Chapter-I

Introduction
INTRODUCTION

Okra (Abelmoschus esculentus (L.) Moench), an important vegetable crop of India, owes its origin to Ethiopia, from where it proliferated into Arabia down the Nile valley and was introduced into Europe by the Moors and further into Louisiana during the early 1700's by the French Colonist (Woodruff, 1972). India is also considered its native place as various ancestral wild forms are met with there (Yawalkar, 1969). It belongs to family Malvaceae.

It belongs to Malvaceae family with having chromosome number $2n = 130$ and grown in Kharif and Zaid seasons. Green edible fruits are consumed for vegetable purpose. Okra is said to be very useful in curing diabetes, chronic dysentery and genitor urinary disorder. Ripe seeds are roasted grained and used as substitute for coffee in Turkey (Mehta, 1959).

Okra is an important fruit vegetable crop of the tropical and sub-tropical regions of the world, grown successfully both in the plains and hills. It is a crop of warm wet season in the north India but it is also taken as winter crop in the forest free areas of the Central and South India, particularly Gujrat and Maharashatra. It is an interesting crop to the breeders and the geneticists for its monadelphous condition of the stamens and large flower are amenable to easy emasculation and its capsule bears large number of seeds. Its tender green fruits are used as vegetable and are generally marketed in the fresh state, but sometimes in canned or dehydrated from. The root and stem of okra are used for cleaning gur, khand or raw sugar.
Among all vegetables, okra contributes total area (5.5%) 325.5 (000'ha) and production (3.8%) 3380.3 (000'mt), Orissa has the highest area 83.7 (000'ha) with the production of 758.8 (000'mt) and Bihar has highest production, 78.8 (000'ha) area and 1103 (000'mt) production. Average productivity of okra in India is 10.39 mt/ha and highest productivity of okra in Bihar State (14.0 mt/ha) followed by Maharastra (12.9 mt/ha) (Horticultural data base 2005, NHB Gurgaon).

It is a good source of vitamins A, B and C, Protein and mineral elements. Singh et al., (1974) analysed fruits and reported 6.60 to 10.40% crude fibres, 84.60 to 90.50% edible protein and 14.40 to 18.60% protein as of the total dry weight. Among minerals, Ca ranged between 99 to 198, P 34.50 to 56.00 and Fe 0.80 to 2.40 mg per 100 g of edible portion.

It is predominantly a self-fertilized crop but natural crossing to the extent of 6.75% has been reported (Purewal and Randhawa, 1947, and Anthoni 1970). It is an interesting crop to breeders and the geneticists, for its monadalphous condition of the stamens and large flower are amenable to easy emasculation and its capsule bears large number of seeds. Being a short duration crops, two generations can be grown in one year. Besides it is a widely grown crop.

Despite these attributes, measure/less/lean/poor information is available regarding its quantitative inheritance for the further improvement of this crop. The information on genetics of the different traits is of paramount importance for devising any breeding methodology for the improvement of various traits. The selection of the breeding method for taking genetic problems is an equally important consideration in all genetically and breeding studies as the performance of parents and their F₁s do not always
give an indication of probable performance of the pure-line of the progenies of such crosses. Hybrids between certain parents appear to nick well and produce superior cross combination, which might not be discovered until several generations grown and studied. The efficiency of breeding of crops could be increased if the value of the crosses of selection could be increased. A more reliable approach is one, which enable the breeder to draw his conclusion on the basis of genetic architecture of the parents for a particular trait.

The genetics principles developed in the allogamous crop may also profitably be utilized in okra improvement. Among several sophisticated biometrical techniques available, diallel cross analysis is the quickest method for obtaining information about the nature and magnitude of the mixing of all possible combinations involving a set of parental lines under study, a breeders unlikely to miss the particular cross combination, which have the desired potential. On the other hand, which is usually the case, it is more likely that the potential cross combinations might be missed (Joshi, 1979).

Fruit yield is a complex character and is the final product generated by the inherited characters controlled by polygenes and are markedly influenced by environmental fluctuations. Although the percentage of homozygous genotypes increases considerably with each generation, however the number of plants that are necessarily involved in the selection becomes so large that the size of population grown becomes unmanageable. The discovery of a plant with all the desire alleles would than becomes just an illusion. Therefore, selection for these characters in early segregating generation is rendered difficult, therefore, to formulate a sound breeding procedure, it is essential to have information on various genetic
parameters including type of gene action, heritability, genetic advance, heterosis, inbreeding depression and relationship among yield component. This information will help the breeder in deciding the proper breeding procedure to be adopted, the character for which selections can be made and the weightage to be given to various yield components.

Different breeding methods for the developments of improved varieties are followed which are in turn based upon some fundamental parameter like variance, heritability, genetic advance, heterosis, inbreeding depression and character association among the various yield and yield contributing characters are of polygenic nature and are influenced greatly by environment. It makes the task of selection difficult in the easily segregating generations.

The proportion of the total variance that is attributed to the average effect of the genes and which determines the degree of resemblance between relatives is heritability. The most important function of the heritability on the genetic study of metric characters had been mentioned because of its predictive role in the reliable expression of the phenotypic value as a guide to the breeding value. The degree of correspondence between phenotype value and breeding value is measured by the heritability (Falconer, 1975). In addition to heritability, its related parameters like variance, genetic advance and genetic advance as percent over mean have been utilized by a number of workers (Sharma and Sharma, 1989, Bhandari 2005 and Singh, 2006).

There are sufficient evidences that the efficiency of selection is very closely related to breeding system like inbreeding and out-breeding. The degree of inbreeding depression is very low in the self-pollinated
crops, whereas, heterosis is much more common in cross pollinated crops that the self pollinated crops because in self pollinated crops superior pure line varieties give considerably high yield and easily multiplied and maintained. But in cross-pollinated crops, heterozygosity must be maintained to prevent inbreeding depression. Inspite of this heterosis has been used commercially in okra.

The information on inter-relationship may be useful in prediction of correlated response to direct selection indices and detection some characters which may have no value in themselves but may be useful as indicator of other important characters (Robinson et. al., 1951) therefore, knowledge of correlation coefficients between yield and its components may be a valuable indication regarding the components.

In case of combining ability of a strain to produce superior progeny upon hybridization with other strain and termed general combining ability as the average performance of a genotype in a series of hybrid combinations and specific combining ability as the average performance of a parent in a specific cross in relation to combining ability. Further, they concluded that gca is primarily due to additive effects of genes, while sca is a consequence of inter-allelic interaction (epistasis) and intraallelic interaction (dominance) by Spargue and Tatum (1942).

The selection of suitable parents is of prime importance for successful hybridization programme. The choice of parents based on there per se performance does not always reflect their inherent ability to produce high yielding cross. It is therefore, essential that parents be selected on the basis of their genetic make-up and performance in cross combinations.
To start with an effective breeding procedure, it would be essential to have information on various genetic parameters mentioned above. This will help the breeder to choose a suitable breeding programme, characters for selection and relative importance of various yield components to make the selection for final product i.e. fruit yield to be more effective.

Looking into these consideration the present investigation "Genetic analysis of yield and its contributing traits in okra [Abelmoschus esculentus (L.) Moench]" has been carried out for gathering information with the succeeding objectives :-

1. To estimate the analysis of variance.

2. To study the variability, heritability and expected genetic advance of different traits.

3. To work out the genotypic and phenotypic correlation coefficient with different attributes in okra.

4. To estimate the gca and sca variances.

5. To find out the general and specific combining ability and their effects.

6. To study the heterosis manifestation in F1 hybrid and inbreeding depression in F2 population.

7. To suggest a suitable breeding plan based on the information of present investigation.