CHAPTER I
INTRODUCTION

Vegetables occupy an important place in diversification of agriculture and have played a vital role in food and nutritional security of ever-growing population of our large vegetarian society. Brinjal or eggplant (*Solanum melongena* L.) originated in India which is also considered as center of diversity (Genebus, 1963). The secondary diversity is in China and South East Asia. However, it is widely cultivated in both temperate and tropical regions of the globe mainly for their immature fruits as vegetable.

Brinjal is an annual herbaceous plant with erect or semi-spreading growth habit belonging to Solanaceae family. It is self-compatible and highly self-pollinating crop but in hot & humid climate cross pollination from surrounding plants may occur up to 20% by insects or wind (Grubben, 1977). It has 2n=24 somatic chromosome number.

Brinjal inflorescence is often solitary but sometimes it constitutes a cluster of 2-5 flowers. Solitary clustering nature of inflorescence is a varietal character. Flower is complete, actinomorphic and hermaphrodite. Calyx is five lobed, gamosepalous and persistent. It forms a cup like structure at base. Corolla is five lobed and gamopetalous. There are five anthers which are free and inserted at throat of corolla. Anthers are cone shaped, free with apical dehiscence. Ovary is hypogynous, bicapellary, syncarpous and with basal placentation. Heterostyly is a common feature. Four types of flowers have been reported depending upon length of style: Long styled with big sized ovary, medium styled with medium sized ovary, pseudo-short styled with rudimentary ovary and true short styled with very rudimentary ovary.

Breeding objectives of brinjal are higher yield, earliness, fruit size, shape and colour as per consumers preference, low proportion of seeds in marketable fruits, soft flesh, fruit colour retention in summer, lower solanine content, upright sturdy plant free from lodging, resistance to diseases like bacterial wilt, phomopsis blight, little leaf and root knot nematode, resistance to pests like shoot and fruit borer, jassids and *Epilachna* beetle.
It is the fourth most important vegetable crop in India and contributes about 8.3 per cent of the total production of vegetables in the country. It is named as “Poor man’s vegetable” because of its low cost of production, ease of culture and availability throughout the year. As fruits are widely used in various culinary preparations viz., sliced bhaji, stuffed curry, bertha, chutney, pickles etc., Contrary to the common belief, it is quite high in nutritive value being rich in vitamins and minerals (calcium, magnesium, phosphorus) and fatty acids.

In India total area and production under brinjal is 7.29 lakh ha and 12.61 million tonnes respectively with an average productivity of 18868 kg/ha (Anon., 2017). The area under brinjal in Gujarat is 74.06 thousand ha and production is 14.71 lakh tones with an average productivity of 19848 kg/ha (Anon., 2017). West Bengal is leading in area and production followed by Odisha, Andhra Pradesh & Gujarat with 17478 kg/ha of productivity, Uttar Pradesh has the highest productivity followed by Karnataka and Himachal Pradesh.

Looking to the increasing population of our nation there is an urgent need to satisfy the demand. The incidence of hunger (malnutrition) and poverty in the country is stubbornly high and India is way off the Millennium developmental goal. Moreover, the country is expected to attain the dubious distinction of being the most populous country in the world by 2020’s and its population may stabilize at 1.5 to 1.7 billion by the year 2050-2070. There are specific genotypes suited for specific preparations apart from the large genetic variation observed with regard to colour, size and shape of fruits. In addition, variation is also noticed for characters like vegetative growth, maturity and presence or absence of spines on leaves, stem and fruit calyx among the indigenous material. To have such kind of plant profile, we have some different breeding methods. One of such method is exploitation of hybrid vigour through hybridization.

Bailey and Munson (1891) reported artificial hybridization in brinjal for the first time. However, none of the hybrids exhibited any heterosis. Nagai and Kada (1926) were probably the first to observe hybrid vigour, hoping some commercial acceptance in crosses among some Japanese varieties. Since then many public and private sectors have developed various hybrids in India, but these hybrids lacked regional preferences for colour, shape and presence or absence of spines and lacked suitability to specific product preparations.
The diallel analysis will attempt in present investigation because of its precision and versatility. This technique provides a systematic approach for identification of superior parents and crosses which is the basic requirement on which the success of a breeding programme rests and also gives an overall genetic picture of the experimental material in a single generation.

Exploiting hybrid vigour in a single cross hybrid depends on the two parents complementing each other with special reference to desirable characters. However, it is often noticed that all the desirable characters need not to be distributed between only these two parents. Therefore, it might be necessary to involve multiple cross combinations of parents to have wider genetic content and thus broaden the genetic base. Therefore, the exploitation of hybrid vigour in brinjal has been recognized as a practical tool in providing the breeder a means of increasing yield and other economic characters. Most of the local varieties which are grown by farmers in India have not been fully utilized in any genetic improvement programme on scientific line. The development of an effective heterosis breeding programme in brinjal needs to elucidate the genetic nature and magnitude of quantitatively inherited traits and judge the potentiality of parents in hybrid combinations.

Combining ability studies like diallel analysis provide information in this direction particularly when large numbers of parents are to be screened for combining ability. Study of gca of genotypes helps in selection of superior parents while sca of genotypes helps in deciding superior hybrid. The information generated in the process is used to understand the magnitude of heterosis of F1 hybrids.

The low fruit yield levels in India are due to the lack of sufficient crop genetic improvement and development of promising genotypes. Therefore, brinjal needs a constant genetic improvement. Thus under such circumstances, it is necessary to develop hybrids superior to these types for qualitative and quantitative characters. The present investigation was, therefore, be undertaken in Brinjal (*Solanum melongena* L.) by using half diallel mating design with the following objectives:

1. To study the nature and magnitude of heterosis for fruit yield and its attributes.
2. To estimate the general combining ability and specific combining ability of parents and crosses respectively.
3. To understand the nature and magnitude of gene action involved in the inheritance of fruit yield and its attributes.