Research Reports

Breeding/Genetics

Natural Outcrossing in Dwarf Pigeonpea

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Genetic studies on three pigeonpea dwarfs at ICRISAT Center indicated that dwarfism was recessive to tallness. Tall plant stature can therefore be used as a genetic marker in studying natural outcrossing in dwarf pigeonpea genotypes. In the 1986 rainy season, open-pollinated seeds from 99 F_2 dwarf plants representing six crosses were harvested. F_3 progenies from these selections were grown in two-row plots in the 1987 rainy season. Within each F_2-derived F_3 family, tall and dwarf plants were counted to estimate the extent of natural outcrossing in the preceding generation.

The frequency of tall plants observed in the F_3 dwarf families in different crosses are given in Table 1. The data showed that natural outcrossing in the dwarfs ranged from 9.7% to 24.1% and the average outcrossing percentage based on pooled value was 13.1%. This compares favorably with the results of Bhatia et al. (1981) who used stem color (green vs purple) marker and Saxena et al. (1987) who used growth habit (determinate vs. indeterminate) marker. The former reported 24% and the latter 15% natural outcrossing.

The present data showed a slightly higher natural outcrossing (24.1%) in the cross PBNA × ICPL 366 relative to other crosses, which could be attributed to the location of the field. The F_2 population of the cross PBNA × ICPL 366 was raised close to the nonsprayed section of ICRISAT farm where there were more bees, while other F_2 populations were grown in precision fields where the crop received insecticide sprays at the time of flowering. This might have influenced the insect population of pollinating vectors to some extent.

These estimates assumed no selective foraging by insects. Since this procedure could not account for the outcrossing from dwarf to tall, among talls, and among dwarfs, it should be inferred that the total outcrossing would be considerably higher.

Although most breeders maintain pigeonpea cultivars as if the crop is self-pollinated, these data indicate that some degree of natural outcrossing occurs that must be considered to maintain genetic purity. The data also indicate that the location of the field in relation to the insect habitat is also important to determine the degree of natural outcrossing. Artificial self-pollination, using cages or muslin cloth bags, or growing the crop in isolation would be of great help to maintain genetic purity of pigeonpea.

References

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Table 1. Percentage of natural outcrossing recorded in F_3 dwarf progenies at ICRISAT Center, rainy season 1987.

Cross	No. of progenies	No. of plants			Natural outcrossing (%)
		Total	Dwarf	Tall	
D 6 × ICPL 1	19	300	271	29	9.7
D 6 × BDN 1	19	322	286	36	11.2
PD 1 × ICPL 1	18	234	204	30	12.8
PD 1 × BDN 1	17	326	284	42	12.9
PBNA × ICPL 366	11	169	126	40	24.1
PBNA × NP (WR) 15	15	279	242	37	13.3
Total	99	1630	1413	214	13.1