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Evaluation of Rabi onion (*Allium cepa* L) genotypes under Western Table Land Zone of Odisha

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ABSTRACT

A field experiment was conducted at Sambalpur, Odisha to assess the response of different onion cultivars under Western Table Land Zone of Odisha during Rabi 2009-10 to identify the suitable Rabi onion genotype(s) for better growth and bulb yield. Significantly better vegetative growth parameters viz plant height (51.33 to 66.07 cm), number of leaves/plant (7.93 to 9.77) and collar thickness (1.30 to 2.01 cm) were observed in NRCRO-1, NRCRO-2 and Sel-126 including the national check L-28 as compared to other tested cultivars. Significant superiority in performance for most of the bulb yield attributing parameters was exhibited by the genotypes Sel-153 and Sel-126 including the check variety L-28. Significantly highest marketable bulb yield was recorded in check variety L-28 (184.53 q/ha) followed by Sel-126 and Sel-153 (159.35 to 174.61 q/ha). Similar trend was also recorded for total bulb yield (277.94 to 335.18 q/ha) with a range of 178.50 (NRCWO-2, Bhima Shweta) to 335.18 q/ha (Sel-153). Thus considering the overall performance of onion cultivars it was concluded that Sel-153, L-28, Sel-126, Arka Niiketan and NRCRO-2 (Bhima Shakti) were suitable for commercial cultivation during the Rabi season under Odisha conditions for better growth and bulb yield in onion. Sel-153 and Arka Niketan exhibited better growth, bulb yield and tolerance to onion thrips and purple disease.

Keywords: Onion cultivars; marketable bulb yield; total bulb yield; onion thrips; purple blotch

INTRODUCTION

Onion (*Allium cepa* L) is an important export oriented vegetable among the cultivated *Allium* species in India. The genus *Allium* includes around 750 species out of which over 20 other *Allium* species have been consumed by humans excluding onion, Japanese onion, leak and garlic the most important edible *Allium* (Van der Meer 1997). Onion, the principal *Allium*, ranks second in value after tomatoes on the list of cultivated vegetable crops worldwide (Anon 2001).

India is anticipated to have a sizeable population of 1.7 billion by 2050 and there is no possibility of increase in cultivable land. To cater to the onion requirement of this ever-growing population and keeping per capita consumption, processing, export and postharvest losses at existing rate we will require 24.62 MT of onion towards 2050 against 19.29 MT produced during 2013-14. This demands an increase in average productivity from 15.85 to 22.65 tons/ha which is about 42.9 per cent higher than that of during 2013-14 (Anon 2014).

On the other hand India is at 90th place (14.53 tons/ha) in onion productivity although it is the second largest producer of onion in the world. The productivity is higher in many European and American countries since they mostly grow long day onions and have congenial climate for bulb bulking. The subtropical countries including India, Pakistan and Bangladesh grow short day onions which have inherent low yield potential. Non-availability of high yielding hybrid onion varieties shortage and high cost of quality onion seed, use of old traditional farmer varieties and farmers own onion seed for large scale production, susceptibility to diseases and pests and their high incidence under tropical conditions and shortage of irrigation water at critical growth stages reduce productivity in India (Anon 2013). Productivity of onion depends upon the adoption of appropriate varieties that are suitable for different conditions exposed by specific environment. Production of onion during Rabi, Kharif and late Kharif is more important to have a continuous supply of onion round the year. Therefore identification of specific cultivars suitable for specific season is an indispensable step towards increase in production and productivity of onion.

Keeping these facts in view the present experiment was conducted to evaluate the response of different onion genotypes under Western Table Land Zone of Odisha during Rabi 2009-10.

MATERIAL and METHODS

A field experiment was carried out under All India Network Research Project on Onion and Garlic operating at College of Horticulture (OUAT), Chiplima, Sambalpur, Odisha known as Western Table Land Zone of Odisha situated at 20^{o}21' N latitude and 80^{o}55' E longitude and at an altitude of 178.8 m amsl during Rabi 2009-10. Nine onion cultivars including three national checks supplied by Directorate of Onion and Garlic Research, Rajgurunagar, Pune were assessed by adopting randomized block design replicated thrice. All the nine cultivars were sown in the nursery on 29 September 2009 and about eight week old onion seedlings were transplanted on 1 December 2009 in the net plot size of 3 x 2 m^2 at a spacing of 15 x 10 cm by adopting recommended package of practices to ensure a good onion crop.

The observations were recorded on ten randomly selected plants of each cultivar per replication for vegetative growth parameters viz plant height, number of leaves/plant, and collar thickness and bulb yield and yield attributing parameters like average bulb weight, polar diameter, equatorial diameter, neck thickness, percentage of bolters, percentage of doubles, days to bulb maturity and both marketable and total bulb yield. The data were subjected to statistical analysis as per the procedure suggested by Sukhatme and Amble (1995).

RESULTS and DISCUSSION

The data presented in Table 1 indicate significant variations among the tested genotypes for various vegetative growth parameters in onion. The genotype NRCRO-2 (Bhima Shakti) exhibited significantly highest vegetative growth than rest of the genotypes tested. Tallest plants of 66.07 cm were recorded in Bhima Shakti having highest number of leaves/plant (9.77) and collar thickness of 2.01 cm. However statistical parity was recorded for plant height and number of leaves/plant with NRCRO-1 (1133) and Sel-126 including check L-28 (51.33-61.47 and 7.93-8.30 cm respectively).

In contrast the check variety Arka Niketan recorded significantly lowest plant height (35.27 cm) and collar thickness (0.84 cm) with relatively less number of leaves/ plant (6.17).

A perusal of results presented in Table 2 reveal significant variations among the tested onion genotypes for bulb yield and yield attributing parameters except days taken to harvesting. The genotype NRCWO-1 (W-448) recorded significantly lowest production of doubles (0.12%) and bolters (0.24%) while the genotype Bhima Shakti recorded the highest (2.96 and 0.72% doubles and bolters respectively). In onion the percentage of production of marketable bulbs usually decides the acceptability of the variety for commercial scale. The present study indicates that the check variety L-28 recorded significantly highest percentage of marketable bulbs (64.30%) closely followed by Bhima Shakti and Sel-126.

The polar and equatorial diameter of the tested cultivars varied from 4.82 (NRCWO-1) to 6.54 cm (Sel-153) and 1.71 (Sel-153) to 4.13 cm (NRCRO-2, Bhima Shakti) respectively. The genotype Sel-153 recorded significantly maximum polar diameter of 6.54 cm with minimum equatorial diameter of 1.71 cm while maximum equatorial diameter was observed in Bhima Shakti. However both the tested genotypes NRCWO-2 and Sel-126 recorded better polar and equatorial diameter of bulbs with highest values which were statistically at par.

In onion a bulb with minimum neck thickness is treated as an important criterion for selection of genotype(s) for better

Table 1. Performance of Rabi onion (*Allium cepa* L) on vegetative growth parameters

Genotype	Plant height (cm)	# leaves/plant	Collar thickness (cm)
NRCRO-1 (1133)	61.47	7.93	1.67
NRCWO-1 (W-448)	44.43	6.28	1.11
NRCRO-2 (1156) (Bhima Shakti)	66.07	9.77	2.01
NRCWO-2 (W EL Composite)	39.47	7.03	1.20
SEL-126	51.33	8.30	1.53
SEL-153	39.00	5.54	0.95
L-28 (C)	52.93	8.00	1.30
Bhima Raj (C)	36.87	6.73	0.97
Arka Niketan (C)	35.27	6.17	0.84
Mean	47.43	7.31	1.29
SEm±	7.94	0.95	0.22
$CD_{0.05}$	16.83	2.01	0.46

storage life or keeping quality. The present study revealed significantly minimum neck thickness with check variety Bhima Raj (0.87 cm) which was statistically at par with the genotypes NRCWO-2 and Sel-153 including check varieties L-28 and Arka Niketan (0.91 to 1.30 cm).

The results also revealed significantly heaviest bulbs of 63.25 g in the check variety L-28 which was statistically at par with the genotypes NRCWO-2, Sel-126 and Sel-153 (56.90 to 62.18 g). The TSS of evaluated onion bulbs varied significantly from 11.39 (L-28) to 16.51 per cent (Sel-153) with an average TSS of 13.13 per cent irrespective of genotypes.

Significant variations were also observed for both marketable and total bulb yield (Table 2). Significantly highest marketable bulb yield was recorded in check variety L-28 (184.53 q/ha) followed by Sel-126 and Sel-153 (159.35 to 174.61 q/ha) than other tested cultivars. Similar trend was also recorded for total bulb yield (277.94 to 335.18 q/ha) with a range of 178.50 (NRCWO-2 and Bhima Shweta) to 335.18 q/ha (Sel-153).

The results on reactions of onion genotypes to both onion thrips (*Thrips tabaci* Linderman) and purple blotch (*Alternaria porii*) are presented in Table 3 that clearly indicate significant variations among the genotypes. The genotype Sel-153 recorded significantly lowest infestation of onion thrips (19.65 thrips/plant) and purple blotch disease (54.87%) than rest of the tested genotypes. However both the check varieties Bhima Raj and Arka Niketan also recorded significantly lower infestation of onion thrips (21.87 to 23.14 thrips/plant) and purple blotch (60.27 to 60.97%) and were statistically at par with superior genotype Sel-153. On the other

Table 2. Performance of Rabi onion (*Allium cepa* L) genotypes for bulb yield and yield attributing parameters

Genotype	Double (%)	Bolters (%)	Marketable bulbs on weight basis (%)	Polar diameter (cm)	Equatorial diameter (cm)	Neck thickness (cm)	Average marketable bulb weight (G)	TSS (%)	Marketable yield (q/ha)	Total yield (q/ha)
NRCRO-1 (1133)	1.25 (6.43)	0.37 (3.49)	53.81 (47.18)	4.62	2.82	1.64	45.75	12.12	108.83	199.11
NRCWO-1 (W-448)	0.12 (1.15)	0.24 (2.81)	55.43 (48.11)	4.82	3.69	1.52	40.36	12.41	99.48	178.93
NRCRO-2 (1156) (Bhima Shakti)	2.96 (9.91)	0.72 (4.87)	61.73 (51.79)	5.50	4.13	1.40	62.38	13.28	134.39	209.39
NRCWO-2 (WEL Composite)	0.69 (4.70)	0.35 (3.42)	43.55 (41.28)	5.52	3.42	1.16	56.90	12.92	69.06	178.50
SEL-126	1.39 (6.73)	0.68 (4.72)	61.70 (51.78)	5.46	3.78	1.33	60.03	14.89	174.61	277.94
SEL-153	0.77 (5.04)	0.38 (3.53)	46.91 (43.22)	6.54	1.71	1.30	59.41	16.51	159.35	335.18
L-28 (C)	0.71 (4.83)	0.35 (3.39)	64.30 (53.32)	5.27	3.44	1.28	63.25	11.39	184.53	280.99
Bhima Raj (C)	0.44 (3.02)	0.56 (4.14)	55.49 (48.15)	4.78	2.06	0.87	37.18	12.06	102.58	182.30
Arka Niketan (C)	1.34 (6.60)	0.59 (4.32)	50.67 (45.38)	4.59	2.97	0.91	43.60	12.61	112.02	215.24
Mean	1.07 (5.38)	0.47 (3.85)	54.84 (47.80)	5.23	3.11	1.27	52.10	13.13	127.20	228.62
SEm±	1.11	0.53	1.34	0.49	0.57	0.22	5.74	1.26	15.82	22.46
$CD_{0.05}$	2.36	1.13	2.83	1.03	1.21	0.46	12.17	2.67	33.55	47.61

Figures in the parentheses indicate the corresponding angular values

Table 3. Performance of Rabi onion (*Allium cepa* L) cultivars against onion thrips and purple blotch

Genotype	Thrips reaction (thrips/plant)	Purple blotch (PDI)
NRCRO-1 (1133)	31.79	62.30
NRCWO-1 (W-448)	31.32	65.79
NRCRO-2 (1156) (Bhima Shakti)	48.01	70.82
NRCWO-2 (WEL Composite)	28.55	65.28
SEL-126	26.58	69.65
SEL-153	19.65	54.87
L-28 (C)	34.28	70.14
Bhīma Raj (C)	23.14	60.27
Arka Niketan (C)	21.87	60.97
Mean	29.47	64.45
SEm±	3.67	3.05
$CD_{0.05}$	7.79	9.15

PDI= Per cent disease incidence

hand Bhima Shakti recorded significantly maximum onion thrips infestation (48.01 thrips/plant) and purple blotch (70.82%). Similar results were also reported by Tripathy et al (2012).

CONCLUSION

Considering the overall performance of onion cultivars it can be concluded that Sel-153, L-28, Sel-126, Arka Niiketan and NRCRO-2 (Bhima Shakti) were suitable for commercial cultivation during the Rabi season under Odisha conditions for better growth and bulb yield. Both Sel-153 and Arka Niketan may be recommended for better growth, bulb yield and tolerance to both onion thrips and purple blotch disease.

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