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Performance Evaluation of Garlic Genotypes for Phenotypical and Yield Parameters under Nilgiris Condition

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ABSTRACT: The present study on the performance evaluation of different garlic genotypes under Nilgiris which is a temperate zone was taken up to assess the phenotypical and yield parameters during the year 2018 in Kharif season. The field trial was carried out in the research farm of Horticultural Research Station, Tamil Nadu Agricultural University, Ooty, The Nilgiris. The work was taken up with eight garlic genotypes under randomized block design with three replications. The identification of newer types of garlic genotypes for morphological and yield parameters combined with disease and pest resistance will help in increasing the productivity of the crop. The productivity is a major factor which helps in increasing the yield potential of garlic in India for which continuous evaluation will help to identify more better yielding types. Among the genotypes evaluated for its performance, the entry GN-18-52 recorded the maximum plant height (71.11 cm), average bulb weight (44.16 g), average clove weight (24.40 g), marketable yield and total yield was observed in entry GN-18-52 (97.80 q/ha) and (102.20 q /ha) leaf length (49.50 cm) was maximum in GN-18-57. Considering the better performing characters for positive attributes which will support for its yield and quality, the genotype GN-18-52 considered to be promising and selected for further trials with a view to consider for release of a variety.

Keywords: Evaluation, garlic genotypes, Nilgiris.

INTRODUCTION

Garlic (*Allium sativum* L.) is one of the important spice crops grown in India, next to onion. It belongs to the family Alliaceae. Its primary center of origin is Central Asia (Kazakhstan). It is an herbaceous annual, the underground edible stem of which is a composite bulb made up of a numerous smaller bulbs known as cloves, covered with pinkish or whitish skin. It is among the most used vegetables for treating Type II diabetes mellitus in diabetic women group from United States (Johnson *et al.,* 2006). Evaluation and document are important for exploitation of genetic variability for sustainable human diets. The characterization gives a rapid, reliable and efficient tool of information to augment the utilization of germplasm (Pandey and Singh 1907). Stavellkova (2008); Immelman (2006) reported that high genetic diversity from point of morphological characters in garlic genotypes and pointed that first step of description of garlic genetics resources comprised of morphological characterization. The morphological characters traits like number of bulbs, weight of bulb, number of cloves may use as criteria of selection for improving agronomical character in garlic breeding programme. There was a positive and significant correlation between yield per hectare and sprouting percentage, plant height, number of leaves, leaf length, leaf width, neck thickness, fresh weight of the plant, dry weight of the plant, days to maturity, bulb weight, bulb diameter, bulb length, clove length, clove diameter, and hundred clove weight, indicating that these traits could be intensely selected to increase the bulb yield (Siddappa *et al.,* 2021).

Inappropriate variety use in different agroecology is one of the primary issues which significantly affect garlic phenotype, growth, yield, and nutritional quality (Gebre Garmame Galgaye and Hachalu Kinfu Deresa, 2023). Genotypes may also differ in pungency, length of storage, colour, size, number of cloves per bulb, hardiness, and suitability for cooking. Some even store longer, some are more gourmets in flavor and some mature earlier and others later. Garlic shows wide morphological and agronomic variations in colour, size of bulb, plant height, flowering, number and size of the

cloves, days to harvesting, resistance to storage capacity, dormancy and adaptation to agroclimatic situations (Mario *et al.,* 2008). Evaluation and performance assessment of garlic genotypes under different environmental conditions will help to identify the garlic genotypes for increasing productivity. The continuous evaluation will help to identify more better yielding types with resistance to biotic and abiotic factors. With the background, the research on performance evaluation of garlic genotypes under Nilgiris conditions was taken up to assess the types for better yield factors.

MATERIALS AND METHODS

The present investigation was carried out during the year 2018 -2019 to study the performance of garlic genotypes from different places in India under Nilgiris condition. The experiment was conducted in Woodhouse farm, Horticultural Research Station, TNAU, The Nilgiris which is located at 11.4025′N Latitude, 76.735′E Longitude and at an altitude of 2635 m above Mean Sea Level. The mean annual rainfall of The Nilgiris is 1632 mm. The average maximum and minimum temperature are 26.0ºC and 2ºC respectively and average relative humidity is 75 per cent. The experiment was laid out in a Randomized Block Design (RBD) with eight treatments replicated thrice and genotypes are furnished in Table 1. The garlic cloves were sown with a spacing of 15 × 10 cm. The entries GN-18-52, GN-18-55, GN-18-57, GN-18-59, GN-18-60, GN-18-62, GN-18-64, Local check (Ooty -1) was received through All India Network Research Project on Onion and Garlic, DOGR, Pune. The current research was taken up during the Kharif season as Advanced Varietal Trial (AVT – II) to test verify the performance of the cultures.

In each replication five plants were selected for recording biometrics observations on plant height (cm), foliage colour, number of leaves, leaf length (cm), leaf width (cm), polar diameter (mm), equatorial diameter (mm), average bulb weight (g), number of cloves, average clove weight (g), bulb skin colour, clove skin colour, marketable yield (q/ha), total yield (q/ha), days to harvest, per cent disease index, stemphylium blight, purple blotch, physiological loss in weight (%). The data generated during the course of study was subjected to statistical analysis as prescribed by Panse and Sukhatme (2000).

RESULTS AND DISCUSSION

The results of the genotypes collected were recorded and observation made on the important parameters which contributes for yield and attributing characters were discussed hereunder. Among the eight entries, GN-18-52 recorded the maximum plant height (71.11 cm) followed by GN-18-57 (69.40 cm) whereas lowest plant height was recorded in GN-18-64 (61.00 cm). Maximum leaf length (49.50 cm) was recorded in GN-18-57. This variation in plant growth, leaf characters might be due to genotype as well as some known or unknown environmental factors.

It has been reported that plant produces food materials through the process of photosynthesis. With the increasing number of leaves, photosynthesis generally increases, and plant can produce more food that influences the growth and development of the plant. So, genotypes that can produce more leaves have more plant growth leading to higher yield. Similar findings have been reported (Sangeeta *et al.,* 2006). The number of leaves was maximum in GN-18-52 with 7.0 and lowest in GN-18-64. The leaf length character was found to have significant difference with a greater number of leaves in GN-18-57 with 49.50 and lowest in GN-18-60 with 35.30 whereas leaf width, it is more in GN-18-52 and lowest in GN-18-64.

The polar diameter was found to be maximum with GN-18-52 having 46.75 mm and Equatorial Diameter with 42.44 in GN-18-57. The number of cloves per bulb was found to be 19.10 in GN-18-52 and the same is very low in Local check (Ooty -1) with 12.81. The wide variation was observed in bulb characters among the cultivars. The entry GN-18-52 recorded maximum average bulb weight (44.16 g) followed by GN-18-60 (41.12 g) and low average bulb weight was observed in GN-18-62 (29.01 g). Differences in weight of the bulbs might be due to the environmental condition and genotype of garlic varieties. This is in agreement with results reported by Islam *et al.* (2007); Panse *et al.* (2013); Benke *et al.* (2018); Yeshiwas *et al.* (2018).

The important yield attributing parameters *viz.*, average clove weight was observed in GN-18-52 (24.40 g), followed by GN-18-55 (23.80 g), marketable yield and total yield were higher in entry GN-18-52 (97.80 q/ha) and (102.20 q /ha) respectively. The marketable yield and total yield were lowest in the entry GN-18-60 with 68.60 q/ha and 78.50 q/ha respectively. The variation in the yields of different cultivars grown under similar conditions has been obtained from several reporters (Pandey *et al.,* 1996; Aljeet Singh, 2003; Golani *et al.,* 2003; Meshram *et al.,* 2011; Singh and Bhonde 2011; Patil *et al.,* 2013). Most of the entries are harvested with a duration of 130 days after sowing of cloves. The percent disease index for the Stemphylium blight is nil. When the garlic bulbs are stored for four months of duration, the physiological loss in weight and rotting of the bulbs after harvest with cumulative total loss of the bulbs for entries were recorded with local check Ooty - 1 with 16.71 % whereas more loss was noticed in GN-18-60 with 30.01 %. Genetic variation among populations of cultivated garlic is precious for an economic use of genes and genomes. The collection of cultivated garlic germplasms and its genetic evaluation will identify accessions that could be useful to obtain cultivars using clonal selection to be used in breeding programmes. The selection of the cultivar should be taken into consideration several different factors and characteristics, some of which include the adaptability of the cultivar to the climate of the growing area, the market demand of the particular cultivar and the resistance or tolerance of the cultivar to various pests.

Table 1: Ancillary characters and yield data of garlic.

Sr. No.	Name of the entry	PH (cm)	FC	NOL	LL (cm)	LW (cm)	PD (mm)	ED (mm)	ABW (g)	NOC/ bulb	ACW (g)	BSC	CSC
1.	GN-18-52	71.11	G	7.0	47.18	3.00	46.75	41.30	44.16	19.10	24.40	P	P
2.	GN-18-55	66.60	G	4.00	38.71	2.00	43.15	37.90	39.10	14.00	23.80	W	P
3.	GN-18-57	69.40	G	7.00	49.50	3.00	46.30	42.44	33.16	17.00	20.10	W	W
4.	GN-18-59	67.41	G	6.80	46.80	2.90	39.00	34.98	39.10	18.60	23.16	P	P
5.	GN-18-60	62.50	G	5.91	35.30	2.50	34.09	29.00	41.12	17.20	24.11	W	W
6.	GN-18-62	65.10	G	6.60	43.00	3.00	36.98	33.00	29.01	14.60	19.00	P	P
7.	GN-18-64	61.00	G	4.0	39.00	1.90	34.10	28.41	35.80	15.00	19.23	W	W
8.	Local check (Ooty -1)	67.60	G	7.5	41.40	3.60	45.40	41.80	35.90	12.81	25.80	W	W
	Mean	66.52	-	6.12	42.46	2.79	41.22	36.40	37.49	16.36	22.31	-	-
	SEd	4.04	-	0.35	3.02	0.26	2.88	1.81	2.72	0.88	0.98	-	-
	CD at 5%	8.48	-	0.68	6.85	0.42	5.72	3.50	5.40	1.65	2.12	-	-

PH: Plant Height; FC: Foliage Colour; NOL: Number of Leaves: LL: Leaf Length; LW: Leaf Width; PD: Polar Diameter: ED: Equatorial Diameter; ABW: Average Bulb Weight; NOC: Number of Cloves; ACW: Average Clove Weight; BSC: Bulb Skin Colour: CSC: Clove Skin Colour; P: Purple; W – White; VS - Violet striped; V – Violet; DG – Dark Green LG – Light green

Table 2: Performance of Garlic AVT-II for yield characters.

Sr. No.	Name of the entry	MY (q/ha)	TY (q/ha)	DTH	Thrips damage	PDI SB	PDI PB	Cumulative storage loss after 4 months		
								PLW%	Rotting%	Total Losses
1.	GN-18-52	97.80	102.20	130	4.82	Nil	5.80	24.16	2.98	27.01
2.	GN-18-55	76.60	84.60	130	5.20	Nil	6.10	20.51	3.15	23.40
3.	GN-18-57	87.80	99.21	130	7.26	Nil	3.90	26.11	3.12	29.12
4.	GN-18-59	76.80	88.20	130	5.50	Nil	6.00	24.5	3.01	27.10
5.	GN-18-60	68.60	78.50	130	8.60	Nil	8.00	22.7	8.00	30.01
6.	GN-18-62	64.70	84.20	130	9.50	Nil	7.20	20.45	6.70	26.12
7.	GN-18-64	77.90	82.60	130	8.00	Nil	6.90	18.16	9.11	27.00
8.	Local check	87.12	98.60	140	7.25	Nil	6.98	14.40	3.16	16.71
	Mean	79.69	89.76	131.25	7.01	-		21.71	4.62	26.33
	SEd	4.02	3.75	5.60	0.32	-	0.35	1.35	0.26	1.82
	CD at 5%	8.82	8.18	11.98	0.71	-	0.81	3.20	0.58	3.88

*MY: Marketable Yield; TY: Total Yield; DTH: Days to Harvest; PDI: Per cent Disease Index – SB: Stemphylium Blight: PB: Purple Blotch; PLW: Physiological Loss in Weight

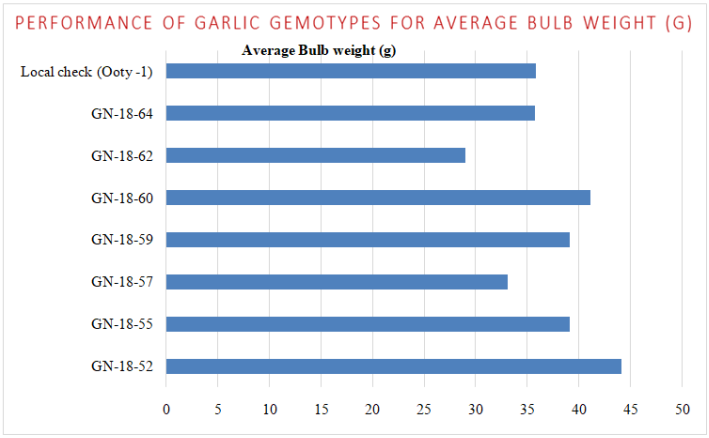

Fig. 1.

CONCLUSIONS

The results of the present study to evaluate the performance of the different garlic genotypes under the Nilgiris conditions during Kharif season indicates that entry with GN-18-52 performs better for most for most of the morphological and yield attributing characters which can be further assessed under large scale trials to impart its adaptability under the similar temperate growing regions for better yield and productivity.

FUTURE SCOPE

The performance evaluation on the vegetative and yield parameters obtained in this project will be further taken up with the qualitative analysis on important characters with allicin content and pyruvic acid will help to take up and promote the identified genotypes for large scale cultivation among the garlic growers in the hill region.

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Conflict of Interest. None.

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