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Evaluation of Garlic (*Allium sativum*L.) genotypes for growth and yield parameters under central dry zone of Karnataka

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Abstract

An investigation was conducted to ascertain the Garlic (*Allium sativum* L.) production depends on the performance of genotypes that are suitable to different conditions imposed by specific environment. Production of Garlic in Rabi season is more important to have continuous supply round the year. So evaluation for performance of Garlic varieties is basic step towards its popularization for its successful cultivation under central dry zone of Karnataka. Keeping this in view, field experiment was conducted at Zonal Agricultural and Horticultural Research Station, Hiriyyur. Ten genotypes (NRCWG-5, Agri Found White, NRCWG-6, G-378, G-324, G-282, NRCWG-3, Rajalli Gadde, NRCWG-4, and Agri Found Parvathi) were supplied under All India Network Research Project on Onion and Garlic (AINRPOG) and evaluated for growth and yield parameters under Central Dry Zone of Karnataka to identify the high yielding genotypes for this location and were tested in randomized complete block design with three replications at spacing of 15X10 cm during the Rabi season of 2013-14. The characters studied were plant height(cm), Number of leaves, leaf length, leaf width (cm), Pseudo stem length(cm), Polar diameter and equatorial diameter of bulb(cm), Average bulb weight(g), Number of Cloves per bulb, 10 Cloves weight(g), % Marketable yield(q/ha), Marketable yield(q/ha) and Total yield(q/ha). Among the genotypes tested, the results revealed that, significantly the highest total yield (62.72q/ha) and marketable yield (51.33/ha) was observed in the genotype Rajalli Gadde. The traits polar diameter of bulb (3.93 cm), equatorial diameter of bulb (4.50 cm) and Average bulb weight (81.93 g) were recorded significantly the highest in the genotype Rajalli Gadde.

Keywords: *Allium sativum*, Garlic, genotypes, growth, yield

Introduction

Garlic (*Allium sativum* L.) is an important commercial spice crop grown throughout India for domestic and as well as export purposes. It is cultivated throughout country during Rabi season in different states. The mature bulbs used for spice purposes and has many medicinal properties (Singh *et. al.*, 2004) [10]. Garlic is used for many conditions related to the heart and blood system. These conditions include high blood pressure, low blood pressure, high cholesterol, inherited high cholesterol, coronary heart disease, heart attack, reduced blood flow due to narrowed arteries, and "hardening of the arteries" (atherosclerosis). India ranks second in the world in area and production after China. India is producing 1225.50 thousand million tones of Garlic from an area of 245.16 thousand ha with an average productivity 5.0 t/ha. In Karnataka, it is grown about 5.69 thousand ha with an average production of 6.00 thousand million tones and productivity 1.10 t/ha (Anon, 2015-16) [2]. In India, Maharashtra, Gujarat, Karnataka, Orissa, Uttar Pradesh, Madhya Pradesh, Rajasthan and Assam are major onion growing states (FAO stat, 2012). Because of its high export potential it comes under cash crop apart from Spices. Garlic cultivars shows wide variation in their yielding ability when grown over varied agro-climatic conditions and variety or hybrid 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 be suitable for all the agro-climatic conditions. Hence, new varieties and hybrids need to be introduced or evolved for specific regions/zones. Garlic 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 cultivars 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 cultivars with better growth and yield traits by screening existing cultivars of Garlic under Central Dry Zone of Karnataka.

Materials and methods

The present study was conducted at Zonal Agricultural and Horticultural Research Station, Hiriya, Karnataka (13°57'N latitude and 70°37' E longitude at an elevation of 606.1 meters mean sea level) Karnataka during Rabi 2013-14. The soil of the experimental block was clay loam, medium organic carbon (0.19 %), available nitrogen (206.0 kg/ha), phosphorus (21.0 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 Ten varieties were evaluated at this centre. The seeds of Garlic varieties were dibbled in flat beds at a spacing of 15 x 10 cm in a plot of 3 x 2 meter size in randomized complete 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 record the observations on plant height (cm) number of leaves, leaf length(cm), leaf width(cm), pseudostem length(cm) weight of bulb (g), polar diameter (cm), equatorial diameter (cm), cloves weight(g), number of cloves per bulb, total yield (q/ha) and marketable yield (q/ha) The data of different cultivars characters statistically analyzed and presented in table.

Results and discussions

The results obtain from the present investigation on Performance of Garlic (*Allium sativum* L.) varieties for morphological and yield traits under central dry zone of Karnataka during Rabi 2013-14 are discussed and presented in table.

Growth traits: It revealed that, at 70 days after sowing, significantly the highest plant height (46.37 cm) was recorded in Rajalli Gadde followed by Agri Found Parvathi (43.28 cm) as compared to rest of the cultivars. Whereas, higher number of leaves (8.87) significantly recorded in Rajalli Gadde which was on par with Agri Found Parvathi (8.78) followed by G-378 (8.73). However, lowest number of leaves was recorded in NRCWG-3(7.23) as compared to rest of the varieties. Leaf length recorded significantly the highest in the cultivar G-282 (39.80 cm) followed by Rajalli Gadde (36.47 cm) as compared to rest of the genotypes and the lowest was recorded in NRCWG-3 (21.70 cm). Whereas, Rajalli Gadde recorded significantly the highest leaf width (1.53 cm) which was on par with Agri Found Parvathi (1.52 cm) followed by NRCWG-6 (1.43 cm) and lowest was recorded in the genotype G-282 (0.93 cm). Significantly the highest pseudo stem length (3.90 cm) was recorded in Rajalli Gadde followed by Agri Found Parvathi (3.78 cm) as compared to rest of the genotypes and the lowest was recorded in Agri Found White (3.10 cm). Among the different cultivars Rajalli Gadde, Agri Found Parvathi G-282 and G-378 recorded better growth in

respect of plant height, number of leaves, leaf length, leaf width and pseudostem length compared to other cultivars. 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 (Pandey *et. al.*, 1996; Daljeet Singh, 2003; Golani *et. al.*, 2003; Patil *et. al.*, 2013; Sandhu, *et al.*, 2015)^[7, 5, 8, 9].

Yield Parameters: Data pertaining to polar diameter of bulb, equatorial diameter of bulb Average weight of bulb, number of cloves per bulb, 10 cloves weight, Per cent marketable yield, marketable yield and total yield and differed significantly during Rabi 2013-14 in Central Dry Zone of Karnataka (Table). The results revealed that, significantly the highest polar diameter of bulb (3.93 cm) was recorded in the cultivar Rajalle Gadde followed by Agri Found Parvathi (3.76 cm) as compared to rest of the cultivars. The equatorial diameter of bulb significantly superior in Rajalle Gadde (4.50 cm) followed by Agri Found Parvathi (3.89 cm) as compared to rest of the cultivars. The highest and significant Average bulb weight was noticed in Rajalle Gadde (18.93 g) which was at par with Agri Found Parvathi (17.96 g) and G-282(17.93 g) followed by Agri Found White (17.53 g) as compared to rest of the cultivars. significantly the highest number of cloves per bulb was observed in Rajalle Gadde (13.30) and which was at par with Agri Found Parvathi (12.45). The highest and significant ten cloves weight was noticed in Rajalle Gadde (11.68 g) which was at par with Agri Found Parvathi (10.65 g) followed by NRCWG-6(10.63 g) as compared to rest of the cultivars.

Among the different cultivars G-282, Rajalle Gadde, NRCWG-6 were recorded the highest polar diameter of bulb, equatorial diameter of bulb, weight of bulb, cloves weight and number of cloves per bulb as these components influence the bulb size which ultimately contributes to the bulb yield Anil Khar *et. al.* (2007)^[1] are in support of the present findings. Among the different cultivars, The highest and significant Per cent marketable yield was noticed in Rajalle Gadde (92.14) which was at par with G-324 (91.53) followed by G-282 (89.23) as compared to rest of the cultivars. Rajalli Gadde recorded significantly the highest total yield (62.72 q/ha) and marketable yield (51.33 q/ha) followed by Agri Found Parvathi recorded the highest total yield (58.12 q/ha) and marketable yield (48.36 q/ha). The highest yield of bulbs from these cultivars 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, bulb weight, cloves weight and number of cloves per bulb which are major yielding contributing components. The variation in the yields of different cultivars grown under similar conditions has been obtained from several reporters (Pandey *et. al.*, 1996; Daljeet Singh, 2003; Golani *et. al.*, 2003; Meshram *et. al.*, 2011; Singh and Bhone, 2011; Patil *et. al.*, 2013; Fanaei *et al.*, 2014)^[7, 5, 6, 11, 8].

Based on the results of the study it is concluded that among all the cultivars Rajalle Gadde and Agri Found Parvathi proved superior considering the growth and yield characteristics for cultivation of Garlic under Central Dry Zone of Karnataka during Rabi season.

Table 1: Growth and yield Parameters of Garlic Varieties.

S. No.	Varieties	Plant height cm	Number of leaves	Leaf length cm	Leaf width cm	Pseudo stem length cm	Polar diameter cm	Equi torial diameter cm	Average bulb weight g	Number of cloves/ bulb	10 cloves weight g	% Markatable yield	Markatable Yield q/ha	Total Yield q/ha
1	NRCWG-5	42.57	8.65	32.57	1.37	3.73	2.90	3.37	16.37	9.63	8.93	87.23	41.11	57.78
2	Agri Found White	37.5	7.33	26.20	1.17	3.10	2.97	3.30	17.53	9.93	9.53	88.13	36.74	45.88
3	NRCWG-6	31.93	7.87	26.73	1.43	3.33	3.13	3.53	16.63	10.67	10.63	87.92	35.93	46.66
4	G-378	40.60	8.73	29.35	1.20	3.13	3.13	3.37	13.73	10.26	10.53	86.21	41.27	57.65
5	G-324	34.57	7.93	27.25	1.23	4.37	2.50	3.20	13.70	9.83	9.33	91.53	41.79	56.58
6	G-282	30.40	8.60	39.80	0.93	3.33	3.57	3.65	17.93	9.60	9.53	89.23	42.70	54.03
7	NRCWG-3	31.10	7.23	21.70	1.37	3.67	3.01	3.26	16.23	9.45	9.86	88.65	41.36	54.23
8	Rajalli Gadde	46.37	8.87	36.47	1.53	3.90	3.93	4.50	18.93	13.30	11.68	92.14	51.33	62.72
9	NRCWG-4	41.26	8.26	31.25	1.42	3.75	3.45	3.26	17.23	11.69	9.98	87.56	45.98	56.23
10	Agri Found Parvathi	43.28	8.78	34.58	1.52	3.78	3.76	3.89	17.96	12.45	10.65	88.32	48.36	58.12
	SEM	1.86	0.29	1.73	0.05	0.18	0.05	0.05	0.68	0.66	0.64	1.63	1.76	1.68
	CD 5%	5.46	0.84	4.96	0.13	0.54	0.15	0.15	2.02	1.92	1.89	4.82	5.32	4.98
	CV %	7.83	6.46	9.10	9.63	8.70	3.57	2.77	8.23	6.70	8.86	4.36	6.54	6.24

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