Development of F_1 hybrids of papaya (*Carica papaya* L.): Seed production and performance of F_1 hybrids

by

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Dedicated to Soon See, Peng-Li and Peng-Joon
for the three happy reasons to savour life

'The canopy that reaches highest into the sky
need not belong to the tree at the very peak of the mountain'
An illustration of genotype - environment effects

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ABSTRACT

Six papaya inbred lines i.e. Sunrise Solo, Eksotika, Line 19, Paris, Subang and Morib were used in the study on the development of F_1 hybrids of papaya. The inbred lines were crossed in a complete diallel to study the seed production behaviour and trends. The performance of the 15 hybrids and six inbred parents was tested over six environments.

The results indicated that all the six inbred parents were compatible in their crosses and reciprocals. Generally, large amounts of seeds, ranging from 238 to over 1 000 seeds, were produced in each successfully pollinated fruit. Differences in seed production were found especially between genotypes and between the two sexes of flower (female and hermaphrodite). Sunrise Solo, Eksotika and Line 19 produced two to three times more seeds than Paris, Subang or Morib. Female flowers that obviated emasculation, were found to produce four times more seeds than hermaphrodites because of better fruit set and higher seed number per fruit. Seed production was also influenced by environments as well as by the age of the trees. Young trees of 9-12 months of age appeared to yield 40% less seeds than 18-24 month-old trees.

Despite the poorer seed yield and increased costs in emasculation in hermaphrodite flowers, it was still found to be economically feasible to produce hybrid seeds from hermaphrodite flowers for Sunrise Solo, Eksotika and Line 19. The lucrative returns arising from a higher proportion of hermaphrodite trees from this seed source appeared to more than compensate for the poor seed yields and high production costs.

The results from the trial over six environments indicated that hybrids were generally superior to inbreds, particularly in characters related to vigour, precocity (earliness to flower) and yield. Heterosis for yield over the better parent was more marked in the first harvest (90%) than in the second harvest (41.5%) because of the precocity and vigour of the hybrids. For characters like fruit weight, height of fruiting, total soluble solids % and fruit number, little or no heterosis was found.

Analysis of genotype x environment interaction (GxE) indicated that the stability exhibited by inbreds was more inclined towards Type 1 (biological or static) while the hybrids have stability that was more of the Type 2 (agronomic or dynamic). Simultaneous selection of mean and stability of the hybrids and inbreds for various characters showed that hybrids were

mostly selected in characters related to vigour, earliness and yield. However, all the hybrids were poor in total soluble solids % and none of them were selected for this character.

The economics in F_1 seed production and the use of F_1 papaya hybrids for dessert and processing were presented. The immediate prospects for F_1 papaya hybrids and their future potential were discussed.

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