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Heterosis Study in Pigeonpea [*Cajanus Cajan (L.) Millsp.*]



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Abstract

The present investigation on diallel analysis was conducted in pigeonpea to study the magnitude of heterosis in pigeonpea for ten plant characters including seed yield per plant and its component characters. The experimental material comprising of seven genetically diverse parental lines and their twenty one hybrids (excluding reciprocals). Significant heterobeltosis and high *per se* performance with regards to seed yield per plant and its components were recorded by the crosses GT-102 x ICPL-87119(33.80% and 95.00g), BSMR-853 x GT-102 (25.35% and 85.00 g) and ICPL -87119 x AGT-2 (25.23% and 92.67g) in positive direction.

Keywords: Pigeonpea, Diallel Mating Design, Heterosis, Heterobeltosis, *per se* performance

Introduction

Pigeonpea (*Cajanus cajan* L. Millsp.) is diploid with a chromosome number of ($2n=22$), belongs to family Fabaceae, one of the oldest source of the oldest source of human food, in form of green pods as well as grains has most likely been used as a crop since, Neolithic times. Development of cultivars with early maturity, acceptable grain as well as vegetable quality, resistance to some important diseases and pests has significantly increased the yield and cultivated area. The overall effect of plant breeding on genetic diversity has been a long standing concern in the evolutionary biology of crop plants. The loss of genetic diversity has been dramatic for many cultivated species. In a self-pollinating crop like pigeonpea, variability is the present investigation was made to collect information on heterosis for seed yield per plant and its components in pigeonpea.

Materials and Methods

The seven parental genotypes were crossed in diallel fashion (excluding reciprocals) to obtain twenty one (21) F_1 hybrids. The emasculation and pollination was done. At the same, time all the seven lines were selfed, so as to get sufficient seeds for experiment. After pollination, the flowers tagged and labeled properly. The seeds of twenty eight (28) F_1 crosses and seven parents were collected separately.

The experiment consisted of twenty eight (28) treatments comprising 7 parents and 21 F_1 S were laid out in a randomized block design with three replications during *Kharif* 2011. The recommended agronomic practices and plant protection measures were adopted for raising good crop. Observations were recorded on randomly selected five plants for fourteen quantitative traits *viz.*, days to 50 per cent flowering, days to maturity, plant height (cm), number of seeds per pod, 100 seeds weight (g), seed yield per plant (g) and protein content (%). The data was analysed to compute heterosis (%) over better parent (BP) values.

Results and Discussion

The analysis of variance for parents, hybrids and parents vs hybrids compared for different ten characters under investigation are presented in Table-1. The mean squares due to genotypes, parents and hybrids were found highly significant for all the characters. This indicated that there is sufficient variability among the genotypes as well as parents and F_1 S for the characters under study and thus there has been a chance for the improvement. The mean squares due to parents and hybrids indicated much variation among them. This indicated the existence of considerable variability contributed by genetic causes. Parents vs hybrids comparison indicated that means of hybrids were significantly different from means of parents as a group for all the characters, except for days to 50% flowering, days to maturity and plant height indicating substantial amount of heterosis for most of the characters.

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Range of mean and heterosis per cent for yield and contributing characters in vegetable in pigeon pea is shown in Table 2. Heterosis for days to 50% flowering, ranged from -21.60 to 20.40 % over better parent for this trait negative heterosis is desirable for days to maturity it is ranged from -16.39 to 7.28 %. Heterobeltiosis was calculated by taking dwarf as a better parent for plant height the range of heterobeltiosis was observed from -23.14 to 14.01 % the heterosis for number of branches per plant, range from -15.56 to 41.65 % over better parent.

The range of heterobeltiosis varied from -26.42 to 38.24 for number of pods per plant. Pod length (cm), ranged from -19.75 to 28.57 % over better parent. The heterosis for number of seeds per pod ranged from -13.57 to 26.92 % over better parent.

The heterosis for 100 seeds weight (g) range from -13.65 to 18.80 % over better parent. The positive heterosis showed the dominant effect for increasing seed yield per plant. The heterosis ranged from -21.85 to 33.80% over better parent. In the context of protein content, the heterosis ranged from -9.04 to 7.29 % over better parent.

Heterosis in desirable direction over parent was observed in respect of all characters. The value of heterosis varied from -21.85 to 33.80 per cent in heterobeltiosis for seed yield per plant. Four crosses viz., GT-102 x ICPL-87119, BSMR-853 x ICPL-87119, ICPL-87119 x AGT-2 and BSMR-853 x GT-102 showed significant and positive better parent heterosis for seed yield per plant (Table-3), almost identical results have been reported by Mehetre *et al.* (1993), Narladkar and Khapre (1996), Aghav *et al.* (1997), Pandey (1999), Hooda *et al.* (2000), Deshmukh *et al.* (2001), Sekhar *et al.* (2004), Aher *et al.* (2006), Patel and Tikka (2009) and Vaghela *et al.* (2011).

Expression of heterosis for seed yield and its components was related to the gca effects of parents. Most of the high heterotic crosses involved at least one parent with high gca effects.

The best cross showing high standard heterosis and their performance for seed yield and related parameters have been summarized in Table-4. The cross GT-102 x ICPL-87119 recorded highest *per se* performance for seed yield and it contain one average and other the good parent.

Conclusion

A single yield attribute with high heterosis is not sufficient to cause the quantum jump in the green pod yield but it is the combined interaction effects of major yield contributors. The critical study of these to five performing hybrids thus clearly indicates that as the high heterosis for green pod yield coupled with high heterosis for yield attribute suggested that there is a predominance of additive gene action for green pod yield heterosis.

References

1. Agahv, S.B.; Khapre, P.R. and Narladkar, V.W. (1997). Heterosis for yield and yield components in pigeonpea hybrids. *J.Maharashtra Agric. Univ.*, **22**(1):49-51.
2. Aher, G.U.; Mandrap, I.A.; Tike, M.A. and Gore, D.R. (2006). Heterosis and inbreeding depression in Pigeonpea. *J.Maharashtra Agric. Univ.*, **31**:33-37.
3. Deshmukh, R.B.; Rodge, R.G.; Patil, J.V. and Sahane, D.V. (2001). Heterosis for yield and yield components in relation to cropping systems in Pigeonpea. *Legume Res.*, **24**(3):101-104.
4. Mehetre, S.S.; Deshmukh, R.B.; Rodge, R.G. and Karale, M.U. (1993). Heterosis in pigeonpea. *Legume Res.*, **16**(2):67-70.
5. Narladkar, V.W. and Khapre, P.R. (1996). Heterosis for yield and yield components in pigeonpea. *Ann. Agric. Res.*, **17** (1):100-103.
6. Pandey, N. (1999). Heterosis and combining ability in pigeonpea. *Legume Res.*, **22**(3):147-151.
7. Patel, K.P. and Tikka, S.B.S (2009). Heterosis for yield and yield components in pigeonpea. *Legume Res.*, **21**(1):65-66.
8. Sekhar, M.R.; Singh, S.P.; Mehara, R.B. and Govil, J.N.. (2004). Combining ability and heterosis in early maturing pigeonpea hybrids. *Indian J. Genet.*, **64**(3):212-216.
9. Vaghela, K.O., Desai, R.T., Nizama, J.R., Patel, J.D. and Kodappully V.C. (2011). Heterosis study for yield and yield components in pigeonpea. *Research on crops.*, **12**(1):192-194.