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Performance of Garlic Genotypes under *Sub montane* Zone of Maharashtra

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ABSTRACT

Background: Knowledge about the morphological characteristics of garlic genotypes is most important for selection of the appropriate varieties for appropriate place and achievement of high yields. Besides, characterization is an important aspect for documentation of the performance of the studied cultivars, which subsequently helps for introduction, selection and improvement in existing varieties of garlic.

Methods: The experimental material was comprised of 16 genotypes of garlic *viz.,* Phule Baswant, Phule Nilima, Kalwan Local, DN-49-395, DN-49-364, Marwar Local, G-284, G-222, G-444, G-41, G-119, G-215, G-752, G-546, Satara Local and Dahiwadi Local. The collected genotypes of garlic was dibbled on flat beds of 1.5 m × 1.0 m dimensions at a spacing of 15×10 cm in randomized block design with three replications and a total plot size of 72.00 m^2. The soil selected for present investigation was of medium texture and rich in organic matter. FYM was applied @ 25 t/ha at the time of land preparation and recommended dose of fertilizers *i.e.* 100:50:50 kg $N:P_2O_5:K_2O$/ha was applied. The observations on growth parameters at harvest, yield attributes, incidence of pests and diseases, physiological loss in weight (%) and decay percentage at the end of 90 days of storage at ambient temperature were recorded.

Result: The data revealed that, the genotypes *viz*., Phule Nilima, Phule Baswant and G-41 had recorded the better performance with respect to growth and yield attributes with minimum disease and pest incidence and least physiological loss in weight and decay at the end of 90 days of storage at ambient temperature.

Key words: Decay, Garlic genotypes, Growth, Physiological loss in weight, Yield.

INTRODUCTION

Garlic (*Allium sativum* L.) belongs to the family Alliaceae is one of the important spice crops grown in India for its edible small bulb made up of a numerous smaller bulblets individually known as a *'clove'*. Garlic has been cultivated for thousands of years for therapeutic and prophylactic properties, religious significance and flavour and taste. Garlic has higher nutritive value than other bulb crops (Mishra and Balaji, 2017). India ranks second after China in area and production contributing 5.29% to the total garlic production in the world. In India, area under garlic during 2018 was 3.17 lakh ha with a production of 16.11 lakh tones (Anonymous, 2018). Present production of garlic is inadequate to meet the indigenous and export demand. The garlic production needs to be increased either by increasing the area or by developing the high yielding varieties. Evaluation, characterization, documentation and conservation of germplasm provide a rapid, reliable and efficient tool of information to augment the utilization of germplasm through the development of suitable varieties Knowledge about the morphological characteristics of garlic germplasm is most important for selection of the appropriate genotypes for appropriate place and achievement of high yield besides a subsequent information to introduce, select and improve the existing varieties (Salahuddin *et al*., 2019). Keeping these points in mind, the present investigation was carried out at RCSM College of Agriculture, Kolhapur during *Rabi*, 2019.

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MATERIALS AND METHODS

The experimental material consisted of 16 garlic genotypes *viz*., Phule Baswant, Phule Nilima, Kalwan Local, DN-49-395, DN-49-364, Marwar Local, G-284, G-222, G-444, G-41, G-119, G-215, G-752, G-546, Satara Local and Dahiwadi Local collected from different parts of Western Maharashtra and were planted at the Instructional-cum- Research Farm of RCSM College of Agriculture, Kolhapur during *Rabi,* 2019. The soil selected for present investigation was of medium texture and rich in organic matter. FYM was applied

@ 25 t/ha at the time of land preparation. Healthy and bold garlic cloves of different genotypes were dibbled in well prepared flat beds of the size 1.5 m × 1.0 m at a spacing of 15 × 10 cm in randomized block design with three replications and a total plot size of 72.00 m^2. The recommended dose of fertilizers *i.e.* 100:50:50 kg N:P_2O_5:K_2O per ha was applied of which 50% nitrogen and full dose of phosphorous and potassium were applied as basal dose during field preparation while remaining half dose of nitrogen was top dressed 30 days after planting. The recommended package of practices was followed during the present investigation. The genotypes were harvested at neck fall stage, bundled separately, cured in shade and were utilized for further studies. The growth parameters were recorded at harvest, while physiological loss in weight and decay were recorded in percentage at the end of 90 days of storage at ambient temperature and the data generated was analyzed as per the method given by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Growth parameters

Growth parameters of different garlic genotypes differed significantly and have been presented in Table 1.

The minimum number of days (4.33) required for germination recorded in Phule Nilima, Phule Baswant and Kalwan Local closely followed by G-444 and G-222 (4.67 days) whereas, maximum number of days for germination were noticed in G-546 (5.67). The variation in days required for germination might be due to genetic makeup of the germplasm. The maximum number of leaves at harvest recorded in G-41 (11.07) followed by Phule Nilima (10.47) and minimum was recorded in G-215 (7.73). The variation in number of leaves per plant in garlic genotypes might be due to the genetic potential of genotypes slightly modified by the new environment. The result of present findings are in close conformity with the earlier findings reported by Sharma *et al.* (2015) and Salahuddin *et al.* (2019) in garlic genotypes. The highest neck length at harvest was recorded in Phule Baswant (8.36 cm) whereas, the lowest recorded in G-119 (5.47 cm). The variation in neck length of garlic bulbs among different genotypes might be due to the genetic differences among the germplasm and adaptability to soil and climatic conditions (Harshita *et al.*, 2016). At harvest, the highest neck thickness, plant height and leaf width were recorded by Phule Nilima (0.93 cm and 55.33 cm and 1.50 cm, respectively) whereas the lowest values were recorded in Satara Local (0.64 cm, 44.33 cm and 0.97 cm, respectively). The variation in neck thickness, plant height and leaf width of garlic genotypes might be due to genetic makeup of specific genotype. The results of present findings are in close conformity with the results reported by Verma and Thakre (2018), Mishra and Balaji (2017), Kowser *et al.* (2018) and Shibana and Menon (2019) in garlic genotypes. Similar results were also reported by Dixit *et al.* (2017) in different garlic genotypes. The minimum number of days to maturity was recorded in Phule Baswant (125.33 days) which was on par with G-119 (131.33 days), G-215 (133.33 days) and G-222 (134.00 days) whereas, G-41 recorded the maximum duration for harvest maturity (151.33 days). Differential behavior of garlic genotypes with respect todays to maturity might be due to variation in their genetic makeup. The results of present findings are in close conformity with the results reported by Semira *et al.* (2017) and Dessie and Mulat (2019) in garlic genotypes.

Yield and yield attributes

The data pertaining to garlic bulb yield and yield attributes presented in Table 1 clearly indicated the significant differences among the genotypes under study.

The maximum polar and equatorial bulb diameters were recorded in Phule Nilima (4.43 and 4.11 cm, respectively) which were statistically on par with G-41 (4.17 and 4.02 cm, respectively) and Phule Baswant (4.14 and 3.92 cm, respectively) whereas the the minimum values for polar (3.10 cm) and equatorial (2.85 cm) diameters were observed in G-215. The results of present finding are in agreement with the results reported by Kanaram *et al*. (2016) and Rajole *et al*. (2016) with garlic genotypes. The data pertaining to single bulb weight (Fig 1) recorded the significant differences among the garlic genotypes under study. The maximum single bulb weight was recorded in G-41 (31.45 g) which was statistically on par with Phule Nilima (30.73 g) and significantly higher over rest genotypes whereas, the minimum single bulb weight was recorded in Satara Local (12.93 g) followed by G-546 (15.22 g). The maximum number of cloves per bulb was recorded in Phule Baswant (29.40) which was statistically on par with Kalwan Local (27.20) and Phule Nilima (26.93) whereas, the minimum number of cloves was recorded in G-546 (11.40). Differential behavior of garlic varieties with respect to bulb weight and number of cloves per bulb might be due to variation in the genetic makeup of germplasm and adaptability to soil and climatic conditions. Present finding are in parallel with the results reported by Mishra and Balaji (2017), Kowser *et al.* (2018) and Raj *et al*. (2019) in garlic genotypes. The highest average clove weight was observed in Phule Nilima (1.45 g) while the minimum was recorded in Satara Local (0.70 g) followed by Dahiwadi Local (0.77 g). The results of present investigation are similar with the results reported by Mishra and Balaji (2017) and Kanaram *et al*. (2016) with different sizes of garlic genotypes. The highest bulb yield was recorded in Phule Nilima (111.77 q/ha) followed by G-41 (104.66 q/ha), Phule Baswant (102.88 q/ha), DN-49-364 (101.77 q/ha) and G-284 (101.1 q/ha) which were also statistically on par with Phule Nilima (Fig 2). The significantly lowest bulb yield was recorded in Satara local (56.22 q/ha). It could be mainly attributed to the higher vegetative growth parameters like plant height, number of leaves per plant neck thickness and higher yield attributes *viz.,* weight of bulb, bulb diameter, weight of clove, *etc*. The results of present findings are in agreement with the results reported by Salahuddin *et al.* (2019), Mishra and Balaji (2017), Kowser *et al*. (2018) and Bagchi *et al.* (2020) in garlic genotypes.

Table 1: Growth and yield parameters, colour of bulbs and clove, number of thrips/plant, PLW and decay in garlic genotypes.

Name of the genotype	Days required for germination	No. of leaves per plant	Neck length (cm)	Neck thickness (cm)	Plant height (cm)	Width of leaf (cm)	Days to maturity	Diameter of bulb (cm)		Av. no. of cloves per bulb	Av. Wt. of clove (g)	Colour of		No. of Thrips/ plant	PLW (%)	Spoilage due to decay (%)
								Polar	Equatorial			Bulb	Clove			
Phule Baswant	4.33	9.73	8.36	0.73	48.70	1.34	125.33	4.14	3.92	29.40	1.02	White	Light violet	3.07 (2.25)	12.57	00.00
Phule Nilima	4.33	10.47	7.77	0.93	55.33	1.50	139.67	4.43	4.11	26.93	1.45	White	Light violet	2.80 (2.17)	18.26	0.42
Kalwan Local	4.33	8.40	6.78	0.85	49.60	1.17	142.33	3.77	3.66	27.20	0.96	White	Light violet	3.30 (2.29)	23.58	3.33
DN-49-395	4.67	7.80	7.05	0.69	47.77	1.18	141.67	3.33	3.24	22.67	1.02	White	Dark violet	3.63 (2.39)	23.06	5.83
DN-49-364	4.33	10.07	7.21	0.71	55.27	1.04	139.00	3.53	3.45	21.27	1.41	White	Light violet	3.17 (2.27)	13.83	0.83
Marwar Local	4.67	8.60	7.08	0.75	49.73	1.21	148.00	3.67	3.54	24.07	0.89	White	Light violet	4.57 (2.62)	25.40	7.17
G-284	5.00	8.13	6.43	0.82	49.70	1.23	136.33	3.50	3.35	18.67	1.07	White	Light violet	5.5 (2.85)	28.97	7.50
G-222	4.67	8.53	7.19	0.68	49.57	1.36	134.00	3.40	3.29	17.93	0.97	White	Light violet	7.57 (3.24)	21.52	2.50
G-444	4.67	9.00	7.39	0.71	49.40	1.03	136.00	3.33	3.17	22.73	1.23	White	White	5.83 (2.90)	15.64	0.83
G-41	4.68	11.07	8.12	0.87	54.60	1.25	151.33	4.17	4.02	15.53	1.16	White	Violet	2.97 (2.21)	15.83	3.33
G-119	5.00	8.60	5.47	0.70	49.00	1.02	131.33	3.37	3.17	14.07	1.14	White	White	3.6 (2.39)	21.79	1.67
G-215	5.00	7.73	6.41	0.71	46.13	1.15	133.33	3.10	2.85	16.47	1.06	White	Dark violet	6.50 (3.04)	19.15	1.25
G-752	4.67	7.93	6.55	0.73	49.83	1.12	139.00	3.30	3.14	15.87	1.03	White	White	6.17 (2.97)	19.16	2.50
G-546	5.67	8.67	6.73	0.76	49.07	1.13	140.67	3.43	3.23	11.40	0.90	White	Light violet	4.30 (2.55)	16.14	2.50
Satara Local	5.33	8.33	7.00	0.64	44.33	0.97	143.33	3.23	3.03	12.27	0.70	Purple	Light violet	5.23 (2.78)	15.49	2.92
Dahiwadi Local	5.00	9.20	7.99	0.73	49.50	1.15	140.00	3.33	3.04	17.87	0.77	White	Dark violet	4.23 (2.55)	23.22	0.83
S.E.±	0.36	0.34	0.39	0.034	1.91	0.08	3.23	0.18	0.17	0.87	0.10	-	-	0.12	1.62	0.53
C.D. @ 5%	NS	1.00	1.13	0.10	5.54	0.25	9.33	0.52	0.51	2.30	0.31	-	-	0.35	4.70	1.54

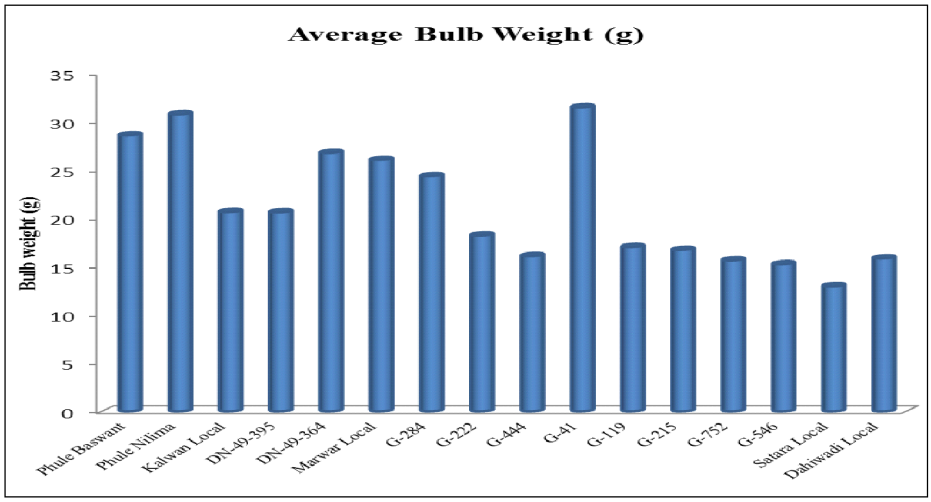


Fig 1: Average bulb weight (g) of different garlic genotypes.

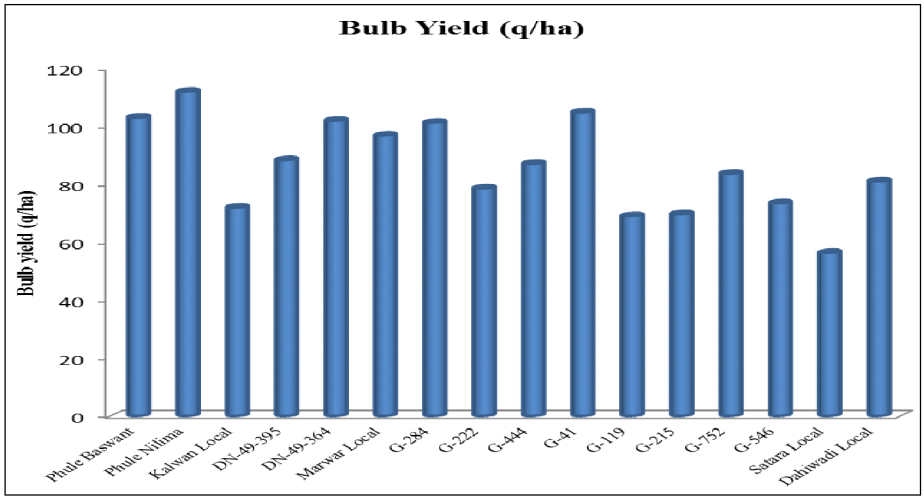


Fig 2: Bulb yield (q/ha) of different garlic genotypes.

Colour of bulb and cloves

A single genotype Satara Local recorded violet colour bulbs while rest 15 genotypes recorded a white bulb colour (Table 1). The results of present findings are in accordance with the results reported by Islam *et al*. (2004) who noticed the different colours like white, silky white, white to pink, pinkish white in garlic germplasm. Among different genotypes, white coloured cloves were observed in G-444, G-119 and G-752; light violet in the cloves of Phule Baswant, Phule Nilima, Kalwan Local, DN-49-364, Marwar Local, G-284, G-222, G-546 and Satara Local whereas, dark violet in DN-49-395, G-41, G-215 and Dahiwadi Local. This variation in of bulb colour and clove colour might be due to genetic makeup of germplasm. The results of present findings are in parallel with the results reported by Dixit *et al.* (2017).

Pest and disease incidence

No incidence of any purple blotch disease was noticed during the experimentation. Significant differences were noticed for thrips population per plant and the least was observed in Phule Nilima (2.80) whereas, highest survival of thrips recorded in G-222 (7.57). The present findings are in accordance with the results reported by Kowser *et al*. (2019) and Hossain *et al*. (2014).

Physiological loss in weight of bulbs (PLW %)

The physiological loss in weight of bulbs of garlic after 90 days of storage at ambient temperature recorded a significant variation with the lowest physiological loss in bulb weight (12.57%) which was followed by DN-49-364 (13.83%), Satara Local (15.49%), G-444 (15.64%), G-41 (15.83%) and G-546 (16.14%) at ambient temperature while the highest PLW (Table 1) was recorded by G-284 (28.97%) closely followed by Marwar Local (25.40%) (Table 1). The variation in physiological loss in weight of garlic bulbs might be due to differences in genetic makeup of the germplasm. The reason for moisture loss is not only that the skin is still permeable to water, but also that much moisture disappears through the cuts and bruises which are inevitably present as a result of harvesting. The results of present findings are in

agreement with the results reported by Sharma *et al*. (2015), Gorrepati *et al*. (2018) and Kowser *et al*. (2018) in different genotypes.

Spoilage losses due to decay (%)

Among different genotypes, Phule Baswant was superior with no (0%) spoilage losses due to decay followed by Phule Nilima (0.42%) whereas, maximum losses due to decay were recorded in genotype G-284 (7.5%) followed by Marwar Local (7.17%) and DN-49-395 (5.83%). The variation in spoilage losses due to decay may be due to the differences in genetic makeup of the germplasm, respiration rate and water loss from the bulbs. The results of present findings are in close conformity with the result reported by Kowser *et al*. (2018), Gorepatti *et al*. (2018) in different number of garlic genotypes.

CONCLUSION

From the present investigation, it is concluded that, genotypes *viz*., Phule Nilima, Phule Baswant and G-41 recorded the better performance with respect to growth and yield attributes disease and pest incidence with least physiological loss in weight and decay losses at the end of 90 days of storage at ambient temperature. On the basis of growth, yield and yield attributes, Phule Nilima, G-41 and Phule Baswant could be recommended for cultivation under *sub-montane* zone of Maharashtra.

Conflict of interest: None.

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