INTRODUCTION

CHAPTER-1

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The pea (*Pisum sativum* L.) is one of the most important vegetable crops grown all over the world. It is believed to be native of Europe and West Asia, while its wild prototypes probably came from Ethiopia (De Candolle, 1968). Pea is very palatable and nutritious for human consumption and it taken fresh, canned, frozen or in dehydrated forms. It contains high per centage of digestible proteins, carbohydrates, vitamins and minerals and ranks next to tomato as a processed vegetable (Talbert, 1953). Pea is also known to have appreciable amount of sugars and starch (Cherian *et al.*, 1955).

In India total area under pea cultivation in the year 1998-99 was 508 thousand hectares yielding 405 thousand tones with the average productivity of 810 Kg. per hectare. (Bharat., 2002).

The ever increasing population and the accompanied problem of malnutrition have been a cause of concern to all right thinking persons. Whereas the goal of self sufficiency in cereals is nearly attained, the problem of protein deficiency i.e. protein malnutrition remains to be tackled.

Pea ranks high among the legume vegetables as far as its protein content is concerned. Its green seed contains 7.2 per cent protein and thus it is much ahead of the next popular

legume vegetable viz. french bean which contains only about 1.7 per cent protein. Besides protein the green pea is also a good supplies of carbohydrates, several minerals and vitamins (Rosario *et al.*, 1980).

In western Uttar Pradesh pea is widely grown and more than 40 per cent of the total area lies in Etawah, Etah, Mainpuri, Firozabad, Agra, Aligarh, Bulandshahar, Bijnor, Ghaziabad, Moradabad, Bareilly, Meerut, Muzaffarnagar and Saharanpur districts. Pea (*Pisum* sativum L.) has not been popular crop among farmers of Tarai region due to its low productivity which is attributable to the factors like heavy rainfall, heavy soils and high incidence of insect, pest and diseases. In Muzaffarnagar and Saharanpur Districts (Saharanpur Division) light loam soils and rainfall are favourable for the production of pea crop.

At present pulse crop yields are quite low especially in comparison to cereals. Hence, there is considerable scope for improvement of these crops especially in view of the genetic diversity that is available (Anishetty and Moss, 1988).

The major goal of pea (*Pisum sativum*) improvement in India is the development of widely adapted, high yielding, disease and insect resistant varieties responsive to improved cultural practices and possessing tolerance to adverse climatic conditions. Improved nutritional and cooking characteristics are equally important. Limited research has been carried out on simultaneous improvement of grain yield and protein content in pea. (Sandhu *et al.*, 1988).

Pea is a multipurpose crop in our country. It can be used in the form of vegetable (green pod),soup, chhole, beson, dal and porridge etc. Frozen pea is used in the preparation of delicious dishes around the year. It is also fed to drought and milch animals in the form of green as well as dry fodder and concentrates.

The legumes specially pea are being cultivated on marginal lands because of their deep root system and nodulation and nitrogen fixing capacity and have thus enjoyed the inputs of irrigation and fertilization.

Pulses have occupied immense significance in recent years as an important component of Indian economy. Pulses are seeds of leguminous plants and belong to the family Fabaceae. Pulses are rich source of protein and thus form an important part of vegetarian diet supplying the major portion of the protein requirements to human nourishment. Pulse crops are unique in the sense that these possess capacity of fixing atmospheric nitrogen through nitrogen fixing bacteria found in their root nodules and thus meet their own nitrogen requirements to a great extent. Pulse are fairly drought tolerant due to their deep root system and many of them are short duration crops. These are also ideal for inter-cropping as well as for multiple cropping system.

Susceptibility to yellow mosaic virus (YMV), asynchronous maturity and low pod bearing are some of the important factors which led slow progress in the productivity of pulses (Jain, 1975). Besides, asynchronous flowering,

maturity and shedding of flowering buds, there are also some of the important factors resulting in the low productivity of pulses. This situation could be improved if the cultivation of these crops becomes more remunerative in comparison to cereal crops and simultaneously by adopting an innovative breeding strategy. For instance, by working out the genetic architecture pertaining to these traits for breeding ideal genotypes which may help in increasing the pulse production and productivity significantly. Considerable variation for productivity exists between important pulses growing countries in the region. In order to ensure "household nutritional security" as per recommendation of the International Conference on Nutrition (ICN), concerted efforts are needed at this stage to improve further the quality and productivity of pulse crops in most of the pulse growing countries in Asia (Paroda, 1994).

India is a major growing country in the world and shares approximately 35 to 36 per cent area under cultivation and 27 to 28 per cent total production at world level. However, the area and production of pulses stagnant for considerable period of time but eventually there is a marginal increase in the production of pulses in recent years.

There has been increase in the production of pulses from 8.57 million tones during 1979-80 to 14.84 million tones during 1993-94 and area increased from 2.46 million ha in 1979-80 to 3.47 million ha in 1991-92. There is satisfactory increase in the area, production and productivity of pea during last decade. (Directors Reports Kharif pulse

group meet, 1994, Hyderabad). Total area, production and yield of pulses have been published in India (Bharat Hindi Edition) 2002. In pulses total area in India in 1998-99 was 235.01 lakh ha; total production was 149.07 lakh tones and yield was 634 kg/ha. In India 1999-2000 the total area was 211.90 lakh ha; total production was 133.50 lakh tones and yield was 630 kg/ha. The data show that all the three area, production and yield were more in 1998-99 than the year 1999-2000.

Several improved verities of pulse crops have recently been released in India. Varietal demonstrations have shown that with the adaptation of recommended technology, yield levels 20-30 q/ha in chickpea and pigeon pea and 10-20 q/ha in mungbean, cowpea, lentil and field pea can be obtained. However, pulses are highly susceptible to various biotic and abiotic stresses, which discourage the farmer, to adopt improved oriented technology (Asthana and Chanada, 1991).

For formulating any breeding programme, a through knowledge of breeding behaviour of economic characters is very essential. Among these, the combining ability is useful to assess the nicking ability of parents in self-pollinated corps and at the same time it elucidates the nature and magnitude of different types of gene action involved. The extent of heterosis and gene action involved are also very important to formulate an efficient breeding plan. The study of heterosis helps the breeder in eliminating the less productive crosses in F_1 itself. The rejection of crosses showing no heterosis would

enable the breeders to concentrate on a few productive crosses.

A through understanding of yield contributing characters is also necessary to make improvement in yield. Correlation and path coefficient analysis appear to be quite powerful tools to understand inter-relationship of various attributes. This can be of immense significance to the plant breeders for rapid genetic improvement. The genetic improvement for yield in crop plants frequently utilizes the selection and hybridization techniques. Selection is usually done in the base population for concentrating favorable genes, while, the hybridization approach is predominantly, utilized to combine the favorable gene(s) of various cultivars for obtaining genotypes of better performance. The success through this approach would generally depend on the basic information concerning the extent of genetic variability, heritability, genotype X environment interactions and genetic advance of the attributes etc. Thus, in practical plant breeding, much depends on the understanding of genetic architecture of yield and related attitudes as well as on the combining ability of the parents to be exploited.

For evolving high yielding, varieties of pea a successful breeding programme is required, which constitutes the choice of the parents for hybridization and selection of desirable lines from their progenies. The information regarding gca helps in indentifying lines in the early stages for involving these as parents for hybridization.

Keeping in view of the above aspects, present investigation entitled **"Studies of genetic parameters related to yield and its attributes in pea (*Pisum Sativum* L.)"** was conducted in the years 2002-2003 and 2003-2004 at C.C.R.(P.G.) College, Muzaffarnagar (Uttar Pradesh) with the following objectives :-

1. To study the genetic variability, heritability, and genetic advance.

2. To work out genetic and phenotypic correlation co-effectives and path co-effectives among yield and its component characters.

3. To work out the direct and indirect contribution of each character on seed yield.

4. To estimate the heterosis manifested in F_1 crosses.

5. To workout the gca (general combining ability) and sca (Specific combining ability) effects of yield and its contributing characters.

6. To suggest appropriate breeding strategy for improvement of pea on the basis of experimental findings.