Evaluation of Onion (*Allium cepa* L.) genotypes for yieldand its attributestraits under Bundelkhand region of Uttar Pradesh, India

Abstract

The present investigation was conducted at the Vegetable Research farm at the College of Horticulture, Banda University of Agriculture and Technology, Banda, Uttar Pradesh, during the *Rabi* season 2019-2020. The experiment was conducted in randomized block design with 20 genotypes of onion. The result obtained showed that the NHRDF Red-4 is performing the best among all genotypes in characters*viz.*, plant height at 75 DAT, number of leaves per plant at 75 DAT, equatorial bulb diameter, 20 bulb weight, average bulb weight, gross yield kg per plot, gross yield q/ha, marketable yield kg/plot and marketable yield q/ha. The Bhima Shweta performed superior regarding most of the traits*viz*., double (%) on number basis, bolters percentage on number basis, rotten percentage at number basis, days to maturity at 60-70% neck fall, days to harvesting after transplanting, thrips per plant and TSS percentage but the genotype/variety Sukh Sagar tookminimum duration and mature only in 80 days after transplanting, it is harvested before others genotypes/varieties and also yielded well, so this variety can be also recommended for cultivation in Uttar Pradesh.

Key word:Onion , Allium cepa L, yield attributes

1.0 Introduction

Onion (*Allium cepa* L.) is one of the oldest and most extensively used vegetables and is found worldwide. The second-largest monocotyledon in Amaryllidaceae is Allium. Onion is native to south western Asia, it is grown worldwide, mostly in temperate zones (Thompson and Kelly, 1957). After China, Netherlands, and Spain, India produces 2362.33 thousand MT of onions per year from 1284.99 thousand hectares at 18.10 MT/ha (Horticulture Statistics Division, 2018-19). It is biannual seed production and herbaceous annual bulb production characterize the onion crop growth. Since onions are protandrous, the flowers cannot fertilize themselves because anthers shed pollen before the stigma becomes receptive (Delaplane and Mayer, 2000). Therefore, seed production requires geitonogamy or allogamy. The onion pollen is sticky and moist. Unfortunately, wind cannot mediate their transport, thus insect pollinators are the sole choice. In the Latin language “onion” means “large pearl”. The onion was compared to a pearl

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for its shape (Mehta, 2017). It contains 47mg Ca, 50mg P, 0.7mg Fe, 11.1% carbs, 1.2% protein, 0.4% dietary fiber, and 0.1% fat per 100 gm (Kumar*et al.,* 2010).

Onions contain phytoncides that destroy harmful bacteria, making them a common cure for flu, angina, suppurative lung inflammation, catarrh and cough. Onion is anti-carcinogenic. It promotes digestion and eliminates microorganisms in the colon. Onion is healthy, as shown. Onion has more medical benefits than many medications, which have adverse effects. Traditional medicine uses several plant parts. Dental worms and urinary problems are relieved by onion seeds.(Kumar*et al.,* 2010).

2.0 Materials and Methods

The present investigation was conducted at Vegetable Research farm of College of Horticulture, Banda University of Agriculture and Technology, Banda, Uttar Pradesh during the *Rabi* season 2019-2020. The university is situated at 24^{o} 53′-25^{o} 55′ N latitudes and 80^{o} 07′-81^{o} 34′ E longitudes. However, Banda District is bounded by districts of Fatehpur in the north, Chitrakoot in the east, Hamirpur and Mahoba in the west, and Satna, Panna and Chhatarpur (Madhya Pradesh) in the south.The climate of Bundelkhand region is predominantly characterized by semi-arid/ that has dry & warm summer, pleasant monsoon and mildly cold winter. The region receives an average rainfall of 800-910 mm of which more than 88-90% occurs during only three months i.e., August and September however, June and October receive only 7-9% of total rainfall.

Table-1. Experimental details of the experiment.

SN	Particular		Specification
1	**Location**		VRF-BUAT, Banda
2	**Crop**		Onion
3.	**Design**		RBD
4.	**Replications**		3
5.	**Number of treatments**		20
6.	**Total Plot size**		378 m2
7.	**Planting distance**	**Row x Row**	15 cm
		Plant x Plant	10 cm
8.	**Number of row per plot**		20
9.	**Number of plant per row**		15
10.	**Total number of plants per plot**		300
11.	**Gross area**		7.0 m^2

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12.	**Net area**	4.5 m^2

The experimental material for the present investigation comprises of 20 genotypes of onion (*Allium cepa* L.) obtained from different institute/organisation and State Agriculture Universities/ research stations. The detailed description of Genotypes symbol and source of different seeds from different institutes 1.1.

Table 2. Genotypes symbol and source of different seeds from different institute

SN	Genotype symbol	Name of genotype	Sources of seed
1.	V_1	Bhima Safed	ICAR-DOGR, Rajgurunagar, Pune, MS
2.	V_2	Bhima Shweta	ICAR-DOGR, Rajgurunagar, Pune, MS
3.	V_3	Bhima Subhra	ICAR-DOGR, Rajgurunagar, Pune, MS
4.	V_4	Phule Suvarna	ICAR-DOGR, Rajgurunagar, Pune, MS
5.	V_5	Bhima Red	ICAR-DOGR, Rajgurunagar, Pune, MS
6.	V_6	Bhima Shakti	ICAR-DOGR, Pune
7.	V_7	Bhima Light Red	ICAR-DOGR, Rajgurunagar, Pune, MS
8.	V_8	Bhima Kiran	ICAR-DOGR, Rajgurunagar, Pune, MS
9.	V_9	Bhima Super	ICAR-DOGR, Rajgurunagar, Pune, MS
10.	V_{10}	N-2-4-1	NIPHAD, Maharashtra
11.	V_{11}	Early Grano	IARI, New Delhi
12.	V_{12}	Pusa Madhvi	IARI, New Delhi
13.	V_{13}	Pusa Ridhi	IARI, New Delhi
14.	V_{14}	Arka Niketan	IARI, New Delhi
15.	V_{15}	Sukhsagar	West Bengal
16.	V_{16}	NHRDF Red	NHRDF, Nashik, Maharashtra
17.	V_{17}	NHRDF Red 2	NHRDF, Nashik, Maharashtra
18.	V_{18}	NHRDF Red 3	NHRDF, Nashik, Maharashtra
19.	V_{19}	NHRDF Red 4	NHRDF, Nashik, Maharashtra
20.	V_{20}	Agrifound Light Red	NHRDF, Nashik, Maharashtra

The observations was recorded for the 20 genotypes are Plant stand at maturity, Plant height at 75 days after transplanting (DAT), Maximum number of leaves per plant at 75 days after transplanting (DAT), Neck thickness, Equatorial bulb diameter, Polar bulb diameter, P:E ratio, Bulb weight, Average bulb weight, Double (%) on number basis, Bolter percentage on number basis, Rotten percentage at number basis, Days to maturity at 60-70% neck fall, Days to harvesting after transplanting, Thrips per plant, Stemphylium blight (Intensity %), TSS

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(percentage), Gross yield (kg/plot), Gross yield (q/ha), Marketable yield (kg/plot) and Marketable yield (q/ha)

3.0 Results and Discussion

The mean performance was calculated using observations for each genotype in three replications for bulb yield and its component traits. The observations were recorded on ten randomly tagged plants from each entry and averaged. The mean performance and grand mean of 20 onion genotypes/varieties for various attributes are presented in Table 3 and 4.The following are the details of the characters that were recorded during the research period.

3.1 Plant stand at maturity

The minimum plant stand at maturity was exhibited by Arka Niketan (280.66), while variety N-2-4-1 having maximum plant stand at maturity (293). The general mean for plant stands at maturity was 286.68.

3.2 Plant height at 75 DAT

Plant height can be used to determine the growth rate of distinct genotypes/varieties. The maximum plant height at 75 days after transplanting (62.66 cm) was exhibited by check variety NHRDF Red-4, while, variety Pusa Madhvi (53.00 cm) noted minimum plant height at 75 days after transplanting. The general mean for plant height at 75 DAT was 57.82 cm.

3.3 Maximum number of leaves per plant at 75 DAT

In the table,maximum number of leaves per plant at 75 days after transplanting is exhibited by NHRDF Red 4 (8.00), while the genotype Bhima Red (4.66) have the minimum number of leaves. The general mean for number of leaves per plant at 75 days after transplanting was 6.25 leaves per plant.

3.4 Neck thickness

The data predicted that the maximum neck thickness at 75 days after transplanting as exhibited by Early Grano (1.26 cm) while, genotype Sukh Sagar (1.03 cm) having minimum neck thickness at 75 days after transplanting. The general mean for neck thickness after curing was 1.18 cm.

3.5 Equatorial bulb diameter

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The data indicated that the check variety NHRDF Red 4 (5.96 cm) observed maximum equatorial bulb diameter while genotype N-2-4-1 (5.26 cm) have the minimum equatorial bulb diameter. The general mean for equatorial bulb diameter was 5.64 cm.

3.6 Polar bulb diameter

The maximum polar bulb diameter is exhibited by Early Grano (4.74 cm) while genotype N-2-4-1 (4.10 cm) have the minimum polar bulb diameter. The general mean for polar bulb diameter was 4.40 cm.

3.7 P:E ratio

The maximum P:E ratio was exhibited by Phule Suvarna (0.84 cm) while genotype NHRDF Red (0.73 cm) have the minimum P:E ratio. The general mean for P:E ratio was 0.78 cm.

3.8 20 Bulb weight

The data presented in table 3 showed that maximum 20 bulbs weight in kg was exhibited by check variety NHRDF Red 4 (1.50 kg) while, genotype Bhima Safed (1.14 kg) have the minimum 20 bulb weight in kg. The general mean for 20 bulb weight was 1.29 kg.

3.9 Average bulb weight

The maximum average bulb weight was exhibit by check variety NHRDF Red 4 (75.16 g) while genotype/variety Bhima Safed (57.16 g) have the minimum average bulb weight in gram. The general mean for average bulb weight was 64.55g.

3.10 Double (%) on number basis

The maximum double (%) on number basis is exhibited by Bhima red (3.34 %) while genotype Bhima Shweta (1.04 %) have the minimum double (%) on number basis. The general mean for double (%) on number basis was2.18 %.

3.11 Bolter percentage on number basis

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The maximum bolter percentage on number basis is exhibited by Bhima Super (1.84 %) while genotype Bhima Shweta (0.64 %) have the minimum bolter percentage on number basis. The general mean for bolter percentage on number basis was 1.18%.

3.12 Rotten percentage at number basis

The maximum rotten percentage on number basis was exhibited by Phule Suvarna (0.32 %) while genotype Bhima Shweta, Bhima Super, Pusa Madhvi, Pusa Ridhi, NHRDF Red 3, NHRDF Red 4 (0.00 %) has no rotten percentage on number basis. The general mean for rotten percentage on number basis was 0.13%.

3.13 Days to maturity at 60-70% neck fall

The maximum days to maturity at 60-70% neck fall is exhibited by NHRDF Red-3 (118.33 days) while genotype Sukh Sagar (76 days) have the minimum days to maturity at 60-70% neck fall. The general mean for days to maturity at 60-70% neck fall was 112.69 days.

3.14 Days to harvesting after transplanting

The maximum days to harvesting after transplanting is exhibited by NHRDF Red 3 (122.66 days) while genotype Sukh Sagar (80.66 days) have the minimum days to harvesting after transplanting. The general mean for days to harvesting after transplanting was 117.29 days.

3.15 Thrips per plant

The maximum thrips per plant is exhibited by Bhima Red (8 thrips/plant) while genotype Sukh Sagar (4.33 Thrips/plant) have the minimum thrips per plant. The general mean for thrips per plant was 5.86 thrips/ plant.

3.16 Stemphylium blight (Intensity %)

The maximum stemphylium blight (Intensity %) isexhibited by Phule Suvarna (6.0 %) while genotype Bhima Light Red (3.0 %) have the minimum stemphylium blight (Intensity %). The general mean for stemphylium blight (Intensity %) was 4.40%.

3.17 TSS (percentage)

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The maximum total soluble solids % is exhibited by Bhima Shweta, Bhima Light Red (13.33 %) while genotype Early Grano (10.33 %) have the minimum total soluble solids %. The general mean for TSS %was 12.60%.

3.18 Gross yield (kg/plot)

The data indicated that maximum gross yield (kg/plot) is exhibited by check NHRDF Red 4 (16.60 kg/plot) while genotype Bhima super (12.86 kg/plot) have the minimum gross yield. The general mean for gross yield (kg/plot) was 14.46 kg/plot.

3.19 Gross yield (q/ha)

The check variety NHRDF Red 4 showed maximum gross yield (368.88 q/ha), while genotype Bhima super (285.92 q/ha) have the minimum gross yield (q/ha). The general mean for gross yield (q/ha) was 321.40 q/ha.

3.20 Marketable yield (kg/plot)

The maximum marketable yield (kg/plot) is exhibited by check variety NHRDF Red 4 (16.20 kg/plot) while, genotype Bhima Super (12.60 kg/plot) have the minimum marketable yield (kg/plot). The general mean for marketable yield (kg/plot) was 14.18 kg/plot.

3.21 Marketable yield (q/ha)

The maximum marketable yield (q/ha) is exhibited by NHRDF Red 4 (360.00 q/ha) while genotype Bhima Super (280.00 q/ha) have the minimum marketable yield (q/ha). The general mean for marketable yield (q/ha) was 315.25 q/ha.

The genotypes Bhima Shubhra, N-2-4-1 andNHRDF Red 3 exhibited maximum plant stands at maturity and minimum plant stand at maturity recorded in genotypes such as Arka Niketan and Pusa Ridhi. Plant height can be used to determine the growth rate of distinct genotypes. The plant height at 75 days after transplanting was recorded maximum in variety/genotype NHRDF Red 4 and was at par with varieties Bhima Red, Bhima Shweta, Bhima Shubhra, Bhima Kiran, Early Grano, NHRDF Red-3 and Agrifound Light Red. While the lowest plant height at 75 days after transplanting was recorded in Pusa Madhvi. Number of leaves per plant at 75 days after transplanting was recorded maximum for the check variety/genotype NHRDF Red 4 and was at

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par with NHRDF Red 3, Bhima Light Red and Bhima Shweta, the lowest number of leaves recorded at 75days after transplanting in genotype Bhima Red and was at par with Phule Swarna, Bhima Super, N-2-4-1, Pusa Madhvi, Pusa Riddhi and Sukh Sagar. The neck thickness at 75 days after transplanting was found to be minimum in variety Sukh Sagar and was at par with N-2-4-1, however, maximum neck thickness at 75 days after transplanting was noted for genotype Early Grano and it was at par with Bhima Safed, Bhima Shubhra, Bhima Kiran, Arka Niketan, NHRDF Red, NHRDF Red 3, NHRDF Red 4 and Agrifound Light Red.

Equatorial bulb diameter (cm) was found maximum for check variety NHRDF Red 4 and was at par with NHRDF Red 3 and Bhima Shweta, while, equatorial bulb diameter was recorded minimum for the genotype N-2-4-1. Polar bulb diameter (cm)exhibited maximum for the genotype Early Grano and was at par with Phule Swarna, NHRDF Red 3 and NHRDF Red 4, however it was found to be minimum for N-2-4-1 and was at par with Bhima Safed, Bhima Red, Bhima Kiran, and NHRDF Red. Polar and Equatorial ratio was found maximum for the genotype of Phule Suvarna and was at par with Early Grano, however, lowest P: E ratio was recorded in the genotype NHRDF Red. The result was also reported by Singh*et al.* (2011) and Singh*et al.* (2013).

The trait 20 bulbs weight (kg) was recorded maximum for the check variety NHRDF Red 4 and was highest among all the treatments. Lowest 20 bulb weight was recorded in genotype Bhima Safed and was at par with Bhima Shubhra, Bhima Light Red, and Arka Niketan. A significantly wide variation was found among the onion genotypes for average weight of bulb. The average bulb weight (gm) was found to be maximum and significant in check variety NHRDF Red 4, however, recorded minimum for the genotypes Bhima Safed. Similar results are reported by (Singh*et al.,* 2016). The above genotypes can be further exploited in breeding programme for increasing production of onion.

The lowest double (%) on number basis was recorded in genotype Bhima Shweta and was found at par with Bhima Safed, Phule Suvarna, Early Grano, Pusa Ridhi and NHRDF Red 3 while, double (%) on number basis was found to maximum in genotype Bhima Red and was at par with Bhima Kiran, N-2-4-1, ArkaNiketan and Agrifound Light Red. Lowest bolters (%) on number basis was observed for the genotype Bhima Shweta and was at par with Bhima Safed, Phule Suvarna, Early Grano, Pusa Ridhi, Sukh Sagar, NHRDF Red 2, NHRDF Red 4 and

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NHRDF Red 3. Bolters (%) on number basis found maximum for the genotype Bhima Super and at par with Bhima Red, Bhima Shakti, Bhima Kiran, N-2-4-1, NHRDF Red and Agrifound Light Red. No rotten (%) on number basis was noted in genotype NHRDF Red 4, NHRDF Red 3, Bhima Super, Pusa Madhvi, Pusa Ridhi and Bhima Shweta. Rotten percent (%) on number basis was recorded maximum for the genotypes Phule Swarna and at par with Bhima Red, Agrifound Light Red and N-2-4-1. Bhonde*et al.* (1991) also recorded similar range of bolting in their study of different varieties. The varieties/genotypes recorded minimum double, bolters and rotten percent can be utilized for development of excellent quality variety of onion for higher production.

Early maturing of bulbs can ensure quick economic return on early harvest and may escape market gluts and give high returns. Days to maturity at 60-70% neck fall was recorded maximum for the genotypes NHRDF Red 3 and at par with Bhima Safed, Bhima Shakti and NHRDF Red 4, while, it was recorded minimum for the genotype Sukh Sagar. Days to harvesting after transplanting was recorded maximum for the genotypes NHRDF Red 3 and at par with Bhima Safed, NHRDF Red 4, Bhima Red, N-2-4-1, Early Grano, NHRDF Red 2 and Bhima Shakti, however minimum days to harvesting after transplanting was recorded for genotype Sukh Sagar. It is suggested that the genotype/variety Sukh Sagar can be utilized by the breeder for development of early onion variety for *rabi* season as it takes minimum duration and yielded well also.

Thrips/plant was recorded minimum for the genotypes Sukh Sagar and was at par with Bhima Shubhra, Bhima Shakti, Bhima Light Red, Bhima Super, Early Grano, Pusa Madhvi, Pusa Ridhi, Arka Niketan, NHRDF Red and Agrifound Light Red, while maximum thrips/plant was recorded in variety Bhima Red, and was at par with Bhima Safed, Bhima Kiran, NHRDF Red 3 and NHRDF Red 4. The minimum stemphylium blight (Intensity %) was recorded in genotype Bhima Light Red and was at par with Bhima Shweta, Bhima Shakti, Bhima Kiran, Bhima Super, Pusa Madhvi, Pusa Ridhi, Arka Niketan, Sukh Sagar, NHRDF Red 2 and Agrifound Light Red, however, maximum recorded for the genotype Phule Swarna and at par with Bhima Safed, Bhima Shubhra, N-2-4-1, Early Grano, NHRDF Red 4, NHRDF Red 3 and Bhima Red.

The total soluble solids have a direct impact on onion and is a crucial biochemical feature for the processing industry. Total soluble solids (%) was recorded maximum for the genotypes

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Bhima Light Red and Bhima Shweta and was at par with Bhima Safed, Bhima Shubhra, Phule Swarna, Bhima Red, Bhima Shakti, Bhima Super, Pusa Madhvi, Pusa Ridhi, Arka Niketan, Sukh Sagar, NHRDF Red 2, NHRDF Red, NHRDF Red 4, and NHRDF Red 3, however the minimum total soluble solids (%) was recorded in variety Early Grano.

One of the most important traits receiving more attention in breeding programmes is yield per plot. The highest gross yield (kg/plot) was recorded in check variety NHRDF Red 4, and was significantly highest among all treatments, however, it was recorded minimum for the genotype Bhima Super and was at par with Bhima Shubhra, Bhima Red, Bhima Shakti, Bhima Kiran, N-2-4-1, Arka Niketan and NHRDF Red. The gross yield (q/ha) was also recorded maximum for the variety/genotypes NHRDF Red 4, and it was highest among all genotypes/varieties, while, minimum noted for genotypes Bhima Super. Marketable yield (kg/plot) and (q/ha) were recorded maximum in check variety NHRDF Red 4, however minimum for the genotypes Bhima Super. Similar findings were reported by Singh*et al.* (2020) and Singh*et al.* (2020)

4.0 Conclusion

Based on the mean data it is suggested that the variety NHRDF Red-4, NHRDF Red-3, Bhima Shweta performed superior regarding most of the traits, but the genotype/variety Sukh Sagar tookminimum duration and mature only in 80 days after transplanting, it harvested approximately 30-40 days before if compared to others genotypes/varieties and also yielded well, so this variety can also be recommended for cultivation in Uttar Pradesh. The above genotypes/ varieties/advance lines can be used in crop improvement programme for development of good quality onion varieties.

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Table 3 Range and mean performance of onion (*Allium cepa* L.) genotypes for different characters

Genotypes	Plant stands at maturity	Plant height at 75 DAT	Number of leaves per plant at 75 DAT	Neck thickness (cm) 75 DAT	Equatorial bulb diameter (cm)	Polar bulb diameter (cm)	P: E ratio	20 bulbs weight (kg)	Average bulb weight (g)	Double (%) on number basis	Bolter (%) on number basis

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Genotypes	Rotten (%) on number basis	Days to maturity at 60-70% neck fall	Days to harvesting after transplanting	Thrips/plant	Stemphylium blight (Intensity %)	TSS (%)	Gross yield (kg/plot)	Gross yield (q/ha)	Marketable yield (kg/plot)	Marketable yield (q/ha)
Bhima Safed	289.66	59.26	6.33	1.21	5.61	4.20	0.74	1.14	57.16	1.72	0.80
Bhima Shweta	285.33	60.33	7.33	1.17	5.84	4.45	0.76	1.40	70.00	1.04	0.64
Bhima Shubhra	291.00	59.33	6.66	1.20	5.68	4.44	0.78	1.16	58.00	2.06	1.26
Phule Swarna	287.00	58.66	5.66	1.16	5.61	4.72	0.84	1.37	68.83	1.50	1.05
Bhima Red	289.00	60.93	4.66	1.18	5.51	4.23	0.76	1.35	62.50	3.34	1.61
Bhima Shakti	288.66	58.53	6.00	1.23	5.61	4.42	0.78	1.35	67.50	1.50	1.10
Bhima Light Red	289.66	55.66	7.00	1.14	5.71	4.27	0.74	1.20	60.33	2.53	1.14
Bhima Kanchan	282.00	59.46	6.66	1.21	5.58	4.23	0.75	1.38	69.16	1.42	1.06
Bhima Super	288.33	56.33	5.66	1.17	5.60	4.39	0.78	1.35	62.50	3.00	1.84
N-2-4-1	293.00	54.00	5.00	1.08	5.26	4.10	0.78	1.15	57.50	2.95	1.47
Early Grano	282.00	60.20	6.66	1.26	5.68	4.74	0.83	1.38	69.16	1.42	1.06
Pusa Madhvi	290.00	53.00	5.66	1.11	5.64	4.50	0.79	1.29	64.50	2.18	1.15
Pusa Ridhi	282.00	56.80	5.66	1.17	5.69	4.51	0.79	1.37	68.83	1.29	1.05
Arka Niketan	280.66	56.00	6.00	1.19	5.52	4.32	0.78	1.16	58.00	2.84	1.18
Sukh Sagar	285.66	54.66	5.33	1.03	5.53	4.43	0.80	1.31	65.50	2.22	0.93
NHRDF Red	284.00	54.66	6.00	1.19	5.59	4.12	0.73	1.21	60.66	2.58	1.63
NHRDF-Red-2	283.33	56.33	6.33	1.18	5.62	4.28	0.76	1.34	67.33	2.33	0.82
NHRDF Red 3	292.66	59.49	7.66	1.24	5.88	4.59	0.78	1.41	70.83	1.36	0.79
NHRDF Red-4©	285.00	62.66	8.00	1.24	5.96	4.62	0.77	1.50	75.16	1.75	0.69
ALR ©	284.66	60.20	6.66	1.19	5.72	4.55	0.79	1.35	67.83	2.70	1.40
Mean	**286.68**	**57.82**	**6.25**	**1.18**	**5.64**	**4.40**	**0.78**	**1.29**	**64.55**	**2.18**	**1.18**
C.V.	2.13	3.55	9.79	3.70	1.76	2.15	3.02	3.13	3.13	19.16	23.88
S.E.	3.52	1.18	0.35	0.02	0.057	0.05	0.01	0.02	1.16	0.24	0.16
C.D. 5%	-	3.39	1.01	0.07	0.16	0.15	0.03	0.06	3.34	0.69	0.46
C.D. 1%	-	4.54	1.35	0.09	0.22	0.21	0.05	0.08	4.47	0.92	0.62
Range Lowest	280.66	53.00	4.66	1.03	5.26	4.10	0.73	1.14	57.16	1.04	0.64
Range Highest	293.00	62.66	8.00	1.26	5.96	4.74	0.84	1.50	75.16	3.34	1.84

Table 4 Range and mean performance of onion (*Allium cepa* L.) genotypes for different characters

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Bhima Red	0.24	115.66	120.33	8.00	5.00	12.96	13.40	297.77	13.10	291.11
Bhima Shakti	0.14	118.00	121.00	4.66	3.33	13.00	13.93	309.62	13.70	304.44
Bhima Light Red	0.11	114.00	118.33	5.66	3.00	13.33	14.23	316.29	13.96	310.37
Bhima Kiran	0.16	114.00	118.33	7.00	3.33	12.00	13.76	305.92	13.53	300.74
Bhima Super	0.00	113.66	118.66	5.00	4.00	12.33	12.86	285.92	12.60	280.00
N-2-4-1	0.24	114.66	121.00	6.00	4.83	11.66	13.20	293.33	12.96	288.14
Early Grano	0.13	114.33	120.33	5.33	5.00	10.33	14.93	331.85	14.60	324.44
Pusa Madhvi	0.00	115.00	119.33	5.66	4.00	12.60	14.56	323.70	14.30	317.77
Pusa Ridhi	0.00	115.00	119.66	5.66	4.00	12.56	15.60	346.66	15.26	339.25
Arka Niketan	0.12	111.66	116.33	5.66	4.33	12.46	13.46	299.25	13.13	291.85
Sukh Sagar	0.17	76.00	80.66	4.33	3.33	12.66	14.13	314.07	13.93	309.62
NHRDF Red	0.12	114.33	119.00	5.00	5.00	13.00	13.60	302.22	13.40	297.77
NHRDF-Red-2	0.14	114.00	120.66	6.00	4.33	12.66	14.70	326.66	14.40	320.00
NHRDF Red-3	0.00	118.33	122.66	7.00	4.66	13.00	16.20	360.00	15.90	353.33
NHRDF Red-4 ©	0.00	117.33	121.33	7.00	5.33	12.94	16.60	368.88	16.20	360.00
ALR ©	0.29	113.00	116.66	5.33	4.00	12.93	15.16	337.03	14.93	331.85
Mean	**0.13**	**112.69**	**117.29**	**5.86**	**4.40**	**12.60**	**14.46**	**321.40**	**14.18**	**315.25**
C.V.	38.72	1.35	1.52	15.40	19.70	5.40	0.96	0.96	0.93	0.93
F ratio	12.85	60.61	50.32	3.36	2.60	3.03	161.14	161.14	170.38	170.39
F Prob.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S.E.	0.02	0.88	1.03	0.52	0.50	0.39	0.08	1.79	0.07	1.69
C.D. 5%	0.08	2.53	2.96	1.49	1.43	1.12	0.23	5.15	0.21	4.84
C.D. 1%	0.11	3.39	3.96	2.00	1.91	1.50	0.31	6.89	0.29	6.49
Range Lowest	0.00	76.00	80.66	4.33	3.00	10.33	12.86	285.92	12.60	280.00
Range Highest	0.32	118.33	122.66	8.00	6.00	13.33	16.60	368.88	16.20	360.00

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