

## INTRODUCTION

The genus Phaseolus of the family Leguminosae consists of 230 species of which 20 species are known to be under cultivation (Zukovskij, 1962). The cultivated species include both American and Asiatic ones which differ in the size of pods and seeds and presence or absence of beak in the pods (Yarnell, 1965). P.aureus Roxb. and P.mungo L. are the two Asiatic species which are cultivated extensively in India for their protein-rich seeds. They are also used as forage and increase the fertility of the soil through root nodules. Being short duration crops, they are grown as catch crops preceding or following the major cereal crops like rice or wheat.

Due to the great economic importance, the genetic studies of the two crops have been undertaken by a number of workers - Bose (1939), Singh and Mehta (1953), Sen and Ghosh (1959, 1963b), Sen and Murty (1960), Khadilkar (1963), Pathak and Balram Singh (1963) in P.aureus and Blakeslee and Avery (1917), Pathak and Singh (1961) and Sen and Jana (1963) in P.mungo. However, cytological aspects of the two species have so far received a very limited attention. The chromosome number has been determined as  $2n = 22$  and  $2n = 24$  for P.aureus (Karpechenko, 1925; Kumar, 1945) and  $2n = 22$  (Karpechenko, 1925) and  $2n = 24$  (Rau, 1929) for P.mungo.

Sen and Ghosh (1963a) reported that both the species are similar in the minuteness of the somatic chromosomes ( $3.52\mu - 1.25\mu$ ) and in the presence of two pairs of satellited chromosomes. However, detailed karyotype analyses of the two species have not, so far, been carried out. Moreover, the small size of chromosomes at somatic metaphase limits the utility of such observations. On the other hand, it is a definite advantage for karyomorphological study at pachytene stage where, the chromosomes provide a wealth of details enabling perfect identification of individual chromosomes, and this information is a prerequisite for trisomic analysis. With this in view, pachytene analyses of the two species were undertaken.

Both P.aureus and P.mungo are similar in many of their morphological characters and according to Prain (1903) both of them have an Indian origin from P.trinervius L.(Syn. P.sublobatus ). P.aureus is favoured for the quality of its seeds and tender pods. On the other hand, P.mungo is vigorous growing and resistant to drought and many diseases. In order to breed better varieties combining the desired characters of the two species, they were hybridized (Sen and Ghosh, 1963a). The hybrid was semisterile although no dissimilarity could be detected in their somatic chromosomes. In the present study the informations obtained from the karyomorphological studies at pachytene

5  
were utilized, to assess the extent of chromosomal homology between the two species and to understand the cytological causes underlying sterility in the hybrids. These informations would be useful for a breeding programme to evolve new and superior varieties.

Many of the crop plants are known to be polyploids. Among the species of Phaseolus, the chromosome number of which are known, the tetraploid chromosome number ( $2n = 44$ ) has been reported for an unidentified species of Phaseolus (Dana, 1964). It was considered to be an amphidiploid with one of its genome homologous to a hypogeally-germinating species, P.riccardianus (Dana, 1964). It is similar to P.aureus in its pod characters and to P.mungo in some of its floral characters, but differs from both of them in its hypogeal germination. It is highly fertile and vigorously growing. It was thought that a knowledge of its origin and its relation to the two cultivated species of Phaseolus might throw light on the possibility of amphiploid breeding in Phaseolus. Hence, pachytene analysis in this species was also undertaken to obtain cytological evidences on its origin and relation to the two cultivated species. It was hybridized with P.aureus and P.mungo and detailed cytological studies of the hybrids were carried out to determine chromosomal homology. The observations so far made and conclusion drawn therefrom are presented in this thesis.