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GENOTYPE - ENVIRONMENT INTERACTION FOR YIELD COMPONENTS IN PIGEONPEA (**Cajanus cajan** (L.) MILLSP)

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ABSTRACT

None of the six pigeonpea cultivars over three different seasons could be identified for yield stability. However SA 1 and PLS 361/1 were identified for the stability of number of branches, number of pods per plant, number of seeds per pod and 1000-grain weight. The genotype-environment interaction is highly significant for all the yield components except number of seeds per pod. This study also suggests that these two cultivars can be used for crop improvement studies in pigeonpea.

KEY WORDS: G x E Interaction, Pigeonpea, Yield Components

Pigeonpea is considered to be one of the important dry-land pulse crops in Tamil Nadu. Pigeonpea is highly sensitive

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to the changing weather parameters that exist in different agro-climatic regions. Fluctuations in the production of pigeonpea are owing to its quantitative short day nature (Wallis et al, 1980). Therefore, there is need to identify and/ or evolve varieties with stable performance over different environments. So, an attempt has been made to find out the stable variety for yield or stable yield parameters over different seasons.

MATERIALS AND METHODS

An experiment was laid out under field conditions with six pigeonpea cultivars comprising of three long duration (CORG 11, PLS 361/1 and SA 1) and three short duration (Co.5, CORG 5 and UPAS 120) during the year 1984-85. The trial has been repeated over three different seasons with the following sowing dates viz., February 21st (I), June 21st (II) and September 21st (III). The design adopted was randomised block design with three replications. Uniform irrigation, plant protection and cultural operations were followed in all the three sowing dates. The yield components such as number of fruiting branches per plant, number of pods per plant, number of seeds per pod, 1000 grain weight and harvest index were measured at harvest stage. The stability parameters were worked out according to the method suggested by Eberhart and Russell (1966).

RESULTS AND DISCUSSION

Data on analysis of variance for mean squares showed that the genotype-environment interaction was found to be significant except for number of seeds per pod, where it was highly significant between seasons (Table 1). In the case of pooled deviation (non linear) also, all the yield components were found to be significant except for number of seeds per pod and number of pods per plant. None of the characters was found to be significant in pooled error. The relationship between linear and non linear responses was observed to be character specific in pigeonpea (Jag Shoran, 1985).

The stability analyses for individual character have been carried for the mean of all the three seasons. Three parameters namely mean value, regression coefficient (bi) and mean square deviation (S^2d) were considered for identifying the stable cultivar for particular yield components. The cultivars showing high mean (mean + 2 S.E.), bi around unity and S^2d around zero were considered for

Table 1. Analysis of variance (mean squares) for phenotypic stability for yield components

Source	df	Harvest index	No.of fruiting branches per plant	1000 grain weight	No. of seed/ pod	No. of pod/ plant	Grain yield
Variety	5	956.36**	158.04**	801.31**	0.245**	407890.35**	10048.69**
Season	2	286.53**	372.47**	109.09**	0.957**	773095.81**	37281.73**
Variety x Season	10	117.29**	22.05**	13.72**	0.093	99117.19**	4045.14**
Season (Linear)	1	191.02**	248.31**	72.73**	0.638**	515397.21**	24854.49**
Variety x Season (Linear)	5	21.17**	13.18**	3.95*	0.024	65629.57**	2635.58**
Pooled deviation (non linear)	6	47.52**	1.28**	4.34*	0.032	373.79	50.99**
Pooled error	30	3.85	0.324	1.49	0.047	675.57	17.58

high stability over three seasons (Eberhart and Russell, 1966).

Data on number of fruiting branches per plant revealed that the cultivars SA 1 and PLS 361/1 were found to be stable over seasons (Table 2). All the three long duration cultivars CORG 11, PLS 361/1 and SA 1 were classified as stable cultivars for number of pods per plant (Table 3). In the case of number of seeds per pod only SA 1 fall under the category of high stability over seasons. 1000-grain weight also showed high stability. Hence these cultivars can be classified as stable for 1000 grain weight over seasons. CORG 5, a short duration cultivar was identified for its stability in harvest index. Eventhough some of the cultivars were identified for stability of all those above yield components, none of the cultivars was identified for grain yield stability. From this, it was evident that the grain yield in pigeonpea was not stable in any cultivars. Narayanan and Sheldrake (1979) also reported that the yield of pigeonpea was highly dependent upon the environmental conditions prevailing during that cropping period. Ganguli and Srivastava (1972) also stated that the environmental factors had the greatest influence on seed yield per plant.

It could be concluded that grain yield in pigeonpea was highly unstable over seasons. No cultivar could be considered as stable over seasons. However, SA 1 a long duration cultivar was found to be stable for yield components such as number of branches per plant, number of seeds per pod and 1000 grain weight; whereas another long duration cultivar PLS 361/1 was identified for the stability of number of fruiting branches per plant, number of pods per plant and 1000-grain weight. The short duration cultivar, CORG 5 was classified as stable cultivar for 1000 grain weight and harvest index. So, these cultivars can be used as parental material for further crop improvement in pigeonpea.

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Table 2. Stability analysis

Variety*	Seasons I	Seasons II	Seasons III	Seasons Mean	Regression coefficient (b_1)	Mean square deviation ($\bar{S}d^2$)
1) No. of fruiting branches/plant						
CO 5	9.6	8.5	5.3	7.8	0.44	1.74**
CORG 5	10.4	8.3	5.2	7.9	0.55	1.94**
UPAS 120	8.9	6.3	4.1	6.4	0.52	0.063
CORG 11	20.9	11.0	9.1	13.7	1.36	3.16**
PLS 361/1	21.2	13.6	9.2	14.7	1.33*	- 0.086
SA 1	25.3	13.7	9.6	16.2	1.78	1.19
Mean	16.05	10.23	7.08	11.12	1.00	
SE	0.474	0.184	0.256	0.189	0.176	
2) No. of pods/plant						
CO 5	220.2	187.2	128.8	178.7	0.21	414.14
CORG 5	241.2	195.6	142.5	193.1	0.23	151.05
UPAS 120	170.8	116.7	95.0	127.5	0.19**	- 225.13
CORG 11	902.2	409.2	266.4	525.9	1.68*	875.31
PLS 361/1	944.2	412.8	195.4	517.5	1.86**	- 225.19
SA 1	1045.6	487.4	279.0	604.0	1.91*	- 98.56
Mean	583.37	301.48	184.51	357.78	1.00	
SE	12.30	22.50	4.23	8.66	0.666	
3) No. of seeds/pod						
CO 5	2.69	3.10	2.86	2.88	0.89	- 0.016
CORG 5	2.71	2.93	2.91	2.85	0.44	- 6.940
UPAS 120	2.31	3.16	3.00	2.82	1.73	0.072*
CORG 11	2.81	3.23	2.90	2.98	0.94	- 0.013
PLS 361/1	3.00	3.56	2.85	3.14	1.35	0.070*
SA 1	3.12	3.40	3.16	3.23	0.64	- 0.013
Mean	2.77	3.23	2.94	2.98	1.00	
SE	0.134	0.139	0.099	0.073	0.545	

Table 2. Stability analysis (contd.)

Variety	Seasons I	II	III	Mean	Regression coefficient (b_1)	Mean square deviation (S^-d^2)
4) 1000 grain weight (g)						
CO 5	78.28	78.20	74.60	77.03	0.28	7.36**
CORG 5	76.95	81.60	77.20	78.58	1.05	- 0.31
UPAS 120	54.25	60.60	56.40	57.08	1.29	0.13
CORG 11	74.34	83.20	80.20	78.91	1.71	14.86**
PLA 361/1	80.33	86.30	81.30	82.64	1.30	- 0.49
SA 1	81.48	82.40	70.80	81.23	0.35	1.48
Mean	74.11	78.72	74.92	75.91	1.00	
SE	0.529	0.639	0.898	0.407	0.598	
5) Harvest Index						
CO 5	31.0	39.0	29.0	33.0	0.61	42.86**
CORG 5	31.9	35.0	32.9	33.3	0.33	0.23
UPAS 120	37.8	43.0	27.8	36.2	- 0.069	17.92**
CORG 11	6.7	17.0	25.1	16.3	1.91	52.86**
PLS 361/1	7.0	15.0	22.1	14.7	1.53	38.75**
SA 1	7.1	17.0	22.2	15.4	1.69	24.78
Mean	20.3	27.7	26.5	24.8	1.00	
SE	0.923	1.535	0.797	0.654	1.221	
6) Grain Yield						
CO 5	41.2	28.9	13.4	27.8	0.29	52.29*
CORG 5	47.9	30.6	16.7	31.7	0.33	28.17*
UPAS 120	33.6	24.8	10.1	22.8	0.23	33.44**
CORG 11	160.6	49.6	35.9	82.0	1.49	73.06**
PLS 361/1	185.4	50.4	25.8	87.2	1.89*	28.41*
SA 1	186.7	59.1	37.2	94.3	1.77*	35.31*
Mean	109.2	40.57	23.15	57.63	1.00	
SE	4.02	0.265	1.15	1.39	0.110	

* deviating from unity and zero respectively for b_1 and S^-d^2

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