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# Adaptability studies of garlic (*Allium sativum*) advanced lines

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## ABSTRACT

The purpose of this research was to identify the most desirable varieties adopted in different environmental conditions of the country. Five garlic advanced lines; NARC Garlic-1, NARC Garlic-3, NARC Garlic-4, NARC Garlic-5 along with 'Lehsan Gulabi' as check were evaluated at different locations along with NARC, Islamabad. Different morphological parameters; plant height, plant girth, leaf number per plant and leaf width were studied at four different growth stages. NARC Garlic-1 performed better as compared to other advanced lines and control tested.

**KEYWORDS:** Adaptability, garlic, *Allium sativum*, advanced lines

## INTRODUCTION

The Garlic (2N=16) (*Allium sativum*) has its place in the family *amaryllidaceae*. It belongs to the known *Allium* genus which contains 600 species [1]. Garlic has advanced nutritive values than other bulbous crops. It is rich in protein, potassium, phosphorus, magnesium, calcium and carbohydrates. The new and fresh peeled garlic comprise approximately 0.8% fibre, 63% water, 7% protein, 28% carbohydrate, 0.2% fat and a great number of sulphur compounds, which subsidize to the pungent taste of garlic [2]. Garlic is grown worldwide but as usual, China is the largest producer of garlic, accounting for 75% of world production. India stands second in area and production in the world after China. On an average, in India, garlic is cultivated on 2.01 lac hectares producing 10.58 lac million tones with an average productivity of 5.27 t ha<sup>-1</sup> [3]. This study concerning the regular developmental growth of the selected garlic lines and their worth in development of pure garlic by improving the practices. Cultivars of Garlic either local or foreign are diverse in their development and yield potentially [4]. When garlic cultivars grown under different and similar environmental circumstances were, vary their traits including their morphology like the number of leaves, date of blossom, final girth and length of stem and their flowering ratio. The basic chemical component of bulbs of garlic was differentiated according to their types [5]. Garlic as an asexually propagated crop expresses extreme structural variations [6-7] and grown since at least 5000 years and it is thought started in Central Asia as garlic wild cultivation.

*Allium* species shows highly diversification from Central Asia, Pakistan to Mediterranean basin [8]. Globally, garlic is thought an important source of medicine for gastronomic problems [9]. It is highly crucial to know local populations demands keeping in view the relationships between yield components and in accordance with specific climatic factors [10-11]. Thus the present work aimed to study the developmental changes in growth and yield potential of garlic advanced lines in comparison to the local cultivar.

## MATERIAL AND METHODS

The experiment was carried out at the experimental field of Directorate of vegetable, DHR&D, National Agriculture Research Center (NARC), Islamabad during 2015-2016. Experimental site is located at longitude 73.08° east and latitude 33.42° north on global scale. Elevation of site was 683 msl (mean sea level). Cloves of all garlic lines were planted on 21 October, 2015 on flat land. Single cloves are used for sowing. Cloves were treated with fungicide. Before planting land was prepared by ploughing and planking and FYM was also mixed. Adaptability trial was planted in NARC, Islamabad. Four garlic cultivars (NARC Garlic-1, NARC Garlic-3, NARC Garlic-4 and NARC Garlic-5) with Lehsan Gulabi as check were planted using Randomized Complete Block Design (RCBD) with three replications. Row to Row and Plant to Plant distances were maintained at 25cm and 10cm, respectively. Cloves were treated with fungicide before sowing. After sowing, first irrigation

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**Table 1: Morphology comparison of Garlic (*Allium sativum*) advance lines**

Varieties	Survival (%)	Plant height				# of leaves				Plant girth				Leaf width			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
V <sub>1</sub>	85.0 <sup>a</sup>	30.1 <sup>b</sup>	38.9 <sup>b</sup>	76.9 <sup>a</sup>	61.8 <sup>b</sup>	6.4 <sup>a</sup>	7.5	8.5	8.8	4.8 <sup>a</sup>	5.4	9.1	6.3	2.6	3.2 <sup>a</sup>	3.3 <sup>a</sup>	3.2 <sup>a</sup>
V <sub>2</sub>	76.7 <sup>ab</sup>	34.6 <sup>b</sup>	43.4 <sup>b</sup>	49.5 <sup>b</sup>	62.4 <sup>b</sup>	5.9 <sup>ab</sup>	7.1	8.1	8.3	4.0 <sup>b</sup>	4.5	4.8	7.9	2.0	2.4 <sup>b</sup>	2.6 <sup>b</sup>	2.4 <sup>b</sup>
V <sub>3</sub>	54.2 <sup>b</sup>	33.3 <sup>b</sup>	41.7 <sup>b</sup>	53.5 <sup>b</sup>	61.9 <sup>b</sup>	5.8 <sup>b</sup>	6.9	8.1	9.1	3.8 <sup>b</sup>	4.2	4.6	4.9	1.9	2.4 <sup>b</sup>	2.7 <sup>b</sup>	2.4 <sup>b</sup>
V <sub>4</sub>	91.7 <sup>a</sup>	34.9 <sup>b</sup>	41.0 <sup>b</sup>	49.6 <sup>b</sup>	63.7 <sup>b</sup>	5.9 <sup>ab</sup>	7.0	16.3	9.0	3.6 <sup>b</sup>	7.2	5.0	5.1	2.0	2.5 <sup>b</sup>	2.6 <sup>b</sup>	2.5 <sup>b</sup>
V <sub>5</sub>	82.5 <sup>a</sup>	65.1 <sup>b</sup>	69.5 <sup>a</sup>	76.9 <sup>a</sup>	81.6 <sup>a</sup>	6.1 <sup>ab</sup>	7.2	8.2	9.0	3.9 <sup>b</sup>	4.4	6.9	4.6	2.7	2.2 <sup>b</sup>	2.6 <sup>b</sup>	2.2 <sup>b</sup>
LSD	27.1	5.2	7.5	18.7	15.6	0.6	NS	NS	NS	0.5	NS	NS	NS	N.S	0.6	0.5	0.6

Means with different letters are significantly different at 5% level of probability

V<sub>1</sub> = NARC Garlic-1, V<sub>2</sub> = NARC Garlic-3, V<sub>3</sub> = NARC Garlic-4, V<sub>4</sub> = NARC Garlic-5, V<sub>5</sub> = Lehsan Gulabi 1=125 Days After Planting, 2=140 Days After Planting, 3 =155 Days After Planting ,4 =170 Days After Planting

was done immediately. First Hoeing and Weeding were done at November 19, 2015. NPK were applied. Water application through flood irrigation by tube well water and water tanks were used. Rain water also a great source of irrigation. Crop mainly remains depended on rain water however; time to time it was also irrigated on need basis. First irrigation was done at the time of planting on 21<sup>st</sup> of October. Flood irrigation is applied through water channel. On 29<sup>th</sup> of November a second irrigation was applied. Third irrigation was applied on 4<sup>th</sup> of December with urea. Last irrigation was applied on 8<sup>th</sup> of April. Hoeing and weeding were done at one month interval. First at 19 November, 2015. Then second at 8<sup>th</sup> of December. Third hoeing is at 7<sup>th</sup> of January then 6<sup>th</sup> of February. From onwards, hoeing is done at 7<sup>th</sup> of March then last at 8<sup>th</sup> of April before irrigation. The amount of fertilizer applied to the field of garlic during research time period were 1 kg of urea mixed with 1 kg of sulphate of potash (SOP). 5 kg fertilizer was applied to the all plots of garlic advanced lines. Four plants per treatment per replication were selected for data recording. Observations were compiled after taking their averages. The data were recorded on the Following Parameters: survival percentage, plant height, # of leaves per plant, leaves width, plant girth. The data obtained were subjected to statistical analysis using the STATISTIX statistical software (Version 8.1) and the mean values were compared using Least significant difference (LSD) multiple range test P: 0.5%. [12].

## RESULTS AND DISCUSSION

A significant difference was recorded among garlic advance lines tested at NARC. Maximum survival was recorded in NARC Garlic-1, NARC Garlic-5 and Lehsan Gulabi (check) ranging 82-91%. However lowest percentage of plant survival 54% was recorded in NARC Garlic-4 (Table-1). Hot and warm climate in India and Bangladesh caused yield reduction of locally garlic cultivars [13]. Al-Zahim *et al.* [14] grown 27 chosen discreetly garlic genotypes under the similar environment conditions for several years, three were selected considering morphological characters. Quantitative distinctiveness are expected to be prejudiced by escalating environment [15]. All garlic advance lines had shown significant difference regarding plant height throughout their life cycle. However, growth rate was different at different stages or plant age. After germination of garlic cloves at 120 days the maximum plant height was recorded (62.40) in genotype Yamuna Safed-3 (G-282) trailed by Yamuna Safed - 1

(G-1)60.15cm. The minimum plant height was documented (54.77) in Madras Local trailed by NHRDF - 1, Deoria (56.00cm) and Gyanpur, Local Collection and SRD Nagar (56.08cm). These outcomes are in agreement with conclusions of [16-17] who assessed the performance of garlic genotypes for height of plant. Overall Lehsan Gulabi used as check produced taller plants as compared to all advance lines tested except at the age of 155 days after planting where NARC Garlic-1 along with Lehsan Gulabi produced more taller plants compared to other advance lines (Table-1).

Garlic is a clonally propagated species, which may reduce variation hence number of clusters should be few [15]. Slightly significant differences were recorded among different garlic advance lines only at 125 days after planting. Maximum number of leaves per plant was recorded from NARC Garlic-1 and minimum for NARC Garlic -4. Rest of two advance lines and Lehsan Gulabi (used as check) showed at par result with the maximum and minimum limits 5.86-6.13 (Table-1). On comparison of number of leaves of garlic advance lines at a particular growth stage, it is evident from the table 1 that pattern remain same up to 155 days after planting. However, after 15 days more the sequence among the advance lines with regard to number of leaves per plant changed. Figure indicated that NARC Garlic-3 produced less number of leaves and NARC Garlic-1 was found at the top as compared to other advance lines and control.

Plant girth also showed similar pattern as number of leaves. A non-significant difference was recorded at 140, 155 and 170 days after planting among garlic advance lines. However, at initial stage of 125 days after planting maximum plant girth was recorded by NARC Garlic-1 followed by all other advance lines and check and no significant difference recorded among these garlic advance lines (Table-1). A great variation with regard to plant girth was found among all advance lines at all growth stages. NARC Garlic-1 showed maximum plant girth at 125 and 155 days after planting while NARC Garlic-3 at 170 days after planting. However, at 140 days after planting no advance lines could exceed from control with regard to plant girth (Table-1)

Similar leaf width was recorded among garlic advance lines at initial growth stages i.e. 125 days after planting. However, with the older plant i.e. at all other stages (140, 155 and 170 days after planting) all lines behave slightly different with each other. Maximum leaf width was recorded by NARC Garlic-1 at all the later stages (Table-1).

## CONCLUSION

Different morphological parameters; plant height, plant girth, leaf number per plant and leaf width were studied at four different growth stages. NARC Garlic-1 performed better as compared other advance lines and control tested.

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