



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; SP3: 344-346

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National conference on "Conservation, Cultivation and Utilization of medicinal and Aromatic plants" (College of Horticulture, Mudigere Karnataka, 2018)

Performance of onion (*Allium cepa* L.) varieties for growth and yield parameters under central dry zone of Karnataka

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Abstract

A study was conducted to ascertain the production potentials of different varieties of onion (*Allium cepa* L.) were carried out at Zonal Agricultural and Horticultural Research Station, Hiriyur, Chitradurga District, Karnataka during kharif season of 2013-14. A study comprises 14 varieties (Agri Found White, Arka Pragathi, N-53, Arka Niketan, Poona Pursangi, ArkaKalyan, Bhima Super, Mahalakshmi, Agri Found Dark Red, Agri Found Light Red, Satara Garva, Prema-178, NHRDF Red, and Bellary Red) and evaluated for growth and yield parameters under Central Dry Zone of Karnataka to identify the high yielding varieties and were tested at this centre and laid out in randomised complete block design with three replications. The results revealed that, the highest and significant total bulb yield (282.63 q/ha) and marketable yield (251.83 q/ha) were recorded in the genotype Bhima Super. The parameters like polar diameter of bulb (4.98 cm), equatorial diameter of bulb (5.46 cm) and Average bulb weight (69.33 g) recorded significantly higher in the genotype Bhima Super.

Keywords: *Allium cepa* L. Performance, varieties, Growth, Yield parameters

Introduction

Onion is one of the most important spice and vegetable crop grown in India. The green leaves immature and mature bulbs used for vegetables and spice purposes and has many medicinal properties incredible onion benefits for health: Fight Cancer, Improve Heart Health, Lower Blood Sugar Levels, Promote Healthy Digestion, Maintain Bone Health, Prevent Inflammation and Other Allergies, Improve Immune System and Cure Ear Disorders.

It is an important bulb crop throughout the world and is commercially cultivated in more than hundred countries. India ranks second in the world in area and production after China and third in export after Netherland and Spain. India is producing 17,511.10 thousand million tonnes of onion from an area of 1,087.26 thousand ha with an average productivity 16.10 t/ha. In Karnataka, it is grown about 177.20 thousand million ha with an average production of 2,451.20 thousand million tonnes and productivity 13.83 t/ha (NHB data base 2016-17). In India, Maharashtra, Gujarat, Karnataka, Orissa, Uttar Pradesh, Madhya Pradesh, Rajasthan and Andhra Pradesh are major onion growing states. Because of its high export potential it comes under cash crop apart from vegetables. Onion cultivar shows wide variation in their yielding ability when grown over varied agro-climatic conditions and variety or hybrids used. Different cultivars have different soils in climatic requirements for their optimum performance. India being a vast country with varied agro-climatic regions, single variety or hybrid may not suitable for all the agro-climatic conditions. Hence, new varieties and hybrids need to be introduced or evolved for specific regions/zones. Onion is a semi perishable crop so that it cannot store for long time. Lack of recommended or released variety of high yielding in the country. It creates shortage during off season arrival period. To meet out the domestic requirement and also full fill the export demand, selection of suitable genotypes for growing under different agro-climatic conditions is required. Therefore, keeping this in view, the different constraints cited above and realizing the need of comprehensive study to select the most suitable high yielding genotypes with better growth, yield and quality by screening existing cultivars of onion for Central Dry Zone of Karnataka.

Materials and Methods

The present investigation was carried out at Zonal Agricultural and Horticultural Research Station, Hiriyyur (13°57'N latitude and 70°37' E longitude at an elevation of 606.1 meters mean sea level) Karnataka during *kharif* of 2013-14. The soil of the experimental block was clay loam, medium Organic Carbon (0.19 %), Available Nitrogen (222.0 kg/ha), Phosphorus (17.0 kg/ha) and high in available Potassium (186.0 kg/ha). The annual Minimum and Maximum Temperature and Humidity ranging between 20.91°C and 31.49°C and 61.74 % to 77.76% respectively, with an Annual Rainfall around 527.10 mm. The study comprises Twenty Two genotypes were evaluated at this Centre. Six week old seedlings of each varieties were transplanted in flat beds at a spacing of 15 x 10 cm in a plot of 3 x 2 meter size in randomized block design with three replications. The recommended packages of practices were followed for raising the successful crop. Randomly ten plants from each plot were selected to recorded the observations on Plant Height (cm), Number of Leaves, Collar Thickness (cm), Neck Thickness (cm), Bolting per cent, Ten Weight of Bulb (g), Polar Diameter (cm), Equatorial diameter (cm), Total Bulb Yield (q/ha) and Total Soluble Solids (%). The data of different genotypes characters statistically analyzed and presented in table.

Results and Discussions

The results obtain from the present investigation on the evaluation of onion (*Allium cepa* L.) varieties for growth and yield traits under Central Dry Zone of Karnataka during *kharif* season of 2013-14 are discussed and presented in table.

Growth Parameters

Data pertaining to Plant Height (cm), Number of Leaves, Collar Thickness (cm), Neck Thickness (cm), differed significantly during *kharif* season of 2013-14 in Central Dry Zone of Karnataka presented in the Table.

It revealed that, at 70 days after transplanting, significantly highest plant height (59.73 cm) was recorded in the variety Bhima Super which was on par with Arka kalyan (58.93 cm) and Satara Garva (58.70cm) and followed by Bellary Red (57.68 cm) as compared to rest of the varieties. Whereas, significantly higher number of leaves (9.27) recorded in Bhima Super followed by Arka Kalyan (9.20). However, lowest number of leaves was recorded in the entry NHRDF RED (8.47) as compared to rest of the genotypes.

At harvest collar girth recorded significantly the highest in the genotype Agri Found Dark Red (1.53 cm) followed by Arka Pragathi (1.50 cm) as compared to rest of the genotypes and lowest collar girth was recorded in the genotype Arka Kalyan (1.29 cm). Whereas, Bhima Super recorded significantly the highest neck thickness (1.22 cm) followed by (1.18 cm) and lowest was recorded in the genotype Bellary Red (1.06 cm). Among the different cultivars Arka kalyan, Agri Found Dark Red, Bhima Super recorded better growth in respect of plant height, number of leaves, collar thickness and neck thickness compared to other genotypes. Thus the increased number of leaves helped in better synthesis of carbohydrates and their utilization for build up new cells apart from better absorption

of nutrients resulting in increased dry matter production on such variations in the growth among the cultivars were reported by several workers [2, 3, 4, 5].

Yield parameters: Data pertaining to polar diameter of bulb, equatorial diameter of bulb, per cent A grade bulb, per cent B grade bulb, per cent C grade bulb, Average bulb weight, Marketable yield, total yield, per cent Marketable bulb and total soluble solids differed significantly during *kharif* season of 2013-14 in Central Dry Zone of Karnataka (Table).

The results revealed that, significantly the highest polar diameter of bulb (4.98 cm) was recorded in the genotype Bhima Super followed by Agri Found White (4.68 cm) as compared to rest of the genotypes. The equatorial diameter of bulb significantly superior in Bhima Super (5.46 cm) and which was at par with Arka Kalyan (5.27 cm) and lowest was in Prema-178 (4.69 cm). Significantly the highest per cent A grade bulb (20.76) was recorded in the genotype Agri Found Light Red followed by Bellary Red (18.73 cm) as compared to rest of the genotypes. The per cent B grade bulb (54.26) and per cent C grade bulb (24.84) superior in the genotype NHRDF RED. The highest and significant average bulb weight was noted for Bhima Super (69.33 g) which was at par with Bellary Red (64.33 g) followed by NHRDF RED (63.33g) as compared to rest of the genotypes. Among the different genotypes, Bhima Super, Agri Found White and Arka Kalyan were recorded the highest polar diameter of bulb, equatorial diameter of bulb, per cent grade bulbs and weight of bulb as these components influence the bulb size which ultimately contributes to the bulb yield [6] are in support of the present findings. Among the different genotypes, Bhima Super recorded significantly the highest total yield (282.63 q/ha) followed by Bellary Red recorded the total yield of (275.23 q/ha) and the lowest was in the genotype N-53 (214.33 q/ha). Whereas The highest marketable yield (251.83 q/ha) and per cent marketable bulb (90.60) was recorded in the genotype Bhima Super as compared to rest of the genotypes.

The highest yield of bulbs from these genotypes can be attributed to maximum plant height, number of leaves which are important component of growth which resulted in accumulation of photosynthates in the bulb. It may be related to maximum polar and equatorial diameter of bulb and bulb weight which are major yielding contributing components. The variation in the yields of different cultivars grown under similar conditions has been obtained from several reporters [6, 7]. The significant variations in total soluble solids were observed among the genotypes. Significantly the highest Total Soluble Solids was recorded in the genotype Agri Found White (13.96%) and which at par with Poona purasangi (13.46 %) and the lowest was recorded in the genotype Agri Found Light Red (11.61). The similar findings also in conformity with [9, 10, 11].

Based on the results of the study it is concluded that among all the cultivars Bhima Super, Arka Kalyan and Bellary Red proved superior considering the growth and yield characteristics for cultivation of Onion under Central Dry Zone of Karnataka during *kharif* season.

Table 1: Growth and yield characters of Onion Varieties.

Sl. No	Varieties	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Plant Height (cm)	Number of Leaves	Collar Thickness (cm)	Polar diameter (cm)	Equitorial diameter (cm)	Neck thickness (cm)	% A Grade Bulb	% B Grade Bulb	% C Grade Bulb	Average bulb weight (g)	Markatable YieldQ/ha	Total Yield q/ha	% Markatable bulb	Total soluble solid %
1	Agri Found White	52.90	8.53	1.47	4.68	5.02	1.13	15.34	52.16	19.63	56.33	241.53	258.61	87.13	13.96
2	Arka Pragathi	53.85	8.53	1.50	4.43	4.96	1.11	15.50	48.26	18.26	51.67	218.77	226.49	82.02	13.26
3	N-53	42.80	8.73	1.47	4.01	4.80	1.14	17.30	54.36	15.26	54.33	201.77	214.33	86.92	11.86
4	Arka Niketan	49.30	9.20	1.43	4.26	4.63	1.08	14.63	48.63	22.43	52.67	224.57	243.86	85.69	12.96
5	Poona Purasangi	52.60	8.54	1.43	4.43	4.86	1.09	16.60	48.76	19.37	58.63	216.87	234.77	84.73	13.46
6	Arka Kalyan	58.93	8.67	1.29	4.20	5.27	1.11	17.83	39.86	22.88	58.00	248.53	267.77	80.57	12.47
7	Bhima Super	59.73	9.27	1.47	4.98	5.46	1.22	18.63	43.26	23.71	69.33	251.83	282.63	90.60	12.46
8	Mahalakshmi	54.90	8.70	1.27	4.33	4.91	1.13	17.79	45.68	21.98	56.00	238.27	261.26	85.45	13.06
9	Agri Found Dark Red	49.50	8.63	1.53	4.20	4.81	1.11	17.67	49.86	22.68	55.33	246.23	264.44	90.21	12.86
10	Agri Found Light Red	52.15	8.83	1.33	4.53	4.86	1.09	20.76	46.26	24.37	54.86	218.72	226.88	89.39	11.61
11	Satara Garva	58.70	8.73	1.40	4.43	4.81	1.04	16.26	49.26	22.67	52.60	246.25	265.88	88.19	12.36
12	Prema- 178	57.67	8.57	1.47	4.26	4.69	1.06	18.66	48.63	18.37	56.33	218.26	227.72	85.66	13.00
13	NHRDF RED	54.15	8.47	1.23	4.37	4.73	1.18	14.66	54.26	24.84	63.33	224.26	241.63	90.26	12.86
14	Bellary Red	57.68	8.90	1.37	4.58	4.98	1.06	18.73	49.26	21.64	64.33	250.68	275.23	89.63	13.46
	SEM	2.47	0.56	0.14	0.9	0.16	0.05	1.02	2.54	2.48	3.27	7.37	9.33	1.54	1.08
	CD 5%	7.10	1.57	0.40	2.46	0.44	0.14	2.94	7.62	7.28	9.51	22.04	26.81	4.42	3.18
	CV %	7.86	8.62	13.18	7.88	6.47	8.76	9.86	8.86	7.68	9.86	8.26	8.68	3.86	12.36

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