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Short Communication

Performance of advanced breeding lines of green-long brinjal for resistance to bacterial wilt disease resistance, yield and quality attributes

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Brinjal (*Solanum melongena* L.) is well known as eggplant or aubergine belongs to the family Solanaceae and is one of the major indigenous vegetable crops grown in India. The name eggplant is derived from the shape of the fruit of most--------- of the varieties, which are white in colour and similar to the shape of chicken eggs. Eggplant is a perennial, warm weather crop however grown commercially as an annual crop. Owing to its highest production potential and availability of the produce to consumers, it is also termed as poor man's vegetable. It is grown extensively in India, Bangladesh, Pakistan, China, Japan and Philippines. Major brinjal producing states are Orissa, Bihar, Karnataka, West Bengal, Andhra Pradesh, Maharashtra and Uttar Pradesh (Prasad et al. 2015). It is an important crop grown in India with a production of 12.40 million tonnes in an area of 0.67 million ha with average productivity of about 18.50 t/ha. India is regarded as primary centre of origin of brinjal (Vavilov 1931). Brinjal (*Solanum melongena* L.) is an important vegetable crop and widely grown in India. Under mild climate of southern states, its bearing period is prolonged whereas under northern conditions it is shortened. In hilly areas, it is cultivated only in summer. Brinjal occupies 8.14% of total area and produces 9% of total vegetable production of the country (Thamburaj and Singh 2001). It is a plant with many medicinal properties. Various parts of the plant are useful in the treatment of inflammatory conditions, cardiac debility, neuralgias, bronchitis and asthma. Recent studies of eggplant fruit have revealed that it is a good source of dietary fiber and vitamins (vitamins A, B1 and B6), and provides significant quantities of minerals such as P, K, Ca and Mg (Okmen et al. 2009). Among the diseases, bacterial wilt has been treated as one of the major constraints in eggplant cultivation. Bacterial wilt [*Ralstonia solanacearum* (Smith)] and fungal wilts (*Fusarium solani* f.sp. *melongenae*, *Rhizoctonia solani, Verticillium dahlia* Kleb. and *Sclerotium rolfsii* Sacc.) are major wilt causing diseases in brinjal. Most of commercially grown cultivars of brinjal are susceptible to bacterial wilt disease. Yield losses vary from 20-100 per cent because of disease incidence (Singh 1995). Even though there are various cultural, biological and chemical control measures have been suggested for the management of bacterial, these are found to be less effective. Thus, the resistant cultivars offer a satisfactory solution for the control of the disease. Unlike tomato, sweet pepper and brinjal has considerable regional preference for shape, size and colours of fruits. The purple colour fruits are most esteemed in northern parts of the country, long and green types are preferred in Bihar and southern Karnataka whereas, round and green types are preferred in Orissa. In northern parts of Karnataka people prefer green round or oval brinjal fruits with purple stripes. Therefore, brinjal breeders must aim at evolving genotypes that are more preferred for each region and yet to be efficient and show substantial increase over the existing types with respect to yield and other economic characters. Therefore, the development of resistant varieties having good horticultural attributes as well as suitable for particular region is most economic, eco-friendly and feasible method to ensure better productivity of brinjal. In this regard, the advanced breeding lines were developed in

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both green long and green round segments of brinjal. There is no improved variety in green round segments of brinjal and hardly few numbers of varieties in green long segments of brinjal. The present research is formulated to evaluate developed advanced breeding lines of green long segment of brinjal.

The present investigation on "Performance of advanced breeding lines of brinjal for bacterial wilt disease resistance, yield and quality attributesî was carried out in the department of Vegetable Science, College of Horticulture, Bengaluru during the year 2017-18. To carry out the investigations on the genotype evaluation of brinjal, four weeks old seedlings were transplanted in the main field at a spacing of 60 cm × 60 cm. Drip laterals were provided for irrigation at regular intervals. During study, recommended cultural practices were followed in the experimental plot. Fourteen genotypes of green long genotypes were replicated twice by using randomized complete block design. The pedigree lines 12-36-46-3-32, 12-36-46-3-35, 12-36-46-6-4, 12-36-46-6-37, 12-36-46-6-10, 12-36-170-11-1, 12-36-170-11-11, 12-36-170-11-14, 12-36-170-9-11, 12-36-170-9-30, 12-36-170-9-15, 12-36-170-9-19, 12-36-170-19-26, 12-36-170-19-19 were obtained from the cross Green Long × IIHR 3. Observations on yield and yield attributing characters, bacterial wilt disease resistance and phenol content in fruits were recorded. The number of wilted plants in each accession were recorded and classified into five different groups according to Hussain et al. (2005).

Statistically, significant results were obtained for all the parameters in this study. Table-1 clearly shows that the Genotype 170-11-11 (75.21 cm) was the tallest whereas, the minimum plant height was recorded in 170-19-19 (59.16 cm). Plant height was measured at final harvest stage. With respect to number of branches per plant, in green long segment, genotype 170-19-26 (6.56) was recorded the maximum number of branches per plant. Plant height and number of branches were good index of plant vigour which may contribute towards greater productivity. Different responses to plant height and number of branches might be due to genetic characteristic of genotypes and adaptability to a prevailing environment as reported by Nirmala et al. (2013), Malshe et al. (2016) and Tripathy et al. (2017). Days to first flowering and days to fifty per cent flowering is envisaged as an index of earliness. The time taken for first flowering and for 50 per cent flowering was less in the genotype, 46-6-4 (36.70 days, 42.90 days). Hence, this cultivar was said to be early type. The genotypes were significantly different in their fruit length. It was measured maximum in the genotype 46-3-32 (15.80 cm). The variation in fruit length in different brinjal genotypes reported to be inter varietal association with the genetic makeup of the cultivar and governed by the cell size and intercellular spaces of the flesh. Fruit width differed significantly among green long genotypes. The genotype 46-6-4 (3.11 cm) has recorded the maximum fruit width. This may be due to sufficient diversity among brinjal genotypes and also due to climatic and genetic factors was reported by

Table 1: Performance of advanced breeding lines of green long brinjal for plant height, number of branches, days to first flowering, Days to 50% flowering, Fruit length (cm), fruit width (cm), No. fruits per plant, Average fruit weight (g), Yield per plant (g), percent disease incidence and Phenol content (GAE mg/g)

Sl. No.	Genotypes	Plant height (cm)	No. of branches	Days to first flowering	Days to 50% flowering	Fruit length (cm)	Fruit width (cm)	No. of fruits/plant	Avg. fruit weight (g)	Yield per plant (g)	PDI (%)	Phenol content (GAE mg/g)
1.	46-3-32	69.79	6.53	38.82	44.87	15.80	2.94	18.95	35.44	667.96	17.85 (24.90)	2.63
2.	46-3-35	70.94	6.14	39.61	45.98	14.10	2.77	18.16	37.93	657.00	10.71 (18.86)	3.04
3.	46-6-4	62.90	4.63	36.70	42.90	13.37	3.11	17.90	36.25	660.60	57.14 (49.17)	2.24
4.	46-6-37	62.22	3.96	39.17	44.49	14.28	2.98	16.78	36.31	623.63	32.14 (34.52)	2.27
5.	46-6-10	62.32	4.84	38.71	44.23	15.62	2.86	17.11	36.27	632.84	21.42 (27.58)	2.80
6.	170-11-1	70.29	3.83	38.58	43.13	13.73	2.88	19.50	34.29	663.12	17.86 (23.92)	3.27
7.	170-11-11	75.21	3.54	38.42	43.75	14.18	2.96	19.54	32.31	662.73	8.93 (17.30)	3.28
8.	170-11-14	69.75	4.42	39.06	46.21	14.24	3.01	18.36	34.35	641.06	21.43 (26.11)	2.97
9.	170-9-11	67.30	3.85	39.97	46.00	15.02	3.10	18.86	35.16	654.00	17.85 (24.90)	2.79
10.	170-9-30	67.44	3.50	42.30	49.35	15.29	2.92	16.23	38.58	646.68	10.71 (18.86)	2.80
11.	170-9-15	65.13	3.37	41.61	46.81	14.63	3.04	20.78	33.60	718.68	14.28 (21.54)	2.92
12.	170-9-19	62.67	4.71	40.50	45.83	14.02	2.96	22.50	27.36	706.23	14.26 (22.20)	2.02
13.	170-19-26	61.37	6.56	40.47	45.30	14.25	2.89	26.31	27.74	836.11	10.71 (18.86)	2.75
14.	170-19-19	59.16	5.99	40.98	46.52	14.03	2.99	22.49	27.36	668.64	28.54 (31.54)	3.56
15.	IIHR-3	67.30	5.80	37.17	43.37	15.17	2.72	17.12	37.19	623.15	10.71 (18.82)	2.14
16.	Green Long	61.70	5.02	36.74	42.38	15.01	2.98	16.80	40.60	665.78	42.86 (40.87)	3.39
17.	Arka Kusumakar	66.63	4.65	38.97	44.75	14.31	2.94	19.58	34.42	687.31	44.46 (41.82)	1.13
18.	Arka Anand	72.57	5.29	43.00	48.57	18.38	2.63	27.64	32.09	731.05	10.71 (18.86)	4.06
	S.Em±	2.16	0.61	0.58	0.85	0.53	0.06	1.29	1.56	32.73	5.02	0.41
	CD at 5%	6.45	1.83	1.73	2.55	1.59	0.18	3.85	4.67	97.66	14.99	1.22

Meena et al. (2009), Nirmala and Vethamoni (2016) and Tripathy et al. (2017).

Significant difference was found among the genotypes with respect to average fruit weight. In green long 170-9-30 (38.58g) has recorded the maximum average fruit weight. This may be due to the variation among the genotypes. The maximum number of fruits was noticed in 170-19-26 (26.31) genotype. This might be due to higher number of flower cluster per plant and higher fruit set. It could also due to higher number of leaves, number of branches and maximum plant spread in genotypes as reported by Malshe et al. (2016), Bhavana and Singh (2016) and Tripathy et al. (2017) in brinjal. Genotypes showed significant differences with respect to fruit yield per plant. In green long segments, the maximum fruit yield per plant was recorded in 170-9-26 (836.11g). This may be due to that, more number of fruits per plant might be due to higher number of flower clusters per plant and higher fruit set. It could also be due to higher number of leaves, number of branches and maximum plant spread in genotypes as reported by Suresh et al. (2012). The genotypes differed significantly with respect to bacterial wilt incidence. The least incidence was recorded in the genotype 170-9-30 (10.71%), where as the maximum disease incidence was recorded in 46-6-4 (57.14%) genotype. This may be due to the resistant accessions had longer incubation period compared to the susceptible ones as reported Santhosh et al. (2015) and Biswas and Ghosh (2018).

Phenol content in brinjal differed significantly among the genotypes. The highest phenol content was recorded in 170-19-19 (3.56). The variation in phenol content depending on genotypes, environment and growing conditions. It could also depend on harvesting stage of the crop as reported by Nayanathara et al. (2016). In the present study, the superior genotypes identified based on yield and yield attributing characters, 170-9-26 genotype was recorded maximum fruit yield. Genotype, 46-6-4 (36.70 days) was the earliest to show the first flowering and 50 per cent flowering respectively. Genotype 170-19-26 (6.56) was recorded the maximum number of branches per plant. The maximum number of fruits per plant was recorded in 170-19-26 (26.31) among green long brinjal genotypes 170-9-30, 46-3-35 and 170-19-26 showed resistant to bacterial wilt disease. Genotype 170-19-19 (3.56) was recorded highest phenol content in fruits. Bacterial wilt disease resistance is mainly affected by environmental factors and the pathogen's race and strain diversity; making it necessary to search for a horizontal resistance source among local genotypes. Investigations on evaluation of genotypes under different seasons of the year is necessary as the present study was restricted to a single season only.

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