated with polar bulb diameter and marketable bulbs. Bolting, sprouting and split percentage in bulb production were negatively correlated with bulb yield, quantity of marketable bulbs, equatorial bulb diameter and polar bulb diameter.

Mohanty and prusti (2000) reported that the pooled analysis Pusa Madhavi, Arka Niketan, Punjab Red Round, Arka Piṭamber, Agrifound Light Red and Pusa Ratnar produced small to medium sized. The cultivars Arka kalyan, N-53, Nasik Red, Punjab Red Round, Agrifound Light Red and Arka Niketan recorded significantly higher bulb yield.

Mohanty (2001b) reported that the moderate to high estimates of heritability, genetic coefficients of variation and genetic gain were recorded for neck thickness, weight of bulb and number of leaves/plant, which could be improved by simple selection. Phenotypic and genotypic associations of bulb yield were significantly positive for plant height, number of leaves per plant, and diameter and weight of bulb, but were significantly negative for neck thickness.

Mohanty (2001c) reported that the bulb yield was significantly and positively correlated with the number of leaves per plant and bulb weight at phenotypic and genotypic levels. Neck thickness was positively correlated with

plant height and bulb diameter, but was negatively correlated with bulb weight and yield at both levels.

Mohanty (2001d) recorded that the high heritability with moderate to high genotypic coefficient of variation and genetic gain were recorded for weight of bulb, neck thickness, bulb yield and number of leaves per plant which could be improved by simple selection. Bulb yield manifested positive and significant phenotypic and genotypic correlation with plant height and diameter and weight of bulb

Mohanty and Prusti (2001b) reported that the pooled analysis revealed that Arka Niketan, Punjab Red Round, Nasik Red, N 2-4-1, Agrifound Light Red and Arka Pitamber produced small to medium bulb with thinner neck, assuring better storage quality. Arka Kalyan recorded the highest yield (21.06 t/ha) which was at par with Arka Niketan (19.64 t/ha) and Pusa Madhavi (18.96 t/ha), while Agrifound Dark Red and N 53 displayed moderately high yield of 18.06 and 17.85 t/ha, respectively

Rahman *et al* (2002) Correlation and path coefficient analysis in onion showed that total bulb yield (kg/ha) had significant positive correlation with plant height, number of leaf per plant, bulb diameter and bulb yield per plant but had significant negative association with plant spacing

Mohanty *et al* (2003) reported that the cultivars Arka Kalyan and N53 recorded significantly higher bulb yield (229.60 and 218.53 q/ha, respectively) than the other cultivars. The Rabi cultivars when grown in during the kharif season could also confer good bulb yield.

Wani (2004) revealed that bulb yield was positively and significantly associated with number of leaves, bulb volume, bulb weight and number of cloves per bulb. After computing partial regression coefficients, multiple regression equation was fitted to serve as selection index in garlic crop, which reflected 89.2% contribution in bulb yield variation by bulb weight and number of cloves per bulb. Hence, emphasis should be placed on these characters-in

selection programmes for genetic improvement to obtain higher bulb yield in garlic

Aliyu *et al.* (2007) the associations among growth and yield components and their direct and indirect influence on the bulb yield of onion were investigated. Correlation and path coefficient analysis in onion showed that cured bulb yield had significant positive correlation with plant height, number of leaves per plant, bulb diameter and bulb weight but had negative association with percentage-culled bulbs. Path analysis indicated that bulb diameter, plant height and number of leaves per plant were the principal component of yield.

CHAPTER-III

MATERIALS AND METHODS

CHAPTER-III

MATERIALS AND METHODS

The present investigation "Performance study of different cultivars of Onion (*Allium cepa* L.) Under Jabalpur condition" was carried out during Rabi season of 2007-08. This chapter contains the details about the materials used and methods employed during the course of present investigation.

3.1 Experimental site

The experiments were conducted at Vegetable Research Farm, Department of Horticulture, JNKVV, Jabalpur. The topography of the experimental field was uniform with good irrigation facilities.

3.2 Climate and season

Jabalpur is situated at 23.9° North latitude and 79.58° East longitude at an altitude of 411.87 m above mean sea level. It has a semi-humid, subtropical climate. The main features are that of a dry summer and cold winter with occasional showers.

On the recommendation of National Bureau of Soil Science and Land Use Planning of ICAR, this area belongs to Agro-ecological sub-region number 10.1, named as sub-humid (dry) Eco-region. The soil of the experimental field was clay loam with uniform topography. The weekly maximum and minimum temperature, relative humidity, rainfall, number of rainy days of the entire crop growing period are presented in Table 3.1.

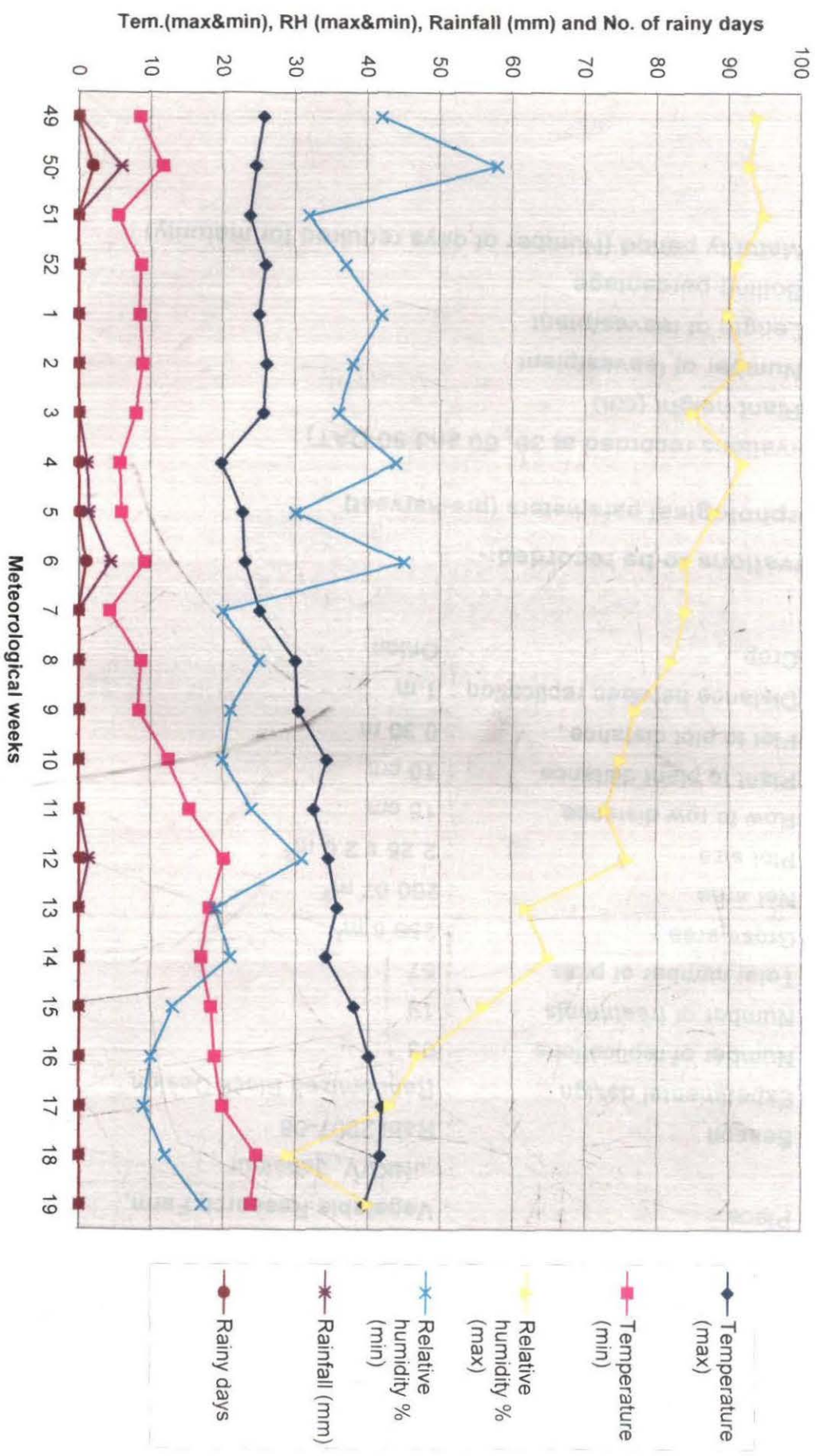
3.3 Soil

The soil of the experimental field was clay loam having good drainage.

Table-3.1 Weekly meteorological data during the period of Investigation from December 2007 to May 2008.

Month	Metro. Week	Temperature (°C)		Relative humidity (%)		Rainfall (mm)	No. of rainy days
		Max.	Min	Max.	Min.		
Dec	49	25.7	8.5	94	42	0	0
	50	24.6	11.7	93	58	6	2
	51	23.8	5.5	95	32	0	0
	52	25.9	8.6	91	37	0	0
Jan	1	25.1	8.5	90	42	0	0
	2	26.1	8.9	92	38	0	0
	3	25.6	7.9	85	36	0	0
	4	19.8	5.7	92	44	1.2	0
	5	22.7	5.9	88	30	1.4	0
Feb	6	23	9.1	84	45	4.4	1
	7	25.1	4.3	84	20	0	0
	8	30	8.6	82	25	0	0
	9	30.4	8.3	77	21	0	0
March	10	34.4	12.4	75	20	0	0
	11	32.6	15.3	73	24	0	0
	12	34.6	20.1	76	31	1.4	0
	13	35.8	18.1	62	19	0	0
April	14	34.2	16.9	65	21	0	0
	15	38.1	18.3	56	13	0	0
	16	40.1	18.8	47	10	0	0
May	17	41.9	19.8	43	09	0	0
	18	41.7	24.6	29	12	0	0
	19	39.5	23.8	40	17	0	0

Fig. 1 Weekly meteorological data during the period of investigation from Dec. 2007 to May 2008.



3.4 Experimental details

The experiment was conducted in Randomized Block Design with 3 replications. Each replication consisted of nineteen (19) treatments. All treatments were randomized separately for each replication. The plan of layout is given below:-

1. Place : Vegetable Research Farm,
JNKVV, Jabalpur
2. Season : Rabi 2007-08
3. Experimental design : Randomized Block Design
4. Number of replications : 03
5. Number of treatments : 19
6. Total number of plots : 57
7. Gross area : 256.5 m²
8. Net area : 200.07 m²
9. Plot size : 2.25 x 2.0 m²
10. Row to row distance : 15 cm
11. Plant to plant distance : 10 cm
12. Plot to plot distance : 0.30 m
13. Distance between replication : 1 m
14. Crop : Onion

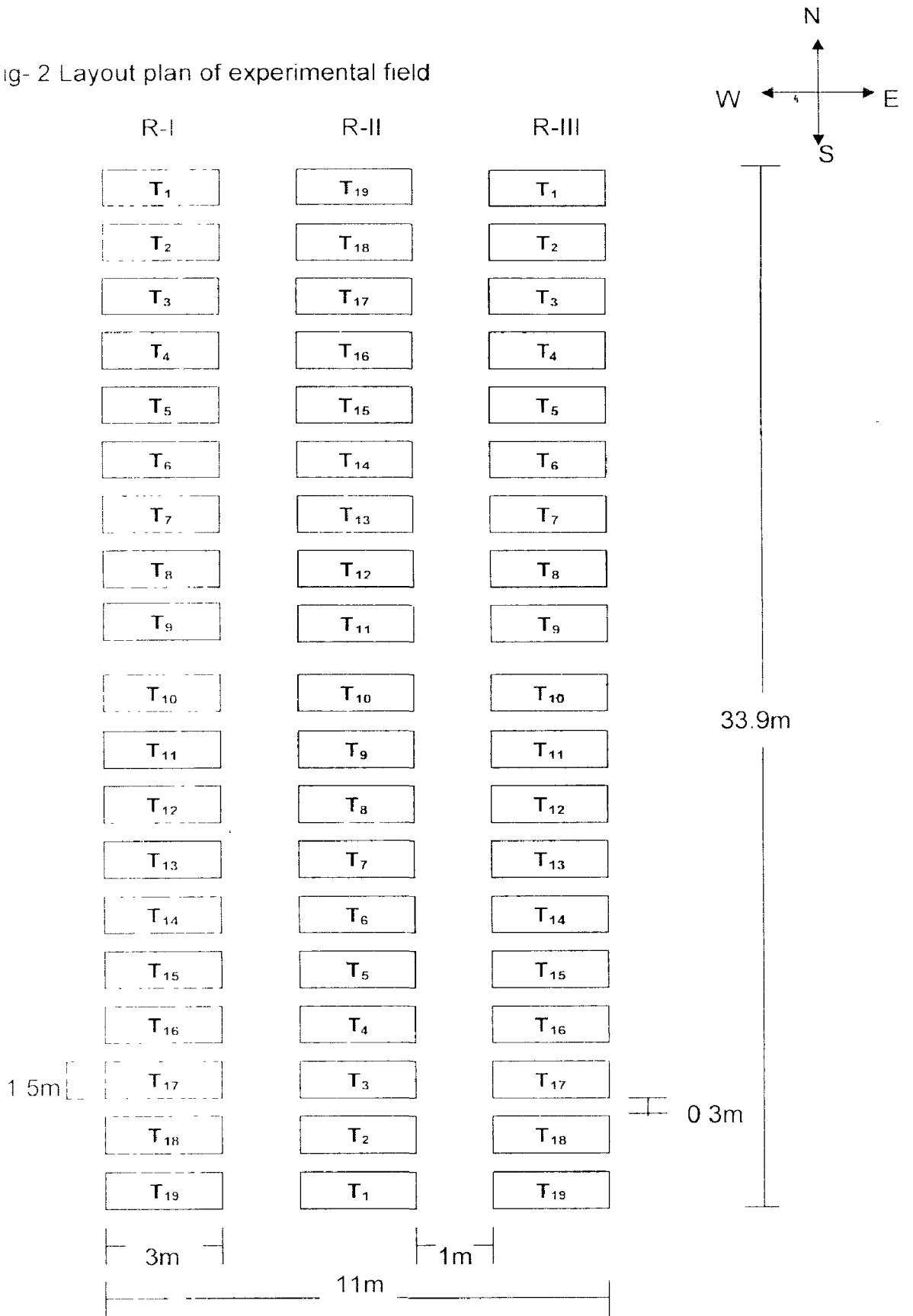
Observations to be recorded:-

(A) Morphological parameters (pre-harvest)

(Observations recorded at 30, 60 and 90 DAT)

- I. Plant height (cm)
- II. Number of leaves/plant
- III. Length of leaves/plant
- IV. Bolting percentage
- V. Maturity period (Number of days required for maturity)

Fig- 2 Layout plan of experimental field



(B) Productivity parameters (at-harvest)

- I Diameter of Bulb (cm)
- II Number of Unmarketable Bulb
- III Number of Marketable Bulb
- IV. Number of Split Bulb
- V. Weight of Bulb/plot
 - a. Average weight of Bulb (gm)
 - b. Weight of Unmarketable Bulb.
 - c Weight of Marketable Bulb
 - d. Weight of Split Bulb
- VI Weight of Bulb/ha.
 - a. Bulb yield (q)
 - b. Marketable Bulb yield (q)
 - c Unmarketable Bulb yield (q)
 - d Split Bulb yield(q)
- VII Percentage of Bulb/plot
 - a. Percentage of Marketable Bulb
 - b Percentage of Unmarketable Bulb
 - c. Percentage of Split Bulb

(C) Qualitative Analysis:-

- I Total Soluble Solids
- II Dry matter content (%) of 100 gm Bulb

3.5 Agronomical operations

3.5.1 Planting material

Nineteen cultivars of onion were studied for their performance in relation to growth, yield and adaptability for high productivity. The information and details of the cultivars and their sources of supply are given below in the following table

Table- 3.2 Cultivar information and their source of supply

Treatments	Name of cultivars	Source
T ₁	AGRIFOUND WHITE	NHRDF
T ₂	LINE-355	NHRDF
T ₃	RO-595	NRCOG
T ₄	AGRIFOUND LIGHT RED	AADF
T ₅	PRO- 6	Ludhiana
T ₆	SEL-383	IARI
T ₇	SEL-402	IARI
T ₈	JNDWO-207	Junagarh
T ₉	PKV SEL WHITE	Akola
T ₁₀	RHR-0-S1	Rahuri
T ₁₁	B-780-5-2-2	NRCOG
T ₁₂	L-28	NHRDF
T ₁₃	B-780-5-3-1	NRCOG
T ₁₄	NRCOG-W-1	NRCOG
T ₁₅	NRCOG-W-2	NRCOG
T ₁₆	NO-355	NHRDF
T ₁₇	PUNJAB WHITE	Ludhiana
T ₁₈	RO-597	NRCOG
T ₁₉	ARKA NIKETAN	IIHR

3.5.2 Nursery raising

After selection of the site the soil was dug out with the help of pickaxe and land was ploughed thoroughly and made friable beds were prepared according to requirement. Thereafter, Beds were 3 x 1 m in size and raised up to 15 cm from the ground level and the seeds were sown immediately, then light irrigation was given.

3.5.3 After care of seedlings

After sowing of seeds, necessary irrigation were given till the seedlings were ready for transplanting. Weeding and plant protection measure was done as and when required.

DIFFERENT CULTIVARS OF ONION



3.5.4 Field preparation

Onion crop require a fine tilth. The field was ploughed twice with the soil turning plough, followed by cross harrowing. The experiment was laid out on well prepared plots.

3.5.5 Fertilizers application

Basal dose of fertilizers was done prior to transplanting of onion seedlings.

Table-3.3 Basal doses of nutrients applied

S. No.	Nutrient	Quantity (kg/ha)	Source
1	Farm yard manure	20 tonnes	Dung (animals)
2	Nitrogen	100	Urea
3	Phosphorus	60	Single super phosphate
4	Potassium	80	MOP (60% K)

Top dressing with urea for remaining half quantity of nitrogen was applied by to split dose at 30 and 45 days after transplanting.

3.5.6 Transplanting and gap filling

45 days old seedlings of uniform height (about 15-17 cm) were selected and transplanted in the field with the spacing of 15x10 cm. Gap filling was done within 10 days after transplanting and light irrigation were given just after gap filling of seedlings. 300 seedlings were transplanted in each plot.

3.5.7 Irrigation

Light irrigation was given just after transplanting and subsequent irrigation was given as and when required depends upon soil type and climatic conditions.

3.5.8 Intercultural operation

Oxygold weedicide @ 0.8 ml/lit. of water were sprayed after sprinkler irrigation at 27 days after transplanting and hoeing was done

after 5 days of weedicide spray. One hand weeding was performed at 55 days after transplanting.

3.5.9 Plant protection measures

A timely spray of Rogor alone with fungicide @ 2 ml/liter of water to control sucking pest and diseases was done for protection of crop

3.5.10 Observations recorded

Observation of the characters under study of onion plants was recorded. Five plants randomly were selected from each plot for observation. The mean value of the recorded data was considered as the actual value of the respective characters. The observation recorded at 30 days after transplanting and there after at a regular interval of 30 days upto 90 days after transplanting.

3.6 Morphological parameters

3.6.1 Plant height (cm)

The plant height was measured in each treatment from ground level up to the tip of fully opened leaves with help of meter scale at 30, 60 and 90 days after transplanting

3.6.2 Number of leaves

Leaves per plant were counted from five selected tagged plants of each plot. The number of leaves per plant was recorded at 30, 60, and 90 days after transplanting.

3.6.3 Length of Leaves (cm)

The length of leaves per plant was measured from leaf base to tip of the leaf at 30, 60 and 90 days after transplanting

3.6.4 Bolting percentage

The bolting percentage was calculated by counting the number of bolted plants before harvesting. Bolting was calculated in percentage.

3.6.5 Days taken for maturity

Days taken for maturity was recorded at the end when tip of the leaf starts turning yellow. The foliage is bent with the help of light weight

3.6.6 Harvesting

The harvesting was done by means of kudali when yellowing and falling of leaves was observed. Then after the foliage is bent down with the help of light pressure and after drying of foliage the bulbs are dug up with the help of kudali and the roots are removed. The produce was recorded in kilograms on net plot basis and the per hectare yield was calculated.

3.7 Productivity parameters (at-harvest)

3.7.1 Bulb diameter (cm)

The diameter of bulbs was recorded from each treatment randomly and measured by Vernier calipers and the mean was calculated.

3.7.2 Number of bulbs per plot

The onion bulbs harvested from each plot were grouped in to marketable bulbs, unmarketable bulbs and split bulbs and their number was counted and recorded.

3.7.3 Average weight of bulb (gm)

The average weight of bulbs was taken after the harvest by taking 20 bulbs from each treatment.

3.7.4 Weight of bulbs (kg/plot)

The onion bulbs harvested from each plot were graded as marketable bulbs, unmarketable bulbs and split bulbs, and their weight was recorded separately. The bulb were harvested carefully by digging and weighed after cleaning them properly.

3.7.5 Weight of bulbs (q/ha)

The crop was harvested and bulbs of each net plot were weighed in kilograms. Later, the yield was calculated in q/ha.

3.7.6 Percentage of bulbs/plot

The onion bulbs harvested from each plot were grouped into marketable, unmarketable and split bulb and their number was counted and recorded separately and converted into percentage.

3.8 Quality parameters

3.8.1 Total soluble solids (TSS %)

Bulbs from each treatment were collected and chopped and squashed. Then after total soluble solids were estimated with the help of hand refractometer and mean TSS percentage was calculated.

3.8.2 Dry matter content

Bulbs from each treatment were collected and chopped samples weighing 100 gm were dried in sunlight for two days. Then these samples were kept in an oven at 60 °C for 24 hours and mean weight of dry matter was recorded.

3.9 Statistical analysis

The collected data were analysed statistically as suggested by Fisher (1954) for analysis of variance and standard error of means were compared at 5 percent level of significance.

The skeleton of analysis of variance table is as under table.

Table- 3.4 Skeleton of analysis of variance

Source of variation	Degree of freedom	S.S.	MSS	Cal. Value	Tab. F value at 5%
Replication	2				
Treatment	18				
Error	36				
Total	56				

The critical difference to test the difference between two mean values was calculated as follows:-

Standard errors were found by using formulae mentioned by Panse and Sukhatme (1957).

$$\begin{aligned}
 1 \text{ S E m } \pm &= \sqrt{\frac{V_e}{r}} \\
 2 \text{ S E d } \pm &= \sqrt{\frac{2 V_e}{r}} \\
 3 \text{ C D } &= \sqrt{\frac{2 V_e}{r}} \times t \text{ at } 5 \% \\
 &= \text{S.E.d} \times t \text{ at } 5 \%
 \end{aligned}$$

Correlation Coefficient

The relationship of some important morphological parameters with yield attributing parameters was studied by means of simple correlation coefficient calculated by the standard procedure given by Panse and Sukhatme (1957)

$$\frac{\sum X Y - \frac{\sum X \cdot \sum Y}{n}}{\sqrt{\sum (X^2) - \frac{(\sum X)^2}{n} \cdot \sum (Y^2) - \frac{(\sum Y)^2}{n}}}$$

Where 'x' and 'y' equal the mean values for different morphological parameters yield attributing character and 'n' is the total number of observations. The calculated 'r' value is then compared with table value of 'r' at 5 percent and 1 percent level of significance.

CHAPTER-IV

EXPERIMENTAL FINDINGS

CHAPTER-IV

EXPERIMENTAL FINDINGS

Results of the investigation "Performance study of different cultivars of Onion (*Allium cepa* L.) Under Jabalpur condition" carried out during the year 2007-08 in the Vegetable Research Farm, JNKVV, Jabalpur have been presented under appropriate heads.

The present growth analysis of nineteen onion (*Allium cepa* L.) cultivar provided important parameters responsible for high economic yield. Morphological characteristics, viz., plant height, number of leaves, length of leaves, bolting percentage and maturity period exhibited significant influence on productivity characters, viz., diameter of bulb, number, percentage and weight of marketable, unmarketable and split bulbs kg per plot and quintals per hectare.

The qualitative characteristics are also projected the cultivars contents, i.e., TSS percentage and dry matter content. The mean and analysis of variance table for different results are presented as follows:

A. Morphological characteristics

The variability amongst the nineteen cultivars was quantified at 30, 60 and 90 days fixed intervals for following quantified various morphological attributes are presented under the following characters:

4.1 Plant height (cm)

Plant height (cm) per plant at different stage of plant growth were recorded at 30 days intervals. The results presented in Table No. 4.1 shows that the plant height (cm) at different stage of plant growth. Data regarding plant height continued to increase at all the stage of plant growth after transplanting in all the cultivars. Significant difference among the cultivars was recorded at all the stage of plant growth.

Table-4.1 Plant Height (cm) in different cultivars of onion (at 30, 60 and 90 DAT)

Treatments	Plant Height (cm)		
	30 DAT	60 DAT	90 DAT
T ₁ AGRIFOUND WHITE	22.86	41.88	53.33
T ₂ LINE-355	23.13	43.55	57.23
T ₃ RO-595	20.60	47.44	51.20
T ₄ AFLR	17.70	30.66	38.78
T ₅ PRO- 6	23.33	50.99	60.76
T ₆ SEL-383	18.13	44.60	49.53
T ₇ SEL-402	21.33	50.56	57.32
T ₈ JNDWO-207	22.93	44.00	54.87
T ₉ PKV Sel WHITE	22.20	40.55	51.63
T ₁₀ RHR-0-S1	21.46	39.21	52.50
T ₁₁ B-780-5-2-2	19.93	42.88	48.20
T ₁₂ L-28	22.53	39.10	49.30
T ₁₃ B-780-5-3-1	18.46	37.50	50.06
T ₁₄ NRCOG-W-1	23.13	42.10	52.96
T ₁₅ NRCOG-W-2	21.80	34.77	53.16
T ₁₆ NO-355	19.93	44.11	52.83
T ₁₇ PUNJAB WHITE	21.66	41.10	54.44
T ₁₈ RO-597	19.46	43.43	51.06
T ₁₉ ARKA NIKETAN	17.13	34.33	44.30
SEm±	1.034	0.778	0.868
CD at 5%	2.967	2.233	2.491

At 30 day stage, significantly maximum plant height was recorded in the cultivar PRO-6 (23.33 cm) followed by LINE-355 (23.13cm) and NRCOG-W-1 (23.13 cm), whereas, the minimum plant height was

recorded in the cultivars Arka nikan (17.13cm) and SEL-383 (18.13cm). At 60 day stage, maximum plant height was noted in cultivar PRO-6 (50.99 cm), followed by SEL-402 (50.55 cm), RO-595 (47.44 cm) and SEL-383 (44.60 cm), while minimum plant height was noted in cultivar Agri found light red (30.66 cm) followed by Arka nikan (34.33 cm). At 90 day stage, significantly higher plant height was noted in the cultivar PRO-6 (60.76 cm) and SEL-402 (57.32 cm). While, the lowest plant height was recorded in the Agri found light red (38.78 cm) followed by Arka nikan (44.30 cm).

4.2 Number of leaves per plant

The data pertaining to number of leaves per plant presented in a table 4.2 indicate that number of leaves continued to increase at all the stage of plant growth. Significant difference among the cultivars was recorded at 30 and 90 days stage of plant growth after transplanting, whereas, nonsignificant differences were recorded at 60 day stage. At 30 day stage, the maximum number of leaves per plant was recorded in cultivar L-28 (4.46) and minimum was noted in Arka nikan (2.86). At 60 day stage, maximum number of leaves was counted in cultivar PRO-6 (6.10), whereas lowest number of leaves was recorded in cultivar Agri found light red (4.44). At 90 day stage, significant differences in number of leaves were among the cultivars. The cultivar PRO-6 (8.44) recorded the maximum number of leaves being significantly superior to Agri found light red (6.44) and was found to be at par with all other cultivars. The cultivars Agri found light red recorded the minimum number of leaves (6.44) at 90 day growth stage.

**Table-4.2 Number of Leaves/Plant in different cultivars of onion
(at 30, 60 and 90 DAT)**

Treatments	Number of Leaves/Plant		
	30 DAT	60 DAT	90 DAT
T ₁ AGRIFOUND WHITE	4.40	5.66	8.33
T ₂ LINE-355	4.06	5.88	7.77
T ₃ RO-595	4.06	5.66	7.22
T ₄ AFLR	3.86	4.44	6.44
T ₅ PRO- 6	4.26	6.10	8.44
T ₆ SEL-383	4.00	5.82	7.44
T ₇ SEL-402	4.33	5.75	7.22
T ₈ JNDWO-207	4.33	5.99	7.99
T ₉ PKV Sel WHITE	4.00	5.21	7.22
T ₁₀ RHR-0-S1	3.86	5.77	7.77
T ₁₁ B-780-5-2-2	4.00	5.99	6.99
T ₁₂ L-28	4.46	5.21	7.55
T ₁₃ B-780-5-3-1	3.06	5.11	7.22
T ₁₄ NRCOG-W-1	4.26	5.88	7.77
T ₁₅ NRCOG-W-2	4.26	5.33	7.89
T ₁₆ NO-355	3.73	4.99	8.44
T ₁₇ PUNJAB WHITE	3.86	5.22	8.10
T ₁₈ RO-597	3.66	5.55	7.55
T ₁₉ ARKA NIKETAN	2.86	5.33	6.77
SEm±	0.193	0.377	0.324
CD at 5%	0.556	1.083	0.930

fig.3 plant height (cm) in different cultivars of onion (at 30, 60 and 90 DAT)

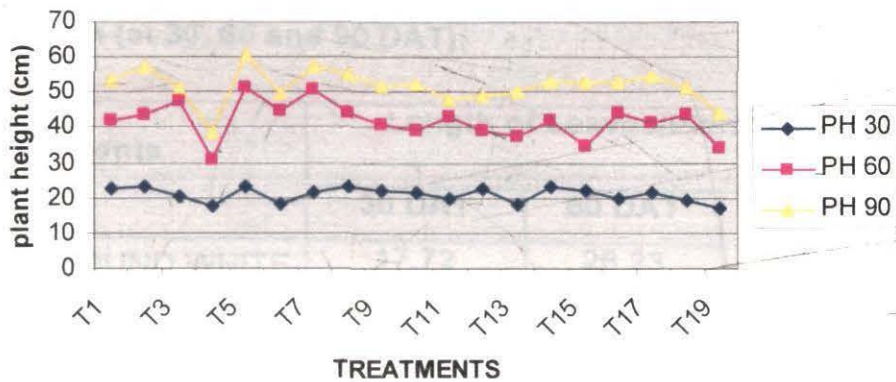
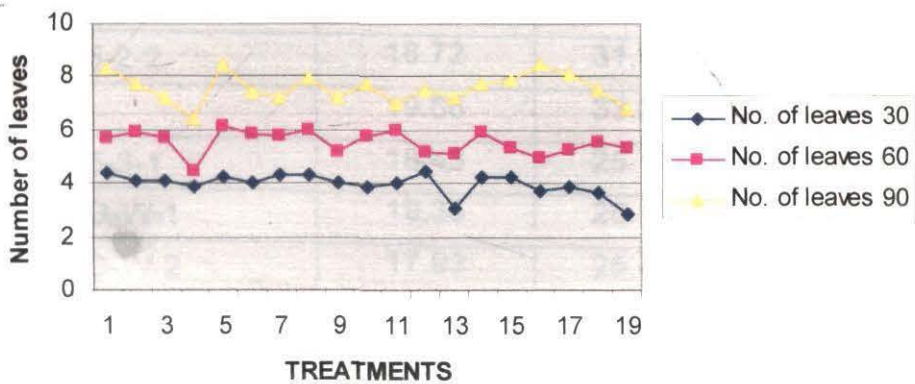


fig. 4 Number of leaves in different cultivars of onion (at 30, 60 and 90 (DAT))



4.3 Length of leaves per plant (cm)

Data regarding length of leaves per plant revealed that a linear increase up to 90 day stage as may be seen from table 4.3 Significant marked differences were obtained in relation to the length of

Table- 4.3 Length of Leaves/Plant (cm) in different cultivars of Onion (at 30, 60 and 90 DAT)

Treatments		Length of Leaves/Plant (cm)		
		30 DAT	60 DAT	90 DAT
T ₁	AGRIFOUND WHITE	17.72	28.23	37.03
T ₂	LINE-355	20.28	31.08	40.26
T ₃	RO-595	20.12	32.74	40.42
T ₄	AFLR	19.18	24.31	29.06
T ₅	PRO- 6	18.59	30.47	38.87
T ₆	SEL-383	18.03	32.69	40.97
T ₇	SEL-402	19.65	31.48	38.02
T ₈	JNDWO-207	19.02	26.98	39.19
T ₉	PKV Sel WHITE	20.09	32.48	39.31
T ₁₀	RHR-0-S1	19.23	26.03	36.58
T ₁₁	B-780-5-2-2	18.72	31.96	40.29
T ₁₂	L-28	19.66	33.21	41.92
T ₁₃	B-780-5-3-1	18.43	25.19	32.53
T ₁₄	NRCOG-W-1	19.36	26.16	36.42
T ₁₅	NRCOG-W-2	17.93	25.46	35.25
T ₁₆	NO-355	18.08	25.09	37.23
T ₁₇	PUNJAB WHITE	20.15	25.06	34.23
T ₁₈	RO-597	19.07	27.23	36.15
T ₁₉	ARKA NIKETAN	19.50	25.27	28.99
SEm±		0.397	0.696	0.591
CD at 5%		1.141	1.997	1.696

leaves at all the stage of plant growth. At 30 day stage significantly highest length of leaves was recorded in cultivar LINE-355 (20.28 cm), followed by the cultivar Punjab white (20.15 cm) The least length of leaves was found in cultivar Agri found white (17.72 cm). At 60 day stage, maximum length of leaves was recorded in cultivar L-28 (33.21 cm), followed by RO-595 (32.74 cm), whereas, the minimum length of leaves was recorded in cultivar Agri found light red (24.31 cm), followed by Punjab white (25.06 cm). At 90 day stage, cultivar L-28 (41.92 cm), had the maximum length of leaves being significantly superior to cultivar Arka nicketan (28.99 cm) and Agri found light red (29.06). The minimum length of leaves was recorded in Arka nicketan (28.99 cm).

4.4 Bolting percentage

The data shown in Table 4 revealed that the maximum bolting percentage was recorded in the cultivar L-28 (1.55%) and it was found significantly superior over other cultivars. Where as minimum bolting percentage was observed in cultivar B-780-5-3-1 (0%) and Arka nicketan (0%)

Table- 4.4 Bolting Percentage in different cultivars of onion.

Treatments		Bolting Percentage
T ₁	AGRIFOUND WHITE	1.33
T ₂	LINE-355	0.88
T ₃	RO-595	0.99
T ₄	AFLR	0.88
T ₅	PRO- 6	1.33
T ₆	SEL-383	1.11
T ₇	SEL-402	0.99
T ₈	JNDWO-207	0.77
T ₉	PKV Sel WHITE	1.44
T ₁₀	RHR-0-S1	0.77
T ₁₁	B-780-5-2-2	0.77
T ₁₂	L-28	1.55
T ₁₃	B-780-5-3-1	0.00
T ₁₄	NRCOG-W-1	1.44
T ₁₅	NRCOG-W-2	1.22
T ₁₆	NO-355	1.10
T ₁₇	PUNJAB WHITE	0.88
T ₁₈	RO-597	0.99
T ₁₉	ARKA NIKETAN	0.00

SEm± 0.156

CD at 5% 0.448

4.5 Maturity period

Significant variations were recorded on maturity days within cultivars. Data shown table 4.5 the maximum number of days was recorded in cultivar PRO-6 (145 days) and minimum number of days was recorded in cultivars RO-595, SEL-383, SEL-402, PKV SEL WHITE, RHR-0-S1, B-780-5-2-2 and L-28 (135 days).

Table- 4.5 Maturity Period in different cultivars of onion. (No. of days required for maturity)

Treatments		No. of days required for maturity
T ₁	AGRIFOUND WHITE	140
T ₂	LINE-355	140
T ₃	RO-595	135
T ₄	AFLR	138
T ₅	PRO- 6	145
T ₆	SEL-383	135
T ₇	SEL-402	135
T ₈	JNDWO-207	140
T ₉	PKV Sel WHITE	135
T ₁₀	RHR-0-S1	135
T ₁₁	B-780-5-2-2	135
T ₁₂	L-28	135
T ₁₃	B-780-5-3-1	138
T ₁₄	NRCOG-W-1	138
T ₁₅	NRCOG-W-2	140
T ₁₆	NO-355	140
T ₁₇	PUNJAB WHITE	138
T ₁₈	RO-597	140
T ₁₉	ARKA NIKETAN	140
SEm±		0.241
CD at 5%		0.693

Fig. 5 Length of leaves in different cultivars of onion (at 30, 60 and 90 DAT)

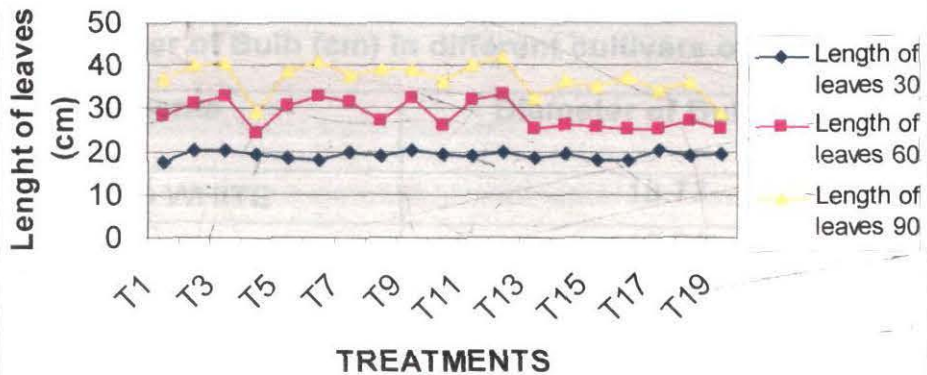
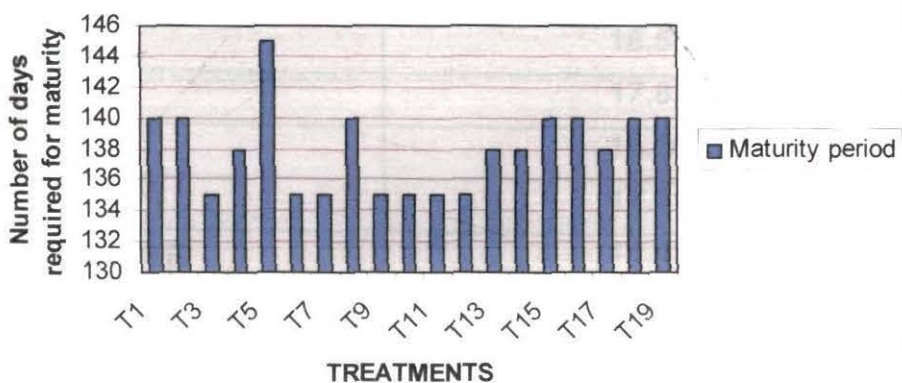


fig. 6 Maturity period (No. of days required for maturity)



B. PRODUCTIVITY PARAMETERS

4.6 Diameter of bulb (cm)

Significant variations amongst the cultivars were also noted with regard to bulb diameter. Table 4.6 the significantly maximum bulb diameter was recorded in the cultivar LINE-355 (19.01cm).

Table- 4.6 Diameter of Bulb (cm) in different cultivars of onion.

Treatments		Diameter of Bulb (cm)
T ₁	AGRIFOUND WHITE	18.73
T ₂	LINE-355	19.01
T ₃	RO-595	18.90
T ₄	AFLR	18.82
T ₅	PRO- 6	18.88
T ₆	SEL-383	18.21
T ₇	SEL-402	18.98
T ₈	JNDWO-207	18.24
T ₉	PKV Sel WHITE	18.12
T ₁₀	RHR-0-S1	17.70
T ₁₁	B-780-5-2-2	17.74
T ₁₂	L-28	17.84
T ₁₃	B-780-5-3-1	18.58
T ₁₄	NRCOG-W-1	17.85
T ₁₅	NRCOG-W-2	18.56
T ₁₆	NO-355	17.59
T ₁₇	PUNJAB WHITE	18.43
T ₁₈	RO-597	17.28
T ₁₉	ARKA NIKETAN	16.69

SEm± 0.182

CD at 5% 0.524

followed by SEL-402 (18.98 cm) and RO-595 (18.90 cm), while, minimum bulb diameter was recorded in the cultivar Arka nikan (16.79 cm).

4.7 Number of marketable bulb per plot

The number of marketable bulbs per plot varied significantly amongst the cultivars (Table 4.7). The higher number of marketable bulb per plot was found in the cultivars, LINE-355 (293), NRCOG-W-1 (291.33), NRCOG-W-2 (291.33) respectively. The lowest number of marketable bulbs was found in cultivars SEL-402 (258.33) followed by RHR-O-S1 (260.66).

4.8 Number of unmarketable bulb per plot

Significantly maximum number of unmarketable bulbs per plot was noted in the cultivars RHR-O-S1 (11.00), Agri found white (9.00), followed by LINE-355 (5.66) The number of unmarketable bulbs per plot was found less in L-28 (1.33), RO-597 (2.33), Agri found light red (2.66) respectively.

4.9 Number of split bulb per plot

Significantly variations existed among cultivars with regard to number of split bulb per plot (Table 4.7). The higher number of split bulbs per plot was noted in cultivar Agrifound white (3.66), followed by PRO-6 (3.00) and Punjab white (3.00) whereas the lowest number of split bulbs per plot was recorded in cultivar Agri found light red (0.00), SEL-402 (0.00), JNDWO-207 (0.00), PKV SEL WHITE (0.00), B-780-5-2-2 (0.0), L-28 (0.00) respectively.

Table-4.7 Number of marketable, unmarketable and split Bulb/Plot in different cultivars of onion.

Treatments		No. of Marketable Bulb	No. of Unmarketable Bulb	No. of Split Bulb
T ₁	AGRIFOUND WHITE	282.66	9.00	3.66
T ₂	LINE-355	293.00	5.66	2.00
T ₃	RO-595	284.66	5.00	1.33
T ₄	AFLR	266.33	2.66	0.00
T ₅	PRO- 6	285.00	5.33	3.00
T ₆	SEL-383	270.33	5.33	0.33
T ₇	SEL-402	258.33	5.00	0.00
T ₈	JNDWO-207	261.00	5.33	0.00
T ₉	PKV Sel WHITE	266.66	4.00	0.00
T ₁₀	RHR-0-S1	260.66	11.00	0.66
T ₁₁	B-780-5-2-2	283.00	3.66	0.00
T ₁₂	L-28	279.66	1.33	0.00
T ₁₃	B-780-5-3-1	266.66	3.00	0.66
T ₁₄	NRCOG-W-1	291.33	3.66	2.00
T ₁₅	NRCOG-W-2	291.33	4.00	0.66
T ₁₆	NO-355	281.33	4.00	1.66
T ₁₇	PUNJAB WHITE	284.00	3.00	3.00
T ₁₈	RO-597	284.33	2.33	1.66
T ₁₉	ARKA NIKETAN	279.33	4.66	0.33

SEm± 3.51 0.496 0.450

CD at 5% 10.09 1.425 1.291

4.10 Average weight of bulb per plot (gm)

Highly significant variations were recorded amongst cultivars with regards to average weight of bulbs per plot (Table 4.8). Significantly highest weight was recorded in the cultivar LINE-355 (74gm), followed by L-28 (72.33 gm) whereas, the lowest average weight of bulbs was noted in the cultivar JNDWO-207 (53.66gm), followed by Agri found light red (56gm).

Table-4.8 Weight of marketable, unmarketable, split Bulb (Kg/plot) and average weight of bulb (gm) in onion cultivars.

Treatments		Weight of Bulb (kg/plot)			
		Average weight of Bulb(gm)	Weight of Marketable Bulb	Weight of Unmarketable Bulb	Weight of Split Bulb
T ₁	AGRIFOUND WHITE	65.00	14.16	0.450	0.180
T ₂	LINE-355	74.00	17.23	0.203	0.133
T ₃	RO-595	62.33	13.96	0.366	0.066
T ₄	AFLR	56.00	7.73	0.266	0.000
T ₅	PRO- 6	69.66	8.50	0.333	0.150
T ₆	SEL-383	64.33	7.41	0.233	0.021
T ₇	SEL-402	62.33	8.83	0.333	0.000
T ₈	JNDWO-207	53.66	7.13	0.341	0.000
T ₉	PKV Sel WHITE	71.00	7.33	0.200	0.000
T ₁₀	RHR-0-S1	64.40	12.83	0.466	0.041
T ₁₁	B-780-5-2-2	61.00	13.76	0.140	0.000
T ₁₂	L-28	72.33	15.50	0.070	0.000
T ₁₃	B-780-5-3-1	63.00	9.70	0.103	0.033
T ₁₄	NRCOG-W-1	63.33	12.83	0.266	0.091
T ₁₅	NRCOG-W-2	63.46	15.00	0.213	0.033
T ₁₆	NO-355	67.33	13.90	0.233	0.066
T ₁₇	PUNJAB WHITE	70.33	12.41	0.166	0.125
T ₁₈	RO-597	66.66	14.00	0.116	0.083
T ₁₉	ARKA NIKETAN	69.00	12.16	0.183	0.050
SEm±		3.363	0.309	0.019	0.0146
CD at 5%		9.646	0.886	0.055	0.0419

4.11 Weight of marketable bulb (kg/plot)

Significant variations were recorded amongst cultivars with regard to weight of marketable bulbs per plot. (Table 4.8). Highest yield was recorded in the cultivar LINE-355 (17.23kg), followed by L-28

(15.50kg), whereas, the lowest yield was noted in the cultivar JNDWO-207 (7.13kg) followed by PKV SEL WHITE (7.33kg).

4.12 Weight of unmarketable bulb (kg/plot)

The yield of unmarketable bulbs in kg per plot also varied significantly among the cultivars (Table 4.8). The higher yield of unmarketable bulbs were obtained from the cultivar RHR-0-S1 (0.466kg), followed by Agrifound white (0.450kg). The significantly lowest yield of unmarketable bulbs was noted in cultivars L-28 (0.070kg) and B -780-S-3-1(0.103kg).

4.13 Weight of split bulb (kg/plot)

The significant difference between the cultivars, for higher yield of split bulbs were obtained from the cultivars Agrifound white (0.180kg) and PRO-6 (0.150kg) (Table 4.8). The lowest yield of split bulbs was found in cultivars Agri found light red (0.00), SEL-402 (0.00), JNDWO-207 (0.00), PKV SEL WHITE (0.00), B-780-5-2-2 (0.0), L-28 (0.00).

4.14 Marketable bulb yield (q/ha)

Highly significant variations were recorded amongst cultivars with regard to yield of marketable bulbs per hectare (Table 4.9). Significantly higher yield was found in the cultivar LINE-355 (382.95q) followed by L-28 (344.44q) and NRCOG-W-2 (333.33q). The lowest yield was obtained from JNDWO-207 (158.51q) followed by PKV SEL WHITE (162.95q).

Table-4.9 Yield of marketable, unmarketable, split Bulb and total yield of bulb (q/ha) in different cultivars of onion.

	Treatments	Yield of Bulb(q/ha)			
		Total Bulb Yield	Marketable Bulb Yield	Unmarketable Bulb Yield	Split Bulb Yield
T ₁	AGRIFOUND WHITE	328.82	314.81	9.99	4.01
T ₂	LINE-355	389.69	382.95	4.51	2.11
T ₃	RO-595	319.98	310.36	8.14	1.48
T ₄	AFLR	177.39	171.84	5.86	0.00
T ₅	PRO- 6	199.61	188.88	7.40	3.33
T ₆	SEL-383	170.47	164.81	5.18	0.47
T ₇	SEL-402	203.69	196.29	7.40	0.00
T ₈	JNDWO-207	166.10	158.51	7.58	0.00
T ₉	PKV Sel WHITE	167.39	162.95	4.44	0.00
T ₁₀	RHR-0-S1	330.54	285.17	11.03	0.92
T ₁₁	B-780-5-2-2	309.03	305.92	3.10	0.00
T ₁₂	L-28	345.98	344.44	1.54	0.00
T ₁₃	B-780-5-3-1	218.51	215.55	2.22	0.73
T ₁₄	NRCOG-W-1	293.13	285.17	5.92	2.03
T ₁₅	NRCOG-W-2	338.80	333.33	4.73	0.73
T ₁₆	NO-355	315.54	308.88	5.18	1.48
T ₁₇	PUNJAB WHITE	282.39	275.92	3.70	2.77
T ₁₈	RO-597	315.55	311.11	2.59	1.85
T ₁₉	ARKA NIKETAN	274.98	270.36	4.06	0.55
SEm±		9.354	6.867	0.401	0.245
CD at 5%		26.830	19.967	1.151	0.703

fig. 7 Bulb diameter (cm) in different cultivars of onion

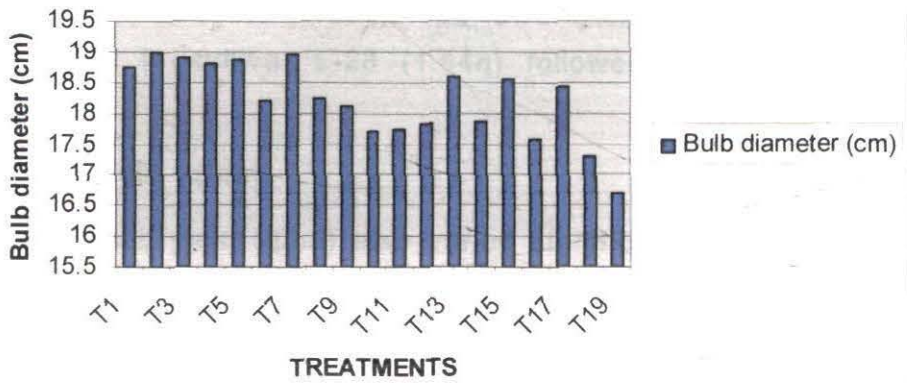
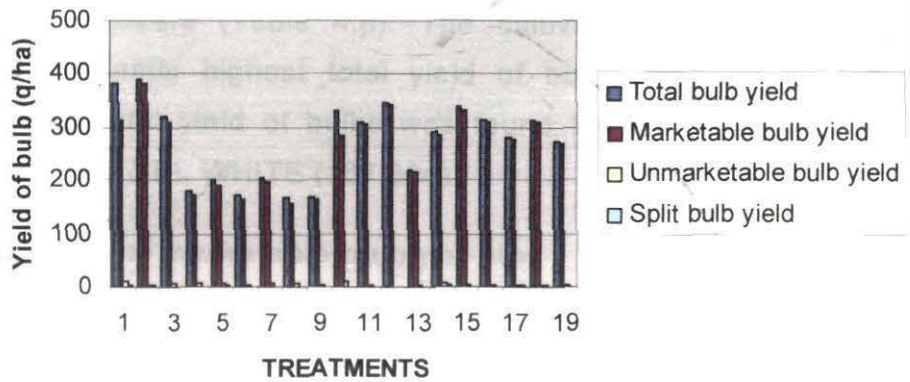


fig.8 Yield of marketable, unmarketable, split and total bulb yield (q/ha) in onion cultivars



4.15 Unmarketable bulb yield (q/ha)

The yield of unmarketable bulbs in quintals per hectare also varied significantly amongst the cultivars (Table 4.9). The higher yield of unmarketable bulbs were obtained from the cultivar RHR-0-S1 (11.03q) followed by Agrifound white (9.99q). The lower yield of unmarketable bulbs was noted in cultivar L-28 (1.54q) followed by B-780-5-3-1 (2.22q).

4.16 Split bulb yield (q/ha)

The split bulb yield (q/ha) also varied significantly amongst the cultivars (Table 4.9) maximum split bulb yield was recorded with Agrifound white (4.01q) followed by PRO-6 (3.33q). Whereas, the lowest yield was recorded in Agri found light red (0.00), SEL-402 (0.00), JNDWO-207 (0.00), PKV SEL WHITE (0.00), B-780-5-2-2 (0.0), L-28 (0.00).

4.17 Total yield of bulb (q/ha)

The total yield (yield of marketable bulbs, unmarketable bulbs and split bulbs) expressed in quintals per hectare, varied significantly amongst the cultivars (Table 4.p). The cultivar LINE-35 (389.69q) recorded significantly highest total yield of bulbs followed by L-28 (345.98q). The total yield of bulbs was found lowest in JNDWO-207 (166.10) and PKV SEL WHITE (167.39q).

4.18 Percentage of marketable bulb per plot

The percentage of marketable bulbs per plot varied significantly amongst the cultivars (Table 4.10). The higher percentage of marketable bulbs per plot was found in the cultivar LINE-35 (97.66%) followed by NRCOG-W-1 (97.11%) and NRCOG-W-2 (97.11%). The lowest percentage of marketable bulbs was found in cultivar SEL-402 (86.10%) followed by RHR-0-S1 (86.88%).

Table-4.10 Percentage of marketable, unmarketable and split Bulb/plot in different cultivars of onion.

	Treatments	Percentage of Bulb/plot		
		Percentage of Marketable Bulb	Percentage of Unmarketable Bulb	Percentage of Split Bulb
T ₁	AGRIFOUND WHITE	94.21	2.99	1.22
T ₂	LINE-355	97.66	1.88	0.66
T ₃	RO-595	94.88	1.66	0.44
T ₄	AFLR	88.77	0.88	0.00
T ₅	PRO- 6	94.99	1.77	0.99
T ₆	SEL-383	90.11	1.77	0.11
T ₇	SEL-402	86.10	1.66	0.00
T ₈	JNDWO-207	86.99	1.77	0.00
T ₉	PKV Sel WHITE	88.88	1.33	0.00
T ₁₀	RHR-0-S1	86.88	2.99	0.22
T ₁₁	B-780-5-2-2	94.33	1.22	0.00
T ₁₂	L-28	93.22	0.44	0.00
T ₁₃	B-780-5-3-1	88.88	0.99	0.22
T ₁₄	NRCOG-W-1	97.11	1.22	0.66
T ₁₅	NRCOG-W-2	97.10	1.33	0.22
T ₁₆	NO-355	93.66	1.33	0.55
T ₁₇	PUNJAB WHITE	94.66	1.00	0.99
T ₁₈	RO-597	94.77	0.77	0.55
T ₁₉	ARKA NIKETAN	93.10	1.55	0.11

SEm± 1.172 0.244 0.149

CD at 5% 3.364 0.702 0.429

4.19 Percentage of unmarketable bulb per plot

Significantly maximum percentage of unmarketable bulbs per plot was noted in the cultivar RHR-0-S1 (3.66%) followed by Agrifound white (2.99%) (Table 4.10). The percentage of unmarketable bulbs per plot was found less in L-28 (0.44%), RO-597(0.77%) and Agri found light red (0.88%) respectively.

4.20 Percentage of split bulb per plot

Significantly variations existed amongst cultivars with regard to percentage of split bulbs per plot (Table 4.10). The higher percentage of split bulbs per plot was noted in cultivar Agrifound white (1.22%) followed by PRO-6 (0.99%) and Punjab white (0.99%). Whereas the lowest percentage of split bulbs per plot was recorded in cultivar Agri found light red (0.00), SEL-402 (0.00), JNDWO-207 (0.00), PKV SEL WHITE (0.00), B-780-5-2-2 (0.0), L-28 (0.00).

C. QUALITATIVE CHARACTERISTICS

4.21 Total soluble solids percentage in degree brix

Average percentage of total soluble solids in bulb juice was determined by Hand Refractometer (Table 4.11). The cultivars differed significantly with regard to TSS content in bulb. Higher TSS was found in the cultivar B-780-5-2-2 (13.76), higher TSS also noted in cultivar B-780-5-3-1 (13.34), while the lowest TSS recorded in Punjab white (11.38) followed by LINE-355 (11.53).

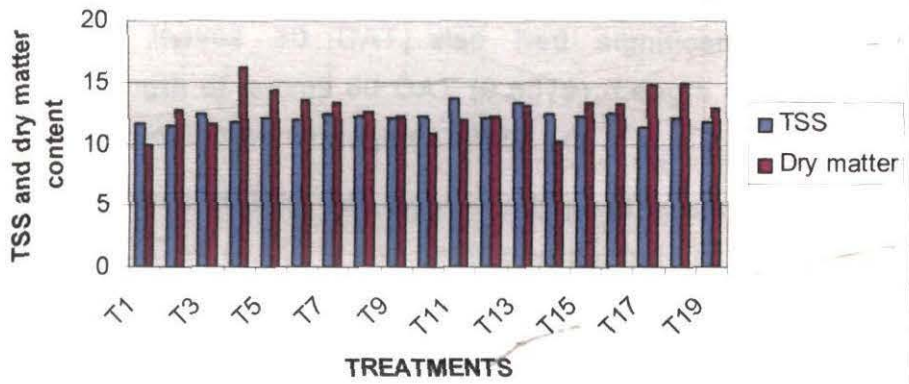
4.22 Dry matter content per 100 gm bulbs

The significant difference recorded between cultivar (Table 4.8). The higher dry matter content per 100 gm bulbs was recorded in cultivar Agri found light red (16.26gm), whereas the lowest dry matter content of bulb was noted in the cultivar Agrifound white (9.96gm), NRCOG-W-1 (10.24gm) and RHR-0-S1 (10.83gm).

Table-4.11 TSS and Dry Matter Content in different cultivars of onion.

Treatments		Total Soluble Solids (^o Brix)	Dry matter content (%) of 100 gm Bulb
T ₁	AGRIFOUND WHITE	11.62	9.96
T ₂	LINE-355	11.53	12.70
T ₃	RO-595	12.40	11.72
T ₄	AFLR	11.82	16.26
T ₅	PRO- 6	12.18	14.40
T ₆	SEL-383	12.00	13.50
T ₇	SEL-402	12.43	13.33
T ₈	JNDWO-207	12.27	12.60
T ₉	PKV Sel WHITE	12.10	12.23
T ₁₀	RHR-0-S1	12.26	10.83
T ₁₁	B-780-5-2-2	13.76	12.03
T ₁₂	L-28	12.07	12.33
T ₁₃	B-780-5-3-1	13.34	13.06
T ₁₄	NRCOG-W-1	12.47	10.24
T ₁₅	NRCOG-W-2	12.26	13.43
T ₁₆	NO-355	12.51	13.23
T ₁₇	PUNJAB WHITE	11.38	14.83
T ₁₈	RO-597	12.09	14.93
T ₁₉	ARKA NIKETAN	11.77	12.93
SEm±		0.181	0.205
CD at 5%		0.521	0.590

fig. 9 TSS and dry matter content in different cultivars of onion



Correlation studies:-

The correlation coefficients of yield with various characters were calculated and significant positive correlations were recorded (Table 4.12). Plant height 30 DAT had significant correlation with plant height 90 DAT (0.5879) and number of leaves 30 DAT (0.5706). Plant height 60 DAT significantly and positively correlated with plant height 90 DAT (0.7008), length of leaves 60 DAT (0.6484) and length of leaves 90 DAT (0.6643).

Plant height 90 DAT significantly positive correlation with number of leaves 90 DAT (0.5546) and length of leaves 90 DAT (0.4835).

Number of leaves 30 DAT also had significantly positive correlation with length of leaves 60 DAT (0.5579). Length of leaves 90 DAT (0.5292) and bolting percentage (0.6835).

Length of leaves 60 DAT had significantly positive correlation with length of leaves 90 DAT (0.9011) and bolting percentage (0.5581).

Length of leaves 90 DAT also had significantly positive correlation with bolting percentage (0.5457).

Number of marketable bulb per plot had significantly positive correlation with bulb yield (q/ha) (0.5617) and weight of marketable bulb (kg/plot) (0.6126).

Weight of marketable bulb (kg/plot) had significantly positive correlation with number of marketable bulb per plot (0.6126).

This indicates that the weight of marketable bulb per plot increases with number of marketable bulb per plot.

Table-4 12 Correlation Coefficient of yield and its attributing characters of onion

S NO.	Character	PH 30	PH 60	PH 90	Leaves 30	Leaves 60	Leaves 90	L length 30	L length 60	L.length 90	Bolting %	DM of Bulb	MB/Plot	AWB (gm)	BY(q/ha)	TSS	DM	WMB/Plot
1	PH 30	1 0000	0 3344	0 5879*	0 5706*	0 1531	0 3945	0 172*	0 4033	0 4479	0 4401	0 1169	0 1333	0 4233	0 1895	-0 0498	-0 3489	0 1939
2	PH 60		1 0000	0 7008**	0 3790	0 4345	0 3181	0 0354	0 6484**	0 6643**	0 2996	-0 0208	0 0509	0 0540	-0 0780	0 3246	-0 1354	-0 0811
3	PH 90			1 0000	0 3816	0 3479	0 5546*	0 0096	0 4364	0 4835*	0 2820	0 0516	0 0999	0 1841	0 1286	0 1397	-0 2229	0 1088
4	Leaves 30				1 0000	0 1190	0 2942	-0 0202	0 5579*	0 5292*	0 6835**	0 2310	0 0919	-0 0304	0 0407	0 0330	-0 2065	0 0470
5	Leaves 60					1 0000	0 0258	-0 1468	0 2787	0 2836	0 0733	-0 0065	0 1302	-0 0192	0 0203	0 1132	-0 2631	0 0076
6	Leaves 90						1 0000	-0 1249	0 1070	0 2457	0 3080	0 0419	0 1424	0 2355	0 1920	-0 2487	-0 1658	0 1892
7	L length 30							1 0000	0 1556	0 0603	-0 0276	-0 2477	-0 0077	0 0416	0 0802	-0 0422	0 0618	0 0849
8	L length 60								1 0000	0 9011**	0 5581*	0 1244	0 1006	0 1044	0 0815	0 1608	-0 2697	0 0807
9	L length 90									1 0000	0 5457*	0 1105	0 0937	0 0848	0 1438	0 1334	-0 3568	0 1469
10	Bolting %										1 0000	0 0953	0 2709	0 1662	0 0762	-0 1463	-0 1469	0 0871
11	DM of Bulb											1 0000	0 0962	-0 1671	-0 1920	-0 2910	0 0745	-0 1961
12	MB/Plot												1 0000	0 0389	0 5617*	-0 2654	-0 0670	0 6126**
13	AWB (gm)													1 0000	0 2688	-0 0871	-0 1318	0 2222
14	BY (q/ha)														1 0000	-0 1625	-0 3557	1 0000
15	TSS															1 0000	-0 1074	-0 1645
16	DM																1 0000	-0 3114
17	WMB/Plot																	1 0000

*Significance at 5 % level

**Significance at 1 % level



CHAPTER-V

DISCUSSION

CHAPTER-V

DISCUSSION

The present investigation entitled "Performance study of different cultivars of Onion (*Allium cepa* L.) Under Jabalpur condition" was carried out at the Vegetable Research Farm, JNKVV, Jabalpur (M.P.) The discussion of the present investigation has been classified under the following heads:-

- 1 Morphological variations
- 2 Productivity variations
3. Qualitative variations
- 4 Correlation studies

1. Morphological variations:-

The result of the present investigation clearly exhibited that plant height (cm), number of leaves, length of leaves (cm), bolting percentage and maturity period were influenced significantly.

PRO-6 had significantly maximum plant height at 30 DAT, 60 DAT and 90 DAT, whereas the minimum plant height at 30 DAT was recorded under arka nikan and plant height at 60 DAT and 90 DAT were in agrifound light red. The significant variations amongst different cultivars may be due to their genetic characters. Similar results were reported by Khan (1989), Mohanty (2002), Mohanty *et al.* (2002), Sarkar and Jain (2002) and Qureshi *et al.* (2004)

The significant differences with regard to number of leaves were exhibited within the cultivars. Higher number of leaves at 30 DAT was recorded in L-28 and number of leaves per plant at 60 DAT recorded under PRO-6 whereas minimum number of leaves per plant at 30 DAT was noted under arka nikan and minimum number of leaves per plant at 60 and 90 DAT were low under agrifound light red. Number of leaves per plant at 90 DAT was

highest in PRO-6 at par with NO-355. Similar results were reported by Khan (1989), Mohanty and Prusti (2001), Mohanty (2002) and Cheema *et al.* (2003).

Length of leaves (cm) was significantly exhibited within the cultivars. Higher length of leaves at 30 DAT was recorded in the cultivar LINE-355 and minimum was in agrifound white, whereas maximum length of leaves at 60 DAT and 90 DAT was recorded in L-28. Minimum length of leaves at 60 DAT was noted in agrifound light red and 90 DAT was in arka nikan. Similar findings were reported by Khan (1989) and Cheema *et al.* (2003) in onion.

This significant increase in the length of leaves may be due to increase in photosynthetic potentiality of the cultivars.

Maximum bolting percentage of onion was recorded in L-28, whereas minimum bolting percentage (0%) was recorded in B-780-5-2-2 and arka nikan. Similar results were reported by Seetohul (2002) in Red Bombay.

Highest number of days required for maturity was noted under PRO-6, whereas minimum was recorded under Ro-595, Sel-383, Sel-402, Pkv Sel White, RHR-0-S1, B-780-5-2-2 and L-28 (135 days). (Shah *et al.*, 2002 and Khandagale *et al.*, 2005). The earliness in maturity may be attributed due to increased photoperiod, high temperature and dry atmosphere which are favourable for early maturity of the bulb.

2. Productivity variations:-

Productivity being a complex character is determined by many number of genes and thus largely influenced by the environment. However, cultivars differences always play an important role in the productivity. The cultivars under study also showed significant response for productivity. Significant maximum average weight of bulb (74gm) was recorded in cultivar LINE-355 and minimum under cultivar JNDWO-207. Similar results were reported by Mohanty *et al.* (2002) Singh and Brar (2002), Savon and Ayala (1986)

Significantly higher total bulb yield (389.69 q/ha) and marketable bulb yield (382.95 q/ha) were recorded under LINE-355, whereas minimum were noted under JNDWO-207. Similar findings were also confirmed by Bhagchandani *et al.* (1980), Chadha and Sidhu (1986), Balanos (1989), Katwale and Saraf (1991), Patil *et al.* (1991), Costa (2000), Mohanty (2001a), Seetohul (2002) and Kabura *et al.* (2008). Higher unmarketable bulb yield was recorded under RHR-0-S1 (11.03 q/ha) and minimum was under L-28 (1.54 q/ha), whereas maximum split bulb yield was noted in agrifound white (4.01 q/ha) and minimum split bulb yield was under agrifound light red, Sel-402, JNDWO-207, Pkv sel white, B-780-5-2-2 and L-28. This may be due to genetical character of individual cultivars. The maximum productivity was due to higher rate of photosynthetic ability. The early maturing cultivars gave poor yield which may be due to incomplete translocation of photosynthate from leaves to sink.

The maximum diameter of bulb was noted in cultivar LINE-355 (19.01 cm), whereas minimum was under arka niketan. Similar findings reported by Mohanty *et al.* (2002), Sarkar and Jain (2002) and Khandagale *et al.* (2005). This may be due to combination of most of the morphological characters. Moreover, the photosynthetic area and efficient translocation of food. The productivity in LINE-355 may also be due to an increase in the diameter of bulb.

3. Qualitative variations:-

Regarding quality aspects, individual cultivars had significant influence on TSS percentage and dry matter content of 100 gm bulb.

However, the maximum dry matter content of 100 gm onion bulb was noted in agrifound light red (16.69 gm) followed by RO-597 (14.93 gm). Similar result was also reported by Bhonde *et al.* (1992), Diaz (1994), Pramanick *et al.* (1999) and Singh *et al.* (2003). The minimum dry matter content of 100 gm onion bulb was recorded under agrifound white (9.96 gm).

The chemical analysis for Total Soluble Solids of the bulb also showed significant variation amongst cultivars. The maximum TSS ($^{\circ}$ Brix) was noted in B-780-5-2-2 (13.76) followed by NO-355 (12.51), where as minimum TSS ($^{\circ}$ Brix) was noted under Punjab white (11.38). This findings was also confirmed by Masthanareddy and Sulikeri (1998), Sarkar and Jain (2002) in arka nikan and Khandagale *et al.* (2005) in phule suwarna.

4. Correlation studies

Thus, the associationship in the present investigation, plant height at successive stage correlated positively and significantly with length of leaves at different stages indicating that with the increase in leaf length, the plant height is increased. Moreover, number of leaves per plant at 30 DAT was also correlated with leaf length at 60 and 90 DAT. Similar result were also reported by Thakur *et al* (1997), Mohanty (2001b) and Rahman *et al.* (2002).

Data presented in table number 12 indicating that weight of marketable bulb (kg/plot) was positively and significantly correlated with number of marketable bulb per plot indicating that increase in number of number of marketable bulb per plot with the increase weight of marketable bulb (kg/plot) Similar findings were also confirmed by Suthanthira Pandian and Muthukrishnan (1982).

Number of marketable bulb per plot was also positively and significantly correlated with Total bulb yield (q/ha). The results indicated that if number of marketable bulb per plot increases, Total bulb yield (q/ha) also increases.

CHAPTER-VI

SUMMARY, CONCLUSION
AND SUGGESTIONS FOR
FURTHER WORK

SUMMARY, CONCLUSIONS AND SUGGESTIONS FOR FURTHER WORK

The present investigation "Performance study of different cultivars of Onion (*Allium cepa* L.)" was carried out primarily under Jabalpur condition during Rabi season 2007-2008. The experiment was laid out in randomized block design with nineteen treatments and replicated three times. The treatments included nineteen cultivars viz Agrifound White, Line-355, Ro-595, Agri Found Light Red, Pro- 6, Sel-383, Sel-402, JNDWO-207, Pkv Sel White, RHR-0-S1, B-780-5-2-2, L-28, B-780-5-3-1, NRCOG-W-1, NRCOG-W-2, No-355, Punjab White, Ro-597 and Arka Niketan

The objective of the investigation was to study the morphological and growth parameter in relation to yield.

The salient features of the findings on different parameters recorded during the course of study are summarized as follows

- 1 Growth of the plant in cultivar PRO-6 was faster and maximum in all the stage of plant growth. Plant height (60.76cm) was noted significantly higher in PRO-6 as compared with all other cultivars. Height of the plant was not found to be significantly Correlated with yield per hectare. Maximum number of leaves was noted in the cultivar PRO-6 and NO.-355 (8.44) Followed by Agrifound white (8.33). The other cultivars showed nonsignificant difference for number of leaves. Higher length of leaves was recorded in the cultivar L-28 (41.92cm).
- 2 Maximum diameter of bulb recorded in the cultivar LINE-355 (19.01cm).
- 3 Plant height, number of leaves, length of leaves and diameter of bulb, correlated positively and significantly which ultimately gave higher production per hectare

- 4 LINE-355 cultivar also exhibited significant influence on number of marketable bulb per plot (393), bulb diameter (19.01cm) and yield of marketable bulb (382 95 q/ha) under Jabalpur condition.
- 5 Cultivar B-780-5-2-2 produced maximum TSS (13.76) and medium dry matter content (12.03 %)

Thus, it may be suggested that the cultivar have their own potential and played an important role for the production of onion bulb.

CONCLUSION:-

The cultivar exhibited considerable variation in the morphological and growth parameters and yield attributing characters.

It is suggested that in the present investigation, considerable variation exist in the morphological character and yield attributing parameters among the cultivars tested.

Cultivar LINE-355 gave highest total yield (389.69q/ha), and highest marketable bulb yields (382.95q/ha.), Hence it is suggested that this cultivar is suitable for kymore plateau and satpura hills condition.

Maximum TSS was recorded in cultivar B-780-5-2-2 (13.76), whereas highest dry matter content (%) of 100 gm bulb recorded with cultivar Agri found light red (16.26)

Marketable bulb yield per plot exhibited positive mutual relationship with the number of marketable bulb per plot and also positively associated with marketable bulb yield per plot in onion cultivars. So for improvement of yield, selection can be based on these characters

SUGGESTIONS FOR FUTURE RESEARCH WORK:

On the basis of the findings of present investigation the following studies are suggested for further work in future:

1. The experiment should be repeated to confirm the findings of the present investigation.
2. Divergent cultivars should be used in the breeding programme to get the better combinations of yield components which may ultimately give higher production of bulbs per unit area.
3. The cultivars included in the present investigation may also be tested during kharif season for their suitability under Jabalpur conditions.
4. The cultivars Line-355 may be tested under different agro climatic conditions of Madhya Pradesh.

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APPENDICES

APPENDICES

Appendix-1 Mean squares for different parameters at different intervals -

1. Plant height (cm) in different cultivars of onion

Sources of variation	d.f.	Intervals		
		30 DAT	60 DAT	90 DAT
Replications	2	1.0034	0.5327	3.1437
Treatments	18	12.0261**	80.2681**	69.7256**
Error	36	3.2124	1.8194	2.2628
Total	56			

2. Number of leaves per plant in different cultivars of onion

Sources of variation	d.f.	Intervals		
		30 DAT	60 DAT	90 DAT
Replications	2	0.0906	1.5394	0.7866
Treatments	18	0.5323**	0.5442**	0.9228**
Error	36	0.1127	0.4283	0.3154
Total	56			

3. Length of leaves (cm) in different cultivars of onion

Sources of variation	d.f.	Intervals		
		30 DAT	60 DAT	90 DAT
Replications	2	0.0901	0.6248	7.5646
Treatments	18	1.9503**	58.0064**	41.1712**
Error	36	0.4750	1.4552	1.0496
Total	56			

4. Bolting percentage, maturity period and diameter of bulb in different cultivars of onion

Sources of variation	d f	Bolting percentage	Number of days required for maturity	Diameter of bulb (cm)
Replications	2	0.1255	27 8421	0.4087
Treatments	18	0.5264**	22 6315**	1.3175**
Error	36	0.0732	0.1754	0.1003
Total	56			

5. Number of bulb per plot in different cultivars of onion

Source of variation	d f.	Number of bulb/plot		
		No of marketable bulb/plot	No. of unmarketable bulb/plot	No. of split bulb/plot
Replications	2	0.2017	1.0000	0.0526
Treatments	18	372.0916**	15 1442**	4.1871**
Error	36	37 1369	0 7407	0.6081
Total	56			

6. Weight of bulb (kg/plot) in different cultivars of onion

Source of variation	d.f	Weight of bulb (kg/plot)			
		Average weight of bulb (gm)	Weight of marketable bulb	Weight of unmarketable bulb	Weight of split bulb
Replications	2	13 9890	0.5067	0.0027	0 0002
Treatments	18	82.3156**	30 1822**	0 0374**	0 0097**
Error	36	33 9373	0.2866	0 0011	0 0006
Total	56				

7. Yield of bulb (q/ha) in different cultivars of onion

Source of variation	d.f.	Weight of bulb (q/ha)			
		Total bulb yield	marketable bulb yield	unmarketable bulb yield	split bulb yield
Replications	2	662.875	250.575	0.7334	0.0153
Treatments	18	15438.832**	14905.002**	19.7542**	4.5623**
Error	36	262.533	141.4948	0.4836	0.1802
Total	56				

8. Percentage of bulb/plot in different cultivars of onion

Source of variation	d.f.	Percentage of bulb/plot		
		Percentage of marketable bulb/plot	Percentage of unmarketable bulb/plot	Percentage of split bulb/plot
Replications	2	0.0360	0.3551	0.0062
Treatments	18	41.3505**	1.2806	0.4624
Error	36	4.1273	0.1799	0.0673
Total	56			

9. T.S.S. percentage in degree brix and Dry matter content of 100 gm bulbs in different cultivars of onion

Source of variation	d.f.	TSS (^o Brix)	Dry matter content
Replications	2	0.1193	0.0407
Treatments	18	1.7459**	7.5698**
Error	36	0.0990	0.1271
Total	56		

*Significant at 5 % level

**Significant at 1 % level

VITA

VITA

The author of this thesis, Mr. Avdhesh Kumar Patel S/O Shri I.P. Patel and smt Anusuiya Rani was born on the 1st March, 1984 at village-Kunwarpur, Post-Padarisahajpur, Teh-Patera, district-Damoh in Madhya Pradesh. He passed his Higher Secondary School Examination from Govt. Multi H S School Hatta, Damoh, M.P with 84.5 % in the year 2001.

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For the partial fulfillment of the master's degree programme he was allotted a research problem on "Performance study of different cultivars of Onion (*Allium cepa* L.) Under Jabalpur condition." which was successfully conducted by him and being submitted in the form of this thesis.