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PHENOTYPIC STABILITY IN BRINJAL

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ABSTRACT

Fifteen varieties of brinjal were evaluated for four environments, and stability parameters were studied for yield (q/ha). Highly significant differences between genotypes and environments were recorded. Environment II gave the highest yield. Varieties S-16, P-8 and Annamalai gave high mean yield and high stability, therefore, they were considered as stable genotypes. Variety S-16 was highest yielding with highest stability. Therefore, this variety can be considered most stable for the environments represented by Ludhiana.

Key words: Phenotypic stability, yield, brinjal.

Brinjal (*Solanum melongena* L.), an important vegetable crop in India, is also cultivated in the warm regions of the globe. The egg plant originated in India, thus, a great deal of variability exists with respect to growth habit and fruit characters. Genotype × environment interactions are of considerable significance in a breeding programme. In the recent years, much emphasis has been laid on the nature of genotype × environment interactions and on the techniques used for analysing such interactions. These parameters have been studied in many crops for measuring phenotypic stability. Information is generally scanty on the stability of promising genotypes in brinjal. This paper reports results on the phenotypic stability of 15 genotypes in brinjal.

MATERIALS AND METHODS

The experimental material consisted of 15 promising long and round genotypes of brinjal, viz. ARU-2-C, Punjab Chamkila, PH-4, PPL, Annamalai, SM-17-4, PBR-129-5, PPC, KT-4, S-16, P-8, K-202-9, PBR-91-1, T-3 and BR 112, grown in four environments (kharif 1980, 1981, 1982 and 1983), in randomized block design with three replications.

Fruit yield was recorded on 15 plants per plot of each variety and later converted into q/ha. The analyses proposed by Finlay and Wilkinson [1] and Eberhart

and Russell [2] were used to study both the linear (b) and nonlinear (S_d^2) parameters of phenotypic stability. Pooled analysis was done on the mean of each set of three replications as suggested by Perkins and Jinks [3].

RESULTS AND DISCUSSION

Pooled analysis of variance (Table 1) showed that all the genotypes and environments differ significantly from each other. This not only indicates the amount of variation in different years but also reflects the extent of genetic variation among genotypes. The significant mean square due to genotype × environment interaction indicates that the genotypes interacted considerably with the environmental conditions of different years. Similar results were reported earlier [4]. Genotypes × environment (regression) interactions were also significant.

Table 1. Pooled analysis of variance

Source	d.f.	MS	F value against pooled error
Genotypes	14	7290.2	6.92**
Environments	3	125877.0	119.50**
Genotype × environment	42	3725.1	3.54**
Regression	14	4672.2	4.44**
Remainder	28	3251.5	3.09**
Pooled error	112	1053.3	

**Significant at 1% level.

Mean yield and stability parameters (b and S_d^2) of 15 genotypes grown in four environments are presented in Table 2. Considerable differences were observed for environmental means. The highest yields were obtained in 1981, followed by 1980. The growing conditions of 1982 and 1983 were the poorest for expression of yield potential. The highest overall mean yield was obtained in variety S-16, followed by KT-4. The lowest yield was recorded in cv. K-202-9.

The genotype S-16 showed above average stability. It also gave above average yield in all environments, which indicates that it is suitable for all the environments. On the other hand, K-202-9 and PPC gave poor yield in all the environments. Variety Punjab Chamkila was very sensitive to changes in environment as is evident from the significant value of b, and had poor stability, as indicated by relatively high S_d^2 value. This variety gave extremely poor yield (69.30 q/ha) in the low yielding environment of 1982, and high yield (384.33 q/ha) in the favourable environment of 1981. Under these conditions, it was among the highest yielding varieties. Punjab Chamkila can, therefore, give high yield in appropriate environments. PH-4, KT-4 and T-3 gave above average yield in the low yielding environment but relatively low yield in high yielding environments.

Table 2. Mean yield and parameters of stability (b and S_d^2) of brinjal varieties grown in four environments (years)

Genotype	Fruit yield, q/ha					b	S_d^2
	1980	1981	1982	1983	mean		
Pb. Chamkila	304.64	384.33	69.30	101.14	214.65	1.61*	1801.59
PH-4	165.64	214.16	151.90	155.85	171.86	0.30*	−946.64
PPL	134.88	307.54	113.72	151.95	177.07	0.84	1740.92
Annamalai	186.08	343.02	133.50	130.05	198.16	1.07*	−428.36
SM-17-4	189.97	420.04	98.52	90.33	199.71	1.65*	71.99
PBR-129-5	188.92	274.52	191.40	75.90	182.68	0.74	2039.10*
ARU-2-C	96.98	457.80	135.50	129.75	205.01	1.55	11687.59**
PPC	60.46	255.67	85.05	100.89	125.52	0.76	3348.61**
KT-4	246.88	467.92	169.80	152.25	259.21	1.55*	189.23
S-16	390.85	387.10	184.80	184.65	286.85	1.13	-688.89
P-8	251.94	350.96	123.15	143.70	217.44	1.14**	−738.86
K-202-9	180.03	158.85	80.40	72.45	122.93	0.48	518.41
PBR-91-1	246.33	228.00	110.70	99.17	171.05	0.70	1617.18
T-3	272.07	262.80	149.55	152.25	209.17	0.63	751.54
BR-112	286.73	245.36	121.94	82.13	184.04	0.84	4379.94**
Mean	213.49	317.20	127.94	121.50	195.03	—	—

*, **Significant at 5% and 1% levels, respectively.

Phenotypic stability can be measured by three parameters, viz. mean performance over environments, linear regression and deviation from regression function. In the final selection of cultivars, it is usually considered necessary to identify genotypes performing good under high, medium and low yielding environments. The estimates of b and S_d^2 showed that there were distinct differences among the genotypes in respect of their deviation around the regression (Table 2). Varieties like Punjab Chamkila and ARU-2-C with high b and S_d^2 could be considered unstable. According to linear regression, although PPL and BR-112 appear to be stable genotypes, their mean performance was not as high as that of S-16, P-8 and Annamalai, which also had very low S_d^2 values, and thus could be considered as stable genotypes. KT-4, Punjab Chamkila and ARU-2-C exhibited high yield but their b and S_d^2 values were also higher, therefore, these varieties cannot be considered stable. S-16 not only showed phenotypic stability but also high yielding potential, therefore, this variety can be used for further improvement of brinjal.

Very few studies have been made so far in this direction and obviously more information needs to be accumulated. However, reports on the subject, including the present one, are quite convincing and encouraging. This study provides a useful basis for the selection of parents for plant improvement programmes.

REFERENCES

1. K. W. Finlay and G. N. Wilkinson. 1963. The analysis of adaptation in a plant breeding programme. Aust. J. Agric. Res., **14**: 742–754.
2. S. A. Eberhart and W. A. Russell. 1966. Stability parameters for comparing varieties. Crop Sci., **6**: 36–40.
3. J. M. Perkins and J. L. Jinks. 1968. Environmental and genotype–environmental components of variability. III. Multiple lines and cross. Heredity, **23**: 339–356.
4. Balwinder Paul Singh. 1978. Stability Studies in Brinjal (*Solanum melongena* L.). M. Sc. Thesis, P.A.U., Ludhiana.