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I. INTRODUCTION

Vigna sinensis (Linn.) Savi of the tribe Phaseoleae Fam. Leguminosae popularly known as cowpea, catjang bean and yard-long bean was domesticated in the early days of civilization. Its cultivation in Southern Asia can be traced back to 2000 years and in Europe in the early Christian Era. According to Vavilov (1949/50) the cowpea originated in the Abyssinian and Indian centers of his classification, the catjang bean in the Abyssinian center, and the Chinese center is the secondary center of origin of yard-long bean. According to Piper (1913) cowpea is a native of Central Africa. A wild prototype of the cowpea from Africa has been reported by him, which differs very little from the cultivated cowpea and is widely distributed in that continent. It readily hybridizes with the cultivated varieties. Ancient Egyptians and Indians seem to have played an important role in domestication and distribution of these groups of plants.

The plants of this species are erect bush, prostrate, twining or climbing vines. The stem is cylindrical with slight ridges and furrows, hairy. The leaves are trifoliate compound, stipulate, petioles long, and the leaflets are generally ovate, acute, or somewhat hastate. The inflorescence is a raceme with a long peduncle bearing flowers at nodose tip in opposite pairs. The flowers are sub-sessile, papilionate. The pods are erect or pendent, firm or flabby, slender, varying in length from 8 cm. to 60 cm. or more. Seeds are 5-12 mm. long, subglobose, oblong,

subreniform or reniform in shape. Considerable varietal differences are seen in the size of plants and their parts, and in the nature and distribution of pigmentation in different parts, specially in seeds.

The three distinct groups - the cowpea, the catjang bean and the yard-long or asparagus bean can be easily recognized by their conspicuous morphological differences. According to Piper (1912) and several other workers they are three closely related but distinct species with intergrading types. They are distinguished from one another on the basis of the following characters:

(i) Catjang bean - Pod 8-13 cm.,erect or ascending. Seed less than 6 mm. Erect bush. ... V.catjang (Burm.)Walp.

(ii) Cowpea - Pod 15-25 cm., pendent. Seed 6-10 mm. Prostrate or twining. ... V.sinensis (Linn.)Savi.

(iii) Asparagus bean - Pod 30-60 cm. or more, pendent, more or less inflated and flabby when green shrinking when dry. Seed 10-12 mm. Climbing vines....V.sesquipedalis(Linn.)Fruw.

Cowpeas, catjang beans and asparagus beans are warm-weather crops but can tolerate moderate cold. They can withstand a much heavier rain and drought than most of the other forage legumes and pulses and can be grown practically in all types of soil. Due to this wide adaptibility it is possible to grow them in areas where very few other legumes can be profitably grown.

Being a luxuriantly growing hardy legume they are extensively grown as forage, green manuring and cover crops. The hay

has a high percentage of digestable protein. The pods and the seeds are very nutritious and are used as green vegetables. Seeds are also used as pulses. The pods are good substitute for common bean. The seeds contain about 25% protein, and are rich in calcium and phosphorus.

Considerable controversy is seen in the taxonomy and reported chromosome number in the three groups of cultivated Vignas. Inter-crossibility studies in the three groups were taken up to see whether their genomes are sufficiently alike and also to transfer characters from one group to another for the genetical and breeding programme of the laboratory. Gradually as the stocks of wild species were collected for breeding work, a project to find out Cytotaxonomical basis of the relationship of these wild species with the cultivated types was taken up. Attempts were also made to hybridize them with the cultivated species to find out their crossibility, so that the desirable characters of the wild species could be transferred to the cultivated ones.

It was also observed that though the cowpea, the catjang bean and the asparagus bean have been favourite materials for genetical study since 1910, there were several characters in the plants maintained in the laboratory and introduced during the period of this investigation whose mode of inheritance was either not known or needed reinvestigation. The segregating progenies from the different crosses made for the genetical study have given many promising plants which are being followed to select improved fodder, vegetable and pulse types.

From the encouraging results of tetraploid breeding in fodder and vegetable plants reported from the different laboratories, it was thought desirable to produce tetraploids of few varieties of the cultivated types. Two varieties of each of the three groups were taken to include considerable variability, as sufficient data has accumulated to show differential response of the varieties of a plant in their performance at the tetraploid level. By broad basing the tetraploid breeding programme the chance of obtaining the desired type is increased, which can be further improved by hybridization and selection at the tetraploid level.

These projects were taken up in August 1955. The results obtained so far are presented in this thesis.