Worawit Sorajjapinun 2012: A Study on Essential Components Required for Hybrid Seed Production in Mungbean. Doctor of Philosophy (Tropical Agriculture), Major Field: Tropical Agriculture, Faculty of Agriculture at Kamphaeng Saen. Thesis Advisor: Professor Peerasak Srinives, Ph.D. 44 pages.

Mungbean [*Vigna adiate* (L.) Wilczek: Leguminosae] is a short-lived annual legume crop cultivated mainly in Asia for its dry seed as a source of protein and carbohydrate as well as for sprouting as a vegetable. Besides being one of the shortest duration field crops in the world, soil rhizobium bacteria around the mungbean root zone can symbiotically fix N_2 gas from the air and thus makes it among the most popular components in cropping systems. The pure line breeding strategies such as pedigree selection, bulk selection, single seed descent and early generation testing have repeatedly shown a limited success in increasing seed yield in legume crops. One way to break the yield plateau is to produce hybrid seed to utilize heterosis or hybrid vigor inherently available in living organisms. The success in hybrid rice encouraged mungbean breeders to explore for the possibility in developing hybrid cultivars to boost up seed yield. The exploitation of heterosis in hybrid cultivars remains the best approach to maximize yield and yield stability. However, a hybrid seed production is not yet available in mungbean. The objective of this study were (1) to develop new essential characters for supporting hybrid seed production in mungbean by mutation techniques, and (2) to compare levels of heterosis among four F_1 hybrids of mungbeans with different genetic distance.

In the first experiment, new chasmogamous mutants were induced by gamma irradiation at the rate of 100 and 200 Gy. The mutants were identified at a low rate of 0.4-0.7% in the M_2 generation of accession V1197, and observed for their purity by growing in plant-to-row in the M_3 and M_4 generations. A uniform chasmogamous line was hybridized to normal flower lines to study the inheritance of this character. All F_1 plants had normal flowers, while the F_2 plants segregated well with a3:1 ratio of normal : chasmogamous plants. When the F_1 was backcrossed to the chasmogamous parent, the progeny gave a 1:1 ratio of normal to chasmogamous plants. Thus, chasmogamy was controlled by a single recessive gene, *cha*.

In the second experiment, the hybrid combinations based on the genetic distance of parental lines, that were developed by using Sukhothai (SKT) as the female parent and pollinated by male parents of different genetic distance as revealed by SSR markers. They are H192 (close distance), C357 (moderate distance), TC1965 (high distance) and W166 (very high distance). The results revealed that the F_1 from the parents with larger genetic distance showed higher heterosis in yield per plant and number of pods per plant. Thus SSR markers combined with yield components can be used to identify parental lines with high genetic distance for hybrid seed production in mungbean. This approach potentially helps reducing the amount of fieldwork required for evaluation of F_1 hybrids.

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