SYNOPSIS

Pre Dissertation

(GPB 591)

Heterosis and Combining Ability for Yield and Yield Related Traits in Okra

Submitted To

Department of Genetics and Plant Breeding

School of Agriculture

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UNDER GUIDANCE OF

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CERTIFICATE

This is to certified that the synopsis entitled **"Heterosis and Combining Ability for Yield and Yield Related Traits in Okra"** submitted in partial fulfillment of requirements for degree of Master of Science (M.Sc.) in Genetics and Plant Breeding by **Aman Deep Ranga** to Department of Genetics and Plant Breeding, School of Agriculture, Lovely Professional University, has been formulated and finalized by the student himself on the subject.

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DECLARATION

I hereby declare that the project work entitled **"Heterosis and Combining Ability for Yield and Yield Related Traits in Okra"** is an authentic record of my work carried at **Lovely Professional University** as requirements of project work for the award of degree of Master of Science in Genetics and Plant Breeding, under the guidance of **Dr. Mayur S. Darvhankar**, Assistant Professor, School of Agriculture, Lovely Professional University, Phagwara, Punjab, India.

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INTRODUCTION

Okra *(Abelmoschus esculentus)* also known as ladies finger in many English-speaking countries is a flowering plant belonging to the malvaceae family. It is valued for its edible green seed pods. The geographical origin of okra is Ethiopia, West African and South Asian region. The plant is cultivated in tropical, subtropical and warm temperate regions around the world. In India, it is one of the most important vegetable crops grown extensively throughout the year during both summer and rainy seasons for its green tender fruits. Its fast growth, short duration and photo-insensitive nature, genetical study can be completed in short span of time.

The okra is an often cross pollinated crop where natural cross pollination occurs up to extant of 8.75 to 9.61 per cent. At edible stage okra is good source of vitamin A, B and C, calcium, iron, proteins, fibres, carbohydrates, minerals viz., magnesium, potassium, sodium, copper and sulphur.

Though, India is the largest producer of okra in world with an annual production of 63.46 lakh tonnes from an area of 5.33 lakh hectares with a productivity of 11.91 tonnes per hectare, but the yield potential is very low attributing to poor yielding varieties and incidence of various pests and diseases. The low cost of production and high nutritional value has enhanced the usefulness of this crop. Hybrid breeding has helped in overcoming the yield barriers by accelerating increase in productivity.

Exploitation of heterosis in okra has been recognized as a practical tool in providing the breeders a mean of improving yield and other important traits. The primary objective of heterosis breeding is to achieve a quantum jump in yield and quality aspects of crop. Yield is one of the most important characters of okra cultivars and hybrids. Great efforts have been directed to improve yield production and quality properties in okra. Heterosis and combining ability provides important information for improving economic characteristics in okra. Several

researchers have reported the occurrence of heterosis in considerable quantities for earliness, fruit yield and its various components.

Hybridization has been the most successful approach in increasing the productivity in vegetable crops. Selection of genetically superior and suitable genotypes is the most important stage from the stand point of hybridization of vegetable crops in order to develop new genotypes having desirable characters. One of the main problems of vegetable breeders for developing high yielding varieties through either heterosis breeding or pedigree breeding is to select good parents and crosses. In a systematic breeding programme, it is essential to identify superior parents for hybridization and crosses to expand the genetic variability for selection of superior genotypes.

The present investigation will be conducted adopting line x tester mating technique with the following objects;

1. To estimate heterosis over better parent and over standard heterosis for yield and its components.
2. To estimate general and specific combining ability (GCA and SCA) of the parents and crosses, respectively.
3. To study the nature and magnitude of gene action involved in the expression of quantitative traits.

REVIEW OF LITERATURE

Two Egyptian and four exotic parental genotypes of okra were self-pollinated for one generation and crossed in half diallel design to study heterosis and combining ability for earliness, vegetative and yield components traits by Hazem A. Obiadalla-Ali, M.H.Z. Eldekashy and A.A. Helaly at Sohag University, Sohag, Egypt (2012).

Heterosis for pod yield and its components was studied in a set of line x tester crosses of 8 lines and 4 testers. The analysis of variance revealed highly significant differences among genotypes, parents and hybrids for all the characters indicating substantial amount of genetic variability present in the material studied by M.D. Khanpara, L.L. Jivani, J.H. Vachhani, V.H. Kachhadia and R.B. Madaria during kharif season of 2005 at Instructional Farm, Department of Agronomy, Junagadh Agricultural University, Junagadh.

Combining ability was estimated for six diverse okra genotypes or varieties by diallel analysis. The combining analysis revealed that Arka Anamika was found to be a good general combiner for fruit number, fruit weight and fruit length. KL9 showed high gca for days to first flowering, internode number and fruit weight. In this study, it was observed that presence of overdominance for most of the yield contributing traits by Divya Balakrishnan, E. Sreenivasan, V.V. Radhakrishnan, R. Sujatha and K. V. Suresh Babu at College of Horticulture, Vellanikkara 680654, Trichur, Kerala in 2006.

To magnitude the combining ability in Okra [Abelmoschus esculentus (L.) Moench] for identifying desirable parents. The experiment comprised of 36 hybrids obtained by crossing 15 parents (12 lines and 3 tasters) for line x taster analysis. All the hybrids and their parents were sown in a randomized block design with three replications completed in 2012 by K.R.Khatik, R.Chodhary and C.L. Khatik at Department of Horticulture, Institute of Agricultural Science, Bundelkhand University, JHANSI (U.P.) INDIA

Several parents and 21 F_1 generations were planted for evaluation in a randomized complete block design with two replications. The results indicated that the mean squares due to GCA and SCA for length and width of pods were significant was done by O.T. Adeniji and O.B. Kehinde, Department of Crop Science, Adamawa State University, PMB 25 Mubi Adamawa

State, Nigeria and Department of Plant Breeding and Seed Technology, University of Agriculture, PMB 2240 Abeokuta, Nigeria

The experimental material consisted of twelve parents and 66 F1 hybrids produced in a diallel mating excluding reciprocals. Analysis of variance for combining ability exhibited the significance of both GCA and SCA effects for all the characters in both 2004-2005 done by SALESH KUMAR JINDAL AND T.R. GHAI Department of Vegetable Crops, PAU, Ludhiana - 141 004 (Punjab).

Eight lines were crossed with five testers. The resulting 40 hybrids along with 13 parents were evaluated in a randomized Block Design with three replications during 2008 to 2011. It was done by Joshi, J. L. and Murugan, S.

Combining ability effects were estimated for different agronomic characters in line × tester crossing program comprising 21 hybrids produced by crossing 7 lines and 3 testers. Parents and hybrids differed significantly for general combining ability (GCA) and specific combining ability (SCA) effects, respectively by Ezatollah Farshadfa , Zeinab Kazemi, Anita Yaghotipoor at Campus of Agriculture and Natural Resources, Razi University, Kermanshah, Iran.

The trial was conducted during summer and rainy seasons of 2006-2008 at the Institute of Agricultural Sciences, BHU, Varanasi. Appreciable heterosis over better parents of 51 F1'S of okra (Abelmoschus esculentus (L.) Moench] was recorded for various horticultural traits and quality traits over both the seasons by S. S. Solankey, A. K. Singh and R. K. Singh

Heterosis and combining ability studies in okra were carried out by using line x tester mating design. The 51 hybrids generated by crossing 17 female lines with 3 male testers were grown along with their parents in a randomized block design with three replications by S.K. Dhankhar, B.S. Saharan and B.S. Dhankhar at Department of Vegetable Crops Chaudhary Charan Singh Haryana Agricultural University Hisar-125 004 India.

MATERIAL AND METHODS

Technical programme:

- **Research topic:** "Heterosis and Combining Ability for Yield and Yield Related Traits in Okra (*Abelmoschus esculentus*)"
- **Location:** The experiment was conducted on agriculture research farm of Lovely Professional University, Phagwara situated geographically at 31.244802, 75.698809.
- **Experimental details:**
    - Year of experiment : 2018-2019
    - Recommended dose of fertilizer : 75:5:15kg N,P,K/hac
    - No. of Genotypes : 15
    - No. of replication : 3
    - Plot size : 500 m^2
    - Dates of sowing : January 2018
    - Experiment design : Randomized Block Design (RBD)
    - Crop and variety : Okra (Germplasm)
    - Spacing : 45 x 30cm
- **Observations to be recorded:**
    1. Plant growth habit
    2. Days to 50% flowering
    3. First flowering node
    4. First fruit producing node
    5. Immature fruit colour
    6. Days to first picking
    7. Inter-nodal length
    8. Number of inter-nodes
    9. Number of ridges per fruit
    10. Fruit length (cm)
    11. Number of fruits per plant
    12. Fruit width (cm)
    13. Number of seeds per fruit
    14. 100 seed weight (g)
    15. Fruit weight
    16. Yield per plant (g)
    17. Plant height
    18. Days to 80% maturity
    19. Mature fruit colour

20. Seed shape
21. Harvest Index

- **Statistical Analysis:**

The mean values of parents and F_1 hybrids for all the characters were subjected to statistical analysis on following aspects:

1. Analysis of Variance for Experimental Design

2. Estimation of heterobeltiosis and standard heterosis

3. Combining ability analysis

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