

**Research Note :****ASSESSMENT OF MORPHOLOGICAL VARIATION IN GARLIC (*Allium sativum* L.) GERMPLASM BASED ON MORPHO-AGRONOMIC TRAITS****Mukesh Kumar\***

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**ABSTRACT :** An experiment was conducted with 53 garlic cultivars at Horticultural Research Centre (HRC) of SVPUA&T, Meerut, UP, India during the year 2013-14. Results on different growth characters showed that cultivar Roshni Mota exhibited the maximum plant height and Bhima Omkar gave maximum number of leaves per plant while cultivar CL Lamba produced maximum leaf length and cultivar PG-20 resulted in maximum leaf width. In regards to the yield characters, PG-20 gave maximum bulb weight, while Jawa exhibited maximum bulb diameter and clove weight, while cultivar F-2-R gave maximum number of cloves per bulb.

**Keywords :** Garlic, evaluation, genotypes, performance, morphological characterization

Garlic is grown world-wide and is one of the most important ingredients of Indian cuisine. China is the leading producer of garlic which contributes 75% of world production (Panse *et al.*, 5). Among the spices grown in India, garlic (*Allium sativum* L.) is the most important bulbous crop and widely cultivated *Allium* throughout country. It is consumed in many forms and valued highly for its characteristic flavour (Roy and Chakraborti, 7). Garlic is well-known for its health benefits and also consumed for its flavours and taste. These properties are the result of interactions between several components, namely, allyl cysteine sulphoxides (ACSO) and their intermediate metabolites and derivatives (Randle and Lancaster, 6). The major ACSO present in garlic are S-2-propenyl-L-cysteine sulphoxide (alliin), S-trans-1-propenyl-L-cysteine sulphoxide (isoalliin) and S-methyl-L-cysteine sulphoxide (methiin). Recent research indicated that fresh and processed garlic may have some health benefits on human health such as anti-carcinogenic, anti-fungal and anti-bacterial properties (Clemente *et al.*, 2). It has higher nutritive value as compared to other cultivated *Alliums*. It is rich in protein, phosphorus, potassium, calcium, magnesium and carbohydrates. It helps in digestion of food, reduces cholesterol level in human blood and lowers blood sugar. Garlic is mostly strong flavoured due to presence of sulphur containing compounds that impart their distinctive smell and pungency. In India, the average productivity of garlic is 5 tonnes /ha which is quite low as compared to other garlic growing countries (Singh *et al.*, 9). In order to make further improvement for the economic traits efforts are needed on the part of breeders to bring about variations in the garlic cultivars for the traits attributing to economic characters.

The experiment was carried out during 2013-14 at Horticultural Research Centre (HRC) of SVPUA&T, Meerut, UP, India. Before planting of cloves, well decomposed farm yard manure @ 25 t ha<sup>-1</sup> was applied for the experimental plots uniformly as basal application. Recommended cultural operations were carried out to ensure a healthy crop growth and development. Healthy and uniform sized cloves were planted at 3-4 cm depth at a spacing of 10 cm × 10 cm in a randomized block design with three replications in Oct., 2013. Harvesting of bulbs were performed only when leaves turned into brown. The data were recorded on five randomly selected plants from each genotype in each replication on 08 characters *i.e.*, Plant height (PH) at 30, 60 and 90 days after planting, number of leaves per plant (NLPP), at 30, 60 and 90 days after planting leaf length (LL), at 30, 60 and 90 days after planting, leaf width (LW) at 30, 60 and 90 days after planting. Bulb weight, bulb diameter, single clove weight and cloves per bulb was also recorded at the time of harvesting. The experimental data was analyzed statistically as proposed by Gomez and Gomez (3) using MSTAT-C software to find the significance.

The observations recorded at the successive stage of the plant development were analysed statistically (Table 1). It is clear from the Table 1 that all the characters under investigation were significantly differed from each other in terms of growth and yield characters, indicating more variation in plant growth and yield characters. Roshni Mota had maximum plant height (94.86 cm), followed by CL Lamba (86.78 cm) and Kadari (83.88 cm), while minimum height of plant

Table 1. Mean performance of garlic genotypes based on morpho-agronomic traits.

Genotypes		PH 90 DAS (cm)	NLPP 90 DAS	LL 90 DAS (cm)	LW 90 DAS (cm)	BW (g)	BD (mm)	WOC (g)	NCPB
1	CL Lamba	86.78	8.03	56.01	1.86	22.56	42.03	1.03	21.84
2	Roshni Mota	94.86	7.97	55.67	1.82	23.07	43.63	1.10	21.49
3	Chechena Mota	75.88	7.95	42.15	1.88	33.40	52.86	0.98	34.53
4	Sukha -44	65.84	6.87	42.33	1.71	17.56	36.69	0.81	20.77
5	Desi Lasan	72.68	8.36	48.91	1.56	24.35	41.19	1.00	23.86
6	Kadari Mota	77.30	8.27	49.85	2.38	26.01	43.90	0.80	33.00
7	Hari Rani	65.07	8.08	44.82	1.86	40.20	52.42	1.00	40.99
8	Jawa	69.09	8.62	54.61	2.07	30.53	57.16	2.14	14.67
9	Kadari -4	83.88	8.30	44.77	2.02	31.67	49.17	1.46	22.10
10	Cheenia	68.93	9.09	47.55	1.91	29.08	52.69	0.95	32.39
11	Up Chattaa	66.27	9.06	47.60	1.83	29.47	29.49	1.09	28.62
12	Kant Gola	79.19	8.47	55.90	1.88	24.64	48.91	0.94	25.65
13	CFG -1	65.25	8.79	44.88	1.99	18.39	43.96	0.77	22.71
14	CFG -2	79.67	8.66	49.15	1.81	18.16	36.81	0.79	24.96
15	CFG- 3	65.82	8.25	41.45	1.85	21.34	46.02	0.90	23.75
16	CFG -4	72.69	7.26	51.47	1.95	18.28	47.67	0.43	42.53
17	CFG- 5	65.89	7.76	42.09	1.76	22.95	43.55	0.97	25.25
18	CFG- 6	65.52	8.57	44.55	1.90	26.65	48.05	0.74	35.20
19	CFG -7	71.47	8.37	40.29	1.93	23.41	43.05	0.92	25.72
20	CFG -8	75.92	8.36	47.15	2.14	18.29	43.90	1.02	18.36
21	F -1	65.30	7.55	42.99	1.85	27.56	46.17	0.75	38.15
22	F -2	62.88	8.20	45.27	1.77	21.93	46.55	0.73	30.50
23	F -3	68.88	8.08	52.19	2.00	16.31	37.95	0.52	31.66
24	F -4	61.87	8.77	31.08	1.71	17.85	43.87	0.68	26.27
25	PG- 17	67.30	7.82	34.41	1.61	14.41	33.43	0.46	31.36
26	PG -20	46.77	8.17	36.20	3.18	42.97	55.09	1.56	30.65
27	F -5	66.86	8.49	36.47	1.56	11.26	32.23	0.40	27.37
28	F -13	69.14	7.41	35.78	1.88	10.47	43.78	0.39	26.78
29	PG -9	71.14	7.30	36.48	1.54	18.91	46.54	0.92	20.51
30	AVTG -1	71.21	7.25	35.86	1.92	25.54	40.98	0.86	30.63
31	BG -108	71.42	7.82	40.73	1.72	12.74	41.17	0.39	32.27
32	AVTG- 4	72.73	8.45	35.93	2.02	21.25	38.92	0.72	29.29
33	PG -32	69.88	8.51	38.84	1.74	8.11	37.44	0.51	16.09
34	F -6- SF	69.13	8.24	35.73	1.62	8.58	35.62	0.42	20.94
35	PG -24	74.76	8.98	40.17	1.80	18.46	43.99	0.58	33.35
36	F -2- R	65.05	8.92	47.67	1.98	19.98	43.15	0.50	43.63
37	PG -35	67.70	8.78	39.49	1.68	16.00	43.26	0.66	24.55
38	F- 2- SF	72.77	8.75	37.67	1.89	9.55	41.13	0.50	20.48
39	G -282	81.63	8.96	45.25	2.02	17.14	41.34	0.84	19.71
40	G -50	78.93	9.16	41.17	1.70	24.31	43.02	0.82	29.87
41	G -323	68.78	8.56	47.64	1.69	11.64	34.22	0.52	22.78
42	Bhima Omkar	63.13	10.60	32.33	1.75	12.87	31.35	0.62	21.10
43	GG- 4	72.54	9.22	36.40	1.60	6.93	23.83	0.40	17.03
44	G -355	68.67	8.71	39.94	1.32	13.32	41.82	0.39	33.83
45	GG- 2	65.50	8.89	42.04	1.61	6.76	31.52	0.36	17.71
46	GG- 1	66.67	9.11	37.80	1.85	7.04	30.85	0.32	22.08
47	Bhima Purpule	65.79	9.16	37.66	2.02	7.03	53.35	0.32	21.26
48	Phule Basant	76.68	8.42	42.02	1.68	10.02	30.11	0.50	20.12
49	Godawari	67.08	8.51	32.92	1.79	11.45	32.31	0.55	21.78
50	GHCL-1	65.74	8.03	48.81	1.73	22.75	36.95	0.96	25.08
51	Single Kali	43.92	8.70	36.07	2.03	17.94	39.88	0.74	24.58
52	Kashmiri Garlic	55.20	9.37	45.47	2.18	21.39	51.30	1.12	19.02
53	Indian Garlic	61.90	9.79	33.86	2.08	13.70	52.02	0.72	23.52
	<b>Mean</b>	69.53	8.45	42.52	1.86	19.36	41.14	0.76	26.27
	Range (Min)	43.92	6.87	31.08	1.32	6.76	23.83	0.32	14.67
	Max.	94.86	10.60	56.01	3.18	42.97	57.16	2.14	43.63
	CD (P=0.05)	1.19	0.55	0.88	0.14	3.10	1.35	0.12	1.93

\*PH = Plant Height, NLPP : No. of leaves/plant, LL : Leaf length, LW : Leaf width, BW : Bulb weight, BD : Bulb diameter, WOC : Weight of Clove, NCPB : No. of Cloves/bulb.

was recorded in cv. Single Kali (43.92 cm). The variation observed in plant height among the genotypes might be due to difference in genetical constituents as well as environmental effects. Wide variation in morphological characters amongst the genotypes of garlic was observed by Singh and Chand (10 and 11). Significant variations was also observed among the cultivars in terms of number of leaves per plant and maximum number of leaves per plant was found in Bhima Omkar (10.66) followed by Indian garlic (9.79 leaves), Kashmir garlic (9.37 leaves) and the minimum number of leaves per plant was found in cv. Sukha-44 (6.82). Significant variations in the leaf length was observed among the among the cultivars and it was maximum noted with CL Lamba (56.01 cm) followed by Kant Gola (55.90 cm), Roshani Mota (55.67 cm) while minimum leaf length (31.08 cm) observed in cultivar F-4. The leaf width also differed each other among the cultivars. Cultivar PG-20 exhibited maximum leaf width (3.18 cm), followed by Kadari Mota and Kashmiri garlic (2.38 and 2.18 cm) respectively and minimum leaf width (1.32 cm) was observed in the cultivar G-355. This variation in leaf characters might be due to genotype as well as some known and/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 by Sangeeta *et al.* (8). The wide variation was observed in bulb characters among the cultivars. The maximum bulb weight was recorded with cultivar PG-20 followed by Hari Rani and Chechena Mota (40.20 and 33.40 g, respectively), while the lowest bulb weight was found in variety GG-2 (6.76 g). Cultivar Jawa showed maximum bulb diameter (57.16 mm) followed by PG-20 (55.09 mm) Cheenia (52.69 mm), while lowest bulb diameter was found in cv. GG-4 (23.83 mm). Significant variation was observed among the cultivars with respect to weight of single clove and cultivar Jawa (2.16 g) produced maximum single clove weight followed by, PG-20 (1.56 g), Kadari-4 (1.46 g), whereas the lowest single clove weight was found in cv. Bheema Purple (.32 g). Number of cloves per plant also differed each other among the cultivars and cultivar F-2-R showed maximum number of cloves (43.63) followed by CFG-4 and Hari Rani (42.53 and 40.99 cloves per bulb, respectively) and it was minimum found in cultivars Jawa (14.67). Sangeeta *et al.* (8) had also reported that

the average weight of clove, number of cloves per bulb and weight of bulb exhibited high genetic variation among the genotypes. These results are in agreement with those reported by Aly (1) and Gouda Anwar (4).

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**Citation :** Kumar M. (2015). Assessment of morphological variation in garlic (*Allium sativum* L.) germplasm based on morpho-agronomic traits. *HortFlora Res. Spectrum*, **4**(3) : 285-287.