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CHARACTER ASSOCIATION AND PATH COEFFICIENT ANALYSIS IN HYBRID PIGEONPEA

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ABSTRACT

Twenty-eight pigeonpea experimental hybrids of diverse origin and late maturity group obtained from Akola, Kanpur, Narendra Deo, Rajaendra Agricultural University and Banaras Hindu University along with two checks were evaluated for character association and path analysis. Correlation studies indicated that phenotypically yield was positively and significantly correlated with number of pods per plant (0.809), dry matter at maturity (0.755) and number of secondary branches (0.623) but at genotypic level the association was highest for dry matter at maturity (0.961). Path coefficient analysis showed that out of six independent characters having positive direct effect on seed yield, maximum contribution was of number of pods per plant (0.819) followed by dry matter at maturity (0.749) and 100-seed weight (0.478)

KEY WORDS : Hybrid Pigeonpea, Character Association, Path Coefficient

Pigeonpea is one of the main sources of proteins in Indian diet. The conventional breeding procedures followed in pigeonpea brought improvement in seed yield and resistance to diseases and pests. However, for further boost in productivity, the possibility of producing pigeonpea hybrid opens up new avenues. Prospects of hybrid pigeonpea to break the existing yield barriers have been discussed (Saxena *et al.*, 1986 Shrivastava *et al.*, 1976 Sinha *et al.*, 1986) reporting 67 to 100 per cent heterosis for grain yield in pigeonpea.

The knowledge of correlation coefficients and path coefficients have provided a clear picture about the association of yield and yield components and the extent of their direct and indirect influences on seed yield in standard cultivars of pigeonpea (Beohar *et al.*, 1980; Marekar and Nerkar, 1987; Patel *et al.*, 1988; Singh *et al.*, 1993). However, scanty information is available on character association in pigeonpea hybrids. This is essential for planned heterosis breeding programme to give due weightage to the character(s) responsible for increased grain yield of hybrids. Therefore, the present investi gation was made with an objective to identify the yield traits and to determine the magnitude of their contribution which is responsible for the increased grain yield in the hybrids.

MATERIALS AND METHODS

The study involved 28 long duration pigeonpea experimental hybrids and two standard checks Bahar and T-7. The experiment was conducted at Agricultural Research Farm, Banaras Hindu University, Varanashi during 1992-93, Each plot consisted of two rows, 3 m long with row to row and plant to plant distance of 75 cm and 25 cm, respectively. From each plot, five competitive plants were selected randomly for recording the observations. Data were recorded on twelve characters. The phenotypic and genotypic correlation coefficients were calculated by the method suggested by Panse and Sukhatme (1967) and path coefficients were analysed to the method suggested by Wright (1921) and elaborated by Dewey and Lu (1959).

RESULTS AND DISCUSSION

Phenotypic and genotypic correlation coefficients between yield and different component traits were calculated. The details of numerical magnitude of the correlation values have been given in Table 1. A close perusal reveals that phenotypic correlation between yield and most of the yield contributing characters are positive. Days to 50% flowering, days to 75 per cent maturity and 100-seed weight showed negative and non-significant correlation with yield. However, number of secondary branches exhibited significant positive correlation values in association with yield per plant.

Characters like days to flower bud initiation, days to 50% flowerin and da s to 75 er cent

Table 1. Genotypic and phenotypic correlation coefficients between seed yield and yield contributing characters in pigeonpea

Characters	Days to 50% flowering	Days to 75% maturity	Plant height	Number of primary branches	Number of secondary branches	Number of pods per plant	Number of seeds per pod	Dry matter at maturity	100 seed weight	Harvest index	Seed yield per plant
Days to flower bud initiation	0.778** (0.790)	0.510** (0.640)	0.363* (0.636)	0.262 (0.409)	0.071 (0.397)	0.017 (0.252)	-0.090 (-1.932)	0.260 (0.540)	0.222 (0.283)	-0.332 (-1.027)	0.048 (0.240)
Days to 50% flowering		0.680** (0.814)	0.266 (0.548)	0.136 (0.222)	-0.161 (-0.031)	-0.166 (-0.093)	-0.011 (-0.816)	0.078 (0.326)	0.201 (0.252)	-0.440* (-1.193)	-0.203 (-0.149)
Days to 75% maturity			0.087 (0.057)	-0.013 (-0.161)	-0.265 (-0.441)	-0.289 (-0.349)	0.004 (-0.075)	-0.060 (-0.086)	0.300 (0.320)	-0.248 (-0.441)	-0.247 (-0.313)
Plant height				0.438* (0.622)	0.354 (0.859)	0.420* (1.034)	-0.058 (-1.478)	0.687** (0.910)	-0.191 (-0.297)	-0.537** (-0.619)	0.383* (0.825)
Number of primary branches					0.417* (0.556)	0.431* (0.521)	-0.120 (-0.299)	0.472** (0.461)	-0.179 (-0.244)	-0.166 (-0.533)	0.327 (0.305)
Number of secondary branches						0.611** (0.969)	-0.171 (-1.133)	0.694** (0.805)	-0.423* (-0.718)	-0.179 (-0.301)	0.623** (0.648)
Number of pods per plant							-0.186 (-0.773)	0.719** (1.029)	-0.441* (-0.718)	0.011 (-0.783)	0.809** (0.864)
Number of seeds per pod								-0.071 (-0.426)	0.179 (0.928)	0.073 (1.944)	0.041 (-0.541)
Dry matter at maturity									-0.297 (-0.367)	-0.376* (-0.504)	0.755** (0.961)
100 seed weight										0.199 (0.471)	-0.184 (-0.243)
Harvest index											0.208 (-0.013)

** Significant at 1% level; * Significant at 5% level

Values in parentheses are the genotypic correlation values, rest are phenotypic correlation values

maturity showed highly significant and positive correlation among themselves exhibiting a key role of reproductive phase in the expression of other yield traits. Number of pods per plant exhibited positive and significant correlations with plant height, number of primary branches, secondary branches and dry matter at maturity, which directly relate its close association with the yield in pigeonpea hybrids. Thus, the present analysis minimises the number of relationship and the interactions that need to be determined while selecting suitable pollen parents for making pigeonpea hybrids. These findings are in agreement with those of several workers that yielding ability of standard pigeonpea cultivars is strongly correlated with number of pods per plant, dry matter at maturity, number of secondary branches and plant height (Beohar *et al.*, 1980; Marekar and Nerkar, 1987; Upadhyay and Saharia, 1980; Yadavendra *et al.*, 1981).

As simple correlation does not provide the true contribution of the characters towards the yield, direct and indirect effects through path coefficient analysis. The result obtained have been presented in Table 2.

The character, number of seeds per pod was excluded from the analysis owing to its negative genotypic correlation values with all the characters including significantly negative value (-0.541) with seed yield. The main contribution of direct effects towards yield per plant was observed in the characters like pods per plant (0.819), dry matter at maturity (0.749) and 100-seed weight (0.478). Plant height showed minimum direct effect (0.009). The negative direct effects on seed yield were observed in characters like days to flower bud initiation (-0.121), days to 50 per cent flowering (-0.381), number of primary branches (-0.125) and number of secondary branches (-0.185). This suggested that an early flowering in pigeonpea hybrids is desirable for its direct contribution towards the seeds yield through characters like dry matter at maturity, 100-seed weight and days to 75 per cent maturity.

Table 2. Path analysis of the genotypic correlation between seed yield and yield contributing characters in pigeonpea

Characters	Days to flower bud initiation	Days to 50% maturity	Days to 75% maturity	Plant height	Number of primary branches	Number of secondary branches	Number of pods per plant	Dry matter at maturity	100 seed weight	Harvest index	'r' with yield per plant
Days to flower bud initiation	-0.121	-0.301	0.136	0.006	-0.051	-0.074	0.206	0.404	0.135	-0.100	0.240
Days to 50% flowering	-0.096	-0.381	0.173	0.005	-0.028	0.006	-0.077	0.244	0.121	-0.116	-0.149
Days to 75% maturity	-0.077	-0.311	0.213	0.001	0.020	0.082	-0.286	-0.064	0.153	-0.043	-0.313
Plant height	-0.077	-0.209	0.012	0.009	-0.078	-0.159	0.847	0.681	-0.142	-0.060	0.825
Number of primary branches	-0.049	-0.085	-0.034	0.006	-0.125	-0.103	0.508	0.345	-0.107	-0.052	0.305
Number of secondary branches	-0.048	0.012	-0.094	0.008	-0.069	-0.185	0.794	0.603	-0.343	-0.029	0.648
Number of pods per plant	-0.030	0.036	-0.074	0.009	-0.077	-0.180	0.819	0.771	-0.343	-0.067	0.864
Dry matter at maturity	-0.065	-0.124	-0.018	0.008	-0.057	-0.149	0.843	0.749	-0.175	-0.049	0.961
100 seed weight	-0.034	-0.096	0.068	-0.003	0.028	0.133	-0.588	-0.275	0.478	0.046	-0.243
Harvest index	0.124	0.455	-0.074	-0.006	0.066	0.056	-0.559	-0.378	0.225	0.097	-0.013

Residual effect = -0.1210

Among eleven yield components, direct effect of number of pods per plant, dry matter at maturity and 100-seed weight of the pod on seed yield appeared important. The direct effect of other independent characters and also the various types of indirect effects which counter balanced these direct effects are not significant enough to be utilized in the hybrid pigeonpea programme. However, a close study of the causal system reveals that the characters like plant height, number of primary branches, number of secondary branches and dry matter at maturity significantly influence the seed yield in pigeonpea hybrids with their indirect effects through the character, number of pods per plant. This also contributes towards the major role of number of pods per plant in the realization of yield in pigeonpea hybrids. This analysis provides clear picture reflecting the strong positive association between number of pods per plant and other two characters in building up the causal relationship of these complex characters vis-a-vis seed yield. Results of similar nature were reported by other works in normal cultivars of

11 Natara aratnam, 1989; Patel *et al.*, 1988; Pokle and Mahatkar, 1976; Singh *et al.*, 1993; Wakankar and Yadav, 1975).

Thus, combination of number of pods per plant, dry matter production and 100-seed weight in a balance production have been mainly responsible for the increased seed yield in hybrids over the standard checks. It would, therefore, be desirable to strike a proper balance between these characters following appropriate breeding methodologies to further enhance the seed yield in pigeonpea hybrids.

REFERENCES

BALKRISHNAN, K. and NATARAJARATNAM, N. (1989) Association of yield attributes in pigeonpea. **Madras Agric. J., 76:** 349-350.

BEOHAR, A.B.L., PANDEY, S.C., SHRIVASTAVA, P.S. and PARASHAR, R.R. (1980). Correlation and path analysis of some yield components in pigeonpea. **JNKVV Res. J., 14:** 83-86.

DEWEY, D.R. and LU, K. (1959). A correlation and path coefficient analysis of components of crested wheat grass seed production. **Agron. J., 51:** 575-578.

MAREKAR, R.V. and NERKAR, Y.S. (1987) Correlation and path analysis in F_1 generation of pigeonpea **PKV Res. J., 11:** 1-6

PANSE, V.G. and SUKHATME, P.V. (1967) **Statistical Methods for Agricultural Workers** ICAR, New Delhi, India.

PATEL, J.A., PATEL, D.B.,ZAVERI, P.P. and PATHAK, A.R. (1988). Path coefficient studies in pigeonpea. **Int.Pigeonpea Newsl., 7:** 5- 6

POKLE, Y.S. and MAHATKAR, L.C. (1976). Path analysis of yield components in pigeonpea. **Nagpur Agri. Coll. Mag., 48:** 23-24.

SAXENA, K.B., FARIS, G., REDDY, L.J., SHARMA, D., REDDY B.V.S., GUPTA, S.C. and GREEN, J.M. (1986) Prospects of hybrid pigeonpea. In: **New Frontiers in Breeding Researches. Proc. V. Int. Cong. (SABRAD).** (NAPOM PETH, B. and SUBHADRA BANDHU, eds). Faculty of Agriculture, Kasetsart University, Bangkok, Thailand, pp. 379- 388.

SHRIVASTAVA, M.P., SINGH, L. and SINGH, R.P. (1976). Heterosis in pigeonpea. **Indian J.Genet., 36:** 197-200.

SINGH, G.P. SINGH, R.M. and SINGH, A.P. (1993). Character association and path coefficient analysis in pigeonpea hybrids. **Indian Biol.,25:** (in press)

SINHA, S.C., SHRIVASTAVA, A.N. and SINGH, K.N. (1986) Heterosis in relation to geneticf divergence in pigeonpea. **Int. Pigeonpea Newsl., 5:** 20-21.

UPADHYAY, L.P. and SAHARIA, P. (1980). Interrelationship between yield and yield components in pigeonpea. **Res.J.Assam Agric. Univ., 1:** 43-47.

WAKANKAR, S.M. and YADAV, L.H. (1975). Path analysis of yield components in Arhar. **Indian J.Agric. Sci., 9:** 182-185.

WRIGHT, S. 1921. Correlation and causation. **J.Agric. Res., 28:** 557-585.

YADAVENDRA, J.P., DIXIT, S.R. and SHAH, R.M. (1981) Genetic variability correlation and path coefficient analysis in pigeonpea. **Gujarat Agric. Univ. J., 7:** 37-40.

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USE OF BRACKISH WATER IN RAISING CHILLIES IN RED SOIL

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ABSTRACT

Field experiments were conducted in the red soil of Agricultural Research Station, Kovilpatti with chillies (var.K2) in raised bed, under brackish water irrigation (EC 5.1 dSm^{-1}) revealed that the application of gypsum to irrigation water (@ 1 t/ha) increased the dry pod yield significantly.

KEY WORDS : Red soil, Raised bed, Chillies, Brackish Water, Gypsum.

The water intended for irrigation must be free from excess soluble salts and concentration of specific chemical substances which may be hazardless to soil environment. The concentration and composition of dissolved salts in the water decides its suitability for irrigation. Salts affect the plants by increasing the osmotic pressure making the plant to exert more energy to absorb the soil water (Wilcox and Durum, 1967). The water samples were collected at random from open wells in different blocks of Kovilpatti Taluk used for irrigation which revealed that 60 per cent of the water samples were unfit for irrigation, 30 per cent suitable for raising tolerant crops like ragi and cotton and the remaining 10 per cent is fit for cultivation of all crops. Hence, a study was carried out to find out the effect of brackish water on the yield of chillies.

MATERIALS AND METHODS

Field experiments were conducted in a split plot design replicated thrice, in the red soil of Agricultural Research Station, Kovilpatti during 1990-91, 1991-92 and 1992-93 with the following treatments.

Main plot treatments

Bed method (M_1)
Raised bed (M_2)
Ridges and furrows (M_3)
Paired rows (M_4)

Sub plot treatments

Controls (S_1)
Gypsum treatment to soil (as per GR) (S_2
Pig manure compost @ 5 t ha_{-1} (S_3)
Green leaf manure @ 5 t ha^{-1} (S_4)