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STABILITY AND SELECTION PARAMETERS IN SUNFLOWER HYBRIDS UNDER RAINFED VERTISOLS

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ABSTRACT

Eleven hybrids and one check variety of sunflower were evaluated for their stability of seed yield and five other metric traits in rainfed vertisol over years. The genotypes showed significant differences among them over environments and genotype x environment interaction was significant for all the characters *viz.*, plant height, head diameter, number of leaves per plant, days to maturity and seed yield except days to 50% flowering. AH 1, AH 3, AH 4, AH 6, and AH 8 are desirable hybrids for adverse environments and head diameter and number of leaves can serve as useful selection indices.

KEY WORDS: Sunflower, Hybrids, Stability, Correlation, Regression

In vertisols, sunflower is sown as late season *rabi* crop because it requires less moisture and shorter duration as compared to sorghum and maize. Sunflower was introduced a decade earlier in rainfed vertisol but at that time the yield level was very poor. Subsequently, the hybrids introduced and cultivated mainly under irrigated conditions, gave higher yield but only limited information is available on the performance of hybrids under rainfed situation. Mandal and Dana (1994) indicated that one of the major factors limiting the sunflower cultivation is the lack of stability in performance. Hence, present study was undertaken to isolate suitable hybrids for rainfed vertisol.

MATERIALS AND METHODS

The present study consisted of 11 single cross hybrids received from Project Co-ordinator (Sunflower) under AICORPO project and one check variety, Co 2. They were tested during *rabi* season (September - October) in the black cotton soils of the Research Station, Kovilangulam from 1991 to 1994. The seeds were sown after getting soaking rains from the North - East Monsoon (delayed monsoon sowings). The plants were spaced between 60 X 30 cm and each genotype was raised in the plots of 3.6 x 4 m size randomised block design, replicated thrice. The observations were recorded on 10 random plants in each plot for plant height (cm) head diameter (cm), number of leaves per plant, days to 50 per cent flowering and days to maturity apart from seed yield (kg) per plot. Stability parameters were worked out for all the traits (Eberhart and Russell, 1966) and from the mean data, simple inter-correlation between the traits were worked out and a multiple regression equation was constructed (Snedecor and Cochran, 1968).

RESULTS AND DISCUSSION

Analysis of variance for the six metric traits pooled over four years indicated the significant

Table 1. Pooled analysis of variance for different characters of sunflower

Source	df	Mean squares					
		Plant height	Head diameter	Number of leaves/plant	Days to 50% flowering	Days to maturity	Seed yield
Genotype (G)	11	106.01**	3.28**	14.91**	12.84**	14.58**	0.03*
Environment (E) + (Genotype X Environment)	36	496.84**	10.38**	25.59**	8.36**	3.02**	0.15**
Environment (linear)	1	13570.23**	288.50**	234.39**	8.24**	5.13**	
G X E (linear)	11	118.67**	4.23**	17.93**	1.21	4.33**	0.012*
Pooled deviation	24	125.44**	1.61**	7.13**	2.23**	2.21**	2.02
Pooled error	96	13.46	0.67	2.29	0.56	1.16	0.002

Table 2. Stability parameters (X, bi and S^2di) of yield of the other five metric traits

Hybrids	Plant height			Head diameter			No. of leaves		
	X	bi	S^2di	X	bi	S^2di	X	bi	S^2di
AH 1	110.50	0.76	18.71	12.62	0.69**	-0.61	18.17	0.82	3.86
AH 2	113.08	1.38	9.03	11.78	1.28	0.83	18.92	0.14	0.49
AH 3	121.08	0.74	158.09**	12.78	0.44	3.00*	19.42	0.88	8.86**
AH 4	120.58	0.86	133.02**	12.25	1.13	1.63	23.08	0.68	-0.72
AH 5	117.83	1.42	135.42**	10.07	1.14	0.57	18.83	1.10	-1.01
AH 6	127.00	1.12	498.90**	11.53	0.741	0.76	19.33	1.39*	-1.94
AH 7	119.83	1.18	78.29**	12.38	0.90	0.76	21.25	0.20**	-1.94
AH 8	117.08	0.88	-6.65	11.73	0.994	2.63*	19.58	0.66**	-2.14
AH 9	122.00	1.52	190.56**	12.08	1.045	2.14*	21.75	2.25*	-0.03
AH 10	122.66	0.57	93.00	12.07	0.919	-0.466	19.67	1.44	1.60
AH 11	144.00	0.83	-1.73	12.68	0.617	-0.283	20.75	0.97	0.15
Co 2	126.75	0.69	36.99**	13.90	2.09**	0.282	24.67	1.63	50.82**

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

Hybrids	Days to 50% flowering			Days to maturity			Seed yield (kg/plot)		
	X	bi	S^2di	X	bi	S^2di	X	bi	S^2di
AH 1	54.25	1.13	7.31**	84.67	-0.48	-0.24	0.853	0.94	0.007
AH 2	51.00	0.97	2.13	82.58	-0.55	-1.00	0.787	0.92	0.000
AH 3	49.83	0.93	6.26**	80.42	6.67*	-0.08	0.894	0.97	0.018
AH 4	52.92	0.59	1.25	84.75	0.17	-0.02	0.892	1.04	0.001
AH 5	50.33	1.36	0.40	81.25	1.43	0.28	0.822	0.92	0.000
AH 6	53.00	1.19	0.50	85.50	0.76	-0.75	0.886	1.06	-0.002
AH 7	50.67	0.89	-0.338	80.16	3.83	6.74**	1.103	1.43	0.016
AH 8	49.17	1.40	2.12	80.83	-2.33	5.25**	0.850	0.01	-0.001
AH 9	52.33	1.12	1.26	83.33	2.17	1.77	0.879	1.16	0.077
AH 10	53.08	0.90	-0.15	83.92	1.90	-1.03	0.850	0.87	0.006
AH 11	54.42	0.69	-0.16	84.75	0.65	-0.48	0.782	0.91	0.031
Co 2	53.75	0.82*	-0.53	84.17	-2.21	2.10	0.806	0.76	0.036

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

difference among the hybrids and the environments (Table 1). The genotypes reacted considerably with the environmental conditions except in respect of days to 50 per cent flowering. A major portion of genotype x environment interaction variance was accounted for by the linear component (deviation) was also significant for all characters except for seed yield. According to Eberhart and Russel (1966), an ideally adapted genotype should record high mean value, unit regression co- efficient (bi=1) and deviation from regression (S^2 di) as small as possible (S^2 dj = 0).

For plant height (Table 2), the high yielding hybrids did not record a non-significant deviation from regression. The hybrid AH 6 showed the highest mean height of 127.0 cm with 'bi' value (1.12) and deviation from regression was also significant. The hybrid AH 6 was suitable for favourable environment. This was followed by Co 2 recording higher mean height of 126.75 cm with 0.69 'bi' value but having significant deviation from regression. This was suitable for unfavourable environment. AH 11 recorded high mean value for head diameter, low 'bi' value (0.617) and showed non-significant deviation from regression. AH 11 may be preferred for unfavourable environments. Co 2 recorded high mean value with high 'bi' value and significant deviation from regression. Co 2 may be preferred for favourable environment. Co2 also recorded the highest leaf number of 24.67 with 1.63 'bi' value but having the significant s^2 di value indicating that the culture was suitable for favourable environment. The other genotype possessing average mean with low 'bi' value and non-significant 'S^2 di' was AH 4, which will be suitable for unfavourable environment. The hybird AH 8 which recorded the lowest days to 50 er cent

Table 3. Correlation co-efficients (r) of seed yield and other traits in sunflower

Character	Head diameter	Number of leaves	Days to 50% flowering	Days to maturity	Seed yield
Plant height (X_1)	0.157	0.515*	0.368	-0.428	0.121
Head diameter (X_2)		0.584**	0.202	-0.562*	0.041
No. of leaves (X_3)			0.291	-0.651**	0.108
Days to 50% flowering (X_4)				-0.089	0.236
Days to maturity (X_5)					0.136

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

flowering of 49.17 days showed high 'bi' value and non-significant deviation from regression. The hybrid AH 8 will be suitable for favourable environments. The hybrid AH 2 recorded lesser number of days to 50 per cent flowering with unit regression and non-significant deviation from regression. This may be suitable for favourable environment. Similarly AH 3, AH 7 and AH 8 recording the lowest days to maturity showed high 'bi' value with significant deviation from regression. These hybrids may be preferred for the favourable environments.

The seed yield showed non-significant deviation from regression and unit 'bi' values mostly for all the genotypes indicating their stability over environments. The hybrid AH 7 recorded the highest mean seed yield, high 'bi' value and low 'S^2 di' value indicating that it is suitable for favourable environment. The hybrids AH 1, AH 3, AH 4, AH 6 and AH 8 recorded average grain yield with unit 'bi' values and non-significant 'S^2 di' values indicating that these hybrids were the most stable once suitable for the changing environments. Co 2 recorded average grain yield, low 'bi' value with non-significant 'S^2 di' value and it can be fitted well for unfavourable environment.

The seed yield was not significantly correlated with any of the other five traits in the present study (Table 3). Days to maturity was significant and negatively correlated with leaf number and head diameter. The leaf number showed positive significant correlation with head diameter and plant height. Similar report was given by kalaiselvan and Manoharan (1994) in sunflower. The multiple regression equation between seed yield and other five traits showed that the head diameter contributed linearly followed by number of leaves.

$Y = 0.5837 + 0.0029\ X_1 + 0.0363\ X_2 + 0.0151\ X_3 - 0.0248 + 0.006\ X_5$ The days to 50 per cent flowering showed a negative contribution. This linear equation revealed that an increase in the size of head diameter and number of leaves will proportionately increase seed yield. But reducing the duration will adversely affect the seed yield. Therefore, in sunflower the head diameter and number of leaves per plant were considered as the important yield contributing traits.

Thus the study disclosed that AH 1, AH 3, AH 4, AH 6 and AH 8 were the hybrids that could be recommended for the rainfed vertisol. Head diameter and number of leaves are the two important selection indices and reducing the duration will adversely affect the seed yield.

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