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STABILITY PARAMETERS FOR SEED YIELD IN SUNFLOWER (*HELIANTHUS ANNUUS* L.)

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Five popular varieties of sunflower (*Helianthus annuus* L,) evaluated for 5 seasons from Kharif, 1970 to Rabi, 1974-75 under semi-arid conditions of Western Rajasthan were studied for stability parameters. The analysis of variance revealed significant differences due to genotypes and environments. Significant genotype-environment (interactions both, linear and genotype environment) (linear) indicated that varieties performed differently in varying environments. EC 68415 gave the highest mean seed yield, showed specific adaptation to favourable environments and was stable. EC 68413 exhibited above average performance but expressed better response to average environments and stability. EC 68414, EC 69874 and Sun-rise Sel recorded below average performance and better response to poor environments. EC 68414 and EC 69874 were stable whereas Sun-rise Sel was unstable. The stability parameters *Viz.* $\bar{X}$ and bi were significantly and positively correlated with each other.

Sunflower (*Helianthus annuus L.*) is an important oilseed crop as it produces more oil per unit area and per unit time. Fluctuations in the production of sunflower are owing to the sensitivity of the crop to environments and, therefore, there is need to identify and/or evolve varieties with stable performance over different environments. The present investigation was, therefore, undertaken to evaluate 5 sunflower varieties for level and stability of performance for seed yield under semi-arid conditions of western Rajasthan

MATERIALS AND METHODS .

Five sunflower varieties *Viz.*, EC 68413, EC 68414, EC 68415, EC 69874 and sunrise sel were evaluated during *Kharif*, 1970, *Rabi* 1971-72, *Rabi* 1972-73, *Rabi* 1973-74 and *Rabi* 1974–75 in a randomized complete block design with four replications at Regional station of Agricultural Research, University of Udaipur (Sumerpur), Rajasthan. The plot size consisted of 6 rows of 6 m length and the spacing followed were 60 cm between rows and 30 cm within row between plants. The seed yields per net plot were statistically analysed.

The stability parameters were worked out according to the method suggested by Eberhart and Russell, (1966). Simple correlations were also worked out among the three stability parameters following usual statistical procedures.

RESULTS AND DISCUSSION:

The mean seed-yield obtained from different seasons indicated that the highest seed yield was realised during *Kharif* 1970, whearas it was the lowest in *Rabi* 1973-74. EC 68415 recorded the highest seed yield in all the seasons except *Rabi* 1972-73 (Table 1),

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The mean squares due to varieties and environments were highly significant indicating that the difference among varieties and environments were real. The genotype environment interaction was also highly significant when tested against pooled error, which revealed differential behaviour of varieties to varying environments for seed yield. The varieties also differed significantly for their linear response to environmental effects and also for the deviations from the linearity which suggested that both the linear regressions and the deviations from the linearty were the major components for differences in stability for seed yield in these varieties (Table 2).

Three parameters of stability for each variety and along with percentage increase or decrease in mean yield performance over grand mean are presented in Table 3.

Significant $\bar{b}i$ values for all the varieties and $\bar{S}di$ for Sunrise Sel only suggested that only linear component accounted for major portion of genotype x environment interactions for EC 68413, EC 68414, EC 68415 and EC 69874 whereas both linear as well as non linear components were responsible for genotype X environment interaction for Sunrise Sel.

A perusal of the first stability parameter ($\bar{X}$) indicated that EC 68415 gave the highest seed yield which was 20.7 per cent higher than grand mean, followed by EC 68413 which also recorded above average seed yield (6.28 percent higher than grand mean). EC 68414, EC 69874 and Sunrise Sel gave seed yields less than grand mean and thus were poor in performance

An observation of the second stability parameter ($\bar{b}i$) revealed that EC 68415 had regression value higher than one. This suggested the sensitivity of the variety to environmental fluctuations and its specific adaptation to favourable environmental conditions. It is plausible that the seed yield of EC 68415 might have been increased substantially by providing conditions to higher productivity. EC 68413 had regression value equal to unity amply suggested its better response to average environmental conditions. EC 68414, EC 69874 and Sunrise Sel revealed their specific adaptation to unfavourable environmental conditions as they possessed regression values lower than unity.

The third stability parameter ($\bar{S}di$) for these varieties showed that EC68413 CE 68414, EC 68415 and EC 69874 had low and non-significant deviation which indicated their stability for the data obtained in different season. Sunrise Sel had the highest and significant deviation value from linear regression. Thus, the variety was unstable and it seemed to behave inconsistantly to varying environmental conditions.

The stability parameter $\bar{X}$ was positively and significantly correlated with $\bar{b}i$. This could be evident due to the possible linkage between the genetic systems controlling these traits. Non-significant correlations observed between $\bar{X}$ and $\bar{S}di^2$ and $\bar{b}i$ and $\bar{S}di^2$ are traceable to independent genetic systems which may be involved for the genetic control of these traits.

Over-all results indicated that the variety EC 68415 which recorded the

Table : 1 Mean seed yield of sunflower varieties over 5 season in Western Rajasthan

Variety	Mean seed yield (Kg/Plot)					
	Kharif-1970	*Rabi* 1971-72	*Rabi*-1972-73	*Rabi*-1973-74	*Rabi*-1974 75	Mean
EC 68413	4.700	2.944	1.515	0.785	0.802	2.149
EC 68414	3.650	2.619	1 046	0.635	0.839	1.758
EC 68415	5.857	3.060	1 421	0 846	1.020	2.441
EC 69874	3.763	2.576	1 103	0.382	1.014	1.768
Sunrise sel	4.200	2.519	1.103	1.263	0.878	1.993
Mean	4.435	2·744	1.238	0.782	0.911	2.022

Table 2. Pooled analysis of Variance for seed yield in sunflower

Sources	dt	S.S.	M S.	Calculated F	
				With pooled error	With pooled deviation
Varieties (V)	4	1.6348	0.4087	9 062**	4.003*
Environments (E)	4	48.6302	12.1576	269.56**	119.075**
Variety X E	16	2.4561	0.1535	3.404**	1.503
E + (V X E)	20	51 0863	2.5543	56.762**	25.018**
Environments (Linear)	1	48 6324	48.6324	108.072**	1113 64**
V X E (Linear)	4	0 822	0.2055	4.567**	2.013
Pooled deviation	15	1.5230	0.1021	2.270*	
V_1	3	0.074	0.0245	0.544	
V_2	3	0.088	0 0293	0 652	
V_3	3	9 160	0.0533	1 184	
V_4	3	0.083	9.0277	0.616	
V_5	3	1.127	0.3757	8.348**	
Pooled error	60	1.82906	0.01085 (0.045)		

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

Table : 3. Stability parameters and correlation coefficients among them for seed yield in sunflower :

Variety	$\bar{X}$ (Kg/plot)	% increase (+) or decrease (−) over grand mean	$\bar{bi}$	$\bar{Sdi}^2$
EC 681413	2.149	+ 6.28	10.07**	— 0.020
EC 68414	1.758	— 13.06	0.839**	— 0.016
EC 68415	2.441	+ 20.72	1.341**	0.006
EC 69874	1.768	— 12.65	0.871**	— 0.017
Sun-rise Sel	1.993	— 1 43	0.878**	0.331

r $(\bar{X}.\bar{bi})$	0.954**
r $(\bar{X}.\bar{Sdi}^2)$	—0.054
r $(\bar{bi}.\bar{Sdi}^2)$	—0.263

*, ** Significant at 5 % 1 % levels of significance, respectively.

highest and above average performance would perform better under favourable environments as it possessed $\bar{bi}$ value higher than unity and non-significant deviation. EC 68413 which also recorded above average mean performance seemed superior for average environmental conditions and had average stability as it possessed b = 1 and non-significant deviation. EC 68414 and EC 69874 which recorded below average mean performance seemed to do better under poor environmental conditions as they possessed b < 1 and non-significant deviations. Sunrise Sel seemed better for poor environments with low productivity but it seemed to perform in an unpredictable manner because of its significant deviation from linear regression.

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