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Evaluation of garlic mutants for yield and quality attributes

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Abstract
The present investigation on "Evaluation of garlic mutants for yield and quality attributes" was carried out during *rabi* season of 2019-2020 at Instructional farm, Department of Vegetable Science, Dr. P.D.K.V., Akola. The experiment was laid out in randomized block design with three replications. Fourteen mutants of M_3 generation i.e. GM-1, GM-2, GM-3, GM-4, GM-5, GM-6, GM-7, GM-8, GM-9, GM-10, GM-11, GM-12, GM-13 and Check (Buldhana Local) were used for evaluation during this study. The results indicated that the garlic mutants differed significantly for different yield and quality characters. Among all the mutants, for yield parameters, GM-8 performed better for characters like diameter of bulb, number of cloves per bulb, weight of clove, length of clove, width of clove, weight of fresh bulb per plot in kg, weight of fresh bulb per hectare in quintal and TSS. GM-11 was recorded maximum Weight of fresh bulb.

Keywords: Garlic, mutants, yield, clove, bulb

Introduction
Garlic (*Allium sativum* L.) is a species in the onion genus, *Allium*. Garlic cloves are used in preparing chutneys, flavouring foods, curry powder, pickles etc. The leaves are nutritive and flattened, they are used in preparing chutney and flavouring vegetables. It has been recognized world-wide as a valuable spice for foods and a popular remedy for various ailments and physiological disorders particularly cardiovascular disease. Garlic has been used as a medicine to prevent as well as for treatment of various diseases and ailment. It also prevents infections such as the common cold, cough as it has anti-bacterial, anti-fungal and anti-viral property. It reduces the cholesterol in blood. The improvement in garlic was attempted for higher yield, better quality and storability in India and world. For successful improvement in any crop the knowledge of its genetic nature is important. Garlic is a sterile diploid (2n=2x=16). Since it is a clonally propagated crop, less variability exists. In consequence garlic breeding has been limited to the selection through the pre-existing genetic variability and increase in garlic variability was attempted via mutation breeding and *in-vitro* techniques. So, it was important to induce variability through mutation. Various physical and chemical mutagens are used to induce mutations in plants (Ahloowalia and Maluszynski, 2001 and Goyal and Khan, 2010) [2, 6]. In all cases, an effective mass propagation system is needed for multiplication of selected elite material for commercial purposes.

Material and Methods
The present investigation "Evaluation of garlic mutants for yield and quality attributes" was carried out at Instructional Farm, Department of Vegetable Science, Dr. PDKV, Akola (MS.) during *rabi* season of the year 2019-2020. The study was under taken by using fourteen treatments of garlic mutant with one check i.e. Buldhana local by using randomized block design with three replications, keeping a plot size of 2 m x 1 m and spacing 10 cm x 10 cm. The material under study was constituted of fourteen garlic mutants which were collected from Instructional Farm, Department of Vegetable Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola as listed in table 1.

Results and Discussion
Among all the garlic mutants, number of cloves per bulb was recorded maximum in GM-8 (24.33) and minimum number of cloves per bulb was recorded in mutant GM-6 (16.33). Similar results were recorded by Mishra *et al.*, (2013) [8], Prajapati *et al.*, (2016) [11] and Bhatt *et al.*, (2017) [3]. Among all the garlic mutants, weight of fresh bulb was found maximum in GM-11 (82.33 g) and minimum weight of fresh bulb was recorded in mutant GM-6 (32.66 g).

These results are in conformity with the findings of Patil *et al*., (2012) [10], Chatoo *et al*., (2017) [4] and Nandini *et al*., (2018) [9]. Among all the garlic mutants, diameter of fresh bulb was maximum in GM-8 (5.13cm) and minimum diameter of fresh bulb was recorded in mutant GM-7 (3.50cm). The differences could be attributed to genetic makeup of the mutants. Similar results were recorded by Mishra *et al*., (2013) [8], Ijaz *et al*., (2015) [7] and Umamaheswarappa *et al*., (2018) [13]. Length of cloves was recorded maximum in GM-8 (3.20cm) and minimum length of clove was recorded in mutant GM-6 (2.23cm). This was in accordance as the results revealed by Sandhu *et al*. (2015) [12]. Width of clove was maximum in GM-8 (1.51cm). Whereas, minimum width of clove was recorded in mutant GM-1 (0.72cm). These results are in conformity with the findings of Agrawal and Tiwari (2004) [1], and Dhall and Brar (2013) [5]. Among all the garlic mutants, weight of clove was maximum in GM-8 (2.03g). Whereas, minimum weight of clove was recorded in mutant GM-1 (0.47g). These results are in conformity with the findings of Agrawal and Tiwari (2004) [1], Singh *et al*., (2012), Dhall and Brar (2013) [5], Bhatt *et al*., (2017) [3] and Chatoo *et al*., (2017) [4]. Differences among the mutants for total yield of fresh bulb per plot and total yield of fresh bulb per hectare were found to be highly significant. Among all the garlic mutants, yield of fresh bulb per plot was maximum in GM-8 (8.26kg). Whereas, minimum yield of fresh bulb per plot was recorded in mutant GM-6 (1.42kg). This was in accordance as results revealed by Sandhu *et al*. (2015) [12]. Among all the garlic mutants, yield of fresh bulb per hectare was maximum in GM-8 (131.66 q) and minimum yield of fresh bulb per hectare was recorded in mutant GM-6 (72.23 q). The highest yield of fresh bulb per hectare was recorded in GM-8. This may be due to improvement in plant height, number of leaves and stem girth as they have physiological capacity to mobilize and translocate photosynthetic to organ of economic value which in turn might have increased bulb yield as observed in this study. These results are in conformity with the findings of Patil *et al*., (2012) [10], Chatoo *et al*., (2017) [4] and Nandini *et al*., (2018) [9].

Table 1: Name of the garlic mutants under study

Sr. No.	Name of garlic mutant	Source
1	GM-1	Department of Vegetable Science, Dr. P.D.K.V., Akola
2	GM-2	
3	GM-3	
4	GM-4	
5	GM-5	
6	GM-6	
7	GM-7	
8	GM-8	
9	GM-9	
10	GM-10	
11	GM-11	
12	GM-12	
13	GM-13	
14	Check (Buldhana Local)	

Quality Character (TSS %)

Among all the garlic mutants, total soluble solid was maximum in GM-8 (39.2%). Whereas, minimum total soluble solid was recorded in mutants GM-3 (35.4%). Similar results were recorded by Mishra *et al*., (2013) [8].

Table 2: Mean performance of different Garlic Mutants

Mutants	NCB	WFB (g)	DFB (cm)	LC (cm)	WC (cm)	WC (g)	YFBP (kg)	YFBH (q)	TSS %
GM-1	20.66	62.00	3.83	2.43	0.72	0.47	2.55	83.83	35.6
GM-2	19.00	60.33	4.50	2.40	0.75	0.94	6.08	108.50	36.2
GM-3	18.66	62.00	4.16	2.53	0.88	1.16	5.28	110.00	35.4
GM-4	19.33	78.00	4.76	2.40	0.82	0.81	5.75	103.33	37.2
GM-5	18.00	42.66	3.66	2.43	1.01	1.08	6.58	107.16	38.4
GM-6	16.33	32.66	4.16	2.23	0.81	0.54	1.42	72.23	38.0
GM-7	21.00	41.33	3.50	2.56	0.90	1.06	5.53	96.83	37.4
GM-8	24.33	71.00	5.13	3.20	1.51	2.03	8.26	131.66	39.2
GM-9	20.66	46.66	4.56	2.60	0.78	0.78	6.53	116.66	36.4
GM-10	18.00	33.33	4.66	2.63	0.96	1.10	6.45	97.16	36.5
GM-11	23.66	82.33	5.06	2.90	0.87	1.04	7.04	130.16	37.8
GM-12	21.33	38.33	4.10	2.73	0.92	1.02	6.69	118.66	36.4
GM-13	18.00	72.33	4.30	2.83	0.92	1.10	5.64	93.33	35.6
Check (Buldhana Local)	18.00	35.00	4.56	2.46	0.89	0.97	4.83	87.50	38.4
F test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE(m)±	0.74	1.67	0.23	0.13	0.08	0.09	0.45	8.37	0.13
CD @ 5%	2.14	4.85	0.68	0.40	0.24	0.28	1.31	24.26	0.38

Whereas,

NCB – Number of cloves per bulb WC (g) – Weight of clove

WFB (g) – Weight of fresh bulb YFBP (kg) - Yield of fresh bulb per plot

DFB (cm) – Diameter of fresh bulb YFBH (q) – Yield of fresh bulb per hectare

LC (cm) – Length of clove TSS (%) – Total soluble solids

WC (cm) – Width of clove

Conclusion

It was evident from the present investigation that, considerable degree of variability was exists among the garlic mutants for yield and quality parameters. Among the different mutants GM-8 and GM-11 were found the best performing mutants for yield and quality characters.

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