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RESEARCH PAPER

Evaluation of garlic (*Allium sativum* L.) genotypes for growth and yield under Northern zone of Karnataka

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Abstract: The present investigation on performance of garlic (*Allium sativum* L.) genotypes for growth and yield attributes under Northern zone of Karnataka was carried out at Main Agricultural Research Station, UAS, Dharwad, Karnataka during *rabi,* 2020-21. Twenty five genotypes were evaluated and laid out in randomized block design with three replications. Mean performance showed highly significant differences for all the growth and yield parameters of garlic genotypes. Among all the treatments, Gulbarga local registered maximum growth parameters like plant height (68.57 cm), leaf length (53.23 cm), fresh weight of plant (189 g), dry weight of plant (123.67 g) and maximum yield parameters like polar diameter of bulb (36.32 mm), equatorial diameter of bulb (43.10 mm), average bulb weight (28.07 g), clove length (2.67 cm), clove width (2.03 cm), hundred clove weight (147.18 g) and bulb yield per hectare (6.39 t/ha).

Key words: Bulb yield, Garlic, Genotypes, Growth

Introduction

Garlic (*Allium sativum* L.) is second widely cultivated vegetable crop after onion, under the genus *Allium,* belongs to family Alliaceae. The wild species *Allium longicuspis* Regel is considered as closest relative and ancestor of garlic. It is one of the ancient cultivated vegetable giving pungency. It is native to Central Asia and Southern Europe especially Mediterranean region. It is being grown in India and China in large areas.

The major garlic growing countries in the world are China, India, Bangladesh and Myanmar. In the world it is grown in an area of 1.6 million hectares with production of 30.7 million tonnes and productivity of 19.18 tonnes per hectare (Anon., 2019a). India is the second largest garlic producing country in the world with production of 2836 thousand metric tonnes from 354 thousand hectares area (Anon., 2019b). Major garlic producing states in India are Madhya Pradesh, Gujarat, Uttar Pradesh, Rajasthan, Assam, Punjab, Maharashtra, West Bengal and Haryana. In Karnataka, it is grown in an area of 4.01 thousand hectares with production of 26.55 thousand metric tonnes and productivity of 6.62 tonnes per hectare (Anon., 2019c).

India being a vast country with varied agro-climatic regions, single variety may not be suitable for all the agro-climatic conditions. Garlic varieties show wide variations in their yielding ability it not only depends on cultural practices and area of cultivation but on high yielding genotypes which have good adoptability to the growing area. Hence, evaluation of garlic genotypes is essential to assess the performance of genotypes for growth and yield traits to identify the potential genotype. In view of this, the present study with twenty-five garlic genotypes are screened for growth and yield attributes in Northern zone of Karnataka.

Material and methods

The present investigation on performance of garlic (*Allium sativum* L.) genotypes for growth and yield attributes under northern zone of Karnataka was conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during *rabi* 2020-21. Twenty five genotypes were evaluated using randomized block design (RBD) with three replications. The selected cloves of each genotypes were dibbled at 15 cm apart from row to row and 7.5 cm from plant to plant by keeping growing ends of cloves upward direction. All the recommended package of practices was followed for garlic as per the package of practices for horticulture crops (Anon., 2013). Five plants were selected randomly from each replication and data were recorded for various characters *viz.*, plant height (cm), number of leaves per plant, leaf length (cm), leaf width (cm), fresh weight of plant (g/plant), dry weight of plant (g/plant), neck diameter (mm), dry matter content of plant (%), pseudo stem length (cm), harvest index (%), days to maturity, average bulb weight (g), bulb polar diameter (mm), bulb equatorial diameter (mm), number of cloves per bulb, clove length (cm), clove width (cm), hundred clove weight (g), bulb yield (t/ha). The differences between all genotypes for different characters were tested for significance by using analysis of variance as par the procedures given by Panse and Sukhatme (1961).

Results and discussion

Growth traits of different genotypes

The data on mean performance of garlic genotypes for growth parameters were presented in Table 1. Among different genotypes evaluated, highest plant height (68.57 cm) was recorded in genotype Gulbarga local which is on par with DWD G-1 (67.43 cm), Rajalle gadde (64.60 cm) and Bidar local (63.67 cm). Whereas, genotype GN 20-43 showed lowest plant height (44.83 cm). The number of leaves per plant found maximum in GN 20-62 (7.13) and found statistically on par with Gulbarga local (6.83) and Bidar local (6.67). While, genotype GN 20-52 had least number of leaves per plant (5.67). The leaf width registered highest in GN 20-02 (2.20 cm) and which is statistically on par with GN 20-67 (2.13 cm) and GN 20-13 (2.10 cm). While, genotype DWD G-1 recorded lowest leaf width (1.37 cm). The leaf length found maximum in Gulbarga local (53.23 cm) and which is statistically on par with

Table 1. Mean performance of garlic genotypes for growth parameters

Genotypes	Plant Height (cm)	No. of leaves	Leaf width (cm)	Leaf length (cm)	Pseudo stem length (cm)	Neck Diameter (mm)	Fresh weight of plant (g)	Dry weight of plant (g)	Dry matter of plant (%)	Days to maturity (No.)	Harvest index (%)
GN 20-02	55.33	6.37	2.20	46.67	8.03	4.47	135.33	92.00	67.59	118.33	70.51
GN 20-06	52.17	5.97	2.03	46.70	6.53	5.02	96.67	63.67	65.78	119.33	65.84
GN 20-08	45.17	6.10	2.07	35.77	6.97	6.74	133.33	87.33	65.89	114.00	61.64
GN 20-11	49.17	6.30	1.90	40.00	7.27	4.90	126.00	87.67	69.36	119.00	85.87
GN 20-13	61.67	5.87	2.10	48.97	7.00	6.24	84.67	52.33	61.83	118.67	60.79
GN 20-15	51.27	6.23	2.10	46.10	7.03	7.35	67.67	33.00	48.61	118.67	51.25
GN 20-41	62.47	6.10	2.02	41.50	6.57	4.42	94.00	57.33	61.00	117.00	81.68
GN 20-43	44.83	6.60	2.03	36.50	6.83	7.27	131.00	94.00	71.68	115.33	62.56
GN 20-45	58.02	6.43	1.87	47.57	6.53	6.89	80.67	53.33	65.49	117.67	70.09
GN 20-48	45.83	6.10	1.57	37.10	6.40	4.11	81.67	47.00	64.66	89.67	58.63
GN 20-50	48.23	6.03	1.70	40.87	6.57	6.49	87.33	61.67	70.82	118.00	79.04
GN 20-52	56.10	5.67	2.03	44.93	6.67	7.56	59.33	32.67	55.02	118.33	60.43
GN 20-54	60.83	6.23	1.73	44.80	6.73	5.65	89.00	55.33	61.50	119.33	68.37
GN 20-57	57.30	6.33	1.93	45.93	6.83	6.56	116.67	90.00	76.85	111.33	60.73
GN 20-59	48.40	6.30	1.93	46.73	6.70	7.03	83.33	40.33	48.41	119.00	60.39
GN 20-62	50.67	7.13	2.03	41.67	6.73	7.91	125.00	72.33	57.88	111.33	61.21
GN 20-65	49.03	5.73	1.53	37.83	6.87	3.67	66.33	35.33	62.98	89.67	62.38
GN 20-67	57.33	6.53	2.13	48.40	6.37	12.56	155.33	77.67	49.16	113.33	36.22
DWD G -2	53.17	5.90	1.80	45.70	7.00	5.80	129.00	85.67	66.38	117.33	68.51
Vannur local	63.00	6.60	1.40	41.67	6.37	3.45	65.33	52.33	81.57	89.33	69.45
Gulbarga local	68.57	6.83	1.93	53.23	6.83	8.84	189.00	123.67	65.56	113.67	64.95
Bidar local	63.67	6.67	1.90	51.83	7.17	7.19	156.67	98.33	63.12	112.33	62.88
Rajalle gadde	64.60	6.67	1.90	45.67	7.10	5.12	110.33	75.00	67.80	117.33	76.51
Fawri	61.30	6.47	1.67	45.60	7.20	7.10	121.00	88.33	73.32	112.67	62.06
DWD G-1	67.43	6.53	1.37	46.00	7.20	3.00	65.00	51.00	78.78	89.33	62.33
Mean	55.82	6.31	1.88	44.31	6.88	6.21	105.99	68.29	64.84	112.00	64.97
S.Em. ±	1.86	0.21	0.11	2.23	0.31	0.41	7.05	6.03	3.52	2.43	0.39
C.D. @ 5 %	5.30	0.59	0.33	6.33	0.88	1.15	20.04	17.14	10.00	6.90	1.10
CV	5.78	5.67	10.58	8.70	7.93	11.32	11.52	15.29	9.39	3.75	1.03

Bidar local (51.83 cm) and GN 20-13 (48.97 cm). While the genotype GN 20-08 recorded lowest leaf length (35.77 cm). The pseudo stem length was found to be highest in GN 20-41 (8.03 cm) and which is statistically on par with GN 20-48 (7.27 cm) and Fawri (7.20 cm). While, genotype GN 20-15 and Vannur local were recorded lowest pseudo stem length (6.37 cm). The neck diameter of bulb was found highest in GN 20-67 (12.56 mm). While, genotype DWD G-1 recorded lowest neck diameter (3.00 mm). The fresh weight of plant registered highest in Gulbarga local (189 g). While, the lowest was recorded in GN 20-52 (59.33 g). The dry weight of plant found maximum in Gulbarga local (123.67 g). While, genotype GN 20-52 accumulated lowest dry weight of plant (32.67 g). The dry matter of plant recorded highest in Vannur local (81.57 %) and which is statistically on par with DWD G-1 (78.78 %) and GN 20-57. While, genotype GN 20-59 accumulated lowest dry matter of plant (48.41 %). Number days to maturity ranges from 89.33 - 119.33 days with a general mean of 112 days for maturity. The minimum days to maturity recorded in Vannur local and DWD G-1 (89.33). While, GN 20-06 took maximum days to maturity (119.33). The harvest index found highest in GN 20-11 (85.87 %). While, genotype GN 20-67 had lowest harvest index (36.22 %). Similar findings were observed with Pervin *et al.* (2014), Vatsyayan *et al.* (2015), Singh *et al.* (2015) and Bhatt *et al.* (2017).

Yield traits of different genotypes

The data with respect to yield traits were presented in Table 2. The results revealed that maximum polar diameter was recorded in Gulbarga local genotype (36.32 mm) which was statistically at par with GN 20-54 (35.41 mm) and GN 20-15 (35.13 mm). However, minimum polar diameter (21.96 mm) was observed in DWD G-1. The for equatorial diameter of bulb was recorded in genotype Gulbarga local (43.10 mm). While, lowest (23.61 mm) was observed in GN 20-52. The average bulb weight was maximum in Gulbarga local (28.07 g). While, the minimum average bulb weight was recorded in GN 20-15 (6.67 g). The number of cloves per bulb (32) were found maximum in GN 20-65 which is statistically on par with Vannur local (29.33) and DWD G-1 (29.00). Whereas, minimum (6.00) was found in GN 20-52 of cloves per bulb than check variety DWD G -2 (12.00). The clove length was found maximum in Gulbarga local and GN 20-43 (2.67 cm each), which are statistically on par with GN 20-62 (2.53 cm) and Fawri (2.50 cm) genotypes. Whereas, minimum was found in GN 20-54 and GN 20-67 (1.70 cm each). The clove

Table 2. Mean performance of garlic genotypes for yield parameters

Genotypes	Polar diameter of bulb (mm)	Equatorial diameter of bulb (mm)	Average bulb weight (g)	No. ofcloves per bulb	Clove length (cm)	Clove width (cm)	100 Clove weight(g)	Bulb yield per ha(t/ha)
GN 20-02	31.75	33.47	14.47	12.00	2.33	1.27	66.36	5.88
GN 20-06	25.84	29.60	16.67	10.33	1.87	1.03	81.69	4.05
GN 20-08	33.24	35.43	21.40	9.67	2.13	1.73	111.57	5.90
GN 20-11	32.23	35.96	12.07	10.33	2.50	1.47	88.09	3.73
GN 20-13	33.12	29.69	7.80	7.00	1.87	0.67	43.07	3.60
GN 20-15	35.13	30.45	6.67	6.67	1.87	0.63	42.17	3.05
GN 20-41	29.55	28.66	12.20	9.67	2.30	1.70	79.33	4.25
GN 20-43	35.03	39.61	20.47	10.67	2.67	1.47	114.38	4.20
GN 20-45	29.93	36.58	12.87	11.67	2.23	1.27	94.28	3.99
GN 20-48	24.57	30.50	15.73	28.00	1.90	0.87	43.45	2.49
GN 20-50	22.18	27.76	12.87	16.33	2.20	1.20	52.78	1.90
GN 20-52	28.34	23.61	7.40	6.00	1.73	0.53	36.70	2.89
GN 20-54	35.41	32.62	10.27	6.33	1.70	0.60	44.30	4.28
GN 20-57	29.33	38.17	19.53	14.67	2.23	1.40	106.38	4.72
GN 20-59	29.25	23.70	8.47	19.33	2.30	1.27	85.00	2.54
GN 20-62	33.93	38.42	19.87	25.33	2.53	1.27	65.17	3.75
GN 20-65	24.33	28.10	10.53	32.00	1.99	0.73	31.50	2.03
GN 20-67	32.45	34.21	18.20	6.33	1.70	0.53	37.00	2.60
DWD G -2	32.09	35.77	16.20	12.00	2.10	1.27	52.73	4.82
Vannur local	23.08	28.43	10.80	29.33	2.40	0.63	37.24	6.02
Gulbarga local	36.32	43.10	28.07	14.33	2.67	2.03	147.18	6.39
Bidar local	32.33	38.09	22.27	10.33	2.27	1.67	95.14	6.02
Rajalle gadde	28.26	30.23	15.67	10.00	2.33	1.60	74.69	3.91
Fawri	32.43	38.77	18.27	12.33	2.50	1.23	88.97	4.43
DWD G-1	21.96	27.49	10.00	29.00	2.31	0.70	40.06	6.07
Mean	30.08	32.74	14.75	14.39	2.19	1.15	70.37	4.14
S.Em. ±	2.30	1.00	0.78	1.44	0.09	0.12	0.96	61.08
C.D. @ 5 %	6.53	2.86	2.21	4.09	0.24	0.34	2.72	173.67
CV	13.22	5.31	9.13	17.33	6.78	17.98	2.36	2.55

width was registered maximum (2.03 cm) in Gulbarga local genotype which is statistically on par with GN 20-08 (1.73 cm) and GN 20-41 (1.70 cm). While, minimum clove width was recorded in GN 20-52 and GN 20-67 (0.53 cm each). The bulb yield per hectare was recorded highest in Gulbarga local (6.39 t/ha). While, the lowest was recorded in GN 20-50 (1.90 t/ha). Similar findings are consistent with outcomes of Pervin *et al.* (2014), Vatsyayan *et al.* (2015), Singh *et al*. (2015) and Bhatt *et al.* (2017).

Conclusion

The performance of the genotypes with regards higher bulb yield was influenced by yield attributing characters like polar diameter of bulb, equatorial diameter of bulb, average bulb weight, clove length, clove width and hundred clove weight. Based on the yield attributes of twenty-five genotypes, Gulbarga local, DWD G-1, Vannur local, GN 20-08 and GN 20-02 were found best bulb yield performing genotypes.

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