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## Assessment of onion (*Allium cepa* L.) varieties for growth and yield attributes under central dry zone of Karnataka

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### Abstract

A field experiment was conducted to ascertain the production potential of different onion varieties and to select the most suitable high yielding varieties with better growth, yield and quality. This research was carried out during *Rabi* 2020-21 at Zonal Agricultural and Horticultural Research Station, Babbur Farm, Hiriyyur, Chitradurga district. The experiment was laid out in Randomized Completely Block Design (RCBD) with eleven onion varieties in three replications. The results revealed that there were significant differences among all the parameters studied. It was observed from the data that among the different onion varieties, Bhima Shakti recorded maximum plant height (62.33 cm), leaf length (61.24 cm), number of leaves (8.53), polar diameter (4.65 cm), equatorial diameter of bulb (5.25 cm), bulb weight (88.21 g), total bulb yield per plot (34.48 kg) and total bulb yield per hectare (38.31 t/ha). While highest percentage of marketable bulb yield (94.93%), A grade (47.36%), B grade (36.05%) and C grade bulb yield (11.52%) was also recorded in variety Bhima Shakti respectively.

**Keywords:** *Allium cepa*, bulb, growth, yield, quality

### Introduction

Onion (*Allium cepa* L.) is one of the most important commercial vegetable crop used as raw as salad, vegetable and spice all over the world. It is one of the oldest bulbous crop known to mankind which is also referred as queen of kitchen. It is one of the most important vegetable crop grown throughout the world and is said to be native of Central Asia and Mediterranean region (McCollum, 1976) [16]. It belongs to the family *Alliaceae*, sub-family *Allioideae* and order *Asparagales* having chromosome number  $2n (2x) = 16$ .

Onion is an important crop of tropical regions of the world grown extensively in China, India, United States, Iran and Pakistan. In India, it is grown under varied agro-climatic regions in an area of 1,434 thousand hectares with a production of 26,738 thousand metric tonnes, and the productivity of 18.64 metric tonnes per hectare (Anon., 2019-20) [3]. In Karnataka, this crop is being cultivated in an area of 165.10 thousand hectares with the production of 16.00 thousand metric tonnes and productivity of 10.31 metric tonnes per hectare. Dharwad, Chitradurga, Gadag, Haveri, Bagalkot and Davangere are the major onion growing districts in Karnataka (Anon., 2018) [2].

Onion varieties shows wide variation in their yielding ability when grown under varied agro-climatic conditions. India being a vast country with varied agro-climatic regions, single variety or hybrid may not be suitable for all the agro-climatic conditions. Hence, new varieties and hybrids need to be introduced for specific zones. Hence to meet out the domestic requirement and also full fill the export demand, selection of suitable onion varieties for growing under different agro-climatic conditions is required. Therefore, keeping this in view, the present experiment was conducted to select the most suitable high yielding onion variety with better growth, yield and quality attributes under Central Dry Zone of Karnataka.

### Material and Methods

The present investigation was conducted at Zonal Agricultural and Horticultural Research Station, Babbur Farm, Hiriyyur, Chitradurga district during *Rabi* season 2020-21. The experimental material comprises of eleven onion varieties and their sources of collection are presented in Table 1.

The fifty days old seedlings were transplanted in the flat beds at the spacing of 15 cm row to row and 10 cm within the plants, and all the cultural practices were followed as per the package of practices.

The experiment was laid out in Complete Randomized Block Design with three replications. Observations were recorded on five randomly selected plants in each replication for various growth and yield attributes *viz.*, plant height (cm), leaf length (cm), number of leaves, collar thickness (cm), neck thickness (cm), number of days taken to harvest, polar and equatorial diameter of bulb (cm), bulb weight (g), total bulb yield per plot (kg), total bulb yield per hectare (t/ha), marketable bulb yield (%), per cent A, B and C grade bulb yield respectively. Then the data taken was subjected to statistical analysis.

**Table 1:** List of onion Varieties used in the study and their sources of collection

Sl. No	Varieties	Source of collection
1.	BhimaKiran	DOGR, Pune
2.	Bhima Shakti	DOGR, Pune
3.	Bhima Super	DOGR, Pune
4.	Bhima Shubra	DOGR, Pune
5.	BhimaSafed	DOGR, Pune
6.	BhimaShweta	DOGR, Pune
7.	Bhima Light Red	DOGR, Pune
8.	Bhima Raj	DOGR, Pune
9.	Bhima Red	DOGR, Pune
10.	Bhima Dark Red	DOGR, Pune
11.	Satara Garva	Local collection from Chitradurga used as check

## Result and Discussion

The data pertaining to mean performance of eleven onion varieties for growth, yield and quality attributes are presented in Table 2 and 3 respectively.

### Growth parameters

Significantly wide variation was observed among the eleven onion varieties for growth parameters. With respect to plant height is concerned significantly highest plant height at 90 DAT of 62.33 cm was noticed in the variety Bhima Shakti whereas, BhimaSafed recorded lowest plant height of 56.85 cm. Significantly maximum number of leaves per plant at 90 DAT was recorded in the variety Bhima Shakti (8.53) and minimum was recorded by Bhima Dark Red (8.00). Significantly the variety Bhima Shakti (61.24 cm) recorded the highest leaf length at 90 DAT and lowest was recorded in the variety Bhima Dark Red (54.28 cm). This variation in growth parameters may be due to genetic makeup of varieties and their suitability under different soil and climatic conditions. The results are in confirmation with the findings of Ram and Kumar (2018)<sup>[17]</sup>, Gautam *et al.* (2019)<sup>[8]</sup>, Behera *et al.* (2017)<sup>[5]</sup> and Tripathy *et al.* (2013)<sup>[20]</sup>.

Whereas, the maximum collar thickness and neck thickness was found in the variety Bhima Shubra (1.43 and 1.16 cm) and minimum in Bhima Light Red (1.22 and 1.06 cm). This increase in collar and neck thickness might be due to better absorption of nutrients and their utilization for buildup of new cells which in turn resulted in increased dry matter production. It may also be due to genetic constitution of plant, soil and climate of the region. Similar findings were obtained by Umamaheswarappa *et al.* (2018)<sup>[21]</sup>, Lakshmi pathi *et al.* (2017)<sup>[14]</sup>, Dhar *et al.* (2019)<sup>[17]</sup> and Gosai *et al.* (2018)<sup>[9]</sup>.

### Yield and quality parameters

Significantly wide variation was observed among the eleven onion varieties for yield and quality parameters and are presented in Table 3 respectively.

It was observed from the data that, the varieties Bhima Kiran and Bhima Shakti reported maximum days to harvest (130 days), while minimum was recorded in Bhima Dark Red (100 days) and is represented in Fig. 1. This difference among the varieties may be due to genetic makeup of varieties and their adaptability to different climatic condition as reported by Kushalet *et al.* (2015)<sup>[13]</sup>, Taraiet *et al.* (2015)<sup>[19]</sup>, Devi *et al.* (2014)<sup>[6]</sup> and Singh *et al.* (2011)<sup>[18]</sup>. With respect to the bulb color of onion varieties Bhima Raj and Bhima Dark Red was dark red in colour, while that of, BhimaKiran and Bhima Light Red was light red. The variety Bhima Shubra, BhimaShweta, BhimaSafed were white in color and Bhima Shakti, Bhima Super, Bhima Red and SataraGarva were red in colour as reported by Ali *et al.* (2014)<sup>[1]</sup>, Jelica *et al.* (2013)<sup>[12]</sup>, Malloret *et al.* (2011)<sup>[15]</sup> and Yadav *et al.* (2009)<sup>[22]</sup>.

Significantly the maximum number of rings were recorded in variety Bhima Shakti (9.75) whereas, the minimum number of rings was noticed in Bhima Super (7.68). With respect to Polar and equatorial diameter of bulb, the highest was recorded in the variety Bhima Shakti (4.65 cm and 5.25 cm) whereas, it was found lowest in BhimaSafed (3.97 cm and 4.71 cm).

Among the different onion varieties, bulb weight of onion differed significantly. The variety Bhima Shakti recorded the maximum bulb weight (88.21 g) while, Bhima Safed registered the minimum bulb weight (55.34 g). Polar diameter and equatorial diameter were found highest in Bhima Shakti (4.65 cm and 5.25 cm) due to better growth and vigour, which helps in better synthesis and accumulation of photosynthates in bulbs. Similar findings were reported by Hussien and Albaiaty (2019)<sup>[11]</sup>, Bashaet *et al.* (2018)<sup>[4]</sup> and Behera *et al.* (2017)<sup>[5]</sup>.

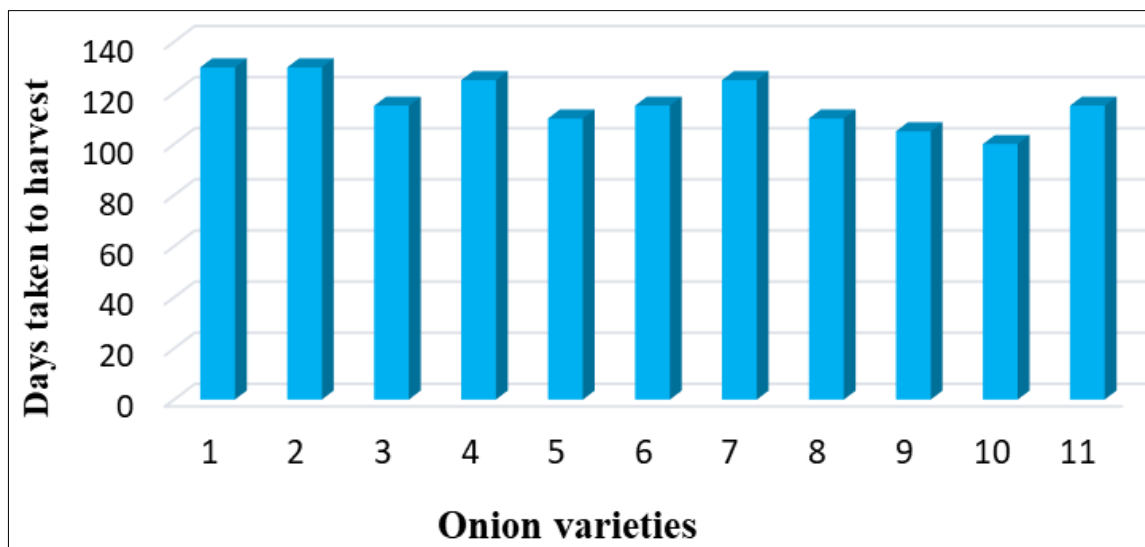
Significant differences were observed for total bulb yield per plot among the onion varieties evaluated. Among the varieties, the maximum total bulb yield per plot was recorded in Bhima Shakti (34.48 kg) and minimum in Bhima Dark Red (22.08 kg). while, Bhima Shakti recorded the maximum estimated total bulb yield per hectare (38.31 t/ha) and minimum in Bhima Dark Red (24.53 t/ha). The marketable bulb yield was maximum in Bhima Shakti (94.93%), while, it was minimum in Bhima Dark Red (70.56%).

There was significant difference among the onion varieties for per cent A grade bulb yield, per cent B grade bulb yield and per cent C grade bulb yield which was found highest in Bhima Shakti (47.36, 36.05 and 11.52%) and the lowest in Bhima Dark Red (34.66, 30.40 and 5.50%). While, it was least in Bhima Safed (3.97 cm and 4.71 cm). The increased plant height and number of leaves increases the accumulation of photosynthates in the bulbs and results in maximum polar diameter, equatorial diameter and bulb weight. This in turn improves the marketable yield of the onion varieties. This might be due to better synthesis and accumulation of photosynthates in bulbs due to efficient metabolism, greater photosynthates mobilization and better source and sink relationship. The results are in agreement with findings of Hirave *et al.* (2015)<sup>[10]</sup>, Devi *et al.* (2014)<sup>[6]</sup> and Tripathy *et al.* (2013)<sup>[20]</sup>.

**Table 2:** Mean performance of different onion varieties for growth attributes

Sl. No.	Varieties	Plant height at 90 DAT (cm)	Leaf length at 90 DAT (cm)	No. of leaves at 90 DAT	Collar thickness (cm)	Neck thickness (cm)
1	Bhima Kiran	61.59	59.33	8.33	1.32	1.07
2	Bhima Shakti	62.33	61.24	8.53	1.42	1.15
3	Bhima Super	60.51	56.53	8.07	1.33	1.08
4	Bhima Shubra	60.55	55.57	8.13	1.43	1.16
5	Bhima Safed	56.85	56.32	8.11	1.30	1.09
6	Bhima Shweta	58.33	58.66	8.27	1.40	1.13
7	Bhima Light Red	61.45	58.27	8.13	1.22	1.06
8	Bhima Raj	56.91	56.83	8.10	1.30	1.07
9	Bhima Red	61.07	58.76	8.53	1.41	1.14
10	Bhima Dark Red	61.36	54.28	8.00	1.33	1.12
11	Satara Garva	57.87	57.19	8.13	1.39	1.07
	S.Em±	1.12	0.98	0.15	0.04	0.02
	C.D @ 5%	3.30	2.04	0.32	0.12	0.06

DAT- Days after transplanting



1-Bhima Kiran, 2- Bhima Shakti, 3- Bhima Super, 4- Bhima Shubra, 5- Bhima Safed, 6- Bhima Shweta, 7- Bhima Light Red, 8- Bhima Raj, 9- Bhima Red, 10- Bhima Dark Red, 11- Satara Garva

**Fig 1:** Number of days taken to harvest among different onion varieties**Table 3:** Mean performance of different onion varieties for yield and quality attributes

Sl. No.	Varieties	Polar diameter of bulb(cm)	Equatorial diameter of bulb (cm)	Bulb colour	No. of rings	Bulb weight (g)	Total bulb yield/plot (kg/plot)	Total bulb yield/ha (t/ha)	Marketable bulb yield (%)	Grade wise yield (%)		
										A	B	C
1	Bhima Kiran	4.61	5.18	Light red	8.66	81.45	30.92	34.35	90.51	45.80	34.83	9.88
2	Bhima Shakti	4.65	5.25	Red	9.75	88.21	34.48	38.31	94.93	47.36	36.05	11.52
3	Bhima Super	4.40	4.81	Red	7.68	67.87	29.56	32.84	83.29	41.22	34.02	8.05
4	Bhima Shubra	4.44	4.92	white	8.27	75.49	28.63	31.81	81.38	40.18	33.80	7.40
5	Bhima Safed	3.97	4.71	white	7.84	55.34	24.43	27.14	71.68	35.43	30.65	5.60
6	Bhima Shweta	4.35	4.88	white	7.97	67.61	27.51	30.56	76.99	38.48	32.10	6.41
7	Bhima Light Red	4.29	4.77	Light red	8.16	71.29	30.12	33.46	86.86	43.59	34.57	8.70
8	Bhima Raj	4.30	4.73	Dark red	8.00	64.50	26.92	29.91	72.74	35.92	31.32	5.50
9	Bhima Red	4.42	5.09	Red	8.51	75.53	27.98	31.09	80.46	40.02	33.47	6.97
10	Bhima Dark Red	4.17	4.80	Dark red	8.10	73.52	22.08	24.53	70.56	34.66	30.40	5.50
11	Satara Garva	4.38	4.89	Red	8.31	64.15	27.52	30.58	78.28	39.05	32.50	6.73
	S.Em±	0.11	0.10		0.13	3.38	0.66	0.68	1.59	0.73	0.72	0.14
	C.D @ 5%	0.32	0.31		0.27	9.97	1.38	1.41	3.32	1.49	1.51	0.29

**Conclusion**

Based on the results obtained from the present study it can be concluded that, among all the evaluated eleven varieties of onion, the variety Bhima Shakti, was found to be superior followed by BhimaKiran, Bhima Red, Bhima Light Red and Bhima Shubra considering the various growth, yield and quality attributes. And these varieties can be recommended

for commercial cultivation under central dry zone of Karnataka during *Rabi* season.

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