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Short Note

Analysis of yield stability in okra [*Abelmoschus esculentus* (L.) Moench.]

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Okra is one of the prominent vegetable crops of Indian Continent. Hence, improvement of its yield potential as well as incorporation of resistance to yellow vein mosaic virus have been the major aim of the past okra breeders. But their efforts were confined to meet the regional needs therefore any superior variety developed for a particular region, showed differential performance with the change of its environment. This is because of the wide occurrence of genotype x environment interaction. These interactions of Gxe can be partly understood as a result of differential reaction to the environmental stress conditions and only a minor part of the gxe interaction can be attributed to the known environmental determinants and the major part is just an inexplicable quantity in the statistical analysis of the yield (Becker and Leon, 1988). Phenotypic stability is often used to discuss the unexpected variation in yield under different environments, while the genotypic composition of the varieties remains stable. Phenotypic stability has recently been studied in a few vegetables like egg plant (Krishna Prasad *et al.*, 2002), tomato (Mulge and Kumar, 2003), chilli (Reddy and Sadashiva, 2003) and cauliflower (Sharma and Behera, 2003). Therefore, to assess the adaptation of the okra cultivars, the present investigation was undertaken in okra.

A total of eighteen okra cultivars were evaluated in randomized block design with three replications for a period of three years i.e. 2000-2002. The year effects were further partitioned into seasonal effects i.e. summer and rainy in each year constituting six environments for evaluation. The summer season crop was sown in March while rainy season in mid June at a spacing of 60 x 20 cm. It constituted a population of 30 plants in each replication and the yield per plant was recorded on five randomly selected plants. All the recommended agronomic practices were followed for growing successful crop in all the environments. The data were subjected to stability analysis as proposed by Eberhart and Russel (1966). The significance of linear response (b_i) was tested by 't' test and deviation from linearity (δ^2_{di}) with F-test.

Variances due to g, e and gxe interactions were significant, indicating substantial variation in the mean yield performance of all the 18 cultivars, over environments and in the environments over test cultivars (Table 1). Cultivars Varsha Uphar and D-I-87-5 recorded maximum yield while Arka Anamika and Durga PK were the poorest yield performers. The data extrapolated summer season as the poor environment and rainy season as rich environment as indicated by the negative and positive I_j index. Significant g x e interaction indicated differential performance of the varieties under different environments. Maximum yield was recorded in D-I-87-5 in rainy season 2002 where as the same cultivar along with Pusa Makhmali recorded minimum yield in the summer 2002 and 2001, respectively. In general all the varieties out performed in rainy season than in summer season. It has been further strengthened by the significant pooled deviation, which indicated significant fluctuating performance of different varieties from their respective linear path of response to environments.

An ideally stable cultivar, under the given set of environments, must confirm to the Eberhert and Russel model i.e. $P_i>0$, $b_i=1.0$ and $\delta^2_{di}=0$. The data in table-1 revealed none of the varieties to be a perfect fit in this model. However, KS-404 was found in close proximity to this model by ignoring its negligible lower yield than overall population mean yield. The P_i (g_i-x) values were found positive in Varsha.

Uphar, D-I-87-5, Pusa Makhmali, Pusa A-4, DKB-2, GK-PK, Hind P-8 and Harbhajan. Out of these, Varsha Uphar and Pusa Makhmali showed linear response to both the environments over different years showing their adaptability to both summer and

Table 1. Mean performance of okra cultivars over environment (e) along with stability

Cultivars	2000		2001		2002		Mean yield	P_i	b_i	δ^2_{di}
	Summer	Rainy	Summer	Rainy	Summer	Rainy	(q/ha)			
P-8	101.2	195.7	87.1	196.5	94.9	180.2	142.6	-21.8	1.53*	259.7*
KS-404	122.8	196.1	120.1	200.1	124.2	199.1	160.4	-4.0	1.23.*	26.6
Arka Anamika	114.4	171.4	87.4	176.4	92.9	174.4	136.1	-28.3	1.19*	231.3*
P-7	116.3	160.0	124.5	165.3	130.0	163.3	143.2	-21.2	0.65*	-17.8
Pusa A-4	120.5	197.9	162.4	208.2	169.5	200.9	176.7	12.3	0.89*	215.2*
VRO-3	98.5	143.3	159.7	150.7	163.6	174.7	148.4	-16.0	0.36	677.4*
Varsha Uphar	185.3	271.4	185.0	226.5	178.5	220.3	211.2	46.8	0.85	539.1*
D-I-87-5	152.0	228.4	201.1	270.5	90.1	274.3	202.7	38.3	1.86*	1528.0*
Musa Makhmali	180.1	213.6	90.1	226.4	199.5	226.5	189.4	25.0	0.98	1953.0*
Prabhani kranti	108.4	218.0	114.0	219.3	95.1	217.3	162.0	-2.4	1.82	134.2*
Pb Padmani	123.1	117.3	154.6	223.0	119.0	221.0	159.7	-4.7	1.03	1620.1*
VB 9101	111.5	200.1	95.4	122.4	161.5	219.4	151.7	-12.7	0.93	1919.8*
DKB-1	130.2	154.3	144.4	205.1	100.5	203.1	156.3	-8.1	1.07	492.3*
Harbhajan	109.5	182.6	237.0	159.4	150.1	149.5	164.7	0.3	0.07*	2225.7*
Hind P-8	130.2	181.2	120.4	215.7	151.1	215.6	166.0	1.6	1.24*	471.5*
GK-PK	144.0	196.2	185.1	172.6	135.9	172.8	167.8	3.4	0.42*	397.9
DK B-2	132.1	190.4	180.3	201.4	191.2	199.2	182.4	18.0	0.55*	381.7*
Durga PK	110.2	170.3	91.6	180.4	96.5	180.1	138.2	-26.2	1.24*	132.7*
E_m	127.2	188.2	140.1	195.6	135.8	199.5				
I_j	-37.2	23.8	-24.3	31.2	-28.6	35.1				

rainy seasons. But the significant deviation of these varieties from linearity entailed them as non-predictable cultivars. Such varieties are highly sensitive to the environments. Under intensive agriculture where inputs are no limitations, such varieties can yield maximum, but under poor environments they fail miserably.

References

Becker, H.C. and Leon, J. 1988. Stability analysis in plant breeding. *Plant Breeding* 101:1-23.

Eberhart, S.A. and Rusel, W.A. 1966. Stability parameters for comparing varieties. *Crop Science* 6:36-40.

Krishna Prasad V.S.R., Singh, D.P., Pal, A.B., Gangopadhyay, K.K. and Pan, R.S. 2002. Assessment of yield stability and covalence in eggplant. *Indian Journal of Horticulture* 59: 386-394.

Reddy, M.K. and Sadashiva, A.K. 2003. Studies on yield stability in chilli (*Capsicum annuum* L.). *Indian Journal of Horticulture* 60:183-187.

Sharma, J.R. 1998. *Statistical and biometrical techniques in plant breeding.* New Age International (P) Limited., New Delhi.

Sharma, S.R. and Behera, T.K. 2003. Stability of yield and qualitative components in early Indian cauliflower. *Indian Journal of Horticulture* 60: 268-72.

Mulge, R. and Kumar, J.S. 2003. Stability analysis for growth and earliness in tomato. *Indian Journal of Horticulture* 60: 353-56.

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