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Short Communication

Stability analysis for yield and quality in brinjal (*Solanum melongena* L.)

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Assessment of genotype × environment interactions in crop breeding programs is assuming importance for identification of genotypes with wider adaptability. This is more so in brinjal (*Solanum melongena* L.), one of the most common, highly productive and popular vegetable crops of India, grown round the year and highly influenced by varied agro-climatic conditions [1]. Studies on stability of brinjal over the different cropping seasons for yield and quality are however, quite limited. In this context, the present investigation was undertaken to elucidate information on the stability of brinjal genotypes for fruit yield, yield components, quality and physiological characters with regards to the three different cropping seasons, namely summer, rainy and late summer.

The experimental material comprised of ten elite homozygous lines, namely, KS 224, JB 64-1-2, AB 98-10, AB 98-13, PLR 1, Gandhinagar Local, Bombay Gulabi, Morvi 4-2, Surati Ravaiya and JBPR 1 obtained from the germplasm collections maintained at the Main Vegetable Research Station, Gujarat Agricultural University, Anand and their 45 hybrids derived from the 10 × 10 diallel mating (excluding reciprocals) of these lines. The hybrids and parents were evaluated along with the check, GBH 1 in a randomized block design with three replications at the Main Vegetable Research Farm, Anand. The sowings were undertaken in the nursery during the first week of February for summer crop; last week of July for rainy season crop; and last week of February for late summer crop. Transplanting of the seedlings was effected 35-40 days after sowing, depending on the growth of seedlings. The normal, healthy and vigorous seedlings of each genotype were transplanted in a single row plot of 6 m length, with a spacing of 90 × 60 cm and the crop was raised following recommended package of practices. The linear model proposed by Eberhart and Russell [2] was adopted for estimating the stability parameters namely, mean ($\bar{X}$), regression coefficient (b_i) and mean square deviation (S^2di) for each genotype.

Analysis of variance revealed significant mean squares due to genotypes and seasons for fruit yield, yield components, quality and physiological characters studied, except plant spread with regards to seasons, indicating the existence of significant variation among the genotypes and seasons with regards to the above traits. Highly significant genotype × season interaction was also noticed for all the characters studied, indicating a variable response of the genotypes to the different seasons studied. The existence of significant genotype × environment interactions for yield and yield components of brinjal were also reported earlier [3]. The partitioning of season + (genotype × season) mean squares (Table 1) showed that seasons (linear) differed significantly and were quite diverse with regards to their effect on the performance of the genotypes for fruit yield, yield components, quality and physiological characters studied, with the exception of plant spread. Further, the higher magnitude of mean squares due to season (linear), compared to genotype × season (linear) indicated that linear response of season accounted for the major part of total variation for the above characters. Mohanty and Prusti [4] also reported similar observations and indicated that the mean differences between seasonal effects and the influence of seasons on yield and its attributes in brinjal were quite real in nature. The significance of mean square due to genotype × season (linear) component against pooled deviation for fruit yield per plant suggested that the genotypes were diverse for their regression response to change with the season. Similarly, the significant mean squares due to pooled deviation, observed for fruit yield per plant suggested that the deviation from linear regression also contributed substantially towards the difference in stability of the genotypes. Thus, both linear and non-linear components significantly contributed to the genotype × season interactions observed for fruit yield per plant. This suggested that predictable as well as unpredictable components were involved in the differential response of genotypes for stability. Similar results were reported

Table 1. Analysis of variance (MS) for stability for fruit yield, yield components, quality and physiological traits in brinjal

Source of variation	df	Fruit yield/plant	Days to picking	Plant height	Plant spread	1000-seed weight	Fruit dry matter	Total soluble sugars	Total phenols	Leaf area per plant
Genotypes	55	0.36**	27.70*	298.93**	2043.28**	1.16**	1.36**	43.58**	0.20**	66766044**
Seasons + (Genotypes × Seasons)	112	0.61**	18.57	118.22	506.11	0.10**	0.34**	30.84**	0.68**	95809974**
Seasons (linear)	1	50.65**	228.47**	2481.16**	9.45	0.76**	2.75**	1127.67**	61.32**	5336629248**
Genotypes × Seasons (linear)	55	0.22**	16.27	77.66	653.43*	0.16**	0.57**	29.91**	0.25**	46514120
Pooled deviation	56	0.09**	17.09**	115.86**	370.28**	0.02	0.07	12.16**	0.00**	50639548**
Pooled error	336	0.02	0.09	12.11	41.51	0.04	0.16	0.01	0.00	154347

*,**Significant at 5 and 1 per cent levels, respectively

Table 2. Stability of the identified brinjal hybrids for cultivation during different seasons with regards to fruit yield, yield, quality and physiological attributes

Season/hybrids identified	Fruit yield per plant			Stable yield, quality and physiological attributes
	$\bar{X}$	b_i	S^2_{di}	
All seasons (summer,rainy and late summer)				
PLR 1 × JBPR 1	2.99	1.23*	0.04	Plant height, plant spread, 1000-seed weight and fruit drymatter
Morvi 4-2 × JBPR 1	2.08	0.82*	0.01	1000-seed weight, fruit drymatter and total phenols
Surati Ravaiya × JBPR 1	2.12	1.01*	0.03	Plant height, 1000-seed weight and fruit drymatter
Rainy season				
KS 224 × Bombay Gulabi	2.10	1.81*@	–0.01	Plant spread, 1000-seed weight and fruit drymatter
KS 224 × JBPR 1	2.28	1.33*@	–0.01	1000-seed weight and fruit drymatter
AB 98-10 × JBPR 1	2.35	1.61*@	–0.02	Plant spread, 1000-seed weight, leaf area per plant, fruit drymatter and total phenols
AB 98-13 × JBPR 1	2.24	2.39*@	–0.02	1000-seed weight, fruit drymatter and total soluble sugars
Morvi 4-2 × Surati Ravaiya	2.42	1.19*@	–0.02	Plant height
Late summer season				
AB 98-10 × Morvi 4-2	2.11	0.80*@	–0.01	Plant height, plant spread, 1000-seed weight, fruit drymatter and total phenols

*Significant at 5 per cent level for bi = 0; @Significant at 5 per cent level for bi = 1

for fruit yield of brinjal by Mohanty and Prusti [4]. Further, the non-linear component of genotype × season interaction was also observed to be significant for days to first picking, plant height, plant spread, total soluble sugars, total phenols and leaf area per plant in the present study. Chadha and Singh [1] had also reported similar significant non-linear component of genotype × environment interaction for days taken to first flower in brinjal.

The stable brinjal hybrids identified for wide and specific adaptability with high *per se* performance for fruit yield (over mean and the check, GBH 1) are presented in Table 2, along with the details regarding other stable yield, quality and physiological attributes observed for these hybrids, since stability for yield has been reported to be the result of stability for its component traits [5 and 6]. A perusal of these results revealed PLR 1 × JBPR 1, Morvi 4-2 × JBPR 1 and Surati Ravaiya × JBPR 1 to be widely adaptable and suitable for wide cultivation during all the seasons studied; KS 224 × Bombay Gulabi, KS 224 × JBPR 1, AB 98-10 × JBPR 1, AB 98-13 × JBPR 1 and Morvi 4-2 × Surati Ravaiya for cultivation during rainy season; and AB 98-10 × Morvi 4-2 for cultivation during late summer.

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