ABSTRACT

This study which consists of genetic and breeding aspects of sesame and yard-long bean, investigates the combining ability effects and inheritance of flowering of some important local and introduced cultivars of sesame and deals with the evaluation of the three native lines of yard-long bean, mode of inheritance of some qualitative and quantitative characters and study of the influence of seasonal variation of these varieties and their hybrids and finally involves with the genetic improvement of yard-long bean.

SESAME:

Sesame varieties namely Kilinochchi local (Kili), Gedi thala (GT), Pokunu thala (PT), MI-3 (hybrid variety of Maha Illupa-llama), Australian introduction (AI) and JT-7 which were selected in field trials carried out with sixty eight lines both native and exotic were used in this study.

With the six varieties all possible thirty six crosses were made and the thirty six genotypes including the parents were grown under field conditions at the Thirunelvely Agricultural Research Station. The determination of height of plant, number of capsules per plant, number of branches per plant and seed yield per plant was made. The data were analysed using Method I and Model I of Griffing's (1956) diallel analysis in the estimation of combining abilities and it was found that there were significant differences between the parents and crosses for all the four characters studied.

The combining ability was found to be highly significant for the three characters namely plant height, number of branches per plant, and seed yield per plant. The general combining ability variance estimated for the parents was considerably lower than the specific combining ability estimates which in turn were also highly significant for these characters except for capsule numbers.

The ratio of general combining ability to specific combining ability variance indicated the predominant nature of non-additive gene effects in the inheritance of these four characters. The variety Kili was the best general combiner carrying positive allelomorphs for all the characters studied except for plant height. However, AI and MI-3 could be considered poor general combiners for number of branches and hence they could be used in obtaining plants with least number of branches per plant. The parent MI-3 and GT were the best parents for increased plant height. However, when shorter plants are preferred AI would be the best parent but it was the lowest combiner for yield.

The hybrids namely Kili x PT, MI-3 x AI, MI-3 x JT-7, GT x AI, JT-7 x Kili, JT-7 x PT, Kili x GT, GT x PT and JT-7 x GT have significant and desirable specific combining ability effects for seed yield per plant.

The four crosses namely MI-3 x JT-7, JT-7 x PT, GT x PT and JT-7 x GT involved parents whose general combining ability (g.c.a.) effects were insignificant. It was observed that g.c.a. of the

parents in general had no direct effect on the specific combining ability of the crosses. General combining ability of Kili was directly related to the per se performance of the parents.

The study on the inheritance of flowering in sesame was carried out in green house with the above thirty six genotypes. All thirty six genotypes were grown under 10.5 h and 14.5 h day-length and the plants were observed for time-to-initial flowering. The data were analysed according to the graphical method of Mather and Jinks (1977) for diallel crosses. There was no maternal influence on inheritance of flowering time in the varieties used. The varieties and the crosses used in this study were short day types with varying sensitivity of three distinct groups. Kili and GT showed significant differences from the other four varieties at 10.5 h day-length. In the 14.5 day-length AI differed from other varieties and Kili and GT did not show any difference among themselves but differed from every other variety. There were three classes for the character of time-to-flowering both at 14.5 h and 10.5 h day-length but the classes were not exactly the same. The class weakly sensitive includes AI, moderately sensitive includes MI-3, JT-7 and GT and the class strongly sensitive includes Kili and PT.

Varietal difference was exhibited among the late varieties Kili and GT for the character time-to-flowering. Kili and GT were found to be late parents, AI, PT, JT-7 and MI-3 were found to be early parents. AI was found to be the least sensitive one and PT and Kili were the most sensitive ones. MI-3, GT and JT-7 were found to be intermediate in sensitivity. There was no interaction

among the genes responsible for the determination of the genotype whether it was of early type or late type.

The significant regression coefficient value (b), the large and small positive values of intercepts (c) along with V_r/W_r values supported that the character flowering time was controlled in an additive dominant manner.

YARD-LONG BEAN:

The three native cultivars namely 'Hawari', 'Polong' and 'Murunga' were used in the second part of the study. They were evaluated under normal cultivation practices and it was found that 'Hawari' was the best line with a single plant yield of 490 g followed by 'Polong' which yielded 200 g per plant. The third variety was found to be inferior in many respects. Hybridization was effected between better parents and their progeny were used in this part of study.

The study of mode of inheritance of qualitative characters revealed that the black colour of seed was dominant over white colour seed with black patches, stem pigmentation was dominant over non-stem pigmentation. Violet colour of flower was dominant over yellow colour of flower and streaked nature of pod was dominant over non-streaked nature of pod. All these characters were found to be controlled by a pair of dominant and recessive alleles. It was observed that the character flower colour and seed coat colour were linked and the other characters were found to be non-linked. The average pod length

of 'Hawari' was 59.1 cm and 'Polong' was 24.9 cm. The broad sense heritability (h_b^2) value for the character pod length was found to be 90.1% and the narrow sense heritability (h_n^2) was found to be 25.01%.

Cultivation under normal practices revealed that the time-to-flowering varied with the season. Both the parents 'Polong' and 'Hawari' were found to be long day plants but variety 'Polong' was early parent and 'Hawari' was late parent. The variety and hybrids used in this study were found to be photo-thermo sensitive in flowering.

Yard-long bean is a vegetable crop which is grown for its immature pods. High mean with variability in pod length was observed in F_2 population. Better plants were selected in F_2 and later pedigree method of selection was followed. Further selection was found to be ineffective after the fourth generation. Hence, preliminary yield trial was carried out in F_5 generation. Advanced trials which led in the production of ten superior hybrid new lines of yard-long bean (JU-1 -- 10) with acceptable qualities, were carried out in the F_6 and F_7 generations. The pod yield of the new lines namely JU-4, JU-1, JU-5 and JU-8 was found to be almost two fold of the better parent 'Hawari'.