SUMMARY AND CONCLUSION

The present investigation of "Genetic analysis of yield and its
complementing traits in rice (Eleusine coracana (L.) Gaertn.)" was
undertaken to carry out the genetic analysis of breeding material through
components of variance, including variance of gene effects, genetic
variation, heritability, and genetic parameters. Chapter association, general
and specific combining ability, and componential analyses were
undertaken and interpreted in detail. Chapter presentation, namely, Azad Qanya, RO-2, K9-310, K9-

Chapter-VI

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The present investigation of "Genetic analysis of yield and its contributing traits in okra [Abelmoschus esculentus (L.) Moench]" was conducted to carried out the genetic analysis of breeding material through components of variance, nature and magnitude of gene effects, genetic variability, heritability and genetic advance, character association, general and specific combining ability effects and heterosis and inbreeding depression among yield and its components in parents, F₁ hybrids and F₂ populations. Ten diverse parents namely, Azad Ganga, BO-2, KS-315, KS-375, KS-408, KS-410, KS-415, KS-418, Parbhani Kranti and Pusa Sawani were selected from the germplasm, maintained through selfing in the Vegetable Research Station, Kalyanpur, Kanpur.

Ten parents diallel set excluding reciprocals was made during the season of zaid 2004. All the 45 F₁ hybrids and their 10 parents were grown and selfed during kharif season of 2004 for producing F₂ seeds. All the 45 F₁ hybrids and 45 F₂ populations along with 10 parents were sown in Randomized Block Design with three replications at Department of Vegetable Science of C. S. Azad University of Agriculture and Technology, Kalyanpur, Kanpur during the zaid season of 2005. Observations were recorded on days to flowering, plant height, number of branches per plant, length of first fruiting node (cm), number of nodes per plant, length of internodes (cm), length of fruit (cm), width of fruit (cm), number of fruits per plant and yield per plant (g), are summarized hereunder.

1. GENETIC COMPONENTS OF VARIANCE ANALYSIS

Component of variance analysis revealed that additive genetic variance was significant for days to flowering, length of first fruiting node, length of internode, length of fruits, width of fruit in both and number of fruits per plant
in both F₁ and F₂ generations while for plant height, number of branches per plant, number of nodes per plant and yield per plant only in F₂ generation. Dominance variance was found to be highly significant for all the characters under study except width of fruit. However, additive gene action was predominant for width of fruits and number of fruits per plant and dominate for days to flowering, plant height, number of branches per plant, number of nodes per plant, length of first fruiting node, length of internodes, length of fruit and yield per plant. Average degree of dominance showed over dominance for all the characters under study.

The estimate of average frequency of negative and positive alleles \( H_1 / 4H_1 \) in the parents suggested asymmetrical gene distribution for all the characters except number of branches per plant, number of nodes per plant and length of fruit in both F₁ and F₂ generations where nearly symmetrical gene distribution was observed. The value of \( \tilde{H}_1 / \tilde{H}_1 \) suggested no definite group of genes for all the characters in both F₁ and F₂ generations. However, width of fruit in F₁ revealed that three gene groups were responsible for the expression of this character.

2. VARIABILITY, HERITABILITY AND GENETIC ADVANCE

The genotypes differed significantly for all the characters under study. Parents also differed significantly from their F₁ and F₂ generations for all the characters, except days to flowering, number of branches per plant, number of nodes per plant, length of fruit and number of fruits per plant in F₂ generation.

Wide range of variation was observed in the mean performance of the parents, F₁ hybrids and F₂ population for all the characters under study.

Phenotypic coefficient of variability was greater than genotypic coefficient of variability for all the characters in parents, F₁ hybrids and F₂
populations. The highest coefficient of variability was found for number of fruits per plant followed by yield per plant, plant height in parents, F₁ hybrids and F₂ populations at both genotypic and phenotypic levels.

Heritability estimates in narrow sense were high with low to medium genetic advance for days to flowering, length of first fruiting node, length of internode; moderate heritability with moderate genetic advance for plant height, number of fruits per plant and yield per plant; moderate heritability heritability with low genetic advance for number of branches per plant, number of nodes per plant, length of fruits and width of fruits in F₁ generation.

3. CHARACTER ASSOCIATION

Correlation coefficients between parental order of dominance and parental measurement were found to be negative for height of plant, number of branches per plant, number of nodes per plant and width of fruits per plant in both F₁ and F₂ generations indicating that dominant genes governed the expression of these characters. The positive and significant values observed for length of fruit, number of fruits per plant and yield per plant in F₁ and F₂ generations and length of first fruiting node and length of internode in F₂ populations suggested that these characters were governed by recessive genes.

Correlation coefficients were estimated among parents, F₁ hybrids and F₂ populations separately at genotypic and phenotypic levels. In general, genotypic correlation coefficients were higher than phenotypic correlation coefficients. The correlation coefficients were consistently significant and positive in all the three populations between yield per plant and number of fruits per plant at both genotypic and phenotypic levels. The consistency was also observed in F₁ and F₂ generations between yield per plant and plant height at both genotypic and phenotypic levels. Yield per
plant showed significant and positive correlation between length of fruit and width of fruit at genotypic level in both $F_1$ and $F_2$ generations.

4. **COMBINING ABILITY ANALYSIS**

4.1 General Combining Ability Effects

The general and specific combining ability variances were highly significant for all the characters under study except for width of fruit in both $F_1$ and $F_2$ generations. The relative magnitude of variances revealed that additive component was of major importance in the expression of all the characters except width of fruit in $F_2$ population, which was found to be under the control of equal proportion of genes. Parent KS-315 showed high general combining ability effect for all the characters except length and width of fruit in $F_1$ and $F_2$ generations; days to flowering in $F_1$ and plant height and number of branches per plant in $F_2$ population. Parents BO-2 for days to flowering; Parbhani Kranti, Pusa Sawani for plant height; KS-375 for number of branches per plant; KS-315, Parbhani Kranti for length of first fruiting node; Pusa Sawani for number of nodes per plant; KS-315, Parbhani Kranti for length of internode; Parbhani Kranti for length of fruit; Pusa Sawani for width of fruit; KS-315 for number of fruits per plant and KS-315, Pusa Sawani for yield per plant were found desirable on the basis of *per se* performance and general combining ability effects.

4.2 Specific Combining Ability Effects

Specific combining ability effects indicated that choice of parents for hybridization could be based on *per se* performance of parents. Cross combinations BO-2 x KS-418 for days to flowering; KS-408 x Pusa Sawani for plant height; KS-375 x Pusa Sawani for number of branches per plant; KS-315 x KS-408 for length of first fruiting node; KS-401 x Pusa Sawani for number of nodes per plant; KS-315 x ks-408 for length of internode; KS-375
x Pusa Sawani for length of fruit; BO-2 x Parbhani Kranti for width of fruit; KS-315 x KS-418 for number of fruits per plant and KS-315 x KS-410 for yield per plant showed high specific combining ability effects as well as per se performance in F₁ generation.

In F₂ populations, cross combinations KS-418 x Pusa Sawani, for days to flowering; Azad Ganga x KS-415 for plant height; KS-375 x KS-408 for number of branches per plant; KS-410 x KS-415 for length of first fruiting node; KS-375 x KS-404 for number of nodes per plant; KS-410 x KS-415 for length of internode; BO-2 x KS-410 for length of fruit; Parbhani Kranti x Pusa Sawani for width of fruit; KS-415 x Pusa Sawani for number of fruits per plant and Parbhani Kranti x Pusa Sawani for yield per plant showed high specific combining ability effects and high per se performance.

No association between general combining ability of parents and hybrids performance was observed. The best cross combinations involved high x high, high x moderate, high x low, moderate x moderate, moderate x low and low x low general combiners.

5. HETEROSIS AND INBREEDING DEPRESSION

In general, considerable heterosis was observed for all the characters. Transgressive segregation was observed for days to flowering and length of first fruiting node over both better and economic parents in several cross combinations. No association between heterosis, general combining ability and genetic diversity of parents was observed. Number of fruits per plant, number of branches per plant and length of fruits were observed to be major component characters of heterosis for yield per plant. The high magnitude of heterosis and per se performance was found in hybrid KS-375 x Pusa Sawani over better as well as economic parent for yield per plant indicating that this cross can be exploited commercially.
Inbreeding depression was observed for different characters studied in number of crosses. Six crosses exhibited inbreeding depression in F₂ population for days to flowering; nine for plant height and number of branches per plant; seven for length of first fruiting node; six for length of fruit; two for width of fruit; seven for number of fruits per plant and ten for yield per plant. For yield per plant, cross combination KS-315 x KS-410 showed maximum heterosis over economic parent and also high heterosis over economic parent as well as high heterosis over better parents accompanied with high inbreeding depression. Ten cross combinations showed significant negative inbreeding depression of yield per plant.

CONCLUSION

Thus, from the present investigation it is concluded that there is no association between heterosis and general combining ability in this crop. The specific combining ability effects indicated that choice of parents could be based on per se performance. The selection in okra crop can be based on the combination of two characters i.e. length of first fruiting node + length of fruit and length of fruit + width of fruit of higher grain over straight selection. Number of fruits per plant, number of branches per plant and length of fruit were observed to be the main components of heterosis for yield per plant. However, the improvement in width of fruit and number of fruits per plant could be made by adoption of family selection with occasional intermatting in segregation populations and triple test cross. These methods may be proving more effective than conventional procedure of mass and pedigree methods of selection. At the last but not least the single seed descent method is most important and more beneficial for the improvement of okra crop.