Chapter-VI

SUMMARY AND CONCLUSION

The present investigation “Genetic Studies on yield and its components in Vegetable Pea (Pisumsativum L.)” comprising of 55 genotypes (10 parents and 45 F₁s) derived from 10 parent diallel mating design excluding reciprocals for 12 characters namely, days to flowering, days to maturity, plant length (cm), number of pods per plant, pod length (cm), pod width (mm), number of seeds per pod, length of first fruiting inter node (cm), number of first fruiting node (cm), 100-grain weight (g), green pod yield per plant (g) and yield per plant (g) to study the genetics of these characters in parents and mode of inheritance for further utilization in breeding programs and to isolate desirable segregates for improving the yield of this valuable crop.

The experiment was laid out in randomized block design (RBD) with three replications at the Department of Genetics and plant breeding in Brahmanand Mahavidyalaya, Rath, Hamirpur in Rabi 2007. The data so generated were subjected to various statistical and biometrical analysis (diallel analysis for analytical and graphical approaches, general and specific combining ability variances and effects, heterosis and heritability and genetic advance) as per usual/standard procedures. The results obtained are described and discussed in earlier chapters in the light of relevant literatures and the same is summarized here as under.

The analysis of variance revealed highly significant differences for treatment for all the characters. Parents and F₁s also showed highly significant variations for all the characters. The Parents vs. F₁s for all the characters except for days to maturity and pod length.
The mean performance of F₁ hybrids were higher than parents. The additive genetic component (D) was highly significant for all the characters under study except for pod width.

The component of variance due to dominance (H₁) revealed highly significant differences for all the traits under study.

The component of variance due to dominance (H₂) was also significant for all the characters under study.

The values of H₁ were higher than H₂ for all the characters except for 100 grain weight.

The significant and positive value of F component was observed for number of first fruiting node and yield per plant.

The estimated value of dominance component (h²) was found positive and significant for pods/plant, pod length, pod width, 100 grain weight and green pod yield per plant.

The estimated value of environmental (E) component was significant for number of seeds/pod and 100 grain weight.

The average degree of dominance (H₁/D)⁰.⁵ showed over dominance for all the characters under study except for days to flowering, days to maturity, 100 grain weight and green pod which were partial dominance in nature.

The ratio (H₂/4H₁) was found to be less than 0.25 for all the characters under study except for 100 grain weight suggested asymmetrical distribution of genes for all the characters.

The ratios of dominant and recessive genes [(4DH₁)⁰.⁵ + F/(4DH₁)⁰.⁵–F] being greater than unity for all the characters except for days to maturity, plant
length and pods/plant suggesting that the parents had proportionally more dominant genes for all the characters. For days to maturity and plant length the parents had proportionally more recessive genes while equal proportion of dominant and recessive alleles were observed for pod length.

The computed ratio of $h^2/H_2$ was less than one for all the characters except green pod yield per plant. It revealed that at least one major gene group was controlling the inheritance of these traits. More than two gene groups were responsible for the inheritance of green yield per plant, 100 grain weight and yield per plant.

**Graphical approach**

The graphical approach of diallel analysis indicated the presence of partial dominance for all the characters under study except for yield per plant which was under control of incomplete dominance.

Combining ability analysis showed highly significant values both for variances due to GCA and variances due to SCA for all the characters under study. The $\sigma^2_{GCA}$ was higher than $\sigma^2_{SCA}$ for days to maturity and plant length.

Non-additive gene effects were found as effective for all the characters except for days to maturity, plant length and 100 grain weight.

Considering simultaneous magnitude of GCA effects as well as *per se* performance of parents, the good general combiners for days to flowering were PSM3, Arkel, PMR20 and KS156; for days to maturity PSM3, Arkel, PMR20, AP3 and KS156; for plant length PSM3, AP4, AP3, AP1 and PMR20; for number of pods/plant PMR20, KS150, KS175 and AP4; for pod length Arkel, AP3, KS150 and E6; pod
width PMR20, KS150, KS175, AP4 and AP1; for number of seeds per pod; AP1, AP3, AP4, KS150 and PMR20; for length to first fruiting internode; AP1, AP4, PSM3 and PMR20; for number of first fruiting node; AP1, AP3, KS150 and E6; for 100 grain weight; PSM3, KS150, AP3, Arkel and AP1; for green pod yield; KS150, AP4, AP3 and AP1 and for grain yield per plant; KS175, KS150, AP1, AP3 and PMR20.

The 10 promising cross combinations identified for higher green pod yield and other traits in order of merit were AP3/KS150, KS175/PMR20, Arkel/PSM3, KS156/KS150, Arkel/KS156, AP4/PMR20, AP3/E6, KS150/E6, Arkel/E6 and E6/PSM3. Among these crosses, AP4/PMR20 falls under high x high GCA status; Arkel/E6 and E6/PSM3 under low x low categories while others under high x low categories.

The five best hetrotic crosses based on superior parent were PMR20/PSM3, ARKEL/PSM3, AP4/PSM3, KS156/KS150 and KS175/PMR20 and over mid parent ARKEL/PSM3, ARKEL/KS156, AP3/KS156, ARKEL/E6 and KS175/PMR20 were identified which also showed desirable heterosis for other trait also these crosses showed high x low and low x low GCA status and can be improved through appropriate breeding procedures.

High heritability (more than 30%) was observed for the characters namely; days to flowering (59.04%), days to maturity (50.31%), plant length (38.26%), number of pods per plant (36.46%), length of first fruiting internode (52.84%), number of fruiting nodes (57.83%), 100-grain weight (81.88%), grain yield per plant (57.72%) and yield per plant (42.38%).

Moderate heritability estimates were observed for pod length (23.85%) and number of seeds per pod (26.84%).

Low estimate of heritability was observed only for pod width (5.50%).
GENETIC ADVANCE:

The genetic advance was high for green pod yield (23.64g) and plant length (19.25cm) while it was low for other characters under study (0.10-14.67 units) per cycle of selection at p=2.06.

CONCLUSION

The parents namely Azad Pea3, Azad P4, KS150 and Azad Pea-1 were found to be good general combiner for different traits and they may be utilize in future breeding programmes for development of improved varieties in vegetable pea.

The 10 best crosses selected on the basis of per se performance and significant desirable SCA effects were AP3/KS156, KS175/PMR20, ARKEL/PSM3, KS156/KS150, ARKEL/KS156, AP4/PMR20, AP3/E6, KS150/E6, ARKEL/E6, E6/PSM3.

On the basis of present findings and nature of gene action

The breeding method like simple recurrent selection followed by diallel selective mating/modified pedigree method would be more appropriate for improving green pod yield and its component. Can be suggest to get transgravedesegregates in advance generations and breaking tight undesirable linkages if any.