SHALIMAR, INDIA
S.K. University of Agricultural Sciences and Technology
PANTNAGAR, INDIA
G.B. Pant University of Agriculture and Technology
LUDHIANA, INDIA
Punjab Agricultural University

Stability analysis in maize (*Zea mays* L.) for anthesis-silking interval and grain yield

--Lone, AA; Sofi, PA; Warsi, MZ; Wani, SH

An ideal approach in plant breeding is to develop high performing cultivars that have fairly uniform performance (low G[enotype] x E[nvironment] interaction) over a range of environments (Lee et al., Crop Sci. 43:2018-2027, 2003; Worku et al., Seventh Berseen and Southern African Regional Maize Conference, Feb. 11-15, pp. 139-142, 2001; Scapim et al., Genet. Mol. Biol. 23:287-292, 2000; Magari and Kang, Euphytica 70:105-111, 1993; Rasul et al., J. Appl. Sci. Res. 1:307-312, 2005; Signor et al., Crop Sci. 41:663-669, 2001). The present study was undertaken to identify superior performing maize hybrids over a range of environments. Five cultivars, Pop-3118, Pop-3121, YHP-Alm-217, YHP-Pant-45 and Tarun-83, were crossed in 2005 in a half diallel fashion to develop 15 cross combinations. The parent and crosses were evaluated in six environments using two locations (Pantnagar and Gorkhpur), two seasons (*rabi* 2005 and *kharif* 2006) and two growing conditions (normal and submerged), in a completely randomized block design with three replications in each environment. The submergence treatment was given at knee-height stage with a water height of 5 cm for seven days. Anthesis-silking interval (ASI) and grain yield were recorded for 10 competitive plants, randomly selected from each replication. Data were statistically analysed by the Eberhart and Russell (Crop Sci. 6:36-40,1966) model where the variance of regression deviations is a measure of cultivar stability and the linear regression coefficient (β) is a measure of environmental index. In this model, the ideal genotype should have a high mean ($\mu > X$), a unit regression coefficient ($\beta i=1$) and no deviation from linearity ($S^2di=0$).

The pooled analysis of variance for stability revealed significant variability for both traits studied, as well as differential effects of each environment. The estimates of environmental index showed that for ASI, Pantnagar *rabi* (submerged) was the most favourable, whereas Gorkhpur kharif (normal) was poorest. For grain yield, Pantnagar *rabi* (normal) was the best environment for realizing higher yields, whereas Gorkhpur *kharif* (submerged) was the poorest. Analysis of stability parameters in the Eberhart and Russell (1966) model (Table 1) indicated that among lines, Pop-3118 and YHP-Alm-217 had the lowest and highest mean values of ASI, respectively. Among crosses, Pop-3118 x Tarun 83 and Pop-3118 x YHP-Alm-217 had the the lowest and highest values for ASI. For grain yield, YHP-Alm-217 and Pop-3121 were the lowest and highest yielding parents, whereas among crosses, Pop-3121 x Tarun-83 was the highest yielding and Pop-3118 x YHP-Alm-217 was the lowest yielding. Among parents, Tarun-83 was responsive to a better environment ($\beta i>1$) for ASI and grain yield, while others were responsive to a poorer environment ($\beta i<1$). Most of the crosses were highly responsive to a better environment for both traits. The mean square deviation of regression coefficient (S^2di) deviated significantly from zero for only a few parents and crosses for ASI, but in all parents and crosses for grain yield. The coefficient of determination (R^2) values ranged from 0.374 to 0.990 for ASI and 0.664 to 0.993 for grain yield, suggesting that a large portion of variation in these traits could be attributed to the environmental index. Though many of the parents and crosses exhibited above average performance for both traits, they could not satisfy other parameters of the model to be designated as generally adaptable. Based on the βi estimates for ASI, YHP-Alm-217 was the most stable among parents and YHP-Alm-217 x YHP-Pant-45 among crosses. In the case of grain yield, YHP-alm-217 was the most desirable parent, while the cross Pop-3118 x Po-312 was the most stable.

Table 1. Mean regression coefficient (βi), mean square deviation (S^2di) and coefficient of determination (R^2) for maize genotypes tested in 6 environments.

Genotype	Anthesis silking interval					Grain yield		
	Mean	βi	S^2di	R^2	Mean	βi	S^2di	R^2
Pop-3118	4.055	0.254	-0.199	0.772	1632.9	0.806	37546.2**	0.895
Pop-3121	4.111	0.336	0.807**	0.374	1941.6	0.604	64199.9**	0.755
YHP-Alm-217	5.778	0.947	1.323**	0.732	1479.1	0.945	30473.5**	0.932
Tarun-83	5.500	0.337	0.744**	0.860	1789.9	1.083	132578.0**	0.839
Pop-3118 x Pop-3121	4.611	1.139	0.607*	0.810	1962.6	0.999	37348.2**	0.929
Pop-3118 x YHP-Alm-217	5.444	0.883	-0.198	0.985	1734.2	1.012	18129.2**	0.957
Pop-3118 x YHP-Pant-45	5.277	1.118	0.787	0.938	1890.2	0.624	-9572.1	0.993
Pop-3118 x Tarun-83	3.889	1.826	0.074	0.867	1894.6	1.403	47500.2**	0.954
Pop-3121 x YHP-Alm-217	4.611	1.741	-0.040	0.983	1872.8	1.056	56917.5**	0.912
Pop-3121 x YHP-Pant-45	4.166	0.699	-0.268	0.990	2424.3	1.848	70801.1**	0.963
Pop-3121 x Taru-83	4.611	1.037	0.538	0.864	2472.2	0.973	66849.9**	0.885
YHP-Alm-217 x YHP-Pant-45	5.111	1.002	0.629	0.842	1781.1	0.703	23151.2*	0.902
YHP-Alm-217 x Tarun-83	4.778	1.276	-0.056	0.971	2349.7	1.383	21825.7*	0.973
YHP-Pant-45 x Tarun-83	5.116	1.681	0.067	0.984	1819.1	0.967	26941.6	0.940
Mean	4.763				1920.5			
SE (Mean)	0.343				109.2			