Pod and Seed Set in Some Cytoplasmic Male Sterile Pigeonpea Progenies

A Nageshwar Rao, K B Saxena, and **Laxman Singh**
(ICRISAT Asia Center)

Several pigeonpea hybrids have recently been released in India. However, their adoption is limited because of the genetic nature of male sterility which poses physical constraints in large scale seed production. To overcome this limitation, a breeding program was initiated at ICRISAT Asia Center to develop cytoplasmic male sterile (CMS) lines. Some progenies derived through wide hybridization have shown preferential segregation in favor of male sterility suggesting the presence of cytoplasmic-genic control of male sterility (Ariyanayagam et al. 1995). To test the usefulness of this material in hybrid seed production, pod and seed set was studied in five progenies during 1994/95 by hand pollination, and through natural cross-pollination.

To study pod and seed set by hand pollination, seeds of a progeny (12-3) were sown in a greenhouse (20–25°C, RH 70%) on 18 Jul 1994. Plants expressing 100% pollen sterility were hand pollinated by the fertile line ICPL 85010-1. For studying pod set under natural conditions, seeds of four other progenies (9-1, 9-4, 1-14, and 12-10) were grown in pots. Five male-sterile plants of each line were used for studying natural insect-aided cross-pollination. At flowering, the potted male-sterile plants were moved to the flowering seed production plots of short-duration pigeonpea varieties. ICPL 84031 was used as the pollinator for progeny 9-1, ICPL 88009 for 9-4, ICPL 151 for 1-14, and ICPL 87 for progeny 12-10. In both the experiments, hybrid pods were harvested at maturity to determine the extent of pod and seed set.

Of the 23 potted plants raised from progeny 12-3, 16 expressed 100% pollen sterility. In the remaining plants pollen sterility was 5–9%. Because of several constraints, only 309 pollinations were attempted on the male-sterile plants, and on an average 62.5% pod set was recorded. The pod set in individual plants was 25–86%. The extent of pod set observed in the CMS plants is comparable to the hybridization among fertile pigeonpea cultivars (Saxena et al. 1976). On an average, 2.6 seeds were harvested from each hybrid pod. These seeds were normal in appearance and germination.

Insect-aided pod set on the male-sterile plants under open pollination was also good. On an average, each male-sterile plant produced 45 hybrid pods with 1.8 seeds pod^{-1}. Among four pollen parents used for natural cross-pollination, ICPL 151 was the best with 79 pods plant^{-1}, followed by ICPL 88009 with 75 pods plant^{-1}. ICPL 87, on the contrary, produced the fewest (28 pods plant^{-1}) number of hybrid pods when used as pollen parent. This variation could be due to the availability of pollen grains and/or presence/absence of pollinating insects in a particular isolation block. Seeds obtained from open pollination were also healthy with good germination.

Pollination studies using hand and natural outcrossing suggest that the CMS plants were female fertile and were capable of an acceptable level of pod set under natural pollination. Thus, these should pose no problem in developing commercial hybrids when CMS lines are fully developed.

References

Ariyanayagam, R.P., Nageshwar Rao, A., and **Zaveri, P.P.** (In press.) Cytoplasmic-genic male-sterility in interspecific matings of Cajanus. Crop Science.

Saxena, K.B., Sharma, D., and **Green, J.M.** 1976. Pigeonpea ratooning—an aid to breeder. Tropical Grain Legumes Bulletin 4:21.

Rapid Generation Turnover in Short-Duration Pigeonpea

K B Saxena (ICRISAT Asia Center)

To accelerate the breeding process rapid generation turnover (RGT) has been proposed for several crop species (Brim 1966, De Pauw and Clarke 1976, Mukade et al. 1973). Breeders usually do this by developing off-season nurseries at a suitable site. Pigeonpea is a short-day plant, and the strict photoperiodic requirements of the traditional long- and medium-duration types set a limit of a single generation per year. Short-duration pigeonpeas are, however, reported to be relatively photo-insensitive (Wallis et al. 1981, Green et al. 1981) and an off-season crop can be grown easily in areas where temperatures are conducive to plant growth. In the present study, in addition to work on the germination of developing (physiologically immature) seeds, attempts were made to effect a rapid turnover of generations by forcing developing seeds to germinate. The use of developing seeds in the acceleration of short-duration pigeonpea breeding programs is also discussed.

To obtain information on the germination of developing seeds, four short-duration pigeonpea varieties,