EVALUATION OF ADVANCED BREEDING LINES OF BRINJAL (*Solanum melongena* L.) AGAINST BACTERIAL WILT DISEASE

MANJUSHREE, B. U.
MH2TAB0299

DEPARTMENT OF VEGETABLE SCIENCE

COLLEGE OF HORTICULTURE, MUDIGERE

KELADI SHIVAPPA NAYAKA

UNIVERSITY OF AGRICULTURAL AND HORTICULTURAL SCIENCES

SHIVAMOGGA

2023

EVALUATION OF ADVANCED BREEDING LINES OF BRINJAL (*Solanum melongena* L.) AGAINST BACTERIAL WILT DISEASE

MANJUSHREE, B. U.
MH2TAB0299

Thesis submitted to the

KELADI SHIVAPPA NAYAKA
UNIVERSITY OF AGRICULTURAL AND HORTICULTURAL SCIENCES
SHIVAMOGGA

In partial fulfillment of the requirements
for the award of the degree of

Master of Science (Horticulture)

in

DEPARTMENT OF VEGETABLE SCIENCE

Mudigere **November, 2023**

DEPARTMENT OF VEGETABLE SCIENCE
COLLEGE OF HORTICULTURE, MUDIGERE

KELADI SHIVAPPA NAYAKA
UNIVERSITY OF AGRICULTURAL AND HORTICULTURAL SCIENCES
SHIVAMOGGA

CERTIFICATE

This is to certify that the thesis entitled **'EVALUATION OF ADVANCED BREEDING LINES OF BRINJAL (*Solanum melongena* L.) AGAINST BACTERIAL WILT DISEASE'** submitted in partial fulfillment of the requirements for the award of the degree of **MASTER OF SCIENCE (HORTICULTURE) in VEGETABLE SCIENCE** to the College of Horticulture, Mudigere. Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga is a bonafide record of research work carried out by **Ms. Manjushree, B. U., ID NO. MH2TBA0299** (bumanjushree@gmail.com) during the period of study in this university under my guidance and supervision and no part of this thesis has previously formed the basis for the award of any other degree, diploma, associateship, fellowship or any other similar titles.

Mudigere
November, 2023

(MAJOR ADVISOR)

APPROVED BY:

Chairman:

(DEVARAJU)

Members:

1. (SRINIVASA, V.)

2. (LAKSHMANA, D.)

3. (G. N. HOSAGOUDAR)

ACKNOWLEDGEMENT

In the light of reaching a milestone in my life. First of all, I owe and express my deep sense of gratitude and sole full respect to my ***Almighty god*** *for life and continuously providing spiritual energy, which has inspired me to reach at the highest excellence. The beatitude and euphoria that accompanies successful completion of any task would be incomplete without expression of appreciation of simple certitude to the people who made it possible to achieve the goal by their encouraging guidance and proper steering. It is still great at this juncture to recall all the faces and spirit in the form of teachers, friends, near and dear ones are an integral task of this. I owe them a lot and it always is a difficult task expressing and putting into words the sense of gratitude I feel towards them.*

I cannot, but consider myself lucky to have worked under guidance of knowledge hungry, excellence pursuing and ever-helpful personality of ***Dr. Devaraju****, Assistant Professor, Department of Vegetable Science, College of Horticulture, Mudigere and chairman of my advisory committee. I wish to express my deep sense of gratitude and thanks for his untiring knowledgeable guidance, meritorious support, inspiring, unique and compassionate steering of the challenging task and affection showing throughout the course of the investigation. They provide all the facilities during my investigation and it was helpful for me to successful completion of my investigation. I only can confess that it had been a privilege for me to be associated with him during my master's degree programme.*

At the same time, I am sincerely thankful to ***Dr. Srinivasa, V.****, Professor and Head, Department of Vegetable Science, College of Horticulture, Mudigere and member of my advisory committee, for his timely guidance, overwhelming support to pursue my research programme is deeply acknowledge with due respect.*

It gives me great pleasure to express my heartfelt thanks to member of my advisory committee ***Dr. Lakshmana, D.****, Professor and Head Department of Genetics and Plant Breeding, College of Agriculture, Shivamogga for their insightful comments, encouragement, advice and critical review of the thesis.*

I also extend heartfelt thanks towards ***Dr. G. N. Hosagoudar,*** *Assistant professor, Department of Plant Pathology, College of Agriculture, Shivamogga and member of my advisory committee for their constant encouragement, inspiring guidance valuable suggestions and sensible criticism.*

The credits of my rise in academic career goes entirely to my sweet family who have initiated me to the beautiful world of learning and were there to help me out when I need them the most. I express my deep sense of gratitude and affection to my father ***Umesha, B. T.*** *and mother* ***Rohini, M. M.*** *and brother* ***Manjunath, B. U.,*** *for their generous love, care, encouragement, moral support and guidance which kept me focused and motivated. I am* grateful to them for giving me the life I ever demand. I also extend heartfelt thanks towards my best friends **Tanya and Chinmayi** for their encouragement and emotional support.

I avail this moment to specially acknowledge my classmates **Rajeshwari, Yoshitha, Rajyalakshmi, Rakshitha, Rashmi, Sourabh, Vinay, Vaishnavi, Chandana, Jyothi Vyshnavi, Shivani, Yashaswini, Sanketh, Abhishek and Yogesh,** who helped me during my research work which leaves a memory regardful and indelible.

I feel immense pleasure and joy in expressing my profound affection and gratitude to my beloved seniors **Vaishnavi, Sanmathi Naik, Latha, Nivetha, Faiziya, Nikhil and Sharath,** for their care, help and inspiration which is always remembered from the depth of my heart. I wish to thank my junior friends **Pooja, Kavya, Prajwal, Manjunath, Chandan, Darshan, Bhoomika, Bhavana, Chaitra, Deekshitha, Shashank, Chandana, Chinmayi, Shreeharsha, Vivek, Rayappa and Srinivas** for their affection, care and unforgettable help.

I take this opportunity to offer sincere thanks to field workers **Prema, Shakunthala, Shivamma, Kamala, Babitha, Anitha** and others who built basement of my field work under hot sun shine and rain, without them the research work would have not completed successfully and I owe special thanks from depth of my heart to **Prajwal anna, Gagan anna** and others who helped me a lot throughout the course of my research work and also I would like to extend my huge and warm thanks to the non-teaching staff of college of horticulture, Mudigere and all other concerned people for their kind help and valuable suggestions during the course of thesis completion.

My sincere thanks to library staffs **Manu, Praveen and Arpitha** for their constant help and support during my M. Sc. programme. I am also thankful to KSNUAHS, Shivamogga COH, Mudigere, ICAR-IIHR Bengaluru and KVK Mudigere.

Last but not least, I express my heartfelt thanks to **Snehamilana associates**, for neat, timely editing and neat binding of manuscript. At last to my PC and laptop for backing me up throughout the studies.

I am overwhelmed with gratitude to all my respondents, the presentation that follows is the work assisted by many seen and unseen hands and minds, I am thankful to all of them without whose whole hearted co-operation, this study would not have been fruitful.

......any omission in this brief acknowledgement doesn't mean lack of gratitude.

MUDIGERE

November, 2023 **(MANJUSHREE, B. U.)**

Evaluation of Advanced Breeding Lines of Brinjal (*Solanum melongena* L.) against Bacterial Wilt Disease

(Manjushree, B. U.)

ABSTRACT

The present investigation was carried out to assess the performance, genetic variability and to screen against bacterial wilt disease in twenty advanced breeding lines of brinjal along with three checks (Arka Keshav, Arka Neelanchal Shyama and Devanur Local) at College of Horticulture, Mudigere during 2022-23. Analysis of variance showed significant differences among genotypes for all the traits under study. High GCV and PCV was recorded for number of primary branches (60 DAT), days to first flowering, number of flower clusters per plant, number of flowers per cluster, number of fruits per cluster, number of fruits per plant, fruit length and fruit diameter indicating the presence of wide variability among the genotypes for different traits. High heritability (>60 %) coupled with high genetic advance (>20 %) as per cent over mean was observed for plant height, number of primary branches, days to first flowering , days to fifty per cent flowering, number of flower clusters per plant, number of flowers per cluster, number of fruits per cluster, fruit setting percentage, days taken for first picking, number of fruits per plant, average fruit weight, fruit length, fruit diameter, stalk length, fruit yield per plant, fruit yield per plot, estimated fruit yield, dry matter content and fruit phenol content suggesting that these traits are governed by additive gene action. Hence, direct selection can be followed for improvement of these traits. Among the lines, the least wilting percentage was observed in CHMB-2, CHMB-6, CHMB-9, CHMB-11 and CHMB-23 and maximum in CHMB-21. Based on the performance for growth and yield attributes, the lines CHMB-2, CHMB-6, CHMB-9, CHMB-11 and CHMB-23 were found superior for most of the traits. Hence, these lines can be utilized for further crop improvement programme.

Department of Vegetable Science
KSNUAHS, Shivamogga
November, 2023

Manjushree
Manjushree, B. U.
(bumanjushree@gmail.com)

Dr. Devaraju
(devaraju.aph@gmail.com)

ದುಂಡಾಣು ಸೊರಗು ರೋಗದ ವಿರುದ್ಧ ಬದನೆಯ (*ಸೋಲನಮ್ ಮೆಲೊಂಜೀನಾ ಎಲ್.*) ವಂಶವಾಹಿ ರೂಪಗಳ ಮೌಲ್ಯಮಾಪನ

(ಮಂಜುಶ್ರೀ, ಬಿ. ಯು.)

ಸಾರಾಂಶ

ಬದನೆಯ ವಂಶವಾಹಿ ರೂಪಗಳ ಅನುವಂಶೀಯ ಕಾರ್ಯಕ್ಷಮತೆಯ, ವೈವಿಧ್ಯತೆ ಮತ್ತು ದುಂಡಾಣು ಸೊರಗು ರೋಗದ ವಿರುದ್ಧ ಪರಿಶೀಲನೆಯನ್ನು ನಿರ್ಣಯಿಸಲು 2022-23 ರ ಅವಧಿಯಲ್ಲಿ ತರಕಾರಿ ವಿಜ್ಞಾನ ವಿಭಾಗ ತೋಟಗಾರಿಕೆ ಮಹಾವಿದ್ಯಾಲಯ ಮೂಡಿಗೆರೆಯಲ್ಲಿ ಈ ಪ್ರಯೋಗವನ್ನು ಕೈಗೊಳ್ಳಲಾಯಿತು. ಎಲ್ಲಾ ವಂಶವಾಹಿ ರೂಪಗಳಲ್ಲಿ ಬೆಳವಣಿಗೆ ಮತ್ತು ಬೆಳವಣಿಗೆಗೆ ಸಂಬಂಧಿಸಿದ ಗುಣಗಳಲ್ಲಿ ಗಣನೀಯ ವ್ಯತ್ಯಾಸವಿರುವುದು ಕಂಡು ಬಂದಿದೆ. ಪ್ರಾಥಮಿಕ ಶಾಖೆಗಳ ಸಂಖ್ಯೆ ನಾಟಿ ಮಾಡಿದ 60 ದಿನಗಳ ನಂತರ, ಮೊದಲು ಹೂ ಬಿಡುವ ದಿನಗಳು, ಪ್ರತಿ ಸಸ್ಯದ ಹೂವಿನ ಗೊಂಚಲುಗಳ ಸಂಖ್ಯೆ, ಪ್ರತಿಗೊಂಚಲಿನ ಹೂವುಗಳ ಸಂಖ್ಯೆ, ಪ್ರತಿಗೊಂಚಲಿನ ಕಾಯಿಯ ಸಂಖ್ಯೆ, ಪ್ರತಿ ಸಸ್ಯಕ್ಕೆ ಕಾಯಿಗಳ ಸಂಖ್ಯೆ, ಕಾಯಿಯ ಉದ್ದ ಮತ್ತು ಕಾಯಿಯ ವ್ಯಾಸಗಳಿಗೆ ಹೆಚ್ಚಿನ ಜಿಸಿವಿ ಮತ್ತು ಪಿಸಿವಿ ದಾಖಲಾಗಿದೆ. ಈ ವಿವಿಧ ಗುಣಗಳಿಗೆ ವಂಶವಾಹಿಗಳಲ್ಲಿ ವ್ಯಾಪಕ ವ್ಯತ್ಯಾಸದ ಉಪಸ್ಥಿತಿಯನ್ನು ಸೂಚಿಸುತ್ತದೆ. ಹೆಚ್ಚಿನ ಅನುವಂಶಿಯತೆ (>60 %) ಜೊತೆಗೆ ಹೆಚ್ಚಿನ ಅನುವಂಶಿಕ (>20 %) ಮತ್ತು ಸರಾಸರಿಗಿಂತ ಶೇಕಡವಾರು ಹೆಚ್ಚಿನ ಅನುವಂಶಿಯ ಮುಂಗಡವನ್ನು ಗಿಡದ ಎತ್ತರ, ಪ್ರಾಥಮಿಕ ಶಾಖೆಗಳ ಸಂಖ್ಯೆ, ಮೊದಲು ಹೂ ಬಿಡುವ ದಿನಗಳು, ಐವತ್ತು ಶೇಕಡ ಹೂಬಿಡುವಿಕೆ, ಪ್ರತಿ ಸಸ್ಯದ ಹೂವಿನ ಗೊಂಚಲುಗಳ ಸಂಖ್ಯೆ, ಪ್ರತಿಗೊಂಚಲಿನ ಹೂವುಗಳ ಸಂಖ್ಯೆ, ಪ್ರತಿಗೊಂಚಲಿನ ಕಾಯಿಯ ಸಂಖ್ಯೆ, ಶೇಕಡವಾರು ಕಾಯಿ ಕಟ್ಟುವಿಕೆ, ಮೊದಲ ಕೊಯ್ಲಿಗೆ ತೆಗೆದುಕೊಂಡ ದಿನಗಳು, ಪ್ರತಿ ಸಸ್ಯಕ್ಕೆ ಕಾಯಿಗಳ ಸಂಖ್ಯೆ, ಸರಾಸರಿ ಕಾಯಿಯ ತೂಕ, ಕಾಯಿಯ ಉದ್ದ, ಕಾಯಿಯ ವ್ಯಾಸ, ಪ್ರತಿ ಸಸ್ಯಕ್ಕೆ ಕಾಯಿಯ ಇಳುವರಿ, ಒಣ ಪದಾರ್ಥ ಅಂಶ ಮತ್ತು ಕಾಯಿಯ ಫಿನಾಲ್ ಅಂಶವು ಕಂಡು ಬಂದಿದೆ. ಈ ಎಲ್ಲಾ ಗುಣಗಳು ಪ್ರಾಬಲ್ಯದ ಸಂಯೋಜಕ ಅನುವಂಶಿಕ ಧಾತುಕ್ರಿಯೆಯ ಕಾರಣದಿಂದಾಗಿ ಈ ಎಲ್ಲಾ ಗುಣಗಳನ್ನು ನೇರ ಆಯ್ಕೆಯ ಮೂಲಕ ಸುಧಾರಿಸಬಹುದು ಎಂದು ಸೂಚಿಸುತ್ತದೆ. ವಂಶವಾಹಿ ರೂಪಗಳ ಪೈಕಿ, ಸಿಹೆಚ್‌ಎಂಬಿ–2, ಸಿಹೆಚ್‌ಎಂಬಿ–6, ಸಿಹೆಚ್‌ಎಂಬಿ–9, ಸಿಹೆಚ್‌ಎಂಬಿ–11 ಮತ್ತು ಸಿಹೆಚ್‌ಎಂಬಿ–23 ಗಳಲ್ಲಿ ಕನಿಷ್ಠ ದುಂಡಾಣು ಸೊರಗು ರೋಗ ಮತ್ತು ಗರಿಷ್ಠ ಸಿಹೆಚ್‌ಎಂಬಿ–21 ನಲ್ಲಿ ಕಂಡುಬಂದಿದೆ. ಬೆಳವಣಿಗೆ ಮತ್ತು ಇಳುವರಿ ಗುಣಲಕ್ಷಣಗಳ ಕಾರ್ಯಕ್ಷಮತೆಯ ಆಧಾರದ ಮೇಲೆ ಸಿಹೆಚ್‌ಎಂಬಿ–2, ಸಿಹೆಚ್‌ಎಂಬಿ–6, ಸಿಹೆಚ್‌ಎಂಬಿ–9, ಸಿಹೆಚ್‌ಎಂಬಿ–11 ಮತ್ತು ಸಿಹೆಚ್‌ಎಂಬಿ–23 ವಂಶವಾಹಿ ರೂಪಗಳು ಉತ್ತಮವೆಂದು ಕಂಡುಬಂದಿದ್ದು, ಈ ವಂಶವಾಹಿ ರೂಪಗಳನ್ನು ಮುಂದಿನ ಬೆಳೆಯ ಅಭಿವೃದ್ಧಿಯಲ್ಲಿ ಉಪಯೋಗಿಸಬಹುದಾಗಿದೆ.

Manjushree
ಮಂಜುಶ್ರೀ, ಬಿ. ಯು.
(bumanjushree@gmail.com)

ತರಕಾರಿ ವಿಜ್ಞಾನ
ಕೆಳದಿ ಶಿವಪ್ಪ ನಾಯಕ ಕೃಷಿ ಮತ್ತು
ತೋಟಗಾರಿಕೆ ವಿಜ್ಞಾನಗಳ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಶಿವಮೊಗ್ಗ
ನವೆಂಬರ್, 2023

ಡಾ. ದೇವರಾಜು
(devaraju.aph@gmail.com)

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF APPENDICES

INTRODUCTION

I INTRODUCTION

Brinjal (*Solanum melongena* L.) is one of the most important vegetable crop. It is popular among people and hence, it is rightly called as vegetable of masses (Patel and Sarnaik, 2003). It is originated in the Indo-Burma region (Vavilov, 1928), Bangladesh and Myanmar region is believed to be the center of diversity (Isshiki *et al.*, 1994). Brinjal is grown on commercial scale in India, China, Turkey, Japan, Egypt, Italy, Indonesia, Iraq, Syria, Spain, Philippines, Bulgaria and USA.

Brinjal is a perennial crop but commercially cultivated as an annual vegetable (Pramila *et al*., 2015). Belongs to family Solanaceae, consisting of 98 genera and over 2700 species (Olmstead and Bohs, 2007). About 150 to 200 species are tuber bearing which belongs to the section Tuberarium, rest of the species (about 1800) are non-tuber bearing. The cytological investigations have indicated that almost all the varieties and species are diploid with the chromosome number of 2n=24. The species melongena has three botanical varieties which are grouped as round or egg-shaped under var. *esculentum*, the long slender type under var. *serpentinum* and the dwarf brinjal plants grouped under var. *depressum.*

Brinjal is a self-pollinated crop but cross pollination also occurs to a considerable extent. This is because, it has pronounced heterostyly which favours cross pollination. Sixty to seventy per cent fruit set happens through insect pollination, while 30-40 per cent by selfing. Hence, it is classified as an often cross-pollinated crop. The fruit setting flowers consist of long (70-86.70 %) and medium styled (12-55.60 %) flowers whereas the non-fruit setting flowers are short-styled and pseudo short-styled flowers (Thamburaj and Singh, 2018) and the flowers are large, violet or white in color. Usually, anthesis starts from 6 am to 7.30 am and continues up to 11:00 am. The anther dehiscence starts from 9.30 am to 10:00 am and the stigma receptivity is highest during anthesis. Fruit setting is affected neither by natural light nor by relative humidity but mainly by the average maximum temperature of 21-27 °C and precipitation during first five days after flower opening.

Brinjal is a day-neutral crop, extensively cultivated in different parts of India on an area of 7.64 million hectares with the production of 1.26 million MT, distributed in the states of Odissa, Bihar, Karnataka, West Bengal, Andhra Pradesh, Maharashtra and Uttar Pradesh except in higher altitudes where it succumbs to frost injury. In Karnataka, brinjal covers an area of 11,360 hectares with the production of 2,84,030 metric tonnes and productivity is 25.02 metric tonnes per hectare (Anon., 2022). It is extensively grown in the districts of Belgaum, Kolar, Mandya, Haveri, Davanagere, Mysore, Tumkur and Chitradurga.

Eggplant is having many medicinal properties and it is useful in the treatment of inflammatory conditions, cardiac debility, neuralgias, bronchitis and asthma (Okmen *et al.* 2009). Analysis of edible parts of fruit (except stalk and calyx) revealed that 100 g fresh weight of brinjal contains moisture (96 %), carbohydrates (4 g), protein (1.4 g), fat (0.3 g), fibre (1.3 g) and essential minerals like calcium (18 mg), magnesium (16 mg), phosphorus (47 mg), iron (0.38 mg), sodium (3 mg), copper (0.17 mg), manganese (2.4 mg), chromium (0.07 mg) and sulphur (44 mg). It is also a rich source of vitamins and 100 g of edible portion of fruit contains Vitamin - A (124 IU), riboflavin (0.11 mg), thiamine (0.4 mg), niacin (0.9 mg), folic acid (5 mg), choline (52 mg) and 12 mg of Vitamin - C (Aykroyd, 1963).

Brinjal is known to be affected by many diseases like bacterial wilt, fusarium wilt, little leaf *etc*. and pests like shoot and fruit borer, jassids, thrips, *etc*. which cause damage throughout the growth and reproductive stages. Among the diseases, bacterial wilt of eggplant has been treated as one of the major constraint in eggplant cultivation (Ali, 1993). Bacterial wilt [*Ralstonia solanacearum* (Smith)] and fungal wilts (*Fusarium solani* f.sp. *melongenae, Rhizoctonia solani, Verticillium dahliae* Kleb. and *Sclerotium rolfsii* Sacc.) are major wilt causing diseases in brinjal.

Most of the commercially grown cultivars of brinjal are susceptible to bacterial wilt disease and yield losses vary from 20-100 per cent because of disease incidence (Singh, 1995). Wilt problems are especially severe in the humid tropics (Rahman *et al*., 2011). The bacterial wilt is caused by *Ralstonia solanacearum* (Smith). There are different sources of bacterial wilt disease resistance such as, *S. melongena, S. torvum, S. sisymbrifolium, S. aethiopicum, S. xanthocarpum, S. toxicarum* and S. *nigrum* (Kalloo, 1994). Resistance is greatly affected by environmental factors, race and strain diversity of the pathogen apart from non-acceptable fruit quality which makes it very difficult to utilize these resistant sources in different situations.

Bacterial wilt is a soil borne disease, which is caused by *Ralstonia solanacearum* (Smith) strains. It is classified into five races based on their host range and into five biovars on the basis of differential ability to produce acid from a panel of carbohydrates. It was first described in 1896 by E. F. Smith and later found that it has wide range of host. The solanaceous crops are mainly affected by race-1 and race-3. Infected seeds and tubers serve as primary source of inoculum and infected soil, irrigation water and implements serve as secondary source of inoculum. The pathogen enters the plant through wounded roots and progressively invades the stem vascular tissues to a sudden wilting while the plant is still green and further leads to death of plant, the affected plant show vascular discoloration which may be accompanied by browning and rotting of tissues inside the vascular bundles. The disease can be confirmed by conducting ooze test where the cut surface of the infected plant's collar region is dipped in water which shows a white milky stream of bacterial ooze coming out.

The pathogen *Ralstonia* is a gram (-) negative bacterium, having single cell with a rod shaped structure with an average size of 0.5–0.7 × 1.5–2.5 µm (Jyothi *et al*., 2012). It requires an optimum temperature of 27–35℃ for its growth. The growth of this bacterium is inhibited in acid medium, at elevated temperature (40°C) and at lower temperature (4°C).

Even though there are various cultural, biological and chemical control measures have been suggested for the management of bacterial disease, these are found to be less effective. Thus the resistant cultivars offer a satisfactory solution for the control of the disease.

A large number of cultivars of various colors, size and shapes are grown in India. However, the consumer preferences for brinjal vary from region to region, for example in Northern Karnataka purple colored fruits with glossiness and spines are preferred and green fruits are preferred by the consumers of Dharwad and Kuduchi area, respectively. Whereas, white fruits are popular in Uttara Kannada and Dakshina Kannada, long type fruits are very popular among Bangalore and Mysore regions. Likewise, preference for color, size and shapes are also varied with locality. Fruit color of eggplant varies from pure white to purple, black, green and variegated in different shades. The purple color of eggplant is due to the presence of anthocyanin pigment, while white fruits lack the pigment. Fruit shape varies from long to oval, oblong and round. Therefore, the development of high yielding varieties or hybrids with local preference is of much importance in brinjal breeding programme.

In the face of increasing population and varied consumer preference there is a need to increase production and productivity levels of brinjal to meet the demand. India being the center of origin has accumulated a wide range of crop species which exhibits a good amount of variability for various characters. However, regional preference differs greatly in size, shape, color of fruits and prickles on the calyx. This has created the necessity to breed new brinjal varieties, which fulfill the area-specific needs of the growers and consumers. It is therefore required to improve yield potential of available land races through hybridization which may yield good hybrids or varieties (Kumar *et al*., 2012).

The success of any crop improvement programme largely depends upon the nature and magnitude of genetic variability existing in the breeding material with which the plant breeder is working (Prabu *et al.*, 2009). The phenotypic expression of plant character is mainly controlled by the genetic makeup of the plant, the environment in which it is grown and the interaction between the genotype and environment. The genetic variance of any quantitative trait is composed of additive variance (heritable) and non-additive variance (non-heritable), which includes dominance and epistasis (non-allelic interaction). Therefore, it becomes necessary to partition the observed phenotypic variability into its genotypic (partly-heritable) and environmental (non-heritable) components with suitable parameters such as phenotypic and genotypic coefficient of variation and heritability in broad sense. The estimates of heritability help the plant breeder in selection of elite genotypes from diverse genetic population. Heritability indicates only the effectiveness with which selection of a genotype can be based on phenotypic performance, but it fails to indicate the expected genetic progress in one cycle of selection. Heritable variation can be effectively used with greater degree of accuracy when heritability is studied in conjunction with genetic advance (Johnson *et al.*, 1955). Further, genetic advance can be used to predict the efficiency of selection. Genetic advance denotes the improvement in the mean genotypic value of selected families over the base population and thus helps the breeder to select progenies in the early generation itself. Therefore, effectiveness of selection directly depends on the amount of heritability and genetic advance as per cent over mean for that character.

Keeping this in view and the facts mentioned earlier, the present research entitled "Evaluation of advanced breeding lines of brinjal (*Solanum melongena* L.) against bacterial wilt disease" has been undertaken with the following objectives

1. To know the performance of advanced breeding lines of brinjal for growth and yield attributes.
2. To assess the genetic variability for growth and yield attributes.
3. To screen the advanced breeding lines of brinjal for bacterial wilt disease.

REVIEW OF LITERATURE

II REVIEW OF LITERATURE

Eggplant (*Solanum melongena* L.) is a hardy important vegetable easily grown in tropical and sub-tropical regions of the world. Information on various quantitative and qualitative traits, particularly on yield contributing traits will be useful in planning and successful implementation of plant breeding programs. Several studies have been carried out for the improvement of various qualitative and quantitative characters in brinjal. The research activities on performance, genetic variability and screening for wilt resistance have been very useful with respect to crop improvement of brinjal. Therefore, the updated relevant literature on the objectives of the present study have been reviewed and presented in this chapter under the following headings.

2.1. Performance of advanced breeding lines

2.2. Studies on genetic variability, heritability and genetic advance

2.3. Bacterial wilt resistance

2.1. Performance of advanced breeding lines

Sanas *et al.* (2012) reported variations observed on physical parameters *viz.,* weight of fruit, length and girth of fruit, shape of fruit and color of fruit showed notable variation among all the thirteen local genotypes of brinjal studied. The genotype SML-5 recorded highest fruit length (23.01cm), longest fruit breadth (8.03cm) in SML-8 and highest fruit weight was observed in SML-3 (178.94g).

Singh *et al.* (2014) conducted an experiment under rainfed Mid Hill condition of Uttarakhand. They revealed with respect to most of desired characters of various varieties. Variety PPL-74 showed its superiority over other varieties under experiment for characters such as fruit length (22.05 cm), stalk length (6.98 cm) and marketable yield (712.96 q/ha). Whereas, variety PB-67 showed minimum values for most of these characters.

Jaswani *et al.* (2015) investigated fifteen genotypes of brinjal under Western part of Madhya Pradesh and concluded that among different genotypes under study, Pusa Purple Cluster recorded significantly higher potential for most of growth and yield related traits.

Nirmala and Vethamoni (2016) evaluated thirty genotypes of brinjal for growth, yield and quality characters and recorded maximum number of fruits (68.55) and fruit yield per plant (2.68 kg) in ABSR-2 followed by EC-316201. The genotype Devachinnampatti Local was found to be good for the earliest flowering (40.30) and yield per plant (2.46 kg) and protein content (17.45 mg/100g). Thus, these three genotypes can be used as parents in hybridization programme.

Reshmika *et al*. (2016) evaluated thirty six genotypes of brinjal for yield and quality characters. Highly significant differences were observed for all the traits under study. Superior genotypes in terms of yield per hectare were Jawahar Brinjal-347 (41.74 t) followed by IC-90123 (36.00 t), IC-90933 (32.92 t) and ABSR-2 (29.69 t). The genotype Swetha recorded the highest phenol content (470 mg/100 g) followed by Rajendra Brinjal and number of trichomes per cm^2 was highest on the leaf of the genotype IC-354666 (4027.20). Per cent dry matter of fruit ranged from (7.34 %) IC-90123 to (14.20 %) IC-545920.

Sharma and Banyal (2016) assessed brinjal genotypes and reported maximum yield per plant in Pant Samrat (2076.53 g) followed by Punjab Sadabahar (1883.08 g). The highest number of fruits per plant was recorded in Pant Samrat (35.66) followed by Neelima (34.66). The highest fruit length was recorded in LS-7(198.33 mm) followed by LS-12 (172.50). The least number of days to first picking was observed in LS-7 (68.00 days) followed by LS-1 (76.00 days).

Chaudhary *et al*. (2017) conducted a research trial on brinjal under Tarai condition of Uttarakhand with nine genotypes and reported, Kashi Taru is the best for fruit yield (490.73 q/ha) and less infested by fruit borer (7.16 %). The fruit diameter was found to be maximum (5.67 cm) in PB-305.The highest number of fruits per plant was produced in Pant Samrat (27.17) followed by Kashi Taru. The Pant Samrat and Pant Bahar were considered promising with (385.70 and 369.33 q/ha) marketable fruit yield, respectively over the other genotypes.

Rahul *et al.* (2017) conducted an experiment in Sher-e-Bangla Agricultural University, the highest values for plant height (60.7 cm), number of branches (8.3), number of leaves per plant (77.0), maximum individual leaf area (200.0 cm^2), number of flowers per plant (41.0), fruit size (185.7 cm) and fruit yield (47.1 t /ha) were observed in variety Green Express (V6). It showed excellent performance as compared to other varieties under experiment.

Sanga *et al.* (2017) evaluated wild brinjal genotypes and the results revealed that among all the genotypes fruit weight (27.86 g), total carbohydrates (375.78 mg/100g), ascorbic acid content (16.73 mg/100g), total alkaloids (4.68 mg/100g) were found highest in CHFG-4. CHFG-5 had the highest number of fruits per plant (93.66), fruit yield per plant (1.97 kg) and total phenol (15.27 mg/100g). Hence, for fruit yield and quality characteristics, the genotypes CHFG-4 and CHFG-5 were best suited for cultivation in different parts of north east region.

Tripathy *et al*. (2017) evaluated eighteen brinjal genotypes for nineteen characters and revealed that 2013/BRLVAR-5 took the shortest period of days to 50 per cent flowering and recorded maximum number of flower clusters per plant (16.80). 2013/BRLVAR-6 recorded a significantly higher number of fruits (2.80) followed by 2013/BRLVAR-1 (2.16), 2014/BRLVAR-3 (1.80) and 2014/BRLVAR-1 (1.73). 2014/BRLVAR-1 was found superior over the rest of the other genotypes for most of the desirable characteristics like plant height (91.31 cm), plant spread (100.06 cm), fruit yield per plant (2.77 kg), marketable fruit yield (971.50 q/ha).

Akshay *et al.* (2018) studied mean performance of thirteen genotypes of brinjal and reported that plant height ranged between 72.93cm (Utkal Anushree) to 95.84 cm (Bhavani Gold), number of branches was highest in IC 3749281 (7.75), least number of days to first flowering (43.15 days) and to first harvest (64.46 days) recorded in ABSR 2 and Karur Local respectively, Thevur Local (12.95 cm) recorded the maximum fruit length, Mattigulla showed the highest value of fruit girth (17.44 cm) and individual fruit weight (88.67 g). The maximum number of fruits was recorded in ABSR 2 (39.75), shoot borer infestation was found least in IC 374928-1 (11.28 %) followed by Karur Local (14.16 %) and ABSR 2 (14.87 %) and highest marketable yield was recorded in Karur Local (2.60 kg) followed by Bhavani Gold (2.15 kg).

Chinthagunti *et al.* (2018) evaluated the performance of sixteen brinjal genotypes and revealed that the genotype 2012/BRRHYB-4 recorded higher number of fruits per cluster (2.39), percentage fruit set (61.94 %), a number of fruits per plant (44.73), yield per plant (2.60 kg) and yield per hectare (446.61 q/ha), maximum number of flowers per cluster was recorded in genotype 2011/BRRHYB-7.

Gogoi *et al.* (2018) evaluated thirty five varieties of brinjal and reported that Utkal Green performed well for fruit yield (2.32 kg/plant) and other growth parameters with resistant reaction to bacterial wilt, with 12.44 per cent incidence compared to other varieties which had good growth parameters but with yield reduction due to bacterial wilt (Ketan - 62.22 % and Vijay Kiron - 57.78 %).

Kanaujia *et al*. (2018) assessed eighteen brinjal genotypes and revealed that BRLVAR-12 exhibited a maximum number of leaves per plant (85.37), number of branches per plant (24.77), number of fruits per plant (52.20) and fruit yield (416.35 q/ha) but BRLVAR-15 gave maximum plant height (101.63 cm). BRRVAR-6 recorded the least number of seeds per fruit.

Kumar *et al*. (2018) reported highest marketable fruit yield per hectare in 2016/BRLVAR-3 (663.07 q/ha) followed by 2014/BRLVAR-1 (567.00 q/ha) and 2014/BRLVAR-4 (545.10 q/ha). The maximum fruit yield per plant was found in 2016/BRLVAR-3 (3.73 kg) followed by 2014/BRLVAR-1 (3.19 kg), and 2014/BRLVAR-4 (3.07 kg). The maximum number of flowers per cluster were observed in Punjab Sadabahar (4.06) followed by 2016/BRLVAR-4 (3.96).

Sadarunnisa *et al.* (2018) evaluated the performance of fifty genotypes of brinjal for yield, quality and resistance to bacterial wilt. The number of flower clusters per plant highest in genotype A7 (29.20), the number of flowers per cluster highest in A23

(4.93), number of fruits per plant recorded maximum in A42 (39.07), maximum fruit yield per plant in A19 (2104.50 g). A5 recorded the highest ascorbic acid content (9.11 mg/100g) and the genotype A48 recorded the lowest incidence of bacterial wilt (1.33%).

Syed *et al*. (2018) evaluated fifty genotypes of brinjal for yield, quality and resistance to bacterial wilt. Results showed highest number of fruits per plant were recorded by the genotype A42 (39.07) and the genotype A19 (2.50 kg) gave maximum fruit yield per plant. A5 recorded highest ascorbic acid content (9.11 mg/100g) and genotype A48 recorded the lowest incidence of bacterial wilt (1.33 %).

Umesh *et al*. (2018) reported that sixteen brinjal genotypes showed significant variation in physical fruit and yield characters. The genotype Arka Shirish recorded significantly the highest fruit length (18.50 cm) and R-2581 showed the highest fruit girth (184.75 mm). The highest fruit weight was reported by the genotype R-2581 (60.50 g). Days to first flowering and minimum number of days to 50 per cent flowering were observed in Swarna Shyamli (42 and 56.5 days respectively).

Vhankhande and Singh (2018) evaluated nineteen genotypes of brinjal and reported the mean performance of the genotypes and revealed a wide range of variability for all the traits. The variation was highest for the number of leaves (118.13 to 245.53 per plant), followed by fresh fruit weight (63.94 to 170.39 g), plant height at final harvest (61.90 to 124.17 cm), fruit yield per hectare (47.26 to 78.97 q/ha), days to first fruit set (41.80 to 54.93 days) and days to 50 per cent flowering (31.33 to 42.00 days).

Konyak *et al*. (2019) reported that the genotype IIVR-7 gave the maximum plant height (108.73 cm), branches per plant (22.5), highest number of fruits per plant (33.83), maximum yield per plant (3846.58 g), maximum yield per plot (12.93 kg) and maximum projected yield per hectare (399.12 q/ha) were recorded in genotype IIVR-31. Shortest crop duration (33 days) was recorded by the genotype IIVR-21.

Singh *et al*. (2019) conducted performance studies with eight varieties of brinjal grown under two different growing conditions *viz.,* poly-tunnel and open field. Results revealed that the plant height was highest in the Sharapova variety, followed by Shyamal, while the highest number of leaves and number of branches were recorded in the Shyamal variety, followed by Purple Round. The number of fruits per plant was highest in White Long followed by Shyamal. The variety Shyamal performed best for yield and most of the yield parameters followed by Sharapova.

Srivastava *et al*. (2019) evaluated the thirty five genotypes and revealed highest number of fruits per cluster (2.50) and days to last harvest (157.67) in genotype IC-136231. The genotype IC-136311 recorded lesser number of days for the first harvest (51.67 days), IC-136196 for maximum fruit length (16.90 cm) and IC-136184 registered the highest values for fruit width (6.49 cm).

Akter and Rahman (2020) evaluated twenty two genotypes of eggplant and revealed that among the genotypes, Local-5 (White Round) produced the highest fruit yield per plant (3.89 kg) and per hectare (64.85 t) followed by BARI Begun-2 (3.69 kg/plant and 61.50 t/ha) and BARI Begun-4 (3.20 kg/plant and 53.26 t/ha). Infested fruit varied from (8.06% to 24.16%) where maximum infestation (24.16%) was observed in Local-9 (White Long)) and minimum infestation (8.06%) was observed in BARI Begun-6.

Arti *et al.* (2020) studied the performance of fifty genotypes of brinjal and revealed that all these fifty brinjal genotypes showed significant variation in growth and yield attributing characters. Maximum fruit yield per plant was observed in PBH-3 (1.180 kg) closely followed by another five genotypes namely PBHR-42 (1.120 kg), SR-312 (1.063), Punjab Barsati (1.000 kg), UHF BRL-4 (0.997 kg) and SR-333 (0.997 kg).

Bhambure *et al.* (2020) investigated the performance of F_6 progenies of brinjal under Konkan agro climatic condition. Their studies showed highest plant height was reported in the treatment T_{11} (94.21 cm), maximum number of primary branches was reported in the treatment T_9 (8.27), lowest days for initiation of flowering (30.3 days) as well as days to 50 percent flowering (34.33 days) was observed in treatment T_3. Whereas, treatment T_2 was showed highest per plant yield (3.12 kg) as well as yield per hectare (80.64 t).

Devi and Kanaujia (2020) evaluated the performance of eighteen genotypes of brinjal and the results revealed maximum number of leaves per plant (85.37), number of branches per plant (24.77), number of fruits per plant (52.20) and fruit yield (416.3 q ha^{-1}) in BRLVAR-12. Maximum plant height (101.6 cm) reported in BRLVAR-15 and BRLVAR-13 genotype recorded maximum leaf area index (3.34), fruit diameter (7.89 cm), fresh weight of fruit (299.5 g) and Vitamin C content (8.57 mg/100g). The genotype BRRVAR-6 exhibited least number of seeds per fruit while highest TSS was found in Azad Brinjal (5.19^0B).

Gotame *et al.* (2020) evaluated eight eggplant genotypes and the results of the on-station experiment showed that genotype PS-1 was the earliest maturing genotype and was harvested at 56 days after transplanting. The number of fruits per plot (9 m^2 area) was 189 in Arka Keshav followed by HRDBRI-012 (180) and PS-1 (179). The number of marketable fruits per plot (9 m^2) was highest in Lalgulab (166) followed by PS-1 (152). The fruit yield was recorded as the highest in PS-1 (25.8 t/ha). In the farmer's field, the highest marketable fruits per plot were produced from PPL followed by Pusa Kranti and PS-1.

Nikitha *et al.* (2020) assessed thirty three brinjal genotypes for yield related parameters. The results revealed that the genotype IC-136182 was superior for yield characters *i.e.,* yield per plant (2.39 kg/plant) and marketable yield per plant (1.16 kg) and IC-136366 recorded the highest plant height (104 cm).

Paridha *et al.* (2020) evaluated thirty five brinjal genotypes and reported considerable variation among the genotypes for various growth, flowering, harvesting and yield attributes. Utkal Anushree and Teispur Long were identified as good yielders. Pusa Purple Long, Pusa Ankur, Pusa Upkar, Pusa Anupam and Local-2 genotypes were found as early types.

Rajatha *et al.* (2020) investigated twelve brinjal genotypes and reported wide variation for plant height, it was higher in cultivar Arka Kusumakar (144 cm) and lower in FMLCOHB (27 cm). Fruit length varied significantly from (31.1 cm) in Arka Anand to (8.0 cm) in Brinjal Green Round. Similarly higher fruit diameter was recorded in the genotype FMLCOHB (16.2 mm). Whereas, lower was noticed in the genotype Arka Nidhi (4.7 mm).

Sahana *et al*. (2020) studied the performance of fourteen advanced breeding lines of green long brinjal. The results revealed highest yield (836.11 g/plant) in genotype 170-9-26. The genotype 46-6-4 (36.70 days) was the earliest for days to first flowering. Nine (46-3-32, 46-3-35, 170-11-1, 170-11-11, 170-9-11, 170-9-30, 170-9-15, 170-9-19, 170-19-26) lines were resistant to bacterial wilt disease.

Tripathy *et al*. (2020) assessed the performance of fifty two local landraces of brinjal and revealed that the average fruit weight varied significantly among the genotypes from (50.85 g) BBSR-114 to (233.97 g) Jammusahi Local. Incidence of wilt revealed significant variations among local landraces which varied from (0.00%) in BBSR-08-2 to (22.76%) Dhenkanal Local. Total fruit yield per plant varied significantly ranging from (865.80 g) BBSR-195-2 to (3045.70 g) selection from BBSR-192-1.

Abdul *et al.* (2021) evaluated nine brinjal genotypes. The results showed that the genotypes CB-27, CB-41 and CB-1 showed lowest bacterial wilt incidence ranging from 2.7 to 4.5 per cent and minimum mean infestation of shoot borer ranging from 2.92 to 3.97 per cent with significantly higher fruit yield. These genotypes *viz.,* CB-1 (egg shaped & purple fruit), CB-27 (oblong & purple fruit) and CB-41 (oblong & light green fruit) could be recommended for commercial cultivation in the state of Jharkhand and adjoining areas of the similar agro-climatic conditions.

Alam *et al.* (2021) evaluated five brinjal germplasm collections for yield and yield contributing attributes and reported significant variations for all the parameters. Round purple brinjal (V1=Mte2) had the highest fruit weight (238.60g) followed by long red purple brinjal (V2=H117) with 167.50g, long green brinjal (V3=H249) with

119.70g and the lowest fruit weight (28.30g) was found in V4 (Telunjuk), red purple brinjal (V2) was the longest (24.23 cm) with 5.60 cm in diameter, but the highest fruit diameter (12.24 cm) was recorded in V3 brinjal. Long red purple brinjal (V2) showed the shortest days to 50 per cent flowering with 49 days. The highest total leaf chlorophyll content was detected in V5 (51.02 nmol/mg) while the lowest (44.06 nmol/mg) was in V3.

Nanthakumar and Savitha (2021) conducted research to identify the yield performance of non-spiny brinjal variety VRM (Br) 2. The results revealed that VRM (Br) 2 recorded the highest fruit yield (46.35 t/ha) as compared to check variety VRM (Br) 1 (32.85 t/ha).

Praneetha *et al*. (2021) evaluated 174 brinjal accessions and revealed that among the evaluated accessions, the Acc-EC 490062, Acc-EC 144139-D and Acc-IC 344646 were identified as the best performers as they showed favorable effects for earliness to flowering and harvest, number of fruits per plant and yield. The maximum marketable yield per plant (3.46 kg) was registered by the Acc-EC 490062 followed by Acc-EC 144139-D (3.80 kg) and Acc-IC 344646 (3.64 kg).

Saikia *et al.* (2021) evaluated thirty genotypes of brinjal and revealed that among the thirty genotypes, eighteen genotypes *viz.,* Kuchia, Brinjal-3, Khoruah-1, Brinjal-6, Brinjal-8, Brinjal-4, Seujia Bengena, Brinjal-1, Brinjal-9, Brinjal-2, Brinjal Long, Green Long, Boga Bengena, Kajala, Sagolishingia, Long Khoruah, Brinjal-7 and Koni Bengena were found to be the superior performers for fruits per plant, primary branches per plant, days to first flowering, days to 50 per cent flowering and fruit yield during Kharif.

Bisht *et al*. (2022) conducted an experiment to assess the performance of brinjal germplasm under organic conditions. Results revealed that the genotypes PB-109, PB-111, Pusa Anupam and Pusa Purple Cluster are comparatively higher yielder with lowest fruit borer infestation and may be suitable for cultivation with organic or low input agriculture.

Patel and Chaurasiya (2022) evaluated brinjal genotypes and revealed that the genotype Kashi Taru had the best total fruit yield per hectare (555.84 q) followed by Pant Samrat (272.57 q). The genotype Kashi Taru also found to be highest value for fruit yield per plant (1.70 kg), marketable fruit yield (522.33 q/ha), fruit length (18.55), days to first flowering in plant (27.33 days), days to 50 per cent flowering in plant (38.00 days), number of pickings. The genotype Green Long recorded highest number of flowers per cluster (4.89). While, highest number of fruits per plant, fruits per cluster were recorded in genotype Indira Safed Baigan (2.86).

Sahu *et al*. (2022) evaluated twelve varieties of brinjal and indicated that plant height (80.27 cm), number of branches per plant (20.20) and number of leaves per plant

(70.13) were found maximum in the variety Kashi Taru. Yield contributing characters *i.e.,* days to first fruit harvesting (56.43 days), fruit length (36.92 cm), fruit shape index (2.11), pedicel length (6.57 cm) were found maximum in variety Niranjan Baigan and average fruit weight (125.63 g), number of fruits per plant (28.17), fruit yield per plant (2.37 kg), fruit yield (39.02 kg/plot) and fruit yield (60.62 t/ha) were found maximum in Kashi Taru.

Lohani *et al.* (2023) evaluated six genotypes of brinjal and reported that the number of fruits per plant (21.56), yield per plant (933.97 g) and yield per hectare (33.24 mt ha^{-1}) were found maximum in Tanahun Collection followed by Pokhara Lurkee. The longest fruit (16.07 cm) was found in Pokhara Lurkee. Though Tanahun Collection performed better in yield, Pokhara Lurkee was preferred by the farmers and consumers of Gandaki province due to long cylindrical shape and its purple color.

Manogna *et al*. (2023) investigated mean performance of eighteen brinjal genotypes and revealed that the genotype, Pusa Purple Long had highest fruit yield per plant (2.12 kg/plant) followed by Sabour Sadabahar (1.52 kg/plant), Green Long (1.17 kg/plant) and Black Beauty (1.15 kg/plant).

Verma *et al.* (2023) assessed the performance of thirty-four genotypes of brinjal and revealed that BUB-18-27 exhibited the best yield potential followed by BUB-18-12, BUB-18-4, BUB-18-24 and BUB-18-20. BUB-18-27 was also found best with respect to average fruit weight, total soluble solids, fruit diameter, fruit circumference, number of primary branches and leaf area index. The genotypes BUB-18-20 recorded lowest value for days to 50 per cent flowering and days to first fruit harvest.

2.2. Studies on genetic variability, heritability and genetic advance

The successful outcome of any crop improvement programme depends on the genetic variability existing in the available genotypes, which may be either due to the genetic constitution of the cultivars or variation in the growing environment. Variability may be defined as the amount of variation present among the members of population or species for one or more characters at phenotypic or genotypic level. A comprehensive summary method for estimating genetic variance was presented by Cockerham (1963), where phenotypic variability is observable and includes both genotypic and environmental variation and therefore, also called as total variation. While, genotypic variation refers to genetic or inherent variability, which remains unaltered by environmental conditions. It is measured in terms of genotypic variance and consists of additive, dominance and epistatic components. Environmental variance is measured in terms of error mean variance. Genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) are derived from variance divided by mean and are used to assess the extent of variation.

Effectiveness of selection of genotypes depends on heritability. Heritability is the transmissibility of characters from parent to off-spring. Heritability in broad sense is the ratio of genotypic variance to total phenotypic variance generally expressed in percentage. Knowledge regarding heritability assists plant breeders to forecast the nature of the progeny, creating a proper selection and evaluating the expansion of genetic advancement through selection (Khatun *et al.,* 2015). Genetic advance (GA) is an improvement over the base population that can be potentially achieved from selection and a function of heritability of trait the breeder uses. High heritability accompanied with high genetic advance indicates the predominance of additive gene effects and selection may be effective. When low heritability is accompanied with low genetic advance, it indicates predominance of environmental effects and selection would be ineffective. High heritability with low genetic advance indicates the importance of non-additive gene action, high heritability is being exhibited due to favorable influence of environment rather than genotype and selection for such traits may not be rewarding. While, low heritability with high genetic advance reveals that the character is governed by additive gene effects. The low heritability is exhibited due to high environmental effects and selection may be effective in such cases. The nature and extent of variation, heritability, genetic advance and genetic advance as per cent of the mean (GAM) for different characters of brinjal and related crops as reported by various researchers are summarized.

Karibasava *et al.* (2010) evaluated sixty-one genotypes and revealed high genotypic and phenotypic variance for plant height, number of fruits per plant, yield per plot and yield per hectare. High values of genetic advance as per cent over mean coupled with high heritability was observed for characters like fruit length, number of fruits per cluster, number of fruits per plant, total yield per plant, yield per plot, yield per hectare and fruit length-diameter ratio.

Muniappan *et al.* (2010) revealed high PCV and GCV for characters *viz.*, number of branches per plant, fruit length, fruit breadth, number of fruits per plant, average fruit weight and fruit yield per plant. All the characters were accompanied by high heritability and high genetic advance except for days to 50 per cent flowering.

Ansari *et al*. (2011) evaluated thirty brinjal genotypes and observed high GCV and PCV for number of flowers per inflorescence, number of fruits per picking and fruit girth, moderate for number of fruits per cluster, average fruit weight, the total number of fruits per plant and fruit length. High heritability with high genetic advance was observed for average fruit weight and the total number of fruits per plant.

Dhaka and Soni (2012) studied genetic variability in twenty diverse brinjal genotypes and reported that average fruit weight showed the highest PCV and GCV closely followed by yield per plant. The maximum heritability was observed for number of fruits per plant and average fruit weight. The genetic advance as per cent of mean was high for average fruit weight, yield per plant, number of fruits per plant and number of leaves per plant. High GCV and heritability coupled with high genetic advance were observed for yield per plant followed by number of fruits per plant.

Karak *et al.* (2012) evaluated seventy genotypes of brinjal and revealed that genetic advance as a per cent of mean was high for mean leaf area followed by leaf area per plant and leaves per plant. Heritability was high for fruit yield and other fruit characters except for fruit weight.

Kumar *et al*. (2012) evaluated thirty three local types of brinjal and revealed high estimates of PCV and GCV for the characters like number of primary branches per plant, internodal length, average fruit weight, number of fruits per plant and fruit yield per plant. The high estimates of heritability coupled with high genetic advance as per cent of mean was observed for number of primary branches per plant, internodal length, fruit length, average fruit weight, ascorbic acid content, number of fruits per plant and fruit yield per plant.

Shekar *et al*. (2012) reported high PCV and GCV for characters like number of fruits per plant, fruit length, fruit diameter, fruit yield per plant, fruit yield per plot and fruit yield per hectare. Almost all the characters exhibited high heritability except for plant height. The high genetic advance as per cent of mean was observed for almost all the characters except for days to first flowering, days to first picking and plant height.

Kumar and Arumugam (2013) reported high PCV and GCV for fruit length, calyx length, number of fruits per plant, little leaf incidence, total phenol content and fruit yield per plant. The characters *viz.,* fruit length, calyx length, number of fruits per plant, little leaf incidence, total phenol content and fruit yield per plant recorded a high heritability coupled with high genetic advance as per cent over mean in brinjal.

Lokesh *et al.* (2013) evaluated sixty brinjal germplasm lines and revealed high PCV and GCV values for plant height, plant spread, number of branches per plant, number of fruits per cluster, average fruit diameter, average fruit weight, shoot and fruit borer incidence on shoot and fruit and fruit yield per plant. High heritability accompanied with high genetic advance as per cent over mean was noticed for plant height, plant spread, average fruit weight and shoot and fruit borer incidence on the shoot.

Manpreet *et al.* (2013) revealed high PCV and GCV for traits like fruits per plant, fruit weight, pseudo short style flowers, long style flowers, short style flowers, medium style flowers, flowers per inflorescence, fruit setting per cent and fruit length in brinjal. Heritability and genetic advance were also high for all these traits. Hence, it could be concluded that improvement by direct selection in eggplant was possible for these traits.

Prabakaran *et al*. (2013) evaluated thirty three eggplant genotypes and recorded high PCV and GCV for number of primary branches per plant, number of long-styled flowers per plant, fruit length, number of fruits per plant, average fruit weight and fruit yield per plant. High heritability coupled with high genetic advance as per cent over mean was observed for the characters like plant height, number of primary branches per plant, fruit width, average fruit weight, number of fruits per plant, fruit yield per plant and total phenol content.

Chaudhary and Kumar (2014) assessed sixteen brinjal genotypes and reported high PCV and GCV for number of flowers per plant, fruit yield per plant, yield per plot, yield per hectare and the average fruit weight. High heritability coupled with high genetic advance as per cent over mean was observed for fruit weight, fruit yield per plant, leaves per plant, fruit length, yield per plot, yield per hectare and total reducing sugars indicating that the characters are governed by additive gene action.

Mili *et al.* (2014) evaluated thirty six different genotypes of brinjal and revealed high GCV for individual fruit weight, fruit diameter, seed yield per fruit, pulp to seed ratio, total fruit yield per plot, number of fruits per plant, fruit yield per plant and fruit length. High heritability coupled with high genetic advance was observed for characters like seed yield per fruit, individual fruit weight, fruits per plant, total fruit yield per plot and fruit diameter.

Pallavi and Sanjay (2014) reported that the analysis of variance indicated prevalence of sufficient genetic variation among sixteen genotypes of brinjal for different characters studied. High PCV and GCV were observed for number of flower clusters per plant, fruit yield per plant, yield per plot, yield per hectare, the average weight of fruits. High heritability coupled with high genetic advance was observed for fruit weight, fruit yield per plant, leaves per plant, fruit length, yield per plot, yield per hectare and total reducing sugars indicating that the characters are governed by additive gene action.

Solaimana *et al.* (2014) evaluated thirty five varieties of brinjal and found significant variation among them for all the characters. Results revealed high phenotypic coefficient variation for number of branches, fruit weight and the number of fruits per plant. High heritability coupled with high genetic advance was observed for single fruit weight.

Madhavi *et al.* (2015) evaluated twenty one eggplant genotypes for plant growth development and fruit yield related characters and reported high PCV, GCV, heritability and genetic advance as per cent over mean for the characters like number of fruits per plant, average fruit weight, fruit yield per plant, fruit volume, fruits per cluster, number of pickings, flowers per cluster, fruit diameter and dry matter content.

Rad *et al*. (2015) evaluated nine advanced lines of brinjal and reported that there was a significant difference between the studied cultivars in terms of average fruit weight, fruit length, fruit diameter, the ratio of fruit length to its diameter, the relative number of seeds per fruit and yield per plant. The high heritability was observed for fruit weight, fruit length and number of seeds per fruit.

Shende *et al.* (2015) conducted genetic variability analysis in brinjal. The results revealed high heritability coupled with genetic advance as per cent over mean for the characters like fruit yield per plant, number of fruits per plant and average fruit weight revealed that the presence of lesser environmental influence and prevalence of additive gene action in their expression.

Vidhya and Kumar (2015) conducted an experiment on genetic variability studies in thirty brinjal genotypes for eleven traits and reported high GCV and PCV for fruit girth followed by the number of fruits per plant. The high heritability and high genetic advance as per cent over mean have been observed for fruit girth, single fruit weight and marketable yield per plant indicating the presence of additive gene action.

Mangi *et al.* (2016) investigated sixty brinjal genotypes. They reported high magnitude for GCV and PCV for characters *viz.,* number of primary branches, number of fruits per cluster, average fruit weight, fruit length to diameter ratio, total number of fruits per plant and total yield per plant. While, heritability coupled with genetic advance over mean (GAM) was also recorded highest for characters *viz.,* plant height, days to first flowering, number of fruits per cluster, fruit length, fruit diameter, average fruit weight and total yield per plant.

High phenotypic and genotypic coefficient of variation was observed for fruit diameter, number of seeds per fruit, fruit weight, leaf blade length and width and height at flowering. In addition, genetic and phenotypic variances were high for the number of seeds, fruit weight, plant height at flowering and days to 50 per cent flowering. High heritability and high genetic advance as per cent over mean estimates were recorded for all traits in brinjal. (Sawadogo *et al.,* 2016).

Singh and Durendra (2016) studied genetic variability in brinjal indicated good amount of genetic variation in germplasm. PCV and GCV of higher order for average fruit yield, fruit weight, number of fruits per plant, fruit length and fruit width. High heritability and high genetic advance were observed for average fruit yield per plant and fruit weight indicating the participation of additive genetic variance.

Harishbabu *et al.* (2017) studied genetic variability, heritability and genetic advance in eggplant genotypes under normal and osmotic stress in the in-vitro condition. Analysis of variance was found to be highly significant in both the conditions for all traits indicating the availability of enormous variability. A high range of variation and high heritability coupled with high genetic advance was recorded for most of the traits. It shows the broad genetic base and less environmental influence, which specifies the predominance of genetic factor controlling variability. Hence, early generation selection schemes would be effective for improvement.

Koundinya *et al.* (2017) reported that the characters exhibited high PCV and GCV for number of fruits per plant, fruit weight, harvest index, fruit yield per plant, anthocyanin in peel and total phenols. High heritability coupled with high genetic advance as per cent of mean was observed for the characters like plant height, days to first flowering, number of fruits per plant, fruit weight, fruit yield per plant, total sugars, anthocyanin in peel and total phenols depicting that these traits were under the influence of additive gene action and hence simple selection for these traits would be more effective to improve yield in brinjal.

Nilakh *et al.* (2017) reported that the characters such as number of branches per plant, days to first flowering, days to 50 per cent flowering and fruit length showed comparatively higher estimates of PCV and GCV. The characters days to initiation of flowering and fruit yield per plant showed higher estimates of heritability coupled with high genetic advance as a per cent of mean indicating influence of additive gene action for the above characters.

Ravali *et al.* (2017) evaluated thirty five accessions of brinjal and revealed high PCV and GCV for the characters like number of fruits per cluster, number of fruits per plant, fruit length, fruit width, average fruit weight, fruit yield per plant and total phenol content. High heritability accompanied by high genetic advance as per cent over mean was noticed for days to first flowering, number of flower clusters per plant, number of flowers per cluster, number of fruits per cluster, number of fruits per plant, fruit length, fruit width, average fruit weight, fruit yield per plant and total phenol content.

Sujin *et al.* (2017) evaluated sixty genotypes of brinjal and revealed maximum phenotypic and genotypic coefficient of variation for fruit yield per plant followed by fruit weight, fruit girth, number of fruits per plant and shoot and fruit borer incidence. High heritability along with high estimates of GCV, genetic advance and genetic gain were observed for fruit yield per plant, fruit weight, number of secondary branches per plant and shoot and fruit borer incidence.

Banerjee *et al.* (2018) evaluated thirty eight genotypes of brinjal and revealed high GCV for fruit length, fruit diameter, number of fruits per plant, fruit weight and marketable yield per plant. The characters like fruit length, fruit diameter, fruit weight and number of fruits per plant showed high heritability along with high genetic advance as per cent over mean which indicated inheritance of those characters is controlled mainly by additive genes and selection based on phenotypic performance may prove useful.

Gupta *et al.* (2018) evaluated thirty two genotypes of brinjal and revealed high magnitude of variability for marketable fruit yield per plant followed by fruit circumference, average fruit yield, primary branches per plant and total fruit yield per plant. High heritability coupled with high genetic advance as per cent over mean was recorded for fruit circumference, average fruit weight, primary branches per plant, number of fruits per plant and marketable fruit yield per plant indicating opportunity for direct selection.

Kanaujia *et al.* (2018) evaluated eighteen genotypes of brinjal and reported high PCV and GCV for number of fruits per plant (79.71 and 77.47 %) followed by fruit yield per plant (67.23 and 65.49 %). High heritability coupled with a high genetic advance as per cent over mean was registered for yield per plant followed by the number of fruits per plant, fruit length, number of branches per plant, fruit weight and fruit diameter.

Singh *et al.* (2018) assessed twenty genotypes of brinjal and stated that PCV was generally higher than the GCV and the highest genotypic coefficient of variation was recorded for fruit yield per plant followed by average fruit weight and the number of fruits per plant. All these characters also recorded high heritability and genetic advance as per cent over mean which indicating the presence of additive genetic variance.

Shilpa *et al.* (2018) assessed variability in eighteen genotypes of brinjal for nineteen quantitative characters and revealed high GCV and PCV for fruit dry matter per cent, fruit yield per plant, fruit yield per hectare, fruit yield per plot, plant height and days required for first flowering. High heritability (>60 %) coupled with high genetic advance as per cent over a mean (>20 %) were recorded for the characters *viz.,* plant height, days required for first flowering, fruit length, fruit diameter, number of fruits per plant, fruit yield per plant, fruit yield per plot, fruit dry matter per cent and fruit protein per cent.

Tirkey *et al.* (2018) studied genetic variability in eighteen genotypes for fourteen different characters and revealed high heritability in the broad sense along with high genetic advance in per cent of mean for fruit length, single fruit weight, and plant height at 60 days after transplanting. High GCV was recorded for the characters like number of fruits per plant, fruit yield per plot and PCV for the number of fruits per plant which was followed by fruit yield per plant.

Vhankhande and Singh (2018) evaluated nineteen genotypes of brinjal and stated high GCV and PCV for fresh fruits weight followed by the number of fruits per plant, fruit length and number of leaves per plant. The high values of GCV suggested greater genotypic variability among the genotypes and responsiveness of the attributes for making further improvement by selection. High heritability coupled with high genetic advance as per cent over mean was observed for the traits like fresh fruit weight followed by the number of fruits per plant, fruit length and the number of leaves per plant.

Ashish *et al.* (2019) evaluated twenty eight hybrids and stated high heritability in broad sense for average fruit weight, high genetic advance in per cent of mean was observed for diameter of fruit followed by average fruit weight. High genotypic coefficient of variation (GCV) was recorded for diameter of fruit followed by fruit index and phenotypic coefficient of variation (PCV) for diameter of fruit followed by average fruit weight.

Jirankali *et al.* (2019) evaluated a hundred genotypes and stated highly significant differences among genotypes for fifteen out of nineteen characters studied. High estimates of PCV, GCV and heritability coupled with high genetic advance were observed for fruit weight, number of fruits per cluster and shoot and fruit borer infestation. Hence indicating high variability for these traits and direct selection for these traits may be effective.

Kumar *et al.* (2019) evaluated sixty four genotypes of brinjal and reported that in the year Y_1, a high estimate of heritability in narrow-sense was recorded for fruit length and fruit circumference. In the year Y_2, a high estimate of heritability in narrow-sense was recorded for fruit length followed by fruit circumference, leaf width and dry matter content. In the years Y_1 and Y_2 high estimate of genetic advance in per cent of mean (>20 %) was observed for average fruit weight.

Magar *et al.* (2019) evaluated fifty F_4 progenies of brinjal and reported that the magnitude of the genotypic variance was greater than the environmental variance for most of the characters except for days to the last harvest, days to first harvest and harvesting span. High heritability values were obtained for most of the characters studied except for days to the last harvest, days to the first harvest and harvesting span. The highest estimates of genetic advance accompanied by higher heritability were observed for the character average fruit weight.

Pramila *et al.* (2019) evaluated thirteen parents along with thirty hybrids for yield attributing characters and reported high PCV for the character number of unmarketable fruits per plant (44.07 %), whereas high GCV was recorded for number of marketable fruits per plant (40.37 %). High heritability coupled with high genetic advance as percent of mean was recorded for total number of fruits per plant (67.99 %).

Saha *et al.* (2019) evaluated twelve genotypes for ten quantitative characters and reported that PCV was found slightly higher than the GCV, which suggested the influence of the environment on the variability of these traits. Characters with a lower difference in GCV and PCV value could be improved by following phenotypic selection. Broad-sense heritability, coupled with moderate to low genetic advance was recorded in fruit length, average fruit weight, plant height and days to maturity.

Shruti *et al.* (2019) evaluated sixty brinjal genotypes for different characters and noted that moderate PCV with low GCV was observed in plant height at 90 DAT, number of primary branches per plant at 90 DAT, stem girth at 90 DAT and leaf area. Fruit weight, number of fruits per cluster and fruit girth had reported moderate PCV with GCV, while number of fruits per plant, fruit length, fruit yield per plant and phenols showed high PCV with GCV. High heritability (>60 %) estimates along with high GAM (>20 %) was noted for all characters.

Srivastava *et al.* (2019) studied the genetic variability among thirty five genotypes of brinjal and revealed high PCV and GCV for fruit weight, fruit length, number of fruits per cluster, fruit yield per plant, shoot and fruit borer infestation, total phenol content. The expected genetic advance as per cent over mean was observed to be high for fruit length, fruit weight, fruit yield per plant, number of fruits per plant, shoot and fruit borer infestation and number of fruits per cluster. Whereas, moderate for fruit width, ascorbic acid content and number of flower clusters per plant.

Akter and Rahman (2020) evaluated twenty two genotypes of eggplant and revealed high genotypic and phenotypic coefficients of variation for the number of fruits per plant, single fruit weight, weight of fruits per plant, fruit length and breadth and yield per hectare. Heritability and genetic advance were also high for these parameters demonstrating the possibility of selection to improve these characters.

Chithra *et al*. (2020) reported high genotypic co-efficient of variation and phenotypic co-efficient of variation for the number of primary branches and number of fruits per plant. High heritability coupled with high genetic advance as per cent of mean was observed for plant height, number of primary branches, plant spread from North to South, plant spread from East to West, fruit length, fruit diameter, average fruit weight, number of fruits per plant, fruit yield per plant and total soluble solids indicating that these characters are governed by additive gene action. Hence, direct selection may be followed for the improvement of brinjal by assessing these characters.

Devaraju *et al.* (2020) evaluated thirty genotypes of brinjal. Highly significant differences were observed among the genotypes studied. High phenotypic and genotypic coefficient of variation was observed for flowers per cluster, fruits per cluster, per cent fruit set, fruits per plant, fruit length, fruit diameter and fruit yield per plant. High heritability along with high genetic advance in per cent of mean was observed for branches per plant, days to first flowering, days to fifty per cent flowering, flowers per cluster, fruits per cluster, per cent fruit set, fruits per plant, fruit length, fruit diameter and fruit yield per plant suggesting that these can be improved through direct selection due to predominance additive gene action.

Konyak *et al.* (2020) evaluated forty six brinjal genotypes for their growth, yield, quality and genetic attributes. High PCV, GCV, heritability coupled with high genetic advance as per cent over mean were found for anthocyanin content, fresh weight of fruit, number of leaves per plant, yield per plant, fruit length and fruit diameter which suggests the predominant role of the additive genetic component in governing of these traits and improvement through simple selection is possible.

Sakriya *et al.* (2020) evaluated 180 genotypes of brinjal to study the genetic variability, heritability and genetic advance for thirteen different characters. Highly significant differences were observed among all the genotypes and characters except for days to last picking. The high PCV was observed for fruit yield per plant followed by the number of fruits per plant. High heritability was noticed for fruit length, plant height, plant spread, the number of branches per plant and total soluble solids which indicates the presence of high variability for these traits and offered better scope for improvement through selection.

Sangam *et al.* (2020) evaluated twenty two brinjal genotypes and revealed high GCV and PCV for characters like fruit girth, length of style, the average weight of individual fruit, number of fruits per plant, yield per plant, total yield per hectare, reducing sugars, total sugars and total phenolic content. Heritability and genetic advance as per cent of mean was high for plant height, length of the style, number of primary branches, fruit length, average fruit weight, fruit girth, yield per plant, number of fruits per plant, total yield per hectare and total phenolic content.

Yankanchi *et al.* (2020) reported that the estimate of PCV was high (>20 %) for number of flowers per cluster, fruit length, fruit girth and fruit weight whereas, GCV was high (> 20 %) for fruit length, fruit girth and fruit weight. High heritability (>60 %) coupled with high genetic advance as per cent over mean (>20 %) was observed for number of secondary branches per plant, number of flowers per cluster, number of clusters per plant, number of fruits per plant, fruit length, fruit girth, fruit weight and fruit yield indicating that these traits were governed by additive genes and there is scope for improving these characters with direct selection.

Anbarasi and Haripriya (2021) evaluated 112 genotypes of brinjal and results showed higher values for PCV and GCV for pseudo and true short-styled flowers, fruit setting per cent, fruit yield per plant, seeds per fruit, medium-styled flowers and fruit girth. High heritability was observed for fruit girth, fruit length, fruits per plant, fruit set, average fruit weight and pseudo and true short-styled flowers. High genetic advance as per cent over mean along with high heritability was observed for pseudo and true short-styled flowers, fruit set percentage, and fruit yield per plant.

Balasubramaniyam *et al.* (2021) evaluated fifty diverse brinjal accessions for thirteen characters and revealed high PCV and GCV for fruit yield per plant, number of fruits per cluster, seeds per fruit, individual fruit weight, number of fruits per plant, fruit length, number of flowers per cluster and plant height. High heritability coupled with high genetic advance was recorded for plant height, number of flowers per cluster, number of fruits per cluster, individual fruit weight, fruit length, fruit diameter, number of fruits per plant, seeds per fruit and 100 seed weight exhibiting that the traits are controlled by additive gene action.

Barik *et al*. (2021) evaluated twenty six germplasm accessions for genetic variability and reported high heritability and high GAM for the number of fruits per plant, fruit yield per plant, fruit length, fruit girth, fruit weight and 1000 seed weight. Hence, simultaneous selection of these traits is advised for yield improvement in the brinjal breeding programme.

Datta *et al.* (2021) assessed genetic variability among fifty six eggplant genotypes and reported high heritability and genetic advance as per cent over mean for different traits *i.e.,* fruit length, fruit diameter, fruit girth, fruit length to width ratio, average fruit weight, number of fruits per plant, fruit yield per plant, plant height and number of primary branches per plant. The high value of PCV, GCV, heritability along with high genetic advance was observed for number of fruits per plant, average fruit weight and fruit yield per plant.

Dhaka and Soni (2021) conducted an experiment to assess genetic variability among twenty brinjal genotypes for different characters and revealed that average fruit weight, yield per plant showed the highest phenotypic and genotypic coefficient of variation. Whereas moderate recorded for days to first flowering and days to first picking. High heritability (above 60 %) coupled with high genetic advance was observed for all the characters.

Patil *et al.* (2021) carried out variability studies in F_2 population of brinjal. In this study, the proportion of the genetic contribution of high GCV, PCV coupled with high broad-sense heritability and genetic advance of the studied traits like number of fruits per plant, number of primary branches and number of flowers per plant was high, indicating predominant control of additive genes and these traits could be improved upon by selection without progeny testing.

Prajapati *et al.* (2021) conducted an experiment to assess the genetic variability among nine genotypes of brinjal and revealed high phenotypic and genotypic coefficients of variation for plant height, number of fruits per plant and fruit yield per plant. High heritability coupled with high genetic advance as per cent of mean was observed for plant height, number of branches per plant, number of fruits per plant, fruit length, fruit diameter and fruit yield per plant suggesting that genotypic variation for the characters is probably attributed due to high additive genetic effect and selection would be rewarded based on phenotypic performance.

Sajjan *et al.* (2021) conducted an experiment to assess the magnitude of genetic variability present in F_4 segregating population of the brinjal cross Sarparam Vanga × Harita among 200 plants. The analysis of data revealed the presence of considerable variability for all the characters among the genotypes. High heritability coupled with high genetic advance as per cent over mean was observed for most of the characters studied suggesting that these characters can be improved through direct selection due to the predominance additive gene action.

Begum *et al.* (2022) evaluated 273 accessions of brinjal and reported the significant differences among the genotypes for all the studied characters and revealed high variability among them. The highest GCV, PCV, heritability and high genetic advance were depicted in 100 fresh fruit weight and the number of fruits per plant indicated high variability due to additive genes action which makes it useful in the selection program. Whereas, low magnitude between GCV and PCV was observed in the trait plant spread.

Bisht *et al*. (2022) evaluated forty six genotypes of brinjal and reported that the analysis of variance showed significant variation for all the traits studied. High genotypic coefficient of variation was found for the number of fruits per plant, average fruit weight, marketable yield per plant, yield per plant and total yield per hectare. High heritability coupled with high genetic advance as per cent over mean was found for fruit length, fruit diameter, number of fruits per plant, average fruit weight, marketable yield per plant and total yield per plant indicating inheritance of these traits is controlled by additive genes.

Kumar *et al*. (2022) reported high PCV and GCV for the characters like the number of fruits per plant and fruit yield per plant. The heritability was found high for the characters studied *i.e.,* plant height (96.82 %), days to 50 per cent flowering (99.81 %), fruit length (99.81 %), number of fruits per plant (66.20 %), fruit yield per plant (96.81 %), days to final harvesting (74.80 %). The genetic advance was high for days to final harvesting (21.42 %) and the genetic advance as per cent of mean was high for the characters like days to 50 per cent flowering (25.50 %), fruit length (23.71 %), number of fruits per plant (23.66 %) and fruit yield per plant (59.67 %).

Sharma *et al.* (2022) assessed the variability among thirty brinjal genotypes and reported that both PCV and GCV were high for traits *i.e.,* the number of long-styled flowers, number of short-styled flowers, number of fruits per plant, the girth of fruit, pulp:seed ratio and total phenol content. High heritability accompanied by high genetic advance as per cent of mean was noted for characters leaf area index and seed weight per fruit, indicating the involvement of additive gene action. Therefore, direct selection may be followed for improving brinjal yield by examining these characters.

Chaudhary *et al*. (2023) reported high magnitudes of PCV and GCV for non-reducing sugars and ascorbic acid. Moderate PCV and GCV were recorded for total fruit yield per plant, average fruit weight, reducing sugars, number of primary branches per plant, total phenol content and total sugars. High heritability coupled with high genetic advance in per cent of mean was recorded for ascorbic acid, non-reducing sugars, reducing sugars, total phenol content, total sugars, average fruit weight, number of primary branches per plant, total fruit yield per plant and plant height. Thus, there exists ample genetic variability and as consequence scope of improvement in the available germplasm of brinjal.

Manogna *et al*. (2023) revealed that analysis of variance was highly significant for all the characters under study except for days to 50 per cent flowering. The magnitude of genotypic coefficient of variation was lower than the corresponding phenotypic coefficient of variation for all the characters under test. High heritability coupled with high genetic advance as per cent of mean was recorded in fruit length, fruit weight, number of fruits per plant, shelf life of fruit and fruit yield per plant.

Patel *et al.* (2023) studied genetic variability, heritability and genetic advance for different yield contributing characters in twenty two diverse germplasm of brinjal. The results indicated existence of considerable amount of genetic variability for all the characters studied except for plant spread, plant height and days to 50 per cent flowering. Fruit length, yield/plant and fruit weight exhibited highest values of GCV, PCV, heritability and genetic advance. Thus, these characters can be effectively improved through selection.

Vaishnavi *et al*. (2023) assessed genetic variability in thirty advanced breeding lines of brinjal and indicated that the genotypic coefficient of variation and phenotypic coefficient of variation was high (>20 %) for the number of primary branches at 30 DAT, average fruit weight, whereas, plant height at 30 and 90 DAT, number of primary branches at 90 DAT, stalk length, fruit yield per plot, estimated fruit yield per hectare, dry matter content and fruit phenol content showed moderate GCV and PCV. High heritability coupled with high genetic advance (>20 %) in per cent of mean was recorded high for all characters except for moisture content indicating that these traits are controlled by additive gene action.

Verma *et al*. (2023) assessed twenty four genotypes of brinjal and reported high PCV and GCV for traits *i.e.,* average fruit weight, number of fruits per plant, number of fruits per cluster, number of flowers per cluster, fruit girth and fruit length also showed high heritability coupled with high genetic advance. Traits such as days to first flowering, days to maturity, days to 50 per cent flowering and fruit stalk length exhibited moderate GCV and PCV values.

2.3 Bacterial wilt resistance

Brinjal fruit yield is affected by pests mainly shoot and fruit borer, jassids and thrips and diseases like bacterial wilt, fusarium wilt, phomopsis blight, little leaf, *etc.,* Biotic stress causes damage throughout the growth and reproductive stages. The most of the commercially grown cultivars of brinjal are susceptible to bacterial wilt disease. The first description of *Pseudomonas* E. F. Smith, causing wilt disease of solanaceous plants was reported by Smith (1896). In India the first report on bacterial wilt of brinjal was given by Das and Chattopadhyay (1953) in West Bengal.

Bacterial wilt is a soil borne disease, which is caused by *Ralstonia solanacearum* (Smith) strains. It is classified into five races based on their host range and into five biovars on the basis of differential ability to produce acid from a panel of carbohydrates. Biovar is a variant prokaryotic strain that differs physiologically and biochemically from other strains in a particular species. It was first described in 1896 by E. F. Smith. It has wide range of host like tomato, potato, brinjal, chilli, capsicum, tobacco, ornamentals and weeds. The solanaceous crops are mainly affected by race-1 and race-3.

Bacterial wilt spread by infected soil and debris serve as primary source of inoculum and infected soil, irrigation water and implements serve as secondary source of inoculum. It is a non-spore forming, gram (-) negative bacterium do not retain the crystal violet stain and spread worldwide, in virtually all environments that support life. They are composed of a thin peptidoglycon cell wall sandwiched between an inner cytoplasmic cell membrane and a bacterial outer membrane having single cell with a rod shaped structure and an average size of 0.5 to 0.7 × 1.5 to 2.5 µm.

In brinjal, the disease can bring about total destruction of the crop during rainy season in all brinjal growing areas of Karnataka. In India, the loss in yield due to the bacterial wilt disease in brinjal as high as 80 per cent (Rao, 1976). Kishun (1987) recorded loss in yield ranging from 10 to 90 per cent and plant mortality ranging from 10 to 100 per cent in tomato. Shekhawat *et al.* (1992) reported that, the disease was wide spread, endemic throughout India. However, the disease is more severe in the parts of Kerala, Gujarat, Karnataka, Western Maharashtra, Madhya Pradesh, Eastern plains of Assam and Nicobar islands. In Karnataka, the disease is locally known as Parrya and Bangadiroga. The disease occurs in both Kharif and Rabi seasons and incidence varies from 0 to 98 per cent (Gadewar *et al.,* 1991).

There are different sources of bacterial wilt disease resistant lines have been identified namely *S. melongena, S. torvum, S. sisymbrifolium, S. aethiopicum, S. xanthocarpum, S. toxicarum* and *S. nigrum* (Kalloo, 1994). The resistance depends on the race prevalence in that particular geographical region. The prevalence of races diversity of the pathogen makes very difficult to breed elite resistant lines. This could be due to the lack of sufficient knowledge about genetics of bacterial wilt disease resistance and resistant source. Knowledge of pathogen physiology, pathogenicity, virulence are very essential to develop superior resistant varieties. Investigations on screening against bacterial wilt in brinjal, tomato and other related crops are briefly reviewed as under.

Hussain *et al.* (2005) screened fifteen brinjal accessions in the sick bed pre inoculated with *Ralstonia solanacearum*. They reported that the accession EG-203 was resistant against the bacterium with lowest wilt incidence. The accession EG-193 was moderately susceptible and remaining accessions were susceptible.

Sharma *et al.* (2005) screened 7 parental lines and 23 F_1 crosses of brinjal in bacterial wilt-sick plot. They reported that 2 parents 'Swarna Shyamli' ('CH-249') and 'Swarna Pratibha' ('CH-309') and 1 F_1 cross 'CH-249' × 'CH-792' showed resistant reaction to wilt with plant survival per cent of 81.7, 80.0, and 81.7, respectively. 1 parent, *viz.,* 'CH -792', and 3 F_1 crosses, *viz.,* 'CH-309' ×'CH-381', 'CH-309' × 'CH-249' and 'CH-381' × 'Swarna Mani', showed moderately resistant reaction to wilt with plant survival per cent of 66.7, 66.7 and 68.3 respectively.

Sharma and Kumar (2007) reported that the entries *viz.,* CH-249 (Swarna Shyamali), CH-309 (Swarna Prathiba), BB-64, JC-8, Arka Nidhi and Arka Keshav were found durable and stable in resistance to bacterial wilt. However, Swarna Shree, SM-141 and JC-1 were durable and moderately resistant to this disease, whereas, BB-60 and SM 6-6 showed instability in resistance to bacterial wilt.

Rahman *et al.* (2011) screened the cultivars of eggplant against wilt disease and they reported that, among the eight cultivars *viz.,* Nayantara, Singhnath, Dhundul, Kazla, Marich Begun Luffa, Kata Begun and Uttara at 55 days after transplanting (DAT), the cultivar Luffa exhibits the highest bacterial wilt incidence (80%) and the lowest wilt incidence was recorded in the cultivar Kata Begun (30%).

Bora *et al.* (2011) screened fourteen promising varieties of brinjal and local ones for resistance to bacterial wilt. The study revealed that Utsav exhibited lowest bacterial wilt incidence of 2.23 per cent and 65.80 per cent in the susceptible check Pusa Purple Long.

Dutta and Rehman (2012) conducted an experiment to identify the resistant sources against disease. Few tomato varieties and hybrids were screened in naturally infested farmers' fields at five different locations. The variety All Rounder was recorded as resistant with a mortality of 8.98 per cent, four tomato varieties *viz.,* Swarakhsha, Rakshak, Trishul and Arka Alok were recorded as moderately resistant. Varieties Yash F_1 Hybrid, TO 1458, Hybrid 7610 and F_1 Amulya 1744 were found moderately susceptible and Loknath and Arka Vikash were found highly susceptible.

Guevarra *et al.* (2012) screened accessions of eggplant against wilt disease and reported that among the local accessions tested Mamburao recorded marketable yield ranged from 13.35 t ha^{-1} during the dry season to 16.61 t ha^{-1} during the wet season, it out yielded than the commercial check varieties with resistance to bacterial wilt.

Seven genotypes of brinjal *viz.,* Utkal Anushri (BB 45C), Utkal Madhuri (BB 44), Utkal Jyoti (BB 13), BCB 64, Ayeb 2, Soiler and Muktakeshi (susceptible check) and seven F_2 generations of tomato *viz.,* Cross 7F2P8, Cross 7F2P-1-2, Cross 4F2P4, Cross 3F2P-1-1, Cross 4F2P-3, Cross 8F2P-1-1 and Cross 7F2P3 were screened against bacterial wilt in laboratory conditions. They reported that only three genotypes of brinjal (Utkal Madhuri, Ayeb 2 and Soiler) and two F_2 generations of tomato (Cross-7F2P8 and Cross-8F2P-1-1) showed resistance reaction, which they suggested to utilize in future breeding programme (Mondal *et al.,* 2012).

Bacterial wilt caused by *Ralstonia solanacearum* was the major disease of brinjal in winter under 'Tilla' (hillock) land condition of Tripura during 2003 to 2005. The disease affected all 10 tested brinjal varieties, however, among them, 'Singnath' was the most resistant nearly immune with 0.93 per cent of wilt. The varieties like '88-40', '88-64' and 'Green Round' were the other three resistant genotypes, while, 'Jhum Begun' and 'Pongal Green' were highly susceptible (Subrata and Singh, 2012).

An investigation was carried out by Tiwari *et al.* (2012) to screen the twenty genotypes along with two checks in tomato with respect to bacterial wilt resistance. Among 20 genotypes, Cherry Jaspur showed high resistant reaction (HR); four genotypes *viz.,* ATL-01-19, Pant T-10 and CO-3 recorded moderately resistant reaction.

Eight local brinjal (*Solanum melongena* L.) germplasm were screened against bacterial wilt caused by the pathogen *Ralstonia solanacearum* by Mondal *et al*. (2013). Reported that Midnapore Local and Bhangar were found tolerant to bacterial wilt and also possess marketable qualitative fruit characters which can be exploited by the breeder to develop resistant lines.

Gopalakrishnan *et al.* (2014) screened forty-one eggplant accessions in a sick plot for bacterial wilt resistance and reported that nine accessions *viz.,* IIHR-322, AVT-IIRES-1, AVT-IIRES-2, AVT-IIRES-4, AVT-IIRES-5, IIHR500-A, BPLH-1, IIHR-3 and IIHR-5 showed highly resistant reaction, with no wilting of plants; five accessions *viz.,* RES-2, RES-5, RES-6, 37-36-4-4 and 36-37-13 showed resistance reaction with wilt incidence 3.33-10.0 per cent. Two accessions *viz.,* 36-37-3 and 37-4-20 showed moderately resistant reaction with 11.0 and 12.0 per cent wilt incidence, respectively. While, 22 accessions were moderately susceptible to highly susceptible with wilt incidence ranging from 25.45 to 100.0 per cent.

A study was conducted to evaluate nine accessions of brinjal in Initial Evaluation Trial (IET) and eight accessions in Advance Varietal Trial (AVT) in the wilt sick plot. Among the accessions, Arka Nidhi was found most resistant in IET. In AVT, two entries BEBWRES-05, Arka Nidhi were highly resistant with wilt per cent of 7 and 19 respectively at 120 days interval whereas BEBWRES-2, BEBWRES-4 and SM 6-6 (C) were found moderately resistant with 40 per cent wilt (Kumar *et al.,* 2014).

Pawaskar *et al.* (2014) screened thirty three varieties of chilli for bacterial wilt resistance and reported that eleven varieties were moderately resistant while nine were susceptible, two were highly susceptible and rest others were moderately susceptible.

Nath *et al.* (2015) assessed forty-seven genotypes of tomato for bacterial wilt (*Ralstonia solanacearum*) resistance and reported that highly resistance reaction (HR) was recorded in Konbilahi (*L. pimpinellifolium*) followed by resistance reaction (R) in Sel-35, Sel-19 and Sel-9. These genotypes were considered as a promising breeding material for development of bacterial wilt resistant tomato variety.

Santhosha *et al.* (2015) evaluated forty brinjal genotypes by artificial inoculation using *Ralstonia solanacearum* inoculum at concentration of 1.0×10^8 cfu/ml ($O.D_{600} = 0.3$) and reported that Arka Nidhi, Haritha, Swetha, Surya, IIHR-3, IIHR-555, WCGR, R-2588, WL-2230, L-3261, L-3270, L-3272 and Arka Anand were found to be resistant to bacterial wilt, whereas, IIHR-7, L-3263, L-3268 and L-3269 were moderately resistant. R-2584, R- 2586, R- 2592, L-3260, L-3262, L-3264, L-3266 and L-3267 were moderately susceptible, R-2580, R-2582, R-2587, R-2591, R-2593 and R-2595 were susceptible and R-2581, R- 2594, R-2589, R-2590, WL-2232, Pusa Hybrid-6, Arka Shirish, R-2585 and R-2583 were highly susceptible to bacterial wilt.

Aslam *et al.* (2017) assessed thirty tomato cultivars for their resistance to bacterial wilt and reported that Early King and Lerica were found resistant (R) and four *viz.,* Red Hero, Giant Cluster, Red Ruby and Red Stone showed moderately resistant (MR) reaction. Eleven cultivars showed moderately susceptible and susceptible reactions while two cultivars (Bonny Best and Roma VF) were highly susceptible (HS) to the bacterium.

Munish *et al.* (2017) screened thirty three cross combinations along with standard check 'CH-1'of *Capsicum annuum* L. for resistance against bacterial wilt (*Ralstonia solanacearum*). Data were recorded on ten plants of each genotype for their reaction to bacterial wilt disease. No genotype was found immune. 13 and 11 cross combinations showed 100 per cent plant survival (resistant) while, 15 and 18 cross combinations revealed moderately resistant reaction and rest of the crosses were moderately susceptible/susceptible.

Yadav *et al.* (2017) screened thirty six genotypes of brinjal against bacterial wilt disease which included eight parents and twenty eight F_1 hybrids and they reported that fifteen genotypes were moderately resistant and thirteen genotypes namely (Swarna Pratibha, *Solanum gilo*, Swarna Pratibha × Pant Rituraj, Swarna Pratibha ×

Pusa Purple Long, Swarna Pratibha × BR-112, Swarna Pratibha × CHFB-6, Swarna Pratibha × CHFB-7, Pant Rituraj × CHFB-6, Pant Rituraj × CHFB-7, Pant Rituraj × *Solanum gilo*, BR-112 × CHFB-6, CHFB-6 × CHFB-7 and CHFB-7 × *Solanum gilo*) were found to be resistant against wilt.

Biswas and Ghosh (2018) screened twenty brinjal cultivars against bacterial wilt disease, among twenty, ten were found resistant (R), four moderately susceptible (MS) and six cultivars were found susceptible (S). Variety Blue Star was found to be most appropriate in terms of minimum wilt incidence of 4.53 per cent.

Six elite genotypes of eggplant were screened against bacterial wilt in field conditions and revealed that eggplant genotypes IIHR-7, IIHR-500A and CARI-1 were resistant and can be used for further breeding programme. (Khapte *et al.,* 2018)

Kumar *et al.* (2018) conducted an experiment to screen eleven lines of tomato for bacterial wilt resistance in initial evaluation trail (IET) and advanced varietal trial (AVT) in sick plot. Among the lines, UK Local-2 was resistant while AR-56, AR- 4 and AR-28 showed the wilting population of 11.11, 16.66 and 33.33 per cent, respectively at IET. While, during AVT maximum resistance was observed in AR-4 (no wilting) followed by AR-29 (11.12 % wilted plant) and UK Local-2 (18.27 % wilted plant).

Kumar *et al*. (2018) screened fifty-seven different tomato genotypes against bacterial wilt by artificial inoculation technique under greenhouse condition. The plants showing symptoms were examined using ooze test. Seven tomato genotypes *viz.,* RIL-118, Indam-1004, Arka Samrat, PKM-1, PED, EC-802390 and EC-816105 were found highly resistant to bacterial wilt.

Neelambika *et al.* (2018) evaluated ten pre-breeding lines of F_4 generation of cross Green Long x IIHR-3 along with their parents and checks (Arka Anand and Arka Kusumakar) for bacterial wilt resistance after artificial inoculation. The results revealed that the progenies of cross *viz.,* 12-36-164-7, 12-36-164-10, 12-36-164-11 and 12-36-164-14 showed moderate resistance, whereas, 12-36-46-3, 12-36-46-6, 12-36-164-1, 12-36-170-9, 12-36-170-11 and 12-36-170-19 were resistant.

Bhanwar *et al.* (2019) carried out an experiment to identify the resistant sources against bacterial disease of brinjal varieties and hybrids. Results revealed that the variety Hara Gold Improved and Mukta Keshi found resistant. Eight cultivars (VNR 60, Sakya, Pusa Kranti, Green Round, Super White Long, Pusa Purple Cluster and Grafted Brinjal) were moderately resistant. Remaining five varieties [VNR 212, Navina, Mathy 112, White Gucchedar and Green Long (Pahuja)] were moderately susceptible.

Debanth *et al.* (2019) screened twenty genotypes of tomato. The results revealed that five genotypes found to be highly resistant, eight genotypes were resistant, one genotype was moderately susceptible, one genotype was susceptible and five genotypes were highly susceptible in field condition against bacterial wilt.

Manoj *et al.* (2019) screened thirty accessions of eggplant (*Solanum melongena* L.) in a sick plot for bacterial wilt (*Ralstonia solanacearum*) resistance and reported that IIHR-500A showed maximum resistance with no wilting symptom while eight genotypes showed resistant reaction. Three genotypes showed moderately resistant reaction and another three showed moderately susceptible reaction. The four genotypes were susceptible and eleven genotypes were highly susceptible.

Singh *et al.* (2019) evaluated wild *Solanum* species and cultivated varieties against *Ralstonia solanacearum* by drenching inoculum with concentration of 1.0×10^8 cfu/ml ($O.D_{600} = 0.3$) and disease incidence was recorded. The cultivated varieties IIHR-108, Pusa Purple Long and Rampur Local were identified as susceptible, whereas, IIHR-7 and CARI-1 were identified as resistant to bacterial wilt.

Sanket *et al.* (2020) evaluated eight parental lines along with their twenty-eight F_1 hybrids against bacterial wilt. Among the parents, two parents CHFT-71 and CHFT-50, showed moderately resistant reaction. Single cross, CHFT-71 × CHFT-50 showed resistant reaction and four hybrids namely, CHFT-77 × CHFT-71, CHFT-79 × CHFT-50, CHFT-60 × CHFT-50 and H-86 × CHFT-50 showed moderately resistant reaction and concluded that these parental lines can be utilized for the improvement of varieties and development of wilt resistant F_1's through hybrid breeding programmes.

Sharma *et al.* (2020) screened twenty F_1 hybrids developed through diallel mating design along with parents Res-1, Res-2, H-8, Arka Nidhi and Arka Keshav for bacterial wilt resistance under mid-hill conditions of Himachal Pradesh over the seasons and the observations were recorded on plant survival. The cross combinations were found immune, highly resistant and moderately resistant to bacterial wilt and can be utilized to develop resistant cultivars through crop improvement.

B-Mensah *et al*. (2021) screened thirteen-tomato genotypes for bacterial wilt resistance in screen house and in field and reported that H7996, LA0442 and LA0443 showed low wilt incidence and severity and LA0442 recorded the highest yield. Thus, LA0442 can be used as a parent for developing a resistant and high yielding variety.

Dossoumou *et al*. (2021) evaluated twenty one tomato varieties under poly house and field conditions and reported that Cobra 26 was moderately resistant. The hybrid varieties Buffalo, Petomech, Tropimech, Sumo, Prado, Ninja, Jaguar, Anaya, Topaze, Cobra 34, Heinz, Kiara and Euclid were all susceptible.

Ramesh *et al.* (2021) conducted an experiment to identify resistant lines for bacterial wilt disease by screening. They reported that lines 262-4, 5-12-1, 66-8-1, 205-1, 12-2-4 and 28-8-5 were promising among the purple types (0 to 4 % wilt). Among the green types, lines 5-8-1, 93-8-1 and 92-3-7 were promising (0 to 5 % wilt) and they demonstrated in farmers field and reported that lines 262-4, 5-12-1, 205-1, 5-8-1 and 12-2-4 were least infected (3 to 17 %).

Sabina *et al.* (2023) conducted an experiment to evaluate bacterial wilt resistance among twenty five brinjal genotypes and revealed that Utkal Keshari was highly resistant followed by Utkal Anushree, BB-67, Kanta Bagan and Arka Neelkanth. The variety Hazari Local showed wilt symptoms 50 days after inoculation (2.42 %). Nayagarh spiny brinjal (1.56 %), BB-67 (1.16 %) showed wilt symptoms at 40 days after inoculation. Kanta Bagan (1.86 %), Utkal Jyoti (1.17%), VNR-5 (3.57 %) exhibited wilt symptoms 30 days after inoculation. Dhenkanal Local (1.49 %), Utkal Anushree (1.84 %), Utkal Tarini (3.33 %) showed wilt symptoms 20 days after inoculation.

MATERIAL AND METHODS

III MATERIAL AND METHODS

The present investigation on "Evaluation of advanced breeding lines of brinjal (*Solanum melongena* L.) against bacterial wilt disease" was carried out at the experimental block of Department of Vegetable Science, College of Horticulture, Mudigere, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga, during the period December 2022 to April 2023. The details of the experimental site, basic experimental material, experimental design, procedures followed and collection of data on different traits, statistical tools and analytical procedures used for data analysis are presented in this chapter.

3.1. Geographical location of the experimental site

The experiment was carried out at the College of Horticulture, Mudigere, which is situated in the Western Ghats and represents the typical hill zone (Zone-9 and Region-V) of Karnataka and lies at 13.13° North latitude and 75.63° East longitude with an altitude of 980 m above mean sea level.

3.2 Climatic condition

Mudigere is one of the area which receives heavy rainfall. The total rainfall of the area is 1150 mm which is distributed for six to eight months which was peak from June to September. The average annual maximum temperature was 33.11°C and the minimum was 12.35°C. The average annual maximum relative humidity (99.57 %) and the minimum relative humidity (50.07 %). The meteorological data for the period of experimentation was obtained from the meteorological observatory, Krishi Vigyan Kendra (KVK), Mudigere is furnished in Appendix-I.

3.3 Soil characteristics of the experimental site

The experiment was conducted in red sandy-loam soil. The physical and chemical composition of the soil is exhibited in Appendix-II

3.4 Experimental details

Experiment I: Performance and variability studies in advanced breeding lines of brinjal for growth and yield attributes (field experiment)

Location	College of Horticulture, Mudigere, KSNUAHS, Shivamogga
Design	Randomized Complete Block Design (RCBD)
No. of Genotypes	20 advanced breeding lines along with three checks
Replications	3
Check varieties	Arka Keshav - Long fruit type

	Devanur Local - Long fruit type Arka Neelanchal Shyama - Round fruit type
Spacing	75 cm × 60 cm
Gross Plot size	3.75 m × 3.0 m
Net plot size	2.25 m × 1.8 m
Number of plants per plot	25
Season	*Summer* - 2023

Experiment II: Screening of brinjal lines under low-cost polyhouse (pot experiment)

Location	College of Horticulture, Mudigere, KSNUAHS, Shivamogga
Design	CRD (Completely Randomized Design)
No. of Genotypes	20 advanced breeding lines along with three checks
Replications	3
Check varieties	Arka Keshav- Long- Resistant Devanur Local - Long - Susceptible Arka Neelanchal Shyama - Round - Resistant
Number of plants per pot	2
Pot size	21" (21 inches)
Season	*Summer* - 2023

3.4.1 Experimental design and layout

The Experiment I was laid out in a randomized complete block design and Experiment II in completely randomized design with twenty advanced breeding lines and three checks replicated thrice.

3.5 Cultural operations

The details regarding the various cultural operations carried out during the investigation are furnished below.

N

REPLICATION -1		REPLICATION -2		REPLICATION -3	
T_1	T_{11}	T_3	T_{13}	T_9	T_{16}
T_2	T_{13}	T_1	T_{10}	T_3	T_{17}
T_3	T_{16}	T_2	T_{18}	T_{13}	T_4
T_4	T_{17}	T_5	T_{16}	T_{11}	T_{20}
T_5	T_{18}	T_6	T_{26}	T_8	T_1
T_6	T_{19}	T_4	T_{23}	T_{26}	T_5
T_7	T_{20}	T_9	T_{21}	T_{10}	T_{19}
T_8	T_{21}	T_7	T_{19}	T_{18}	T_6
T_9	T_{23}	T_8	T_{17}	T_2	T_{21}
T_{10}	T_{26}	T_{11}	T_{20}	T_{23}	T_7
C-1	C-2	C-2	C-3	C-3	C-1
C-3		C-1		C-2	

***C-1 to C- 3 – CHECKS**

Figure 1. Plan and layout of the experimental plot

Table 1. List of advanced breeding lines and checks used for the study

Sl. No.	Breeding lines	Sl. No.	Breeding lines
1	CHMB-1	**13**	CHMB-16
2	CHMB-2	**14**	CHMB-17
3	CHMB-3	**15**	CHMB-18
4	CHMB-4	**16**	CHMB-19
5	CHMB-5	**17**	CHMB-20
6	CHMB-6	**18**	CHMB-21
7	CHMB-7	**19**	CHMB-23
8	CHMB-8	**20**	CHMB-26
9	CHMB-9	**CHECK-1**	Arka Keshav
10	CHMB-10	**CHECK-2**	Arka Neelanchal Shyama
11	CHMB-11	**CHECK-3**	Devanur Local
12	CHMB-13		

Note: Advanced breeding lines generated from different crosses *viz.,*

1. CHMB-1 to CHMB-13 : Surya × Utkal Anushree
2. CHMB-16 to CHMB-23 : Sarparam Vanga × Haritha
3. CHMB-26 : Pusa Shyamala × Haritha

***CHMB-College of Horticulture Mudigere Brinjal**

Experiment I

3.5.1 Nursery preparation

Seeds of twenty advanced breeding lines and three checks were treated with Bavistin (1 g / kg seeds) and sown in 98 celled pro trays with the coco peat as growing media. The media was mixed with Bavistin (20 g / 10 kg of cocopeat) to avoid mortality of seedlings due to damping off. After 2 weeks of germination, the young seedlings were sprayed with DAP (1 g / L of water) 2-3 times in a week interval. All the recommended cultural practices like irrigation, spraying and drenching were followed to raise good quality and healthy seedlings.

3.5.2 Transplanting and aftercare

Thirty days old seedlings were transplanted into the experimental plots after allotting entries randomly in each block. Before transplanting, healthy and uniform seedlings were selected and these seedlings were dipped in Bavistin (2 g / L) for two minutes to control soil-borne pathogens. Immediately after transplanting, the field was irrigated lightly. The remaining half dose of nitrogen was top-dressed 30 days after transplanting. Standard crop production practices were followed as per recommended package of practices for brinjal.

3.5.3 Preparation of experimental plots

The experimental land was bought to a fine tilth by 2–3 ploughing and harrowing. The plot was applied with FYM (20 t / ha) and the recommended fertilizer dose of 125:100:50 kg NPK per hectare. According to the package of practices, half dose of N and full dose of P and K were applied in the form of urea, single super phosphate and muriate of potash at the time of final harrowing and mixed thoroughly in the soil.

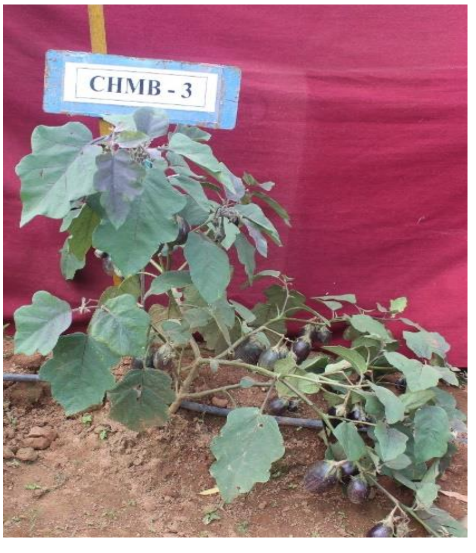
Experiment II

3.5.4 Sub culturing of Ralstonia solanacearum

Ralstonia solanacearum culture was brought from the division of plant pathology, Indian Institute of Horticultural Research, Bengaluru. The culture was sub cultured on dilution plating on Triphenyl Tetrazolium Chloride (TTC) agar medium. One hundred microliters of the diluted bacterial suspension was poured onto the surface of solidified Triphenyl Tetrazolium Chloride agar (TTC) medium (Kelman, 1954) in sterilized Petri plates. The culture was spread onto the surface of the TTC medium with a sterilized spreader. The inoculated plates were incubated at 28°C for 48 hours. At the end of the incubation period, the plates were observed for the development of well-separated irregularly shaped, fluidal, dull-white colonies with a slight red center typical of virulent *R. solanacearum* colonies. The concentration of the inoculum was adjusted

CHMB - 1

CHMB - 2



CHMB - 3

CHMB - 4

CHMB - 5

CHMB - 6

Plate 1a. Advanced breeding lines of brinjal used for the experiment

CHMB - 7

CHMB - 8

CHMB - 9

CHMB - 10

CHMB - 11

CHMB - 13

Plate 1b. Advanced breeding lines of brinjal used for the experiment

CHMB - 16

CHMB - 17

CHMB - 18

CHMB - 19

CHMB - 20

CHMB - 21

Plate 1c. Advanced breeding lines of brinjal used for the experiment

CHMB - 23

CHMB - 26

Plate 1d. Advanced breeding lines of brinjal used for the experiment

to 0.3 optical density (OD) at 600 nm wave length (approximately 1.0×10^8 cfu/ml) using a spectrophotometer.

3.5.5 Sterilization of soil

Sandy loam soil, free of stubble and stones was collected from the field of College of Horticulture, Mudigere. The soil was mixed thoroughly with 1:1 proportion of soil and sand. The mixture was sterilized with formaldehyde at 4 per cent. The soil was sprinkled with formaldehyde and covered with a plastic sheet. After 72 hours, the plastic sheet was removed and the soil was watered to remove fumes of the chemical. The plastic pots are filled with sterilized soil.

3.5.6 Nursery

The nursery was raised in 98 cells plastic protrays filled with sterilized coco-peat. Protrays were slightly watered before sowing. Sowing was done at about one cm depth and then irrigated. Protrays were covered with plastic cover in order to ensure proper germination of seeds for five days and later it was removed. Care was taken by irrigating the seedlings twice daily and also nutrient 19:19:19 was sprayed at the rate of 1 g/liter of water for proper growth of the seedlings.

3.5.7 Transplanting

Thirty five days old seedlings of twenty three genotypes were transplanted in a plastic pots filled with sterilized soil and aftercare was taken according to the package of the practice.

3.5.8 Inoculation of Ralstonia solanacearum

A total of twenty three different genotypes were inoculated with the culture of *R. solanacearum* by drenching 5.0 ml of bacterial suspension (1.0×10^8 cfu/ml) to the soil around root zone with the help of micropipette. Before inoculation, the roots were slightly severed by inserting a sharp knife 1.0 cm away from the stem. Root severing was done to ensure bacterial penetration through roots.

3.6 Observations recorded

Experiment I

The experimental observations were recorded on randomly selected tagged plants from the net plot area. The characters studied and the procedure adopted for recording observations for different characters are furnished below.

3.6.1 Growth and Flowering parameters

3.6.1.1 Plant height (cm)

The length of the main stem from the ground level to the apical bud was recorded using meter scale at 30, 60 and 90 days after transplanting from five randomly selected tagged plants and expressed in centimeters.

3.6.1.2 Number of primary branches per plant

The total number of branches borne at the leaf axils on the main stem in tagged plants was counted at 30, 60 and 90 days after transplanting.

3.6.1.3 Days to first flowering

Days for first flowering was recorded by counting the number of days from the date of transplanting to the day on which the first flower bloomed.

3.6.1.4 Days to fifty per cent flowering

Number of days required for flowering of fifty per cent plants from transplanting in a given plot was recorded.

3.6.1.5 Number of flower clusters per plant

The number of flower clusters per plant was recorded from five randomly selected tagged plants at the time of peak stage of flowering and the average was worked out.

3.6.1.6 Number of flowers per cluster

The number of flowers per cluster was recorded from randomly selected three flower clusters on each tagged plant at the time of peak stage of flowering and later averaged to obtain mean values for each treatment.

3.6.1.7 Number of fruits per cluster

The number of fruits per cluster was recorded from randomly selected three fruit clusters on each tagged plant from each plot at the time of peak stage of fruiting and later averaged to obtain mean values for each treatment.

3.6.1.8 Fruit setting percentage

It is the ratio of the number of flowers appeared on the plant to that of the flowers that turned into fruits, describing whether the flowers on a plant produced fruit or not after pollination.

3.6.1.9 Days taken for first picking

The number of days taken from the date of transplanting to the days on which the first fruit picked was recorded.

3.6.2 Yield parameters

The yield parameters studied and techniques adapted to record the observations are represented below.

Plate 2. General view of the experimental plot of experiment I

3.6.2.1 Number of fruits per plant

The number of fruits per plant was computed by adding the number of fruits of all pickings in each plant.

3.6.2.2 Fruit length (cm)

The length of five randomly selected fruits was recorded from the joint of calyx to the apex was measured in centimeters using a scale at peak fruiting stage and the average was calculated.

3.6.2.3 Stalk length (cm)

The stalk length of five randomly selected fruits was measured by using a meter scale in centimeters at peak fruiting stage and the average values were worked out.

3.6.2.4 Fruit diameter (mm)

The diameter of five randomly selected fruits was measured with the help of vernier caliper at the widest point of the fruits in millimeter at peak fruiting stage and the average was calculated.

3.6.2.5 Average fruit weight (g)

Average fruit weight was calculated by adding the weight of the fruit of all the pickings and divided by the total number of fruits and expressed in grams.

3.6.2.6 Fruit yield per plant (kg)

The fruit yield per plant was computed by adding the weight of the fruit of all the pickings in each plant and expressed in kilograms per plant.

3.6.2.7 Fruit yield per plot (kg)

The total yield per plot was computed by adding the weight of the fruits of all the plants in a plot and expressed in kilograms.

3.6.2.8 Estimated fruit yield (t/ha)

The total yield per plot was multiplied with total number of plants accommodated per hectare to obtain yield per hectare.

3.6.3 Quality and Biochemical parameters

3.6.3.1 Fruit shape

The shape of fruits was noted at edible maturity stage based on visual appearance as round, oval, oblong and cylindrical shapes recorded for all advanced breeding lines.

3.6.3.2 Fruit color

Color of fruits was recorded at edible maturity stage based on visual appearance as purple, deep purple, light purple, purplish green, green, light green, dark green and greenish purple.

3.6.3.3 Fruit spininess

Spines on the pedicel were judged by moving the fingers on the fruit surface and categorized into presence or absence.

3.6.3.4 Dry matter content (g / 100 g)

Fresh weight of the fruit was noted and fruit samples were cut into pieces and kept in hot air oven for obtaining dry weight. The samples were dried at 60°C till constant weight of samples was achieved over the two subsequent observations and dry weight of the fruits was recorded and dry matter content in fruits was worked out as follows:

$$\text{Dry matter content} = \frac{\text{Final dry weight of the sample (g)}}{\text{Initial fresh weight of the sample (g)}} \times 100$$

3.6.3.5 Moisture Content (g / 100 g)

Moisture is determined by the Ohaus Instant Moisture Analyzer (MB45, Parsippany, NJ, USA) in which water in the fresh fruits or crude extract was evaporated until the mass is constant.

3.6.3.6 Fruit phenol content (mg / 100 g)

Total phenolic contents were determined using Folin-Ciocalteu reagent and expressed as Gallic Acid Equivalents (Singleton and Rossi, 1965). Folin-Ciocalteu reagent contains metals like polytungsten. Phenol content from the sample reduces the metal and change color from yellow to Prussian blue. The intensity of the color is directly proportional to the phenolic content.

The extracts were diluted with the same solvent used for extraction, to a suitable concentration for analysis and 0.5 ml of commercial Folin-Ciocalteu reagent was added. The contents were mixed well and kept for 5 min at room temperature followed by addition of 1 ml of 20 per cent aqueous sodium carbonate. After incubation at room temperature for 90 minutes, the absorbance of the developed blue color was read at 760 nm using spectrophotometer against reagent blank and results were calculated as Gallic Acid Equivalents (mg / 100 g) of sample.

3.6.4 Observation of pests

3.6.4.1 Incidence of shoot and fruit borer (%)

$$\text{\% Incidence of shoot and fruit borer} = \frac{\text{Number of plants infested}}{\text{Total number of plants}} \times 100$$

Experiment II

As per Hussain *et al*. (2005), bacterial wilt symptoms and total number of wilted plants per genotypes were recorded on a 0-5 scale, with minor modifications. Based on the percentage of wilted plants, accessions were categorized as highly resistant to highly susceptible.

3.6.5 Per cent disease incidence (PDI) of bacterial wilt

$$\text{\% Incidence of bacterial wilt} = \frac{\text{Number of plants infected}}{\text{Total number of plants}} \times 100$$

3.7. Statistical analysis

The details of the statistical procedure adopted for analysis of the data recorded on checks and advanced breeding lines of brinjal to get an idea of the nature of magnitude of variation are presented below.

3.7.1 Mean

Mean is the sum of all observations in a sample divided by the number of observations (n)

$$\text{Mean} = \sum \frac{xi}{n}$$

Where,

X_i = i^{th} observation of a population

n = Number of observations

3.7.2 Range

The range is the minimum and maximum values of the observations in a sample of a genotype.

3.7.3 Analysis of variance

Source of variation	Degree of freedom	Sum of squares	Mean sum of squares	F_{cal}
Treatment	(t-1)	S_t	$M_t = S_t/(t-1)$	M_t/M_e
Replications	(r-1)	S_r	$M_r = S_r/(r-1)$	M_r/M_e
Error	(r-1) (t-1)	S_e	$M_e = S_e/(r-1)(t-1)$	
Total	(tr-1)	S_T		

The data on various biometric observations collected during the study were subjected to statistical analysis using Fischer's method of analysis of variance technique as given by Panse and Sukhatme (1967). The significance of treatment mean squares and replication mean squares were tested by comparing with error mean squares referring to "F" table values at the 5 per cent level of probabilities.

Where,

r	=	Number of replications
t	=	Number of treatments
S_r	=	Sum of squares due to replications
S_t	=	Sum of squares due to treatments
S_e	=	Sum of squares due to error
S_T	=	Total sum of squares
M_r	=	Mean sum of squares due to replications
M_t	=	Mean sum of squares due to treatments
M_e	=	Mean sum of squares due to error

The replication and entries mean sum of squares was tested against error mean squares by the 'F' test at (r-1), (r-1) (t-1), and (t-1) degree of freedom for RCBD at a 5 per cent level of significance.

3.7.4 Standard error

It is the measure of uncontrolled variation present in a sample which was estimated by dividing the standard deviation (SD) by the square root of the number of observations (n) in the sample and was denoted by SE.

$$\mathrm{SE} = \frac{\mathrm{SD}}{\sqrt{\mathrm{n}}}$$

3.7.5 Critical difference

Critical difference (CD) was calculated by multiplying the SE with table 't' value at 5 per cent and 1 per cent of probabilities for error degrees of freedom. The critical difference was calculated as,

$$\mathrm{CD} = \sqrt{2 \times \mathrm{S.Em} \times \mathrm{t}\,(\alpha, \mathrm{df})}$$

Where,

α - the level of significance (5 and 1 per cent)

df - degrees of freedom.

Plate 3. General view of the experimental plot of experiment II

Table 2. Bacterial wilt disease scoring scale

Sl. No.	Disease incidence (%)	Scale	Disease reaction
1	No wilt symptom (0%)	0	Highly resistant (HR)
2	1 – 10% wilted plants	1	Resistant (R)
3	11- 20 % wilted plants	2	Moderately Resistant (MR)
4	21- 30 % wilted plants	3	Moderately Susceptible (MS)
5	31- 40 % wilted plants	4	Susceptible (S)
6	>40% wilted plants	5	Highly Susceptible (HS)

3.7.6 Variance

Variance is defined as the average of the standard deviations of individual observation from the mean. It is expressed as the sum of squares of the deviations of all observations of a sample from its mean and divided by (n-1), where 'n' is the number of observations. It is estimated by the following formula:

$$\text{Variance} = \frac{\sum x_i^2 - (\sum x) x^2 / n}{(n - 1)}$$

Where,

x_i = i th observation of a population

n = number of observations

3.7.7 Standard deviation (SD)

The Standard deviation was calculated as,

$$SD = \sqrt{\text{Variance}}$$

3.7.8 Estimation of genetic variability parameters

The variability for different quantitative and qualitative traits in brinjal was estimated in the advanced breeding lines as detailed below.

3.7.8.1 Phenotypic, genotypic and environment variances

Variance due to genotype, phenotype and environment were computed as follows.

a. Genotypic variance ($\sigma^2 g$) $= \frac{\text{Treatment MSS} - \text{Error MSS}}{r}$

b. Environmental variance ($\sigma^2 e$) = Error mean sum of squares

c. Phenotypic variance ($\sigma^2 p$) = $\sigma^2 g + \sigma^2 e$

Where, ‘r’ is the number of replications.

3.7.8.2 Phenotypic and genotypic coefficient of variation

Phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) for all the characters were calculated according to the formula provided by Burton and Devane (1953).

a. Phenotypic coefficient of variation (PCV %) $= \frac{\sigma^2 p}{\bar{X}} \times 100$

b. Genotypic coefficient of variation (GCV %) $= \frac{\sigma^2 g}{\bar{X}} \times 100$

Where,

$\sigma^2 p$ = Phenotypic variance

$\sigma^2 g$ = Genotypic variance

$\bar{X}$ = Mean

PCV and GCV were classified as shown below following the method suggested by Robinson *et al*. (1949)

0-10 % = Low

>10-20 % =Moderate

>20 % = High

3.7.8.3 Heritability (h^2 broad sense)

Broad-sense heritability was estimated for all the traits using the following formula of Johnson *et al*. (1955).

$$h^2 (\%) = \frac{\sigma^2 g}{\sigma^2 p}$$

Where,

h^2 (b) = Heritability (broad sense) expressed in per cent

$\sigma^2 g$ = Genotypic variance

$\sigma^2 p$ = Phenotypic variance

The heritability percentage was categorized as low, moderate and high as suggested by Robinson *et al*. (1949) and is given below.

0-30 % = Low

>30-60 % = Moderate

>60 % = High

3.7.8.4 Genetic advance (GA)

The extent of genetic advance was estimated by using the following formula of Johnson *et al*. (1955).

$$GA = h^2 \times K \times \sigma p$$

Where,

h^2= Heritability estimate

K= Selection differential at given intensity (which is equal to 2.06 at 5 % intensity of selection)

σp = Phenotypic standard deviation

3.7.8.5 Genetic advance as per cent over mean (GAM)

Genetic advance as per cent over mean was assessed by using the following formula.

$$\text{Genetic advance as per cent over mean} = \frac{\text{GA}}{\text{Grand Mean}} \times 100$$

Genetic advance as per cent over mean was grouped into low, moderate and high as given below following the method of Johnson *et al*. (1955).

0 to 10 % = Low

>10 to 20 % = Moderate

>20 % = High

EXPERIMENTAL RESULTS

IV EXPERIMENTAL RESULTS

The main objective of the present study was to assess the performance, genetic variability, heritability (broad sense), genetic advance of different characters and to screen for bacterial wilt resistance in advanced breeding lines of brinjal. The results obtained from the present study have been grouped under the following subheadings.

4.1. Analysis of variance

4.2. Performance of advanced breeding lines

4.3. Genetic variability studies

4.4. Screening against bacterial wilt disease

4.1. Analysis of variance

The analysis of variance (Table 3 and 4) showed significant mean sum of squares in breeding lines for all quantitative traits indicating that sufficient genetic variability exists among various lines for these traits. Thus, further analysis was carried out for all the quantitative traits. However, mean sum of squares in replications was not significant for any of the traits under study showing that there was no variation among replications.

4.2 Performance of advanced breeding lines

The mean performance of twenty advanced breeding lines of brinjal along with three checks for twenty two characters were presented in Table 5 to 12

4.2.1 Plant height (cm) at 30 DAT

Plant height at 30 days after transplanting in advanced breeding lines ranged from 17.32 cm to 30.27 cm with the average mean value of 23.41 cm. The line CHMB-6 has recorded the maximum plant height of 30.27 cm which was on par with CHMB-2 (28.66 cm), followed by CHMB-17 (27.08 cm) and the minimum plant height during thirty days after transplanting was recorded by the genotype Arka Neelanchal Shyama (17.32 cm).

4.2.2 Plant height (cm) at 60 DAT

The plant height at 60 DAT in advanced breeding lines of brinjal ranged from 37.96 cm to 54.53 cm with the average mean value of 46.22 cm. Among the different lines, the line CHMB-6 (54.53 cm) recorded the highest plant height which were on par with CHMB-2 (53.29 cm), CHMB–9 (52.48 cm) followed by CHMB–11 (51.22 cm), CHMB–17 (49.16 cm). Whereas, the genotype Arka Neelanchal Shyama (37.96 cm) recorded the minimum plant height.

Table 3. Analysis of variance (mean sum of squares) for growth and flowering parameters in advanced breeding lines of brinjal

Sl. No.	Source of variation / Characters	Replication	Treatments (Breeding lines)	Error	S. Em±	CD @ (5%)
	Degrees of freedom	2	22	44		
1	Plant height (cm) at 30 DAT	0.59	28.42**	1.32	0.66	1.89
2	Plant height (cm) at 60 DAT	0.44	73.43**	2.93	0.99	2.81
3	Plant height (cm) at 90 DAT	0.24	97.19**	3.15	1.03	2.92
4	Number of primary branches (30 DAT)	0.02	2.31**	0.10	0.19	0.53
5	Number of primary branches (60 DAT)	0.26	16.64**	0.66	0.47	1.34
6	Number of primary branches (90 DAT)	0.19	15.06**	0.39	0.36	1.03
7	Days to first flowering	5.73	283.14**	13.07	2.09	5.95
8	Days to fifty per cent flowering	1.83	260.82**	9.23	1.75	5.00
9	Number of flower clusters per plant	0.34	50.31**	1.20	0.63	1.81
10	Number of flowers per cluster	0.02	3.14**	0.07	0.15	0.44
11	Number of fruits per cluster	0.00	1.12**	0.03	0.10	0.27
12	Fruit setting percentage	0.44	308.56**	4.29	1.20	3.41
13	Days taken for first picking	1.13	240.33**	7.54	1.59	4.52

**Significance @ 1%   DAT – Days after transplanting

Table 4. Analysis of variance (mean sum of squares) for yield and biochemical parameters in advanced breeding lines of brinjal

Sl. No.	Source of variation / Characters	Replication	Treatments (Breeding lines)	Error	S. Em ±	CD @ (5%)
	Degrees of freedom	2	22	44		
1	Number of fruits per plant	0.19	132.71**	2.06	0.83	2.36
2	Average fruit weight (g)	5.38	240.73**	6.93	1.52	4.33
3	Fruit length (cm)	0.18	18.41**	0.39	0.36	1.02
4	Fruit diameter (mm)	3.76	259.74**	6.10	1.43	4.06
5	Stalk length (cm)	0.02	1.90**	0.03	0.11	0.30
6	Fruit yield per plant (kg)	0.00	0.17**	0.00	0.03	0.08
7	Fruit yield per plot (kg)	1.29	105.06**	1.80	0.77	2.21
8	Estimated fruit yield (t/ha)	0.13	83.27**	1.42	0.69	1.96
9	Dry matter content (g/100g)	0.05	6.72**	0.13	0.21	0.60
10	Moisture content (%)	9.01	10.90**	3.91	1.14	3.25
11	Fruit phenol content (mg/100g)	3.12	213.28**	3.77	1.12	3.19

**Significance @ 1%   DAT – Days after transplanting

Table 5. Performance of advanced breeding lines of brinjal for morphological parameters

Treatments (Breeding lines)		Plant height (cm) at			Number of primary branches at		
		30 DAT	**60 DAT**	**90 DAT**	**30 DAT**	**60 DAT**	**90 DAT**
T_1	CHMB-1	23.77	44.68	59.10	4.99	9.94	12.45
T_2	CHMB-2	28.66	53.29	66.35	6.02	14.40	17.52
T_3	CHMB-3	22.40	48.84	60.38	4.97	9.67	12.01
T_4	CHMB-4	24.72	49.22	57.30	4.21	9.08	11.35
T_5	CHMB-5	20.44	39.76	50.14	3.63	8.13	11.04
T_6	CHMB-6	30.27	54.53	67.12	5.29	13.12	15.11
T_7	CHMB-7	25.18	50.36	60.99	6.33	10.82	13.47
T_8	CHMB-8	19.62	38.25	46.16	3.21	7.13	9.66
T_9	CHMB-9	25.68	52.48	63.54	5.59	12.57	14.01
T_{10}	CHMB-10	21.48	40.00	54.31	3.49	7.40	10.13
T_{11}	CHMB-11	24.86	51.22	62.15	5.45	12.00	13.98
T_{12}	CHMB-13	22.42	49.07	56.32	4.51	8.09	10.33
T_{13}	CHMB-16	19.38	39.00	49.63	3.79	7.07	9.12
T_{14}	CHMB-17	27.08	49.16	58.37	4.71	8.46	11.34
T_{15}	CHMB-18	25.49	48.84	60.18	5.13	10.67	12.99
T_{16}	CHMB-19	23.31	45.10	59.75	4.20	7.47	11.00
T_{17}	CHMB-20	21.91	47.25	61.01	5.05	10.59	13.05
T_{18}	CHMB-21	23.19	43.33	54.81	4.40	7.60	10.62
T_{19}	CHMB-23	21.43	46.18	60.02	5.33	11.33	13.38
T_{20}	CHMB-26	20.11	41.88	52.14	4.21	8.20	11.11
T_{21}	**CHECKS:** Arka Keshav	24.40	47.54	54.31	4.17	6.46	9.33
T_{22}	Arka Neelanchal Shyama	17.32	37.96	46.22	2.89	5.27	7.25
T_{23}	Devanur Local	25.24	45.21	57.37	4.81	7.20	10.66
Mean		**23.41**	**46.22**	**57.29**	**4.63**	**9.25**	**11.78**
S. Em ±		**0.66**	**0.99**	**1.03**	**0.19**	**0.47**	**0.36**
CD @ (5%)		**1.89**	**2.81**	**2.92**	**0.53**	**1.34**	**1.03**

DAT – Days after transplanting

Table 6. Performance of advanced breeding lines of brinjal for days to first flowering, days to fifty per cent flowering and days taken for first picking

Treatments (Breeding lines)		Days to first flowering	Days to fifty per cent flowering	Days taken for first picking
T_1	CHMB-1	35.66	42.18	58.49
T_2	CHMB-2	30.16	38.66	54.69
T_3	CHMB-3	36.51	43.89	58.69
T_4	CHMB-4	45.74	52.91	66.80
T_5	CHMB-5	50.13	58.35	73.92
T_6	CHMB-6	32.16	39.87	55.97
T_7	CHMB-7	34.16	41.32	57.47
T_8	CHMB-8	51.19	59.44	74.59
T_9	CHMB-9	33.12	40.11	55.16
T_{10}	CHMB-10	47.91	54.41	70.16
T_{11}	CHMB-11	28.22	37.04	54.24
T_{12}	CHMB-13	52.38	59.88	75.55
T_{13}	CHMB-16	55.65	62.78	77.92
T_{14}	CHMB-17	47.83	55.14	69.63
T_{15}	CHMB-18	36.21	44.50	60.13
T_{16}	CHMB-19	49.90	57.48	74.41
T_{17}	CHMB-20	46.56	53.32	68.22
T_{18}	CHMB-21	54.48	61.63	78.37
T_{19}	CHMB-23	37.50	45.64	59.65
T_{20}	CHMB-26	56.35	63.54	78.29
T_{21}	CHECKS: Arka Keshav	52.12	59.04	73.16
T_{22}	Arka Neelanchal Shyama	38.11	46.41	64.22
T_{23}	Devanur Local	61.87	67.04	80.39
Mean		**44.08**	**51.50**	**66.96**
S. Em ±		**2.09**	**1.75**	**1.59**
CD @ (5%)		**5.95**	**5.00**	**4.52**

Table 7. Performance of advanced breeding lines of brinjal for number of flower clusters per plant, number of flowers and fruits per cluster and fruit setting percentage

Treatments (Breeding lines)		No. of flower clusters per plant	No. of flowers per cluster	No. of fruits per cluster	Fruit setting percentage
T_1	CHMB-1	23.36	4.76	2.69	56.81
T_2	CHMB-2	27.70	4.34	3.19	73.67
T_3	CHMB-3	22.10	3.87	2.13	55.18
T_4	CHMB-4	20.16	4.28	2.21	51.89
T_5	CHMB-5	16.55	6.57	2.95	45.22
T_6	CHMB-6	26.01	3.59	2.23	62.76
T_7	CHMB-7	22.21	5.15	3.07	59.84
T_8	CHMB-8	14.53	3.16	1.12	35.51
T_9	CHMB-9	24.36	4.60	2.86	62.01
T_{10}	CHMB-10	15.25	4.00	2.01	50.47
T_{11}	CHMB-11	23.48	4.58	2.79	60.80
T_{12}	CHMB-13	18.18	7.06	2.62	37.29
T_{13}	CHMB-16	13.65	3.27	1.19	36.40
T_{14}	CHMB-17	17.13	5.41	2.25	41.79
T_{15}	CHMB-18	22.16	4.36	2.58	59.00
T_{16}	CHMB-19	16.13	3.26	1.55	47.99
T_{17}	CHMB-20	21.53	4.00	2.39	59.80
T_{18}	CHMB-21	17.24	3.01	1.45	48.22
T_{19}	CHMB-23	22.23	3.80	2.32	60.95
T_{20}	CHMB-26	15.48	3.58	1.75	48.93
T_{21}	CHECKS: Arka Keshav	18.70	4.27	2.23	52.60
T_{22}	Arka Neelanchal Shyama	12.75	3.24	1.14	35.21
T_{23}	Devanur Local	19.68	4.47	2.18	48.91
Mean		**19.59**	**4.29**	**2.21**	**51.79**
S. Em ±		**0.63**	**0.15**	**0.10**	**1.20**
CD @ (5%)		**1.81**	**0.44**	**0.27**	**3.41**

Table 8. Performance of advanced breeding lines of brinjal for fruit parameters

Treatments (Breeding lines)		Fruit length (cm)	Fruit diameter (mm)	Stalk length (cm)
T_1	CHMB-1	7.64	37.88	3.54
T_2	CHMB-2	10.56	42.87	3.13
T_3	CHMB-3	5.87	39.72	2.98
T_4	CHMB-4	6.52	43.19	3.78
T_5	CHMB-5	7.98	36.51	4.65
T_6	CHMB-6	9.43	34.29	3.45
T_7	CHMB-7	10.79	46.25	4.06
T_8	CHMB-8	8.47	35.53	4.85
T_9	CHMB-9	6.41	50.62	3.08
T_{10}	CHMB-10	7.87	34.19	4.98
T_{11}	CHMB-11	11.06	49.09	2.61
T_{12}	CHMB-13	9.55	35.15	4.61
T_{13}	CHMB-16	10.69	38.50	4.17
T_{14}	CHMB-17	8.16	34.16	4.68
T_{15}	CHMB-18	14.90	36.26	3.24
T_{16}	CHMB-19	10.66	40.21	5.01
T_{17}	CHMB-20	11.30	44.28	4.12
T_{18}	CHMB-21	8.25	30.78	5.15
T_{19}	CHMB-23	6.87	45.87	3.17
T_{20}	CHMB-26	12.45	29.56	4.96
T_{21}	CHECKS: Arka Keshav	13.97	22.48	4.02
T_{22}	Arka Neelanchal Shyama	5.95	67.49	5.01
T_{23}	Devanur Local	10.99	26.57	4.65
Mean		**9.41**	**39.19**	**4.08**
S. Em ±		**0.36**	**1.43**	**0.11**
CD @ (5%)		**1.02**	**4.06**	**0.30**

Table 9. Performance of advanced breeding lines of brinjal for yield parameters

Treatments (Breeding lines)		No. of fruits per plant	Yield per plant (kg)	Average fruit wt (g)	Yield per plot (kg)	Estimated fruit yield (t/ha)
T_1	CHMB-1	25.17	1.45	57.73	35.90	31.87
T_2	CHMB-2	37.45	1.78	47.49	44.28	39.42
T_3	CHMB-3	27.59	1.36	49.45	33.98	30.23
T_4	CHMB-4	24.18	1.25	51.90	31.17	27.70
T_5	CHMB-5	20.16	1.10	54.72	27.36	24.31
T_6	CHMB-6	35.14	1.73	49.28	43.14	38.38
T_7	CHMB-7	29.78	1.48	49.86	36.95	32.82
T_8	CHMB-8	14.76	0.98	66.84	24.37	21.66
T_9	CHMB-9	32.72	1.62	49.56	40.31	35.85
T_{10}	CHMB-10	24.05	1.09	45.45	27.19	24.20
T_{11}	CHMB-11	32.07	1.59	49.98	39.61	35.22
T_{12}	CHMB-13	19.64	1.20	61.85	29.86	26.54
T_{13}	CHMB-16	17.81	1.01	56.84	25.16	22.36
T_{14}	CHMB-17	20.17	1.21	60.09	30.12	26.76
T_{15}	CHMB-18	28.77	1.49	51.75	37.14	33.03
T_{16}	CHMB-19	18.54	1.25	67.66	31.15	27.72
T_{17}	CHMB-20	28.52	1.47	51.80	36.64	32.59
T_{18}	CHMB-21	19.81	1.15	58.46	28.39	25.23
T_{19}	CHMB-23	30.45	1.54	50.73	38.31	34.11
T_{20}	CHMB-26	18.33	1.09	59.66	27.10	24.10
T_{21}	CHECKS: Arka Keshav	21.50	1.20	55.99	29.81	26.49
T_{22}	Arka Neelanchal Shyama	13.01	1.13	87.04	28.19	25.04
T_{23}	Devanur Local	19.77	1.06	53.77	26.26	23.37
Mean		**24.32**	**1.31**	**56.00**	**32.71**	**29.09**
S. Em ±		**0.83**	**0.03**	**1.52**	**0.77**	**0.69**
CD @ (5%)		**2.36**	**0.08**	**4.33**	**2.21**	**1.96**

Table 10. Performance of advanced breeding lines of brinjal for biochemical parameters

Treatments (Breeding lines)		Dry matter content (g/100g)	Moisture content (%)	Fruit phenol content (mg/100g)
T_1	CHMB-1	8.01	92.24	52.03
T_2	CHMB-2	9.87	90.21	37.56
T_3	CHMB-3	7.69	92.87	47.25
T_4	CHMB-4	8.21	91.58	44.25
T_5	CHMB-5	6.59	94.87	38.46
T_6	CHMB-6	9.58	90.38	41.29
T_7	CHMB-7	12.13	86.97	39.53
T_8	CHMB-8	6.88	94.05	50.67
T_9	CHMB-9	10.42	88.96	40.37
T_{10}	CHMB-10	8.06	92.18	46.30
T_{11}	CHMB-11	11.96	87.52	45.27
T_{12}	CHMB-13	8.57	91.26	35.12
T_{13}	CHMB-16	7.01	93.76	55.23
T_{14}	CHMB-17	8.37	91.39	41.57
T_{15}	CHMB-18	10.69	89.06	43.27
T_{16}	CHMB-19	8.36	91.43	55.21
T_{17}	CHMB-20	10.02	90.15	46.25
T_{18}	CHMB-21	7.97	92.74	49.52
T_{19}	CHMB-23	9.63	90.55	42.57
T_{20}	CHMB-26	8.96	91.11	53.49
T_{21}	CHECKS: Arka Keshav	10.38	91.18	72.54
T_{22}	Arka Neelanchal Shyama	8.51	91.01	51.28
T_{23}	Devanur Local	8.14	90.76	59.79
Mean		**8.96**	**91.14**	**47.34**
S. Em ±		**0.21**	**1.14**	**1.12**
CD @ (5%)		**0.60**	**3.25**	**3.19**

4.2.3 Plant height (cm) at 90 DAT

The range of plant height at 90 DAT in brinjal lines varied from 46.16 cm to 67.12 cm with the average mean of 57.29 cm. The line CHMB-6 recorded the maximum plant height (67.12 cm) which was on par with CHMB-2 (66.35 cm), followed by CHMB–9 (63.54 cm), CHMB–11 (62.15 cm) and the minimum plant height during ninety days after transplanting was recorded by the genotype CHMB–8 (46.16 cm).

4.2.4 Number of primary branches at 30 DAT

Number of primary branches at 30 DAT in advanced breeding lines of brinjal ranged from 2.89 to 6.33 with the average mean of 4.63. Among the different advanced breeding lines, the highest number of primary branches at 30 DAT recorded in CHMB-7 (6.33) which was on par with CHMB-2 (6.02), followed by CHMB–9 (5.59) and CHMB-11 (5.45). Whereas, minimum number of primary branches recorded in the genotype Arka Neelanchal Shyama (2.89).

4.2.5 Number of primary branches at 60 DAT

Number of primary branches at 60 DAT ranged from 5.27 to 14.40 with the average mean value of 9.25. The line CHMB-2 (14.40) recorded the maximum number of primary branches which was on par with CHMB-6 (13.12) followed by CHMB–9 (12.57), CHMB–11 (12.00) and CHMB–23 (11.33). Whereas, the minimum number of primary branches at 60 DAT was recorded by the genotype Arka Neelanchal Shyama (5.27).

4.2.6 Number of primary branches at 90 DAT

Number of primary branches at 90 DAT in advanced breeding lines of brinjal ranged from 7.25 to 17.52 with the average mean of 11.78. Among the different lines, the line CHMB-2 (17.52) recorded highest number of primary branches at 90 DAT which was followed by CHMB–6 (15.11) and CHMB–9 (14.01). Whereas, the genotype Arka Neelanchal Shyama (7.25) recorded minimum number of branches.

4.2.7 Days to first flowering

Days to first flowering from the date of transplanting was recorded and it ranged from 28.22 days to 61.87 days with a general mean of 44.08 days. The earliest flowering was observed for CHMB-11 (28.22 days) which was on par with CHMB-2 (30.16 days), CHMB-6 (32.16 days), CHMB–9 (33.12 days) and CHMB–7 (34.16 days), followed by CHMB–1 (35.66 days) and CHMB–18 (36.21 days). Whereas, Devanur Local (61.87 days) noted delayed flowering.

4.2.8 Days to fifty per cent flowering

Days to fifty per cent flowering was recorded and it ranged from 37.04 days to 67.04 days with the average mean of 51.50 days. The earliest days to fifty per cent

Plate 4. Variability for fruit characters in advanced breeding lines of brinjal

flowering was observed for CHMB-11 (37.04 days) which was on par with CHMB-2 (38.66 days), CHMB-6 (39.87 days), CHMB-9 (40.11 days) and CHMB-7 (41.32 days), followed by CHMB-1 (42.18 days) and CHMB-3 (43.89 days). Whereas, the delayed days to fifty per cent flowering was recorded in Devanur Local (67.04 days).

4.2.9 Days taken for first picking

Days taken for first picking from the date of transplanting was recorded and it ranged from 54.24 days to 80.39 days with a general mean of 66.96 days. The minimum number of days taken for first picking was noted in the line CHMB-11 (54.24 days) which was on par with CHMB-2 (54.69 days), CHMB-9 (55.16 days), CHMB-6 (55.97 days), CHMB-7 (57.47 days), CHMB-1 (58.49 days) and CHMB–3 (58.69 days) followed by CHMB-23 (59.65 days) and CHMB-18 (60.13 days). Whereas, the maximum number of days to first picking was reported in Devanur Local (80.39 days).

4.2.10 Number of flower clusters per plant

The number of flower clusters per plant varied from 12.75 to 27.70 with overall mean of 19.59. The maximum number of flower clusters per plant was found in the line CHMB-2 (27.70) which was on par with CHMB-6 (26.01) followed by CHMB-9 (24.36) and CHMB-11 (23.48) while, the Arka Neelanchal Shyama (12.75) recorded minimum number of flower clusters per plant.

4.2.11 Number of flowers per cluster

The number of flowers per cluster ranged from 3.01 to 7.06 with average mean of 4.29. The maximum number of flowers per cluster was observed in CHMB-13 (7.06) which was followed by CHMB-5 (6.57) and CHMB-17 (5.41). While, the minimum number of flowers per cluster was found in CHMB-21 (3.01).

4.2.12 Number of fruits per cluster

The number of fruits per cluster varied from 1.12 to 3.19 with general mean of 2.21. Among the different advanced breeding lines. The line CHMB-2 (3.19) recorded maximum number of fruits per cluster which was on par with CHMB-7 (3.07), CHMB-5 (2.95) followed by CHMB-9 (2.86) and CHMB-11 (2.79). The minimum number of fruits per cluster was recorded in CHMB-8 (1.12).

4.2.13 Fruit setting percentage

Fruit setting percentage ranged from 35.21 per cent to 73.67 per cent with an overall mean of 51.79 per cent. The maximum fruit setting percentage was observed in CHMB-2 (73.67 %) followed by CHMB-6 (62.76 %), CHMB-9 (62.01 %) and CHMB–23 (60.95 %). The genotype Arka Neelanchal Shyama (35.21%) recorded minimum fruit setting percentage.

4.2.14 Fruit length (cm)

Fruit length in advanced breeding lines of brinjal varied from 5.87 cm to 14.90 cm with average mean of 9.41 cm. The maximum fruit length was found in CHMB-18 (14.90 cm) which was on par with Arka Keshav (13.97 cm), followed by CHMB-26 (12.45 cm) and CHMB-20 (11.30 cm), while the minimum fruit length was observed in CHMB-3 (5.87 cm).

4.2.15 Fruit diameter (mm)

Fruit diameter in advanced breeding lines of brinjal ranged from 22.48 mm to 67.49 mm with an overall mean of 39.19 mm. The maximum fruit diameter was found in Arka Neelanchal Shyama (67.49 mm) which was followed by CHMB-9 (50.62 mm) and CHMB-11 (49.09 mm). While, the minimum fruit diameter was observed in Arka Keshav (22.48 mm).

4.2.16 Stalk length (cm)

Stalk length in advanced breeding lines of brinjal varied from 2.61 cm to 5.15 cm with the average mean of 4.08 cm. Among the different lines, the line CHMB-21 (5.15 cm) recorded maximum stalk length which was on par with CHMB-19 (5.01 cm), Arka Neelanchal Shyama (5.01 cm), CHMB-10 (4.98 cm) and CHMB-26 (4.96 cm) followed by CHMB-8 (4.85 cm) and CHMB-17 (4.68 cm). Whereas, minimum stalk length recorded in line CHMB-11 (2.61 cm).

4.2.17 Number of fruits per plant

The number of fruits per plant ranged from 13.01 to 37.45 with overall mean of 24.32. The maximum number of fruits per plant was found in CHMB-2 (37.45) which was on par with CHMB-6 (35.14) followed by CHMB-9 (32.72), CHMB-11 (32.07) and CHMB-23 (30.45). While, minimum number of fruits per plant was found in Arka Neelanchal Shyama (13.01).

4.2.18 Fruit yield per plant (kg)

Fruit yield per plant in advanced breeding lines of brinjal ranged from 0.98 kg to 1.78 kg with the average mean of 1.31 kg. Among the different lines, the line CHMB-2 (1.78 kg) recorded highest fruit yield per plant which was on par with CHMB-6 (1.73 kg), followed by CHMB-9 (1.62 kg), CHMB-11 (1.59) and CHMB-23 (1.54 kg). Whereas, the line CHMB-8 (0.98 kg) recorded the minimum fruit yield per plant.

4.2.19 Average fruit weight (g)

The average fruit weight varied from 45.45 g to 87.04 g with an overall mean of 56.00 g. Among the different lines. The highest average fruit weight was observed in Arka Neelanchal Shyama (87.04 g) followed by CHMB-19 (67.66 g), CHMB-8 (66.84 g), while lowest average fruit weight was found in CHMB-10 (45.45 g).

4.2.20 Fruit yield per plot (kg)

Fruit yield per plot in advanced breeding lines of brinjal varied from 24.37 kg to 44.28 kg with the average mean of 32.71 kg. Among the different advanced breeding lines, the line CHMB-2 (44.28 kg) recorded maximum fruit yield per plot which was on par with CHMB-6 (43.14 kg) followed by CHMB-9 (40.31 kg), CHMB-11 (39.61 kg) and CHMB-23 (38.31 kg). Whereas, the genotype CHMB-8 (24.37 kg) recorded the minimum fruit yield per plot.

4.2.21 Estimated fruit yield (t/ha)

Estimated fruit yield per hectare in advanced breeding lines of brinjal ranged from 21.66 tonnes per hectare to 39.42 tonnes per hectare with general mean of 29.09 tonnes per hectare. Among the different lines, the line CHMB-2 (39.42 t/ha) recorded the maximum estimated fruit yield per ha which was on par with CHMB-6 (38.38 t/ha) followed by CHMB-9 (35.85 t/ha) and CHMB-11 (35.22 t/ha). Whereas, minimum estimated fruit yield per ha recorded in the line CHMB-8 (21.66 t/ha).

4.2.22 Dry matter content(mg/100g)

Dry matter content in advanced breeding lines of brinjal varied from 6.59 g/100g to 12.13 g/100g with the average mean of 8.96 g/100g. Among the different lines, the highest dry matter content was noted in line CHMB-7 (12.13 g/100g) which was on par with CHMB-11 (11.96 g/100g). Whereas, the line CHMB-5 (6.59 g/100g) recorded the minimum dry matter content.

4.2.23 Moisture content (%)

Moisture content ranged from 86.97 per cent to 94.87 per cent with an overall mean value of 91.14 per cent. Among different lines, the maximum moisture content was found in CHMB-5 (94.87 %) which was on par with CHMB-8 (94.05 %), CHMB-16 (93.76 %), CHMB-3 (92.87 %), CHMB-21 (92.74 %), CHMB-1 (92.24 %), CHMB-10 (92.18 %). Whereas, minimum moisture content found in the line CHMB-7 (86.97 %).

4.2.24 Fruit phenol content(mg/100g)

Fruit phenol content in advanced breeding lines of brinjal varied from 35.12 mg/100g to 72.54 mg/100g with general mean of 47.34 mg/100g. The maximum fruit phenol content was observed in Arka Keshav (72.54 mg/100g) which was followed by Devanur Local (59.79 mg/100g), CHMB-16 (55.23 mg/100g). Whereas, the line CHMB-13 (35.12 mg/100g) recorded minimum fruit phenol content.

4.2.25 Fruit shape, color and spininess

The fruit quality parameters *viz.,* fruit color, shape and fruit spininess were recorded for various advanced breeding lines of brinjal on the visual observation basis and is presented in Table 11.

Advanced breeding lines of brinjal varied in the shape of their fruit, which was categorized into three types: round, oblong, and long. Genotypes of brinjal produce fruit with a range of colors, including purple, light purple, purplish green, light green, dark green and greenish purple. Spines on the pedicel were judged by moving the fingers on the fruit surface and categorized into spiny or non-spiny.

4.2.26 Observation of pests

Based on eye observation symptoms, the prevalence of shoot and fruit borer was documented and is shown in the Table 12.

4.3 Genetic variability studies

To understand the extent of genetic variability present in advanced breeding lines of brinjal, phenotypic variance (PV), genotypic variance (GV), phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), broad-sense heritability (h^2), genetic advance (GA) and genetic advance as per cent of mean (GAM) concerning the growth and yield related characters were computed and the results are presented here.

4.3.1 Genetic variability studies in advanced breeding lines of brinjal for growth and flowering parameters

The estimates of genetic parameters for growth and flowering attributes in advanced breeding lines of brinjal are presented in Table 13.

4.3.1.1 Plant height (cm) at 30 DAT

Plant height at 30 days after transplanting in advanced breeding lines of brinjal ranged from 17.32 cm to 30.27 cm with the mean value of 23.41 cm. This trait has recorded low GV (9.03) and moderate PV (10.35), moderate GCV (12.84 %) and PCV (13.74 %). The high broad sense heritability (87.29 %) with low genetic advance (5.78) and high genetic advance as per cent of mean (24.72 %) were observed for this character.

4.3.1.2 Plant height (cm) at 60 DAT

The range of plant height at 60 days after transplanting in brinjal lines varied from 37.96 cm to 54.53 cm with general mean of 46.22 cm. The high GV (23.50), PV (26.43) and moderate GCV (10.49 %) and PCV (11.12 %) were observed for this

Plate 5. Discoloration of stem

Plate 6. Ooze test

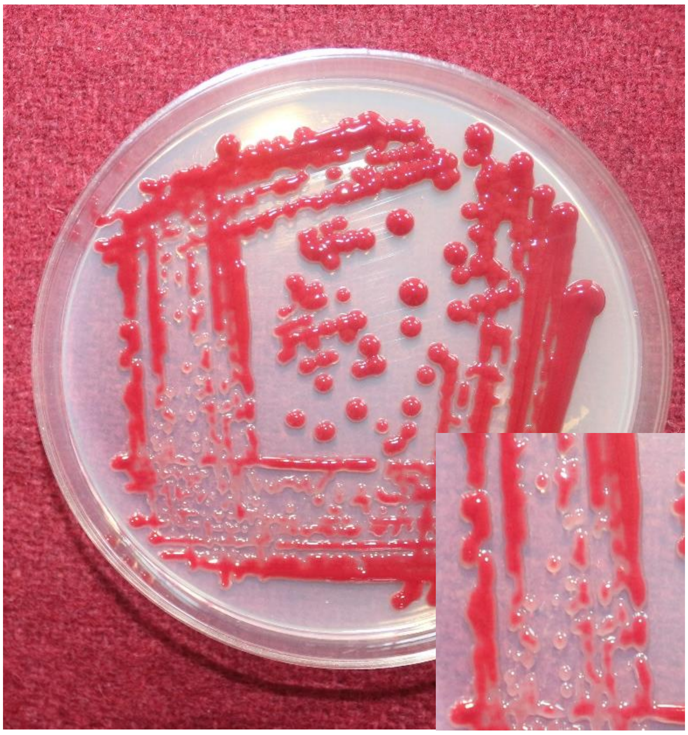


Plate 7. *Ralstonia solanacearum* on Triphenyl Tetrazolium Chloride (TTC) agar media

Table 11. Performance of advanced breeding lines of brinjal for fruit quality characters

Treatments (Breeding lines)		Fruit shape	Fruit colour	Spininess
T_1	CHMB-1	Oblong	Purple	Spiny
T_2	CHMB-2	Oblong	Light green	Non-spiny
T_3	CHMB-3	Oblong	Purple	Spiny
T_4	CHMB-4	Oblong	Purple	Non-spiny
T_5	CHMB-5	Oblong	Light purple	Spiny
T_6	CHMB-6	Oblong	Greenish purple	Spiny
T_7	CHMB-7	Oblong	Light green	Non-spiny
T_8	CHMB-8	Oblong	Purplish green	Spiny
T_9	CHMB-9	Round	Light green	Non-spiny
T_{10}	CHMB-10	Oblong	Light purple	Non-spiny
T_{11}	CHMB-11	Oblong	Light green	Non-spiny
T_{12}	CHMB-13	Oblong	Dark green	Non-spiny
T_{13}	CHMB-16	Oblong	Purplish green	Spiny
T_{14}	CHMB-17	Oblong	Purplish green	Non-spiny
T_{15}	CHMB-18	Long	Dark green	Spiny
T_{16}	CHMB-19	Oblong	Light green	Non-spiny
T_{17}	CHMB-20	Oblong	Light green	Non-spiny
T_{18}	CHMB-21	Oblong	Light green	Spiny
T_{19}	CHMB-23	Round	Dark green	Spiny
T_{20}	CHMB-26	Long	Dark green	Non-spiny
T_{21}	CHECKS: Arka Keshav	Long	Purple	Non-spiny
T_{22}	Arka Neelanchal Shyama	Round	Greenish with purplish tinge	Non-spiny
T_{23}	Devanur Local	Long	Purple	Non-spiny

Table 12. Incidence of shoot and fruit borer (%) in advanced breeding lines of brinjal under field condition

Treatments (Breeding lines)		Shoot and fruit borer (%)
T_1	CHMB-1	21.15
T_2	CHMB-2	14.87
T_3	CHMB-3	22.37
T_4	CHMB-4	25.89
T_5	CHMB-5	32.49
T_6	CHMB-6	20.51
T_7	CHMB-7	16.58
T_8	CHMB-8	34.83
T_9	CHMB-9	18.24
T_{10}	CHMB-10	31.19
T_{11}	CHMB-11	17.68
T_{12}	CHMB-13	28.39
T_{13}	CHMB-16	35.67
T_{14}	CHMB-17	26.48
T_{15}	CHMB-18	20.57
T_{16}	CHMB-19	29.26
T_{17}	CHMB-20	19.35
T_{18}	CHMB-21	38.24
T_{19}	CHMB-23	19.04
T_{20}	CHMB-26	32.01
T_{21}	CHECKS: Arka Keshav	31.24
T_{22}	Arka Neelanchal Shyama	33.61
T_{23}	Devanur Local	27.46
Mean		**25.99**
S. Em ±		**1.14**
CD @ (5%)		**3.25**

Table 13. Estimates of genetic parameters for growth and flowering parameters in advanced breeding lines of brinjal

Sl. No.	Characters	Mean	Range		GV	PV	GCV (%)	PCV (%)	h^2 (%)	GA	GAM (%)
			Minimum	Maximum							
1	Plant height (cm) at 30 DAT	23.41	17.32	30.27	9.03	10.35	12.84	13.74	87.29	5.78	24.72
2	Plant height (cm) at 60 DAT	46.22	37.96	54.53	23.50	26.43	10.49	11.12	88.93	9.42	20.37
3	Plant height (cm) at 90 DAT	57.29	46.16	67.12	31.35	34.50	9.77	10.25	90.86	10.99	19.19
4	Number of primary branches (30 DAT)	4.63	2.89	6.33	0.73	0.84	18.52	19.80	87.50	1.65	35.68
5	Number of primary branches (60 DAT)	9.25	5.27	14.40	5.33	5.99	24.96	26.47	88.95	4.48	48.50
6	Number of primary branches (90 DAT)	11.78	7.25	17.52	4.89	5.28	18.77	19.50	92.62	4.38	37.21
7	Days to first flowering	44.08	28.22	61.87	90.02	103.09	21.52	23.03	87.32	18.26	41.43
8	Days to fifty per cent flowering	51.50	37.04	67.04	83.86	93.10	17.78	18.73	90.08	17.90	34.76
9	Number of flower clusters per plant	19.59	12.75	27.70	16.37	17.57	20.65	21.40	93.15	8.04	41.06
10	Number of flowers per cluster	4.29	3.01	7.06	1.02	1.09	23.58	24.39	93.54	2.01	46.99
11	Number of fruits per cluster	2.21	1.12	3.19	0.36	0.39	27.29	28.30	92.98	1.20	54.20
12	Fruit setting percentage	51.79	35.21	73.67	101.42	105.72	19.44	19.85	95.94	20.32	39.23
13	Days taken for first picking	66.96	54.24	80.39	77.60	85.14	13.16	13.78	91.15	17.32	25.87

GV = Genotypic variance GCV = Genotypic coefficient of variation h^2 =Heritability GA= Genetic Advance

PV = Phenotypic variance PCV =Phenotypic coefficient of variation GAM =Genetic Advance as per cent over mean character. Further, estimates revealed high broad sense heritability (88.93 %) coupled with low genetic advance (9.42) and high genetic advance as per cent over mean (20.37 %) were observed for this character.

4.3.1.3 Plant height (cm) at 90 DAT

Plant height at 90 days after transplanting in brinjal lines varied from 46.16 cm to 67.12 cm with an overall mean value of 57.29 cm. This trait has exhibited high GV (31.35), PV (34.50) and low GCV (9.77 %), moderate PCV (10.25 %). The high broad sense heritability (90.86 %), moderate genetic advance (10.99) and genetic advance as per cent of mean (19.19 %) were recorded for this character.

4.3.1.4 Number of primary branches at 30 DAT

The range for number of primary branches at 30 days after transplanting in brinjal lines was from 2.89 to 6.33 with the mean value of 4.63. This trait has recorded low GV (0.73), PV (0.84) and moderate GCV (18.52 %), PCV (19.80 %). The high broad sense heritability (87.50 %) along with low genetic advance (1.65) and high genetic advance as per cent over mean (35.68 %) were observed for this character.

4.3.1.5 Number of primary branches at 60 DAT

The range for number of primary branches at 60 days after transplanting in brinjal lines was from 5.27 to 14.40 with the mean value of 9.25. This trait has recorded low GV (5.33), PV (5.99) and high GCV (24.96 %), PCV (26.47 %). The high broad sense heritability (88.95 %) along with low genetic advance (4.48) and high genetic advance as per cent over mean (48.50 %) were reported for this character.

4.3.1.6 Number of primary branches at 90 DAT

In this population, for this trait ranged from 7.25 to 17.52 with general mean of 11.78. This trait has recorded low GV (4.89), PV (5.28) and moderate GCV (18.77 %), PCV (19.50 %). The high broad sense heritability (92.62 %) along with low genetic advance (4.38) and high genetic advance as per cent over mean (37.21 %) were observed for this character.

4.3.1.7 Days to first flowering

The range for days to first flowering ranged from 28.22 days to 61.87 days with a mean value of 44.08 days. This trait has shown high GV (90.02) and PV (103.09), high GCV (21.52 %) and PCV (23.03 %). The estimates of high broad sense heritability (87.32 %), moderate genetic advance (18.26) and high genetic advance as per cent of mean (41.43 %) were observed for this trait.

4.3.1.8 Days to fifty per cent flowering

All the advanced breeding lines of brinjal have expressed the values for days to fifty per cent flowering in the range from 37.04 days to 67.04 days with a mean value of 51.50 days. This trait has shown high GV (83.86) and PV (93.10), moderate GCV (17.78 %) and PCV (18.73 %). The high broad sense heritability (90.08 %), moderate genetic advance (17.90) and high genetic advance as per cent of mean (34.76 %) were observed for this trait

4.3.1.9 Number of flower clusters per plant

In this population, number of flower clusters per plant varied from 12.75 to 27.70 with an overall mean of 19.59. This trait has exhibited moderate GV (16.37), PV (17.57) and high GCV (20.65 %), PCV (21.40 %). The high broad sense heritability (93.15 %) along with low genetic advance (8.04) and high genetic advance as per cent over mean (41.06 %) were observed for this character.

4.3.1.10 Number of flowers per cluster

Number of flowers per cluster in this population varied from 3.01 to 7.06 with the mean value of 4.29. This trait has exhibited low GV (1.02), PV (1.09) and high GCV (23.58 %), PCV (24.39 %). The high broad sense heritability (93.54 %) along with low genetic advance (2.01) and high genetic advance as per cent over mean (46.99 %) were reported for this character.

4.3.1.11 Number of fruits per cluster

Number of fruits per cluster varied from 1.12 to 3.19 with a general mean of 2.21. This trait has exhibited low GV (0.36), PV (0.39) and high GCV (27.29 %), PCV (28.30 %). The high broad sense heritability (92.98 %) along with low genetic advance (1.20) and high genetic advance as per cent over mean (54.20 %) were observed for this character.

4.3.1.12 Fruit setting percentage

Fruit set percentage in advanced breeding lines of brinjal ranged from 35.21 per cent to 73.67 per cent with mean value of 51.79 per cent. This trait has shown high GV (101.42), PV (105.72) and moderate GCV (19.44 %) and PCV (19.85 %). The high broad sense heritability (95.94 %) coupled with high genetic advance (20.32) and genetic advance as per cent over mean (39.23 %) were observed for this character.

4.3.1.13 Days taken for first picking

In this population, days taken for first picking varied from 54.24 days to 80.39 days with the mean value of 66.96 days. This trait has shown high GV (77.60), PV (85.14) and moderate GCV (13.16 %), PCV (13.78 %). Further, the high broad sense heritability (91.15 %) coupled with moderate genetic advance (17.32) and high genetic advance as per cent over mean (25.87 %) were observed for this trait.

4.3.2 Genetic variability studies in advanced breeding lines of brinjal for yield and biochemical parameters

The estimates of genetic parameters for yield and biochemical attributes in advanced breeding lines of brinjal are presented in Table 14.

4.3.2.1 Number of fruits per plant

Number of fruits per plant ranged from 13.01 to 37.45 with a mean value of 24.32. This trait has expressed high GV (43.55), PV (45.61) and high GCV (27.13 %), PCV (27.77 %). The estimates of high broad sense heritability (95.49 %) coupled with moderate genetic advance (13.28) and high genetic advance as per cent over mean (54.62 %) were observed for this character.

4.3.2.2 Average fruit weight (g)

In this advanced breeding lines of brinjal average fruit weight was in the range of 45.45 g to 87.04 g with an overall mean of 56.00 g. The high GV (77.93), PV (84.86) and moderate GCV (15.77 %) and PCV (16.45 %) were recorded for this character. Further, high broad sense heritability (91.84 %) with moderate genetic advance (17.43) and high genetic advance as per cent over mean (31.12 %) were reported for this character.

4.3.2.3 Fruit length (cm)

Fruit length in advanced breeding lines of brinjal ranged from 5.87 cm to 14.90 cm with 9.41 cm as a mean value. This trait has shown low GV (6.01), PV (6.39) and high GCV (26.06 %) and PCV (26.88 %). The high broad sense heritability (93.97 %) coupled with low genetic advance (4.89) and high genetic advance as per cent over mean (52.04 %) were observed for this character.

4.3.2.4 Fruit diameter (mm)

Fruit diameter in advanced breeding lines of brinjal ranged from 22.48 mm to 67.49 mm with 39.19 mm as a mean value. This character has expressed high GV (84.55), PV (90.64) and high GCV (23.46 %) and PCV (24.29 %). The high broad sense heritability (93.27 %) coupled with moderate genetic advance (18.29) and high genetic advance as per cent over mean (46.67 %) were recorded for this character.

4.3.2.5 Stalk length (cm)

In this population, stalk length of the fruit was in the range of 2.61 cm to 5.15 cm with a mean value of 4.08 cm. For this character low GV (0.62), PV (0.65) and moderate GCV (19.31 %) and PCV (19.82 %) were recorded. Further, high broad sense heritability (94.85 %) with low genetic advance (1.58) and high genetic advance as per cent over mean (38.73 %) were observed for this trait.

Table 14. Estimates of genetic parameters for yield and biochemical parameters in advanced breeding lines of brinjal

Sl. No.	Characters	Mean	Range		GV	PV	GCV (%)	PCV (%)	h^2 (%)	GA	GAM (%)
			Minimum	Maximum							
1	Number of fruits per plant	24.32	13.01	37.45	43.55	45.61	27.13	27.77	95.49	13.28	54.62
2	Average fruit weight (g)	56.00	45.45	87.04	77.93	84.86	15.77	16.45	91.84	17.43	31.12
3	Fruit length (cm)	9.41	5.87	14.90	6.01	6.39	26.06	26.88	93.97	4.89	52.04
4	Fruit diameter (mm)	39.19	22.48	67.49	84.55	90.64	23.46	24.29	93.27	18.29	46.67
5	Stalk length (cm)	4.08	2.61	5.15	0.62	0.65	19.31	19.82	94.85	1.58	38.73
6	Fruit yield per plant (kg)	1.31	0.98	1.78	0.06	0.06	17.87	18.27	95.68	0.47	36.01
7	Fruit yield per plot (kg)	32.71	24.37	44.28	34.42	36.22	17.93	18.40	95.03	11.78	36.02
8	Estimated fruit yield (t/ha)	29.09	21.66	39.42	27.28	28.70	17.96	18.42	95.05	10.49	36.06
9	Dry matter content (g/100g)	8.96	6.59	12.13	2.20	2.33	16.54	17.04	94.21	2.96	33.08
10	Moisture content (%)	91.14	86.97	94.87	2.33	6.24	1.68	2.74	37.39	1.92	2.11
11	Fruit phenol content (mg/100g)	47.34	35.12	72.54	69.84	73.60	17.65	18.12	94.88	16.77	35.42

GV = Genotypic variance   GCV = Genotypic coefficient of variation h^2 =Heritability   GA= Genetic Advance

PV = Phenotypic variance   PCV =Phenotypic coefficient of variation   GAM =Genetic Advance as per cent over mean

4.3.2.6 Fruit yield per plant (kg)

Fruit yield per plant varied from 0.98 kg to 1.78 kg with a mean value of 1.31 kg. This trait has shown low GV (0.06), PV (0.06) and moderate GCV (17.87 %), PCV (18.27 %). Further, this character has exhibited high broad sense heritability (95.68 %) coupled with low genetic advance (0.47) and high genetic advance as per cent over mean (36.01 %) were recorded for this character.

4.3.2.7 Fruit yield per plot (kg)

In this population, fruit yield per plot varied from 24.37 kg to 44.28 kg with a mean value of 32.71 kg. This trait has expressed high GV (34.42), PV (36.22) and moderate GCV (17.93 %), PCV (18.40 %). Further, high broad sense heritability (95.03 %) coupled with moderate genetic advance (11.78) and high genetic advance as per cent over mean (36.02 %) were observed for this character.

4.3.2.8 Estimated fruit yield (t/ha)

Estimated fruit yield per hectare in brinjal genotypes varied from 21.66 t/ha to 39.42 t/ha with a mean value of 29.09 t/ha. This trait has shown high GV (27.28), PV (28.70) and moderate GCV (17.96 %), PCV (18.42 %). The high broad sense heritability (95.05 %) coupled with moderate genetic advance (10.49) and high genetic advance as per cent over mean (36.06 %) were observed for this character.

4.3.2.9 Dry matter content (g/100g)

All the genotypes have expressed the values for this trait in the range of 6.59 g/100g to 12.13 g/100g with a mean value of 8.96 g/100g. This trait has expressed low GV (2.20), PV (2.33) and moderate GCV (16.54 %), PCV (17.04 %). The high broad sense heritability (94.21 %) coupled with low genetic advance (2.96) and high genetic advance as per cent over mean (33.08 %) were observed for this trait.

4.3.2.10 Moisture content

The value for moisture content in this population ranged between 86.97 % and 94.87 % with the mean value of 91.14 %. This character has recorded low GV (2.33), PV (6.24) and low GCV (1.68 %), PCV (2.74 %). The estimates of moderate broad sense heritability (37.39 %), low genetic advance (1.92) and low genetic advance as per cent over mean (2.11 %) were observed for this trait.

4.3.2.11 Fruit phenol content (mg/100g)

The values for fruit phenol content ranged from 35.12 mg/100g to 72.54 mg/100g with the mean value of 47.34 mg/100g. High GV (69.84), PV (73.60) and moderate GCV (17.65 %), PCV (18.12 %) were observed. This parameter has recorded high broad sense heritability (94.88 %) along with moderate genetic advance (16.77) and high genetic advance as per cent over mean (35.42 %).

4.4 Screening against bacterial wilt disease

Twenty brinjal lines along with susceptible check (Devanur Local) and resistant checks (Arka Keshav, Arka Neelanchal Shyama) were screened against bacterial wilt in pot culture in the polyhouse during *Summe*r 2023 and disease scoring was done using 0 to 5 scales as described in the material and methods. The results obtained are presented in Table 15 and 16.

Among the lines, CHMB-2, CHMB-6, CHMB-9, CHMB-11, CHMB-23, Arka Keshav (check) were found highly resistant with no wilting of plants and disease scoring of 0. CHMB-1 (10.00 %), CHMB-3 (6.60 %), CHMB-7 (3.33 %), CHMB-18 (6.66 %) were found resistant with disease scoring of 1. CHMB-4 (13.33 %), CHMB-5 (16.66 %) CHMB-8 (19.99 %), CHMB-17 (13.32 %), CHMB-20 (16.65 %), Arka Neelanchal Shyama (13.33 %) were found moderately resistant with disease scoring of 2. CHMB-10 (23.32 %), CHMB-16 (26.66 %) were found moderate susceptible with disease scoring of 3. Whereas, CHMB-19 (36.66 %), CHMB-13 (33.68 %), CHMB-26 (40.00 %) were found susceptible with disease scoring of 4. Remaining two genotypes *viz.*, CHMB-21 (56.68 %) and (66.70 %) Devanur Local (check) showed highly susceptible reaction with disease scoring of 5.

Table 15. Screening of brinjal genotypes against bacterial wilt caused by *Ralstonia solanacearum* in pot culture

Advanced breeding lines		Disease incidence (%)	Reaction	Score
T_1	CHMB-1	10.00 (18.43)*	R	1
T_2	CHMB-2	0.00 (0.28)*	HR	0
T_3	CHMB-3	6.60 (14.95)*	R	1
T_4	CHMB-4	13.33 (21.41)*	MR	2
T_5	CHMB-5	16.66 (24.09)*	MR	2
T_6	CHMB-6	0.00 (0.28)*	HR	0
T_7	CHMB-7	3.33 (10.51)*	R	1
T_8	CHMB-8	19.99 (26.56)*	MR	2
T_9	CHMB-9	0.00 (0.28)*	HR	0
T_{10}	CHMB-10	23.32 (28.88)*	MS	3
T_{11}	CHMB-11	0.00 (0.28)*	HR	0
T_{12}	CHMB-13	33.68 (35.48)*	S	4
T_{13}	CHMB-16	26.66 (31.08)*	MS	3
T_{14}	CHMB-17	13.32 (21.41)*	MR	2
T_{15}	CHMB-18	6.66 (14.95)*	R	1
T_{16}	CHMB-19	36.66 (37.26)*	S	4
T_{17}	CHMB-20	16.65 (24.09)*	MR	2
T_{18}	CHMB-21	56.68 (48.86)*	HS	5
T_{19}	CHMB-23	0.00 (0.28)*	HR	0
T_{20}	CHMB-26	40.00 (39.26)*	S	4
T_{21}	CHECKS: Arka Keshav	0.00 (0.28)*	HR	0
T_{22}	Arka Neelanchal Shyama	13.33 (21.41)*	MR	2
T_{23}	Devanur Local	66.70 (54.83)*	HS	5
Mean		**20.58**		
S. Em ±		**0.57**		
CD @ (5%)		**1.62**		

* Figures in the parenthesis are arc sine transformed values

HR – Highly Resistant, R – Resistant, MR – Moderately Resistant, MS – Moderately Susceptible, S – Susceptible, HS – Highly Susceptible

Table 16. Grouping of brinjal genotypes based on disease reaction to bacterial wilt incidence in pot culture

Sl. No.	Rating	Disease Reactions	Genotypes	Total
1	0	HR	CHMB-2, CHMB-6, CHMB-9, CHMB-11, CHMB-23, Arka Keshav	6
2	1	R	CHMB-1, CHMB-3, CHMB-7, CHMB-18	4
3	2	MR	CHMB-4, CHMB-5, CHMB-8, CHMB-17, CHMB-20, Arka Neelanchal Shyama	6
4	3	MS	CHMB-10, CHMB-16	2
5	4	S	CHMB-13, CHMB-19, CHMB-26	3
6	5	HS	CHMB-21, Devanur Local	2
Grand total				**23**

HR – Highly Resistant, R – Resistant, MR – Moderately Resistant, MS – Moderately Susceptible, S – Susceptible, HS – Highly Susceptible

CHMB - 2

CHMB - 6

CHMB - 9

CHMB - 11

CHMB - 23

Highly resistant advanced breeding lines of brinjal

CHMB - 21

Highly susceptible advanced breeding line of brinjal

Plate 8. Highly resistant and highly susceptible advanced breeding lines of brinjal against bacterial wilt disease

DISCUSSION

V DISCUSSION

Brinjal is an important vegetable crop grown commercially throughout the world. Successful cultivation of this crop is hindered due to attack of many diseases. Among these, bacterial wilt caused by *Ralstonia solanacearum* is the most devastating soil borne pathogen in the tropics. In India, it causes serious economic losses of 4.24 to 86.14 per cent (Sabita *et al.,* 2000). In the absence of effective control methods (chemical, cultural and biological) to address this serious problem, screening for disease resistance source to this disease reemerges as the most effective method of management. Genetic variability, which forms the basis for improvement by selection, can be obtained by pooling genotypes from different geographical regions or by crossing contrasting parents. The idea of variability in segregating generations gives a scope for the breeder to carry out the selection and generation advancement. Improving yield potential of vegetable crops is one of the major endeavours of breeders. So, assessment of genetic variation is also a vital criterion for initiating fruitful breeding program as it provides a basis for tailoring desirable genotypes. Until the collected germplasm is adequately investigated and its traits are explored, it has no practical significance. Thus, the success of any breeding programme depends upon evaluation of the trait *i.e.,* yield and yield contributing traits and also identification of the stable bacterial wilt disease resistance genotype for that particular region is important in increasing the productivity of eggplant.

Keeping all these in view, the present study was undertaken to study the performance, variability, screening against bacterial wilt disease in advanced breeding lines of brinjal. The results obtained and conclusion drawn thereof have been discussed in the light of available literatures, under the following headings.

5.1. Analysis of variance

5.2. Performance of advanced breeding lines

5.3. Genetic variability studies

5.4. Screening against bacterial wilt disease

5.1. Analysis of variance

The analysis of variance revealed significant differences among the genotypes for all traits studied which indicated the existence of variability in the germplasm. Overall high variability existed for most of the traits studied and considerable improvement could be achieved in most of the traits by selection. However, the analysis of variance itself is not enough and conclusive to explain all the inherent genotypic variance in the genotypes. So along with this, there is a need to study the magnitude of genetic variability available in the population.

5.2. Performance of advanced breeding lines

It is clear from the experimental results that significant variations were recorded among the advanced breeding lines of brinjal for the growth, flowering, yield and biochemical parameters.

5.2.1 Plant height

Significant difference observed for plant height in every growth stage of advanced breeding lines of brinjal. The line CHMB-6 has recorded the maximum plant height during thirty days after transplanting, which was on par with CHMB-2 and minimum plant height was recorded by Arka Neelanchal Shyama. At 60 days after transplanting maximum plant height was observed in CHMB-6 which was on par with CHMB-2 and minimum observed in Arka Neelanchal Shyama. During ninety days after transplanting, the line CHMB-6 recorded the maximum plant height, whereas on par recorded in CHMB-2 and minimum plant height was recorded by the genotype CHMB-8. The significant differences recorded in plant height among the brinjal lines could be due to their specific genetic makeup of plant and its interaction with the environment as well as differences in apical dominance controlled by the endogenous auxin level of the lines. The present findings were in conformity with the findings of Bhambure *et al.* (2020), Patel and Chaurasiya (2022), Nikitha *et al*. (2020), Rajatha *et al*. (2020), Praneetha *et al*. (2021) and Sahu *et al*. (2022).

5.2.2 Number of primary branches

Number of primary branches per plant is an important character which contributes to the fruit yield. The higher number of primary branches is a desirable trait for obtaining higher number of fruits. The line CHMB-7 reported highest number of primary branches at 30 DAT. Whereas, the line Arka Neelanchal Shyama recorded minimum number of branches. At 60 DAT, the line CHMB-2 recorded the maximum number of primary branches which was on par with CHMB-6 and minimum number of primary branches was recorded by the genotype Arka Neelanchal Shyama. The line CHMB-2 recorded the highest number of primary branches at 90 DAT and minimum number of branches was observed in Arka Neelanchal Shyama. The differences in number of primary branches among the brinjal lines could be attributed due to genetic makeup of different lines, environmental factors and their differential endogenous auxin and cytokinin contents which regulate the lateral growth and bud development, as low auxin and higher cytokinin levels promote lateral growth and bud development or vice-versa. These findings were similar to those noticed by Saikia *et al.* (2021), Singh *et al*. (2019), Konyak *et al*. (2019), Sahu *et al*. (2022), Praneetha *et al*. (2021), Patel and Chaurasiya (2022) and Verma *et al.* (2023).

CHMB - 2 **CHMB - 6** **CHMB - 9** **CHMB - 11** **CHMB - 23**

Plate 9. Best performing advanced breeding lines of brinjal

5.2.3 Days to first flowering

Earliness in flowering is the desirable character for any crop especially in multiple harvest crops like vegetables to get early harvest and to fetch better price in the market. The earliest flowering was noted for CHMB-11. Whereas, the delayed flowering was observed in Devanur Local. This variation in days for initiation of flowering among different brinjal lines may be due adaptability of these lines in a particular environment, better and efficient utilization of nutrients in a relatively hostile environment which might have resulted in early termination of vegetative phase and initiation of reproductive phase as compared to late flowering genotypes as well as difference in genetic makeup which decides the early, mid and late character for flowering. Above findings regarding the variation in days to initiation of flowering in different brinjal lines were in conformity with Nirmala and Vethamoni (2016), Praneetha *et al*. (2021), Akshay *et al.* (2018), Bhambure *et al.* (2020), Sahana *et al*. (2020) and Patel and Chaurasiya (2022).

5.2.4 Days to fifty per cent flowering

The line CHMB-11 recorded earliest days to fifty per cent flowering. Whereas, delayed observed in Devanur Local. This variation is due to genotypic characters of the plant in association with environment and management practices which decides the magnitude of earliness, mid or late flowering. Above information were in contrary to the findings of Paridha *et al.* (2020), Patel and Chaurasiya (2022), Umesh *et al*. (2018), Bisht *et al*. (2022).

5.2.5 Days taken for first picking

The lines which come in bearing early capture early markets and fetch good price in market. Days to first harvest is an important yield attributing character in commercial cultivation point of view. Farmers start getting income as and when the harvesting is started. Therefore, early harvesting is beneficial to the farmers. The minimum number of days taken for first picking was noted in CHMB-11. Whereas, the maximum number of days was observed in Devanur Local. The variation in days to first harvest is basically due to variation in days for initiation of flowering and days to fifty per cent flowering. The lines which recorded lesser days for initiation of flowering and days to fifty per cent flowering commence early harvesting. Similar findings, were noticed by Akshay *et al.* (2018), Praneetha *et al*. (2021), Srivastava *et al*. (2019), Paridha *et al.* (2020), Gotame *et al.* (2020), Saikia *et al.* (2021), Bisht *et al*. (2022) and Verma *et al.* (2023).

5.2.6 Number of flower clusters per plant

Maximum number of flower clusters per plant was found in CHMB-2 which was on par with CHMB-6, while minimum number of flower clusters per plant was found in Arka Neelanchal Shyama. The variations in flower clusters production among brinjal lines could be directly related due to their genetic makeup, environmental factors, intercultural practices that decides availability of photosynthates and also due to production of branches. The findings were in conformity with reports of Tripathy *et al.* (2017), Sadarunnisa *et al.* (2018) and Sahu *et al*. (2022).

5.2.7 Number of flowers per cluster

Maximum number of flowers per cluster was found in CHMB-13, while minimum number of flowers per cluster was found in CHMB-21. The variations in flower production among the brinjal lines could be directly related to their genetic makeup resulting in differential hormonal content and photosynthetic efficiency. Similar findings have been reported by Kumar *et al*. (2018), Sadarunnisa *et al.* (2018), Praneetha *et al*. (2021) and Patel and Chaurasiya (2022).

5.2.8 Number of fruits per cluster

The maximum number of fruits per cluster was observed in the line CHMB-2 whereas minimum number of fruits per cluster was found in CHMB-8. The significant variations in number of fruits per cluster might be due to differential production of different flower types (long, medium and short styled) by the different lines which directly affects the pollination and fertilization and ultimately fruit set. The findings were in accordance with the reports of Chinthagunti *et al.* (2018), Kumar *et al*. (2018), Srivastava *et al*. (2019), Praneetha *et al*. (2021), Patel and Chaurasiya (2022) and Lohani *et al.* (2023).

5.2.9 Fruit setting percentage

The comparison of brinjal lines indicated that they differed significantly for fruit setting percentage. The maximum fruit setting percentage was observed in CHMB-2. While, the minimum fruit setting percentage was observed in Arka Neelanchal Shyama. Flowering and fruit setting are two most important factors determining the yield of cultivated eggplants, especially the style length which determines the effectiveness of fruit setting. There are four types of flowers found in brinjal depending on the length of the style, *viz.,* long styled with big size ovary, medium styled with medium size ovary, pseudo short styled with rudimentary ovary and true short styled with very rudimentary ovary. Fruit setting percentage is high in long styled and medium long styled flowers, while true short styled and pseudo short styled flowers do not set fruits at all. These findings were in accordance with reports of Kumar *et al*. (2018), Chinthagunti *et al.* (2018), Srivastava *et al*. (2019), Patel and Chaurasiya (2022), Sahu *et al*. (2022) and Lohani *et al.* (2023).

5.2.10 Fruit length

The maximum fruit length was found in the line CHMB-18. While, the minimum fruit length was observed in CHMB-3. The significant differences for fruit length among the brinjal lines could be attributed due to their genetic makeup as brinjal varieties are classified into different shapes of fruits as per their differential growth in terms of length and breadth which is important varietal genetic character and also the nutrient availability as it directly relates to fruit weight. The variation in fruit length was also reported by Sharma and Banyal (2016), Akshay *et al.* (2018), Umesh *et al*. (2018), Praneetha *et al*. (2021), Sahu *et al.* (2022), Rajatha *et al.* (2020), Nanthakumar and Savitha (2021), Patel and Chaurasiya (2022) and Lohani *et al.* (2023).

5.2.11 Fruit diameter

The maximum fruit diameter was found in Arka Neelanchal Shyama. While, minimum was observed in Arka Keshav. Fruit diameter differences among the brinjal lines is mainly attributed to the genetic potential as fruits of different shapes such as long, oblong, round are produced by different genotypes. It is also due to variation in dry matter partitioning ability of plants which could have been further influenced by the prevailing environmental factors. Similar results were noted by Chaudhary *et al*. (2017), Rajatha *et al.* (2020), Devi and Kanaujia (2020), Nanthakumar and Savitha (2021), Praneetha *et al*. (2021), Alam *et al.* (2021) and Verma *et al.* (2023).

5.2.12 Stalk length

Among the different lines, CHMB-21 recorded the maximum stalk length. Whereas, the line CHMB-11 recorded minimum stalk length. This might be due to the inherent genetic potential of the genotype. Variation of stalk length was also reported in different brinjal genotypes by Singh *et al.* (2014), Nanthakumar and Savitha (2021), Praneetha *et al*. (2021) and Sahu *et al*. (2022).

5.2.13 Number of fruits per plant

Fruits per plant are the most important character as it directly influences the yield of the crop. The maximum number of fruits per plant was found in CHMB-2 which was on par with CHMB-6, while the minimum number of fruits per plant was found in Arka Neelanchal Shyama. This might be due to inherent character of genotypes that influence higher number of primary branches per plant, relatively higher percentage of long styled flowers and more number of fruits per cluster which directly contributes to more number of fruits per plant. These findings were in accordance to those recorded by Sanga *et al.* (2017), Syed *et al*. (2018), Konyak *et al*. (2019), Devi and Kanaujia (2020), Praneetha *et al*. (2021), Siva *et al*. (2020), Sahu *et al*. (2022), Saikia *et al.* (2021), Patel and Chaurasiya (2022) and Lohani *et al.* (2023).

5.2.14 Fruit yield per plant

Yield being polygenic trait, is a result of component characters like number of fruits per plant and fruit weight. Significantly, the highest yield per plant was observed in the line CHMB-2 and on par noted in CHMB-6, while minimum fruit yield per plant was found in CHMB-8. Variation observed might be due to difference in genetic makeup of specific genotype and its ability to perform in specific environment, which had influenced flowering, fruiting, fruit weight, number of fruits and ultimately the yield. The variation in number of fruits per plant was also reported by Tripathy *et al*. (2021), Akter and Rahman (2020), Arti *et al.* (2020), Nikitha *et al.* (2020), Sahu *et al*. (2022), Lohani *et al.* (2023) and Manogna *et al*. (2023).

5.2.15 Average fruit weight

Average fruit weight was highest in Arka Neelanchal Shyama whereas the lowest was recorded in CHMB-10. The variations in fruit weight among the brinjal lines could be primarily attributed to their genetic makeup controlling fruit shape and size. Further it could also be directly related to availability of photosynthates for diversion to the fruit. Maximum fruit weight is one of the main yields contributing character in brinjal. Similar results were also noticed by, Bisht *et al*. (2022), Tripathy *et al*. (2021), Vhankhande and Singh (2018), Tripathy *et al*. (2020), Sahu *et al*. (2022), and Verma *et al.* (2023).

5.2.16 Fruit yield per plot and estimated fruit yield

The highest fruit yield per plot and estimated fruit yield per hectare was recorded in the line CHMB-2. Whereas, the line CHMB-8 recorded minimum fruit yield per plot and estimated fruit yield per hectare. The fruit yield potential might be attributed due to the inherent genetic makeup of the genotype and also due to a greater number of fruits per plant, higher fruit weight, number of fruits per cluster in addition to comparatively a greater number of primary and secondary branches and adaptability of the genotype to the local environmental conditions. Similar results were reported by Vhankhande and Singh (2018), Konyak *et al*. (2019), Akter and Rahman (2020), Bhambure *et al.* (2020), Gotame *et al.* (2020), Nanthakumar and Savitha (2021), Patel and Chaurasiya (2022), Sahu *et al*. (2022) and Lohani *et al.* (2023).

5.2.17 Dry matter content

Among the different lines, the line CHMB-7 recorded maximum dry matter content which was on par with CHMB-11. Whereas, the line CHMB-5 recorded minimum dry matter content. It mainly depends on climatic conditions and intercultural operations like watering, fertilizer applications, *etc.,* For cooking side dishes, moderate dry matter content is desirable. It ensures the necessary elasticity and softness of the finished product. To produce high-quality canned foods, an increased dry matter content reduces fruit shrinkage in the jar and improves its appearance for a longer time. It was visually revealed that eggplant genotypes with a high dry matter content have a glossy surface, strong skin, dense pulp and are more suitable for transportation and storage. The findings are in accordance with the reports of Reshmika *et al*. (2016), Praneetha *et al*. (2021), Patel and Chaurasiya (2022) and Paridha *et al.* (2020).

5.2.18 Moisture content

The maximum moisture content was found in the line CHMB-5. Whereas, the line CHMB-7 recorded minimum moisture content. These findings are in accordance with the reports of Praneetha *et al*. (2021), Akter and Rahman (2020), and Srivastava *et al*. (2019).

5.2.19 Fruit phenol content

The maximum fruit phenol content was observed in Arka Keshav, which was followed by Devanur Local. Whereas, the line CHMB-13 recorded minimum phenol content. Eggplant fruits have shown high hydrophilic oxygen radical absorbance capacity which has been correlated to phenol compounds presence, including delphinidin as a major component in peel and chlorogenic acid in flesh (Kandoliya *et al*., 2015). A considerable variability noted might be due to genetic factors and growing conditions. It could also depend upon the harvesting stage of the crop as reported by (Nayanathara *et al*., 2016). The findings are in accordance with the reports of Sahana *et al*. (2020), Reshmika *et al*. (2016), Sanga *et al.* (2017), Patel and Chaurasiya (2022) and Srivastava *et al*. (2019).

5.2.20 Fruit shape, color and spininess

Fruit morphological diversity appeared to be more promising tool, can be utilized to differentiate the genotypes. The fruit qualitative parameters *viz.*, fruit colour, shape and fruit spininess were noted and presented as their typical genetical characters in Table 11. These characters could be absolutely attributed to their genetic nature which could have been influenced by the prevailing environmental conditions.

5.3. Genetic variability studies

Estimation of variability parameters in a population is prerequisite for breeding programme, aimed at improving yield and other important characters under consideration through appropriate selections. Unless a major portion of variation is heritable, attempts are made to improve characters by selection would be futile. The success in a crop improvement programme depends on the ability of breeder to define and assemble the required genetic variability and select for yield indirectly through yield associated and highly heritable characters after eliminating the environmental components of phenotypic variation. Therefore, it is necessary to have information on both PCV and GCV, to estimate heritability, which to predict the expected gains through selection.

The range and mean values do not reflect the total variance in the material studied. Hence, actual variance has to be estimated for the characters to know the extent of existing variability. Genotypic variance measures the magnitude of genetic variability present in the crop and phenotypic variance indicates the amount of variation which is due to phenotypic values. The absolute values of phenotypic and genotypic variance cannot be used for comparing the degree of variability in different characters because the characters differ in the unit of measurement. Hence, the coefficient of variation (PCV and GCV) which is calculated by considering the respective means has been used for the comparisons. High values PCV and GCV indicate wider variability and vice versa. Accordingly, narrow difference between phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) implies lesser effect of environment on the expression of these traits.

Knowledge of genetic advance that is expected by applying selection pressure to a segregating population is useful in designing effective breeding programme. Evaluation of segregating progenies helps in estimation of various genetic and non-genetic components of variance. Heritability is a fraction of variance in phenotypic expression that arises from genetic effects. The nature of selection units and sampling errors influence greatly the magnitude of heritability estimates. Heritability estimates in segregating generations help to know genetic variance, genotype-environment interaction and the progress expected from selection. A most misleading estimate of phenotypic variance for yield under natural conditions would have been estimated from a single test, resulting in the confounding of the interaction variances with progeny variance. The estimates of genetic advance may be biased upward, if phenotypic variance contains a fraction of genetic variance due to non-additive effects (dominance or epistasis) if present (Hansen *et al*., 2006).

Besides, heritability is the heritable portion of the phenotypic variance. It is an efficient indicator of the transmission of characters from parents to offspring (Falconer, 1981). For plant breeders, selection of elite genotypes from the diverse genetic population could be easily achieved through heritability. Heritability suggests plant breeders about the proportion of improvement of their populations through the genetic study of plants. In the selected plants, improvement in the mean genotypic value over the parental population is termed as genetic advance. It helps to measure the genetic gain under selection. Enhancement of yield and quality of brinjal is attributed by the simultaneous choice of desirable character combination of genotypes existing in nature (Lokesh *et al*., 2013).

According to Johnson (1955), heritability estimates along with the genetic gain would be more useful than the former alone in predicting the effectiveness of selection. Therefore, it is essential to consider the predicted genetic advance along with heritability estimates as a tool in selection programme for better efficiency.

In the present study, for all the characters studied, genotypic coefficient of variability was lower in magnitude than the phenotypic coefficient of variability. High values of these characters indicate wider variability and vice versa. Accordingly, a narrow difference between the phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) implies the lesser effect of environment on the expression of these traits.

5.3.1 Genetic variability studies in advanced breeding lines of brinjal for growth, flowering, yield and biochemical parameters

High values of PCV and GCV were observed for the characters like number of primary branches at 60 DAT, days to first flowering, number of flower clusters per plant, number of flowers per cluster, number of fruits per cluster, number of fruits per plant, fruit length, fruit diameter. For comparison and measurement of genetic variability among different characters GCV is helpful. High GCV and PCV values indicate large amount of variation and consecutively more scope for improvement through selection. High GCV indicates, more will be the chance for utilization of that particular character in the selection programme. These results were in accordance with the findings of Sharma *et al*. (2022) for number of fruits per cluster and number of fruits per plant, Chithra *et al*. (2020) and Vaishnavi *et al*. (2023) for number of branches and fruits per plant, Verma *et al*. (2023) and Patel *et al.* (2023) for fruit length, Pallavi and Sanjay (2014) for number of flower clusters per plant, Ashish *et al.* (2019) for fruit diameter, Shilpa *et al*. (2018) for days to first flowering, Verma *et al*. (2021), Konyak *et al*. (2020), Begum *et al.* (2022) Devaraju *et al.* (2020), Prajapati *et al*. (2021), Balasubramaniyam *et al.* (2021), Srivastava *et al* (2019), Kumar *et al*. (2022) and Barik *et al*. (2021) for number of fruits per plant, Bisht *et al*. (2022) and Sajjan *et al*. (2021) for number of flowers per cluster, number of primary branches and number of fruits per cluster.

Moderate PCV and GCV were registered by the characters like plant height at 30 and 60 DAT respectively, number of primary branches at 30 and 90 DAT, days to fifty per cent flowering, fruit yield per plant, fruit yield per plot, estimated fruit yield, dry matter content, fruit phenol content, average fruit weight, days taken for first picking, fruit setting percentage and stalk length which means that the magnitude of genetic variation observed was somewhat less for these characters and there is greater scope for selection to improve upon these characters in the genotypes studied. These results were in line with the findings of Kumar *et al.* (2020), Sajjan *et al*. (2021), Verma *et al*. (2021), Prajapati *et al*. (2021) and Kumar *et al*. (2022) for plant height. Dhaka and Soni (2021) for days to fifty per cent flowering, Verma *et al*. (2023) for days taken for first picking, Chaudhary *et al*. (2023) for average fruit weight, fruit yield per plant, number of primary branches per plant and total phenol content, Vaishnavi *et al*. (2023) for fruit yield per plot, estimated fruit yield per hectare, stalk length and fruit phenol content. Ansari *et al*. (2011) for average fruit weight.

Low GCV and moderate PCV was reported in plant height at 90 DAT shows influence of environment on expression of the trait. These results were in line with the findings of Shruti *et al.* (2019), Vhankhande and Singh (2018) and Sujin *et al.* (2017).

Low PCV and GCV were observed for the characters like moisture content indicating that extent of genetic variation observed was low for this character among the genotypes studied. Low PCV and GCV showed the narrow genetic base consequently selection for such characters may not give pleasing results. These results were in agreement with the findings of Verma *et al*. (2021), Kumar *et al*. (2022), Barik *et al*. (2021) and Balasubramaniyam *et al.* (2021).

It is not possible to determine the amount of variation, which is heritable with the help of phenotypic coefficient of variation and genotypic coefficient variation alone. The heritability along with genetic advance is more meaningful and helps in predicting the resultant effect of selection on phenotypic expression.

Estimates of high heritability coupled with high genetic advance as per cent of mean was recorded for plant height (30, 60 and 90 DAT respectively), number of primary branches (30, 60 and 90 DAT respectively), days to first flowering, days to fifty per cent flowering, number of flower clusters per plant, number of flowers per cluster, number of fruits per cluster, fruit setting percentage, days taken for first picking, number of fruits per plant, average fruit weight, fruit length, fruit diameter, stalk length, fruit yield per plant, fruit yield per plot, estimated fruit yield, dry matter content and fruit phenol content. The results indicate the presence of additive genes in these attributes and less influence of environmental variation which further suggest reliable crop improvement through selection based on phenotypic performance for these attributes would be effective. These results were in agreement with the reports of Kumar *et al*. (2022), Manogna *et al*. (2023) and Patel *et al.* (2023) for fruit length, number of fruits per plant and fruit yield per plant, Verma *et al*. (2021), Srivastava *et al.* (2019), Yankanchi *et al.* (2020) and Sajjan *et al*. (2021) for flowers per clusters, number of flower clusters per plant, number of primary branches, number of fruits per cluster, fruit set percentage, plant height at harvest, number of fruits per plant, fruit length, stalk length, average fruit weight and fruit yield per plant, Dhaka and Soni (2021) and Shilpa *et al*. (2018) for days to first flowering, Vaishnavi *et al*. (2023) Sangam *et al.* (2020) and Chaudhary *et al*. (2023) for stalk length, yield per plot, estimated fruit yield, phenol content, Sharma *et al*. (2022), Gupta *et al*. (2018), Balas *et al*. (2019) and Konyak *et al.* (2020) for number of primary branches and plant height, Anbarasi and Haripriya (2021), Prajapati *et al*.(2021), Balasubramaniyam *et al.* (2021), Barik *et al*. (2021), Begum *et al.* (2022), Bisht *et al*. (2022), Kumar *et al*. (2022) and Patil *et al.* (2021) for number of branches, average fruit weight, fruit length, fruit diameter, number of fruits per plant and yield per plant.

Moderate heritability in broad sense and low genetic advance as per cent over mean was observed for the character moisture content indicating that this character was influenced by environment and selection for improvement of this character would be ineffective. Similar reports were illustrated by Verma *et al*. (2021), Anbarasi and Haripriya (2021), Sharma *et al*. (2022), Kumar *et al*. (2022) and Vaishnavi *et al*. (2023).

5.4 Screening against bacterial wilt disease

Management of the disease through host plant resistance has been the best choice in all crop improvement programme. The utilization of resistant cultivars in the farming system is the most simple, effective and economical method in management of the disease. Besides this, these resistant cultivars conserve natural resources and reduce the cost, time and energy when compared to the other methods of disease management.

5.4.1 Per cent disease incidence and disease scoring of advanced breeding lines

Twenty brinjal lines along with three checks were screened in pot culture for resistance against bacterial wilt. The study revealed that five lines (CHMB-2, CHMB-6, CHMB-9, CHMB-11, CHMB-23) and check (Arka Keshav) were found to be immune or highly resistant, whereas four lines (CHMB-1, CHMB-3, CHMB-7, CHMB-18) showed resistant reaction, five lines (CHMB-4, CHMB-5, CHMB-8, CHMB-17, CHMB-20) and check (Arka Neelanchal Shyama) showed moderately resistant reaction, two lines (CHMB-10, CHMB-16) showed moderately susceptible reaction, three lines (CHMB-19, CHMB-13, CHMB-26) showed susceptible reaction and a line (CHMB-21) and check (Devanur Local) showed highly susceptible reaction. This might be due to difference in the degree of resistance to bacterial wilt by different lines. The results were in agreement with findings of Hussain *et al.* (2005), Gopalakrishnan *et al.* (2014), Santhosha *et al.* (2015), Munish *et al.* (2017), Singh *et al.* (2019), Ramesh *et al.* (2021) and Sabina *et al.* (2023).

Conclusion

In the present study, high PCV and GCV were recorded for number of primary branches at 60 DAT, days to first flowering, number of flower clusters per plant, number of flowers per cluster, number of fruits per cluster, number of fruits per plant, fruit length and fruit diameter.

The high broad sense heritability (>60 %) coupled with high genetic advance as per cent over mean (>20 %) was recorded for the traits like plant height (30, 60 and 90 DAT respectively), number of primary branches (30, 60 and 90 DAT respectively), days to first flowering, days to fifty per cent flowering, number of flower clusters per plant, number of flowers per cluster, number of fruits per cluster, fruit setting percentage, days taken for first picking, number of fruits per plant, average fruit weight, fruit length, fruit diameter, stalk length, fruit yield per plant, fruit yield per plot, estimated fruit yield, dry matter content and fruit phenol content.

The lines CHMB-2, CHMB-6, CHMB-9, CHMB-11 and CHMB-23 are highly resistant with no wilting of plants.

From overall discussion of the results, it can be concluded that lines CHMB-2, CHMB-6, CHMB-9, CHMB-11 and CHMB-23 (39.42 t/ha, 38.38 t/ha, 35.85 t/ha, 35.22 t/ha and 34.11 t/ha) were found best which gave high yield and they were highly resistant to bacterial wilt. The higher yield in these genotypes is attributed due to a greater number of fruits per plant, plant height at 60 DAT, fruit setting percentage, number of primary branches at 60 DAT, number of fruits per cluster, fruit diameter and fruit length. High heritability coupled with high GAM and narrow differences between GCV and PCV indicating variation observed in these characters is mainly due to genotypic, so selecting the genotype based on these characters can be done to improve the yield potential.

Future line of work

By looking into the salient findings of the study, the future line of work may be thought of in the following directions.

1. The resistant source can be confirmed by using molecular techniques.
2. Fruit yield and quality over locations and quality assessment of identified lines can be done.
3. Best lines may be promoted as varieties after multi location and farm trials.

SUMMARY

VI SUMMARY

The experiment entitled "Evaluation of advanced breeding lines of brinjal (*Solanum melongena* L.) against bacterial wilt disease" was undertaken to assess the performance, level of variability spectrum present in the population and screening against bacterial wilt disease. The study was conducted at the research field unit, Department of Vegetable Science, College of Horticulture, Mudigere, Karnataka during 2022-2023. The results gathered in the present study are summarized below.

The analysis of variance (ANOVA) showed highly significant differences among the different brinjal lines for all the traits studied indicating the presence of variability among the genotypes.

For morphological parameters, the line CHMB-6 recorded the maximum plant height at 30, 60 and 90 DAT and the minimum plant height was recorded in Arka Neelanchal Shyama at 30 and 60 DAT, while at 90 DAT in CHMB-8. The line CHMB-7 recorded the highest number of primary branches at 30 DAT, while at 60 and 90 DAT in CHMB-2. In contrast, Arka Neelanchal Shyama recorded minimum number of primary branches.

The minimum number of days taken for flowering, fifty per cent flowering and for first picking was observed in CHMB-11. Whereas, maximum number of days was observed in Devanur Local.

The maximum number of flower clusters per plant was observed in CHMB-2, while minimum in Arka Neelanchal Shyama. The maximum number of flowers and fruits per cluster were found in CHMB-13 and CHMB-2 respectively. While, minimum in CHMB-21 and CHMB-8 respectively. The highest fruit setting percentage was noted in CHMB-2. While, the minimum was found in Arka Neelanchal Shyama.

For fruit parameters, the longest fruit was found in CHMB-18, whereas the shortest fruit was observed in CHMB-3. The maximum fruit diameter was found in Arka Neelanchal Shyama, while minimum in Arka Keshav. The line CHMB-21 recorded maximum stalk length and the shortest stalk length was found in CHMB-11.

For yield parameters, maximum number of fruits per plant was found in CHMB-2 while, the minimum number was found in Arka Neelanchal Shyama. The highest average fruit weight was observed in Arka Neelanchal Shyama, while lowest fruit weight was observed in CHMB-10. The line CHMB-2 produced the highest fruit yield per plant, fruit yield per plot and estimated total fruit yield per hectare and the lowest recorded in CHMB-8.

For biochemical parameters, the highest dry matter and minimum moisture content were found in the genotype CHMB-7. Whereas the genotype CHMB-5 had the lowest dry matter and maximum moisture content. The highest fruit phenol content reported in Arka Keshav. Whereas, the genotype CHMB-13 recorded the lowest fruit phenol concentration.

High values of genotypic as well as phenotypic coefficient of variations (>20 %) were registered for the characters like number of primary branches at 60 DAT, days to first flowering, number of flower clusters per plant, number of flowers per cluster, number of fruits per cluster, number of fruits per plant, fruit length and fruit diameter. The difference between genotypic and phenotypic coefficient of variation were also less for above characters suggesting less influence of environment on expression of these traits.

Moderate PCV and GCV were recorded by the traits like plant height at 30 and 60 DAT, respectively, number of primary branches at 30 and 90 DAT, days to fifty per cent flowering, days taken for first picking, average fruit weight, stalk length, fruit yield per plant, fruit yield per plot, estimated fruit yield, dry matter content and fruit phenol content.

High broad sense heritability (>60 %) coupled with high genetic advance as per cent over mean (>20 %) was noted for plant height (30, 60 and 90 DAT, respectively), number of primary branches (30, 60 and 90 DAT respectively), days to first flowering, days to fifty per cent flowering, number of flower clusters per plant, number of flowers per cluster, number of fruits per cluster, fruit setting percentage, days taken for first picking, number of fruits per plant, average fruit weight, fruit length, fruit diameter, stalk length, fruit yield per plant, fruit yield per plot, estimated fruit yield, dry matter content and fruit phenol content.

Five lines (CHMB-2, CHMB-6, CHMB-9, CHMB-11 and CHMB-23) are highly resistant with no wilting of plants.

REFERENCES

VII REFERENCES

ABDUL, M. A., AHMAD, E., KUMAR, R., NAZRUSSALAM AND SINGH, D. N., 2021, Evaluation of brinjal genotypes for morphological characters, yield performance and resistance to bacterial wilt and shoot and fruit borer. *Int. J. Agric. App. Sci*., **2**(1): 163-169.

AKSHAY, D. A., PRANEETHA, S., VETHAMONI, P. I. AND RAJESWARI, S., 2018, Mean performance of brinjal (*Solanum melongena* L.) genotypes under Tamil Nadu condition. *J. Agric. Ecol.*, **6**: 47-53.

AKTER, A. AND RAHMAN, H., 2020, Genetic variation and characteristics relationship in the eggplant genotypes*. Int. J. Genet. Eng. Recom*., **4**(6): 28-38.

ALAM, M. A., KAMARZAMAN, A. B., JALLOH, M. B. AND LASSIM, M. B. M., 2021, Evaluation of varietal performance for yield and yield contributing attributes of local brinjal (*Solanum melongena* L.) germplasm collections. *J. Agrobiotechnol.,* **12**(1): 1-9.

ALI, M., 1993, Workshop on research and development of vegetable crops. Institute of Post graduate Studies in Agriculture (IPSA), Gazipur, pp. 68-75.

ANBARASI, D. AND HARIPRIYA, K., 2021, Genetic variability, heritability and genetic advances in brinjal (*Solanum melongena* L.). *Ann. Plant Soil Res.,* **23**(2): 196-199.

ANONYMOUS, 2022, First advance estimates, National Horticulture Board, New Delhi. https://nhb.gov.in

ANSARI, S. F., MEHTA, N., ANSARI, S. AND GAVEL, G. P., 2011, Variability studies in brinjal (*Solanum melongena* L.) in Chhattisgarh plains. *Electron. J. Plant Breed.,* **2**(2): 275-281.

ARTI, D., SHARMA, A. K. AND KUMAR, R., 2020, Performance evaluation of different genotypes of brinjal (*Solanum melongena* L.) under mid hill conditions of Himachal Pradesh. *Electron. J. Plant Breed*., **11**(2): 405-410.

ASHISH, K., VIPIN, K., AMIT, K., UJJWAL, V. AND RAMRAJ, S., 2019, Studies on variability, heritability and genetic advance for yield and its attributes in brinjal (*Solanum melongena* L.). *Int. J. Curr. Microbiol. App. Sci.,* **8**(6): 1507-1513.

ASLAM, M. N., MUKHTAR, T., HUSSAIN, M. A. AND RAHEEL, M., 2017, Assessment of resistance to bacterial wilt incited by *Ralstonia solanacearum* in tomato germplasm. *J. Plant Dis. Prot.,* **124**: 585-590.

AYKROYD, W. R., 1963. Composition of brinjal fruit. *ICMR special Rept*, pp.42.

BALAS, A., JIVANI, L. L., VALU, M. G., SAKRIYA, S. G., GAMIT, U. C. AND RATHOD, R. K., 2019, Study of genetic variability and heritability in brinjal (*Solanum melongena* L.). *The Pharm. Innov*., **8**(9): 44-46.

BALASUBRAMANIYAM, K., HARIPRIYA, K., KUMAR, T. R. B. AND ELANGAIMANNAN, R., 2021, Assessment of genetic variability, heritability and genetic advance in brinjal (*Solanum melongena* L.). *Plant Arch*., **21**(1): 1784-1786.

BANERJEE, S., VERMA, A., BISHT, Y. S., MAURYA, P. K., JAMIR, I., MONDAL, S., BHATTACHARJEE, T. AND CHATTOPADHYAY, A., 2018, Genetic variability, correlation coefficient and path coefficient analysis in brinjal germplasm. *Int. J. Chem. Stud.*, **6**(4): 3069-3073.

BARIK, S., PONNAM. N., ACHARYA, G. C., SINGH, T. H., DASH, M., SAHU, G. S., MAHAPATRA, S. K., 2021, Genetic variability, character association and diversity studies in brinjal (*Solanum melongena* L.). *Electron. J. Plant Breed*., **12**(4): 1102-1110.

BEGUM, T., MUNDA, S., PANDEY, S. K. AND LAL, M., 2022. Estimation of selection criteria through multi-year assessment of variability parameters, association studies and genetic diversity of *Solanum khasianum*. *Sci. Hortic*., https://doi.org/10.1016/j.scienta.2022.110923.

BHAMBURE, D. G., NAIK, H. P., NIRMAL, O. A., KAPSE, V. D., VAIDYA, K. P., MORE, S. S. AND DHOPAVKAR, R. V., 2020, Performance of F_6 progenies of Brinjal (*Solanum melongena* L.) under Konkan agro climatic condition. *J. Pharm. Innov.,* **9**(1): 183-184.

BHANWAR, R. R., TIWARI, P. K. AND THAKUR, A. K., 2019, Screening of brinjal cultivars against bacterial wilt disease under artificially inoculated conditions at Bastar Plateau zone of Chhattisgarh. *Int. J. Curr. Microbiol. Appl. Sci.,* **8**(2): 3113-3119.

BISHT, Y. S., VERMA, A., BANARJEE, S., RATHORE, V. AND SINGH, D., 2022, Genetic variability and trait association in organically grown genotypes in Brinjal. *Agric. Res. J*., **59**: 21-29.

BISWAS, M. K. AND GHOSH, T., 2018, Screening of brinjal genotypes for their resistance against fungal and bacterial wilt and integrated management of the disease. *Plant cell Biotechnol. Mol. Biol.,* **19**(2): 61-71.

B-MENSAH, I. N., OSEI, K. AND RUTH, N. A. P., 2021, Screening of tomato genotypes for bacterial wilt disease (*Ralstonia solanacearum*) resistance in Ghana. *European J. Agric. Food Sci.*, **3**(5): 1-8.

BORA, G. C., DEVI, J., GOGOI, S., DEKA, A., BHATTACHARYYA, A. K. AND PASWAN, L., 2011, Evaluation of varieties of brinjal (*Solanum melongena* L.) for resistance to bacterial wilt in North East India. *Cur. Adv. Agri. Sci.,* **3**(1): 36-38.

*BURTON, G. W. AND DEVANE, E. H., 1953, Estimating heritability in tall fescue (*Festuca arundinacea*) from replicated clonal material. *Agron. J.,* **45**: 418-481.

CHAUDHARY, A. K., YADAV, G. C., MAURYA, R. K., ANJANA, C. S. AND PRAJAPATI, J., 2023, Estimates of genetic variability, yield and quality traits of Brinjal (*Solanum melongena* L.). *Int. J. Environ. Clim. Change,* **13**(9): 583-589.

CHAUDHARY, A. S., UNIYAL, S. P. AND PANDEY, P., 2017, Evaluation of new genotypes of brinjal (*Solanum melongena* L.) under Tarai condition of Uttarakhand. *J. Nat. Appl. Sci.,* **9**(3): 1840-1843.

CHAUDHARY, P. AND KUMAR, S., 2014, Variability, heritability and genetic advance studies in egg-plant (*Solanum melongena* L.). *Plant Arch.,* **14**(1): 483-486.

CHINTHAGUNTI, H., SARNAIK, D. A. AND SHARMA, D., 2018, Evaluation of brinjal (*Solanum melongena* L.) genotypes for flowering and yield parameters. *Int. J. Curr. Microbiol .App. Sci*., **7**(12): 3101-3105.

CHITHRA, K., DEVARAJU, M., SRINIVASA, V., VARALAKSHMI, B. AND ASHA, A. B., 2020, Genetic investigation in segregating generation of brinjal (*Solanum melongena* L.). *Natl. Acad. Sci. Lett.,* **45**(1): 5-8.

*COCKERHAM, C. C., 1963. Estimation of genetic variances. *Statistical genetic. Plant Breed.*, **982**: 53-94.

DAS, C. R. AND CHATTOPADHAYAY, S. B., 1953, Bacterial wilt on eggplant. *Indian Phytopathol.,* **8**: 130-135.

DATTA, D. R., RAFII, M. Y., MISRAN, A., JUSOH, M., YUSUFF, O., SULAIMAN, N. M. AND MOMODU, J., 2021, Genetic diversity, heritability and genetic advance of *Solanum melongena* L. from three secondary centers of diversity. *Bangladesh J. Plant Taxon.,* **28**(1): 155-169.

DEBNATH, D., DIVYA, M., GOLDER, S., JAMIR, I. AND BHATTACHARJEE, T., 2019, Screening of different genotypes/crosses of tomato (*Lycopersicon esculentum* L.) for resistance to bacterial wilt (*Ralstonia solanacearum*) under field condition. *J. Pharmacogn. Phytochem.*, **8**(5): 174-177.

DEVARAJU, INDIRESH, K. M., SRINIVASA, V., LAKSHMANA, D., SINGH, T.H., DEVAPPA, V. AND VENUGOPALAN, R., 2020, Studies on variability components for yield and its attributes in Brinjal (*Solanum melongena* L.) under hill zone of Karnataka. *J. Pharmacogn. Phytochem.*, **9**(2): 2200-2203.

DEVI, O. B. AND KANAUJIA., S. P., 2020, Performance of various brinjal (*Solanum melongena* L.) genotypes under foothill condition of Nagaland. *Ann. Plant Soil Res.,* **22**(2): 189-192.

DHAKA, S. K. AND SONI, A. K., 2021, Genetic variability and response to selection in brinjal (*Solanum melongena* L.). *J. Pharm. Innov.,* **10**(12): 3102-3105.

DHAKA, S. K. AND SONI, A. K., 2012, Genetic variability in brinjal (*Solanum melongena* L). *Asian J. Hort*., **7**(2): 537-540.

DOSSOUMOU, M. E., SIKIROU, R., ADANDONON, A., GONROUDOBOU, J. AND BABA-MOUSSA, L., 2021, Tomato hybrid and local varieties screened for resistance to bacterial wilt caused by *Ralstonia solanacearum* under screen house and field conditions. *American J. Plant Sci.,* **12**: 1222-1235.

DUTTA, P. AND RAHMAN, B., 2012, Varietal screening of tomato against bacterial wilt disease under subtropical humid climate of Tripura. *Int. J. Farm Sci.,* **2**(2): 40-43.

*FALCONER, D. S., 1981, An Introduction to Quantitative Genetics, 2nd Ed. Longman, Newyork.

GADEWAR, A. V., TRIVEDI, T. P. AND SHEKHAWAT, G. S., 1991, Potato in Karnataka. Tech. Bull. No. 34, Central Potato Research Instiitute, Shimla (India), pp.17-33.

GOGOI, S., MAZUMDER, N. AND TALUKDAR, J., 2018, Evaluation of brinjal varieties for yield, genetic variability and disease reaction grown as late rabi season crop in Assam. *Indian J. Agric. Res*., **52**(2): 191-194.

GOPALKRISHNAN, C., SINGH, T. H. and ARTAL, R. B., 2014, Evaluation of eggplant accessions for resistance to bacterial wilt caused by *Ralstonia solanacearum* L. *J. Hortl. Sci.,* **9**(2): 202-205.

GOTAME, T. P., POUDEL, S., SHRESTHA, S. L. AND SHRESTHA, J., 2020, Evaluation of yield and yield components of eggplant (*Solanum melongena* L.) genotypes in the Terai region of Nepal. *Int. J. Environ.*, **9**(2): 67-80.

GUEVARRA, M. L. D., MAGHIRANG, R. G. AND OPINA, N. L., 2012, “Philippine-Mamburao”-a new eggplant (*Solanum melongena* L.) variety. *J. Crop Sci.,* **37**(2): 81-85.

GUPTA, R. A., RAM, C. N., CHAKRAVATI, S. K., DEO, C., VISHWAKARMA, M. K., ARYA, R. AND PAL, B., 2018, Studies on variability, heritability and genetic advance in brinjal (*Solanum melongena* L.). *J. Pharmacogn. Phytochem.,* **1**: 3195-3198.

HANSEN, J. L., REED, D. R., WRIGHT, M. J., MARTIN, N. G. AND BRESLIN, P. A., 2006. Heritability and genetic covariation of sensitivity to PROP, SOA, quinine HCl, and caffeine. *Chem. senses*, **31**(5): 403-413.

HARISHBABU, B. N., GOBU, R., KAILASH, C., SHANKAR, M. AND OMPRAKASH, 2017, Genetic variability, heritability and genetic advance in eggplant (*Solanum melongena* L.) genotypes under normal and osmotic stress in in vitro condition. *Int. J. Curr. Microbiol. App. Sci.,* **6**(3): 749-760.

HUSSAIN, M. Z., RAHMAN, M. A. and BASAR, M. A., 2005, Screening of brinjal accessions for bacterial wilt caused by *Ralstonia solanacearum*. *Bangladesh J. Bot.,* **34**(1): 53-58.

ISSHIKI, S., OKUBO, H. AND FUJIEDA, K., 1994, Genetic control of isozymes in eggplant and its wild species. *Euphytica*, **80**: 145-150.

*JACKSON, M. L., 1967, Soil chemical analysis. Prentice Hall of India Private Limited, New Delhi (India), pp. 111-225.

JASWANI, N., TEMBHRE, D., AGRAWAL, S., KADWEY, S., PRAJAPATI, S. AND DADIGA, A., 2015. Characterization of genetic resources and identification of suitable brinjal (*Solanum melongena* L.) genotypes in Malwa Plateau region of Madhya Pradesh. *Bio scan,* **10**(2): 831-836.

JIRANKALI, J. P., REDDY, N., GANGAPRASAD, S. AND MANOHARA, S. N., 2019, Genetic variability for quantitative and qualitative characters in brinjal (*Solanum melongena* L.). *Int. J. Curr. Microbiol. App. Sci*., **8**(3): 476-484.

*JOHNSON, H. W., ROBINSON, H. F. AND CONSTOCK, R. E., 1955, Estimate of genetic and environmental variability in soyabeans. *Apron: J. Seni. Pertunjukan*, **47**: 314-318.

JYOTHI, H. K., SANTHOSHA, H. M. AND BASAMMA, 2012, Recent advances in breeding for bacterial wilt (*Ralstonia solanacearum*) resistance in Tomato - review. *Curr. Biot.,* **6**(3): 370-398.

KALLOO, G., 1994, Vegetable breeding combined edition (Volume I, II and III). Panima educational book agency, New Delhi, India. pp. 90-91.

KANAUJIA, S. P., BIDYALAXMI, D. O., AASTIK, J. AND ANANDA, A., 2018, Evaluation of brinjal genotypes under foothill condition of Nagaland. *Curr. Adv. Agric. Sci*., **10**(1): 55-57.

KANAUJIA, S. P., BIDYALAXMI, D. O., AASTIK, J., ASHWINI, A. AND PANKAJ, S., 2018, Genetic variability, characters association and path coefficient analyisis of brinjal (*Solanum melongena* L.) genotypes under foothill condition of Nagaland. *Int. J. Biol. Sci*., **8**(2): 85-91.

KANDOLIYA, U. K., BAJANIYA, V. K., BHADJA, N. K., BODAR, N. P. AND GOLAKIYA, B. A., 2015, Antioxidant and nutritional components of eggplant (*Solanum melongena* L.) fruit grown in Saurastra region. *Int. J. Curr. Microbiol. Appl. Sci*., **4**(2): 806-813.

KARAK, C., RAY, U., AKHTAR, S., NAIK, A. AND HAZRA, P., 2012, Genetic variation and character association in fruit yield components and quality characters in brinjal (*Solanum melongena* L.). *J. Crop Weed*, **8**(1): 86-89.

KARIBASAVA, N., SREENIVASULU, G. B., PRASHNATH, S. J., JAYPRAKASHNARAYAN, R. S., MADALGIRI, M. B. AND MULGE, R., 2010, Studies on genetic variability and its importance in brinjal (*Solanum melongena* L.). *Asian J. Hort*., **4**(2): 380-382.

KELMAN, A., 1954, The bacterial wilt caused by *Pseudomonas solanacearum*. A literature review and bibliography. Tech. Bull. No. 99, North Carolina Agric. Exp. Station, pp. 194-197.

KHAPTE, P. S., SINGH, T. H. AND LAKSHMANA, R. D. C., 2018, Screening of elite eggplant (*Solanum melongena*) genotypes for bacterial wilt (*Ralstonia solanacearum*) in field conditions and their genetic association by using SSR markers. *Indian J. Agric. Sci.,* **88**(10): 1502–1509.

KHATUN, T. M., HANAFI, M. M., YUSOP, R. M., WONG, M. Y., SALLEH, F. M. AND FERDOUS, J., 2015, Genetic variation, heritability, and diversity analysis of upland rice (*Oryza sativa* L.) genotypes based on quantitative traits. *Bio. Med. Res. Int.*, https://doi.org/10.1155/2015/290861.

KISHUN, R., 1987, Studies on bacterial wilt of solanaceous crops. *Ann. Sci. Reptv.,* IIHR, Bangalore, Karnataka (India). pp. 65.

KONYAK, K. W. L., KANAUJIA, S. P., JHA, A. AND VERMA, S. K., 2019, Characterization of brinjal genotypes for growth, yield and quality traits under foothill condition of Nagaland. *Ann. Plant Soil Res*., **21**(4): 380-385.

KONYAK, W. L., KANAUJIA, S. P., JHA, A., CHATURVEDI, H. P. AND ANANDA, A., 2020, Genetic variability, correlation and path coefficient analysis of brinjal. *SAARC J. Agric*., **18**(1): 13-21.

KOUNDINYA, A. V. V., DAS, A., LAYEK, S., CHOWDHURY, R. AND PANDIT, M. K., 2017, Genetic variability, characters association and path analysis for yield and fruit quality components in Brinjal. *J. Appl. Nat. Sci*., **9**(3): 1343-1349.

KUMAR, C. H. D. H., JYOTI, U. K., KUMARA, U. K., REKHA, K. G. AND RAO, P. M., 2022, Studies on variability, heritability and genetic advance in F_2 generation of Brinjal (*Solanum melongena* L.) for different yield attributing characters. *The Pharm. Innov*., **11**(5): 2121-2123.

KUMAR, K., SINGH, D. P., KUMARI, M., SHRIVASTAV, S. P., TIWARI, P. K., TOMAR, S. AND LAL, K., 2019, Genetic variability, heritability and genetic advance estimates for yield and its contributing traits in brinjal (*Solanum melongena* L.). *J. Pharmacogn. Phytochem*., **8**(5): 2168-2172.

KUMAR, M. K., MISHRA, H. N., MANAS, P. AND NAYAK, D. P., 2020, Genetic variability and correlation studies in brinjal (*Solanum melongena* L.). *J. Pharm. Innov.,* **9** (2): 416-419.

KUMAR, M., SRINIVASA, V. AND KUMARI, M., 2018, Screening of tomato line/varieties for bacterial wilt (*Ralstonia solanacearum*) resistance in hill zone of Karnataka, India. *Int. J. Curr. Microbiol. App. Sci.*, **7**: 1451-1455.

KUMAR, R., ANJALI K., SINGH, A. K. AND MAURYA, S., 2014, Screening of bacterial wilt resistant accessions of brinjal for Jharkhand region of India. *Int. Biannual. J. Environ. Sci.,* **8**(2): 67-70.

KUMAR, R. S, ARUMUGAM, T. AND PREMALAKSHMI, V., 2012, Evaluation and variability studies in local types of brinjal for yield and quality (*Solanum melongena* L.). *Electron. J. Plant Breed*., **3**(4): 977-982.

KUMAR, S., GOWDA, P. H. R., SAIKIA, B., DEBBARMA, J., VELMURUGAN, N. AND CHIKKAPUTTAIAH, C., 2018, Screening of tomato genotypes against bacterial wilt (*Ralstonia solanacearum* L.) and validation of resistance linked DNA markers. *Australasian Plant Pathol.*, **47**(4): 365-374.

KUMAR, S. R. AND ARUMUGAM, T., 2013, Variability, heritability and genetic advance for fruit yield, quality and pest and disease incidence in eggplant. *Veg. Sci*., **40**(1): 111-113.

KUMAR, S., SHARMA, D., DIXIT, A. AND JANGHEL, A. K., 2018, Yield and yield attributing traits in diverse genotypes of brinjal (*Solanum melongena* L.). *Int. J. Curr. Microbiol. App. Sci*., **7**(10): 983-988.

LOHANI, S., ARYAL, L. N., ARYAL, S., ADHIKARI, S. AND BHUSAL, Y., 2023, Performance evaluation of brinjal genotypes in the mid-hill region of Gandaki province, Nepal. *Nepal Agric. Res. J.,* **15**(1): 152-162.

LOKESH, B., REDDY, S. P., REDDY, R. V. S. K. AND SIVARAJ, N., 2013, Variability, heritability and genetic advance studies in brinjal (*Solanum melongena* L.). *Electron J. Plant Breed.,* **4**(1): 1097-1100.

MADHAVI, N., MISHRA, A. C., PRASAD, O., J. AND BAHUGUNA, N., 2015, Studies on variability, heritability and genetic advance in brinjal (*Solanum melongena* L.). *Plant Arch.,* **15**(1): 277-281.

MAGAR, P. G., SHINDE, K. G., BHALEKAR, M. N. AND MAGAR, V. G., 2019, Genetic variability studies in brinjal (*Solanum melongena* L.). *Contemp. Res. India*, **7**(4): 2231-2237.

MANGI, V., PATIL, H., MALLESH, S., KARADI, S. M. AND MUTHAIAH, K., 2016, Genetic variability and correlation studies in brinjal (*Solanum melongena* L.) genotypes. *Bio scan,* **11**(3):1975-1978.

MANOGNA, G. S., MOUNKIA, A., PUSHPALATA, G., SHAMPA, P. AND CHAURASIA, N. K., 2023, Assessment of genetic parameters on various quantitative traits in brinjal (*Solanum melongena* L.). *Crop Res.,* **58**(1): 53-56.

MANOJ, K., SINGH, T. H., SADASHIVA, A. T., REDDY, K. M., LAKSHMANA, R. D. C. AND SAMUEL, D. K., 2019, Screening of eggplant (*Solanum melongena* L.) genotypes to isolate the stable source of resistance for bacterial wilt. *Int. J. Chem. Stud*., **7**(3): 3274-3277.

MANPREET, A. S., DHATT AND SINGH, B., 2013, Variability, heritability and genetic advance in eggplant (*Solanum melongena* L.) during summer and rainy season. *Asian J. Bio. Sci.,* **8**(2): 200-204.

MILI, C., BORA, G. C., DAS, B. J. AND PAUL, S. K., 2014, Studies on variability, heritability and genetic advance in (*Solanum melongena* L.) brinjal genotypes. *Direct Res. J. Agric. Food Sci.*, **2**(11): 192-194.

MONDAL, B., BHATTACHARYA, I., SARKAR, A. AND KHATUA, D. C., 2013, Evaluation of local brinjal (*Solanum melongena* L.) germplasm for bacterial wilt resistant. *Int. J. Agric. Stat. Sci.,* **9**(2): 709-716.

MONDAL, B., BHATTACHARYA, I., SARKAR, N. C., PAUL, A. AND KHATUA, D. C., 2012, Standardization of inoculation technique and screening of some brinjal and tomato lines against bacterial wilt. *Res. Crops,* **13**(2): 737-742.

MUNIAPPAN, S., SARAVANAN, K. AND RAMYA, B., 2010, Studies on genetic divergence and variability for certain economic characters in eggplant (*Solanum melongena* L.). *Electronic J. Plant Breed.,* **1**(4): 462-465.

MUNISH, S. AND AKHILESH, S., 2017, Screening of *Capsicum annuum* L. germplasm for resistance against bacterial wilt (*Ralstonia solanacearum*) in mid hill, sub-temperate, humid region of north western Himalayas. *Int. J. Curr. Res. Biosci. Plant Biol.,* **4**(1): 105-109.

NANTHAKUMAR, S. AND SAVITHA, B. K., 2021, Yield performance of non-spiny brinjal variety VRM (Br) 2 in northern zone of Tamil Nadu, India. *Curr. J. Appl. Sci. Technol*., **40**(34): 38-42.

NATH, B. C., BORA, L. C., MALEMNGANBA AND BORA, G. C., 2015, Assessment of resistance in tomato genotypes against bacterial wilt disease (*Ralstonia solanacearum*) in Assam condition. *Bio scan,* **10**(4): 1889-1893.

NAYANATHARA, A. R., MATHEWS, A., AALOLAM, K. P. AND RESHMA, J. K., 2016. Evaluation of total phenol, flavonoid and anthocyanin content in different varieties of eggplant. *Emergent Life Sci. Res.,* **2**: 63-65.

NEELAMBIKA, LINGAIAH, H. B., KATTEGOUDAR, J., PRASHANTH, S. J., SINGH, T. H. AND AMRUTA, S. B., 2018, Evaluation of green long pre-breeding lines of Brinjal (*Solanum melongena* L.) for bacterial wilt resistance, yield and yield attributing traits. *Int. J. Curr. Microbiol. Appl. Sci.,* **7**(8): 1650-1657.

NIKITHA, M., PRABHAKAR, B. N., PADMA, M., BHAT, B. N. AND SIVARAJ, N., 2020, Evaluation of brinjal (*Solanum melongena* L.) germplasm lines for yield related parameters and collar rot resistance. *Int. J. Curr. Microbiol. Appl. Sci*., **9**(9): 3216-3224.

NILAKH, S. B., THAWARE, B. L., DHEKALE J. S. AND PALSHETKAR M. G., 2017, Genetic variability studies on F_5 generation of brinjal (*Solanum melongena* L.). *Plant Arch*., **17**(1): 103-105.

NIRMALA, N. AND VETHAMONI, P. I., 2016, Evaluation of green fruited brinjal genotypes for growth, yield and quality characters. *Madras Agric. J.,* **103**(3): 57-61.

OKMEN, B., SIGVAHO, H. O., MUTLU, S., DOGANLAR, S., YEMENICIOGLU, A. AND FRARY, A., 2009, Total antioxidant activity and total phenolic contents in different Turkish eggplant (*Solanum melongena* L.) cultivars. *Int. J. Food Prop.,* **12**: 616-624.

OLMSTEAD, R. G. AND BOHS, L., 2007, A summary of molecular systematic research in Solanaceae: 1982-2006. *Acta Hortic*., **745**: 255-268.

PALLAVI, C. AND SANJAY, K., 2014, Variability, heritability and genetic advance studies in eggplant (*Solanunm melongena* L.). *Plant Arch.,* **14**(1): 483-486.

*PANSE, V. G. AND SUKHATME, P. V., 1967, Statistical methods for Agriculture workers. *Indian council of Agricultural Research*, *New Delhi.*

PARIDHA, H. R., MANDAL, J., CHAKRABORTY, N. R. AND MOHANTA, S., 2020, Production performance of brinjal (*Solanum melongena* L.) genotypes in laterite belt of eastern India. *Int. J. Curr. Microbiol. App. Sci.*, **9**(7): 912-919.

PATEL, K. K. AND SARNAIK, D. K., 2003, Performance study of long fruited genotypes of brinjal under Raipur conditions. *Orissa J. Hortic.,* **31**(1): 74-77.

PATEL, K. K., SARNAIK, D. A., ASATI, B. S. AND TIRKEY, T., 2023, Studies on variability, heritability and genetic advance in brinjal (*Solanum melongena* L.). *Agric. Sci. Dig.,* **24**(4): 256-259.

PATEL, Y. K. AND CHAURASIYA, P. C., 2022, Evaluation of brinjal (*Solanum melongena* L.) genotypes for growth and yield parameters under Chhattisgarh plains. *The Pharma Innov.*, **11**(7): 1769-1772.

PATIL, V. S., GANGAPRASAD, S. AND KUMAR, D. B. M., 2021, Studies on variability, heritability, genetic advance in transgressive segregating brinjal (*Solanum melongena* L.). *J. Pharm. Innov*., **10**(8): 1763-1766.

PAWASKAR, J. R., KADAM, SUDHIR, N., KADAM, J. S., 2014, Response of chilli varieties and genotypes to bacterial wilt caused by *Ralstonia solanacearum* and its management. *Indian J. Sci.,* **11**(29): 66-72.

*PIPER, C. S., 1966, *Soil and Plant Analysis*. Academic Press, New York, p. 368.

PRABAKARAN, S., BALAKRISHNAN, S., KUMAR, S. R., ARUMUGAM, T. AND PREMALAKSHMI, V., 2013, Performance and genetic variability in eggplant germplasm. *J. Prog. Agric*., **4**(2): 98-105.

PRABU, M., NATARANJAN, S. AND VEERARAGARATHATHAM, D., 2009, Correlation and path coefficient analysis in brinjal (*Solanum melongena* L.). *Indian J. Agric. Res.,* **42**: 232-234.

PRAJAPATI, D. R., PATEL, D. A. AND PATEL, D. K., 2021, Study of genetic variability in brinjal (*Solanum melongena* L.). *Int. J. Chem. Stud*., **9**(2): 945-947.

PRAMILA, KUSHWAHA, M. L., KUMAR, U. AND YADAV, L. M., 2019, Genetic variability, heritability and genetic advance studies in brinjal (*Solanum melongena* L.). *Int. J. Chem. Stud*., **6**: 592-595.

PRAMILA, M. L., VERMA, K. A., KUMAR, S. AND KUMAR, U., 2015, A review on variability, heritability and genetic advance in eggplant (*Solanum melongena* L.). *Int. J. Agric. Res*., **10**(3): 1528-1532.

PRANEETHA, S., SIVAKUMAR, V. AND HEMALATHA, P., 2021, Performance of Brinjal (*Solanum melongena* L.) germplasm for shoot and fruit borer infestation and marketable yield. *Madras Agric. J.,* https://doi.org/10.29321/MAJ.10.000565.

RAD, M. R. N., POODINEH, M., GHALANDARZEHI, A. AND ABKHOO, J., 2015, Variability, heritability and association analysis in eggplant (*Solanum melongena* L.). *J. Agric. Biol. Sci.,* **10**(12): 464-468.

RAHMAN, M. A., ALI, F., HOSSAIN, K. M. A. AND LAILA, L., 2011, Screening of different eggplant cultivars against wilt disease caused by fungi, bacteria and nematodes. *J. Experimental Sci*., **2**(1): 6-10.

RAHUL, S. K., FERDOUS, M., AHMAD, H., IFAZ, M. I. AND UDDIN, A. F. M. J., 2017. Evaluation of eight brinjal varieties at Sher-e-Bangla Agricultural University. *Int. J. Bus. Soc. Sci. Res.,* **6**(1): 42-47.

RAJATHA, K. D., CHANNAKESHAVA, B. C., HULLUR, N. AND KOTI, V., 2020, Characterization of brinjal genotypes based on morphological traits. *Green Farming,* **11**(4): 309-313.

RAMESH, R., D'SOUZA, M., ASOLKAR, T., ACHARI, G., GAITONDE, S. AND THANGAM, M., 2021, Field evaluation of bacterial wilt resistant lines and identification of promising bacterial wilt resistant varieties for Coastal region. *Indian Phytopathol.*, **74**(4): 1129-1134.

RAO, M. V. B., 1976, Bacterial wilt of tomato and eggplant in India. In: Proc. 1st Planning Conf. and workshop on ecology and control of bacterial wilt caused by *Pseudomonas solanacearum* L. Sequerianad A. Kelman, North Carolina State. *Univ., Raleigh*, pp. 94.

RAVALI, B., REDDY, K. R., SAIDAIAH, P. AND SHIVRAJ, N., 2017, Variability, heritability and genetic advance in brinjal (*Solanum melongena* L.). *Int. J. Curr. Microbiol. Appl. Sci*., **6**(6): 42-47.

RESHMIKA, P. K., GASTI V. D., EVOOR, S., JAYAPPA, J., MULGE, R. AND BASAVARAJ, L. B., 2016, Performance of brinjal (*Solanum melongena* L.) genotypes under GLBC Condition. *J. Ecol. Environ*., **34**(2): 519-525.

ROBINSON, H. F., CORNSTOCJ, R. E. AND HARVEY, P. M., 1949, Estimates of heritability and degree of dominance in corn. *Agron*. *J.*, **41**: 353-359.

SABINA, D. M., GAYATRI, B., SAHU, G. S., SENAPATI, A. K. AND SAMA, K. C., 2023, Screening of Brinjal genotypes against bacterial wilt caused by *Ralstonia solanacearum*. *Biol. Forum-Int. J.,* **15**(1): 201-205.

SABITA, J. N., BORUAH, B. M. AND RACHID, H. A., 2000, Yield potentiality of some brinjal cultivars in severely bacterial wilt infected condition. *Veg. Sci.,* **27**: 76-77.

SADARUNNISA, S., REDDY, R. V. S. K., BEGUM, H. AND REDDY, T. M., 2018, Performance of Brinjal (*Solanum melongena* L.) genotypes for yield and quality traits under Southern zone of Andhra Pradesh. *Int. J. Curr. Microbiol. App. Sci.,* **7**: 4977-4985.

SAHANA, K. P., KATTEGOUDAR, J., LINGAIAH, H. B., SANGEETHA, C. G., PRASHANTH, S. J., PADMANABHA, K. AND UGALAT, J., 2020, Performance of advanced breeding lines of green long brinjal for resistance to bacterial wilt disease resistance, yield and quality attributes. *J. Pharmacogn. Phytochem*., **9**(2): 155-157.

SAHA, S., HAQ, M. E., PRAVEEN, S., MAHMUD, F., CHOWDHURY, S. R. AND RASHID, M. H. U., 2019, Variability, correlation and path coefficient analysis: principle tools to explore genotypes of brinjal (*Solanum melongena* L.). *Asian J. Biotechnol. Gent. Eng*., **2**(3): 1-9.

SAHU, P., SAURABH, MANDLOI, M. AND JAISWAL, R. K., 2022, Evaluation of different varieties of brinjal (*Solanum melongena* L.) for growth, yield and economics attributing characters. *The Pharm. Innov*., **11**(1): 107-111.

SAIKIA, J., PHOOKAN, D. B., BARUA, N. S., DAS, P., SAIKIA, L. AND SAIKIA, J., 2021, Morpho-biochemical characterization of brinjal (*Solanum melongena* L.) genotypes during kharif season. *Agric. Sci. Digest.,* **41**(3): 1-7.

SAJJAN, P. T. S., DEVARAJU, SRINIVASA, V., LAKSHMANA, D. AND SINGH, T. H, 2021, Genetic variability, interrelationships and path analysis for growth and yield attributes in F4 segregating population of brinjal (*Solanum melongena* L.). *J. Pharm. Innov*., **10**(12): 1376-1379.

SAKRIYA, S. G., VADDORIA, M. A. AND BALAS, A. D., 2020, Study on character association in brinjal (*Solanum melongena* L.). *Int. J. Chem. Stud*., **8**(2): 37-39.

SANAS, M. P., SANAS, A. P. AND SHINDE, S. M., 2012, Performance of different types of brinjal for their physical fruit parameters and flowering parameters. *Int. J. Sci. Res.,* **3**(12): 1995-1997.

SANGA, L., PANDEY, A. K., WARADE, S. D., HAZARIKA, B. N. AND SINGH, S., 2017, Assessment of wild brinjal *(Solanum gilo)* genotypes of north-eastern region. *Int. J. Curr. Microbiol. App. Sci*., **6**(10): 1451-1458.

SANGAM, S., KANT, K., AKHTAR, S., KUMARI, N., CHATTOPADHYAY, T. AND KUMAR, R., 2020, Genetic variability in summer brinjal (*Solanum melongena* L.). *Int. J. Plant Soil Sci.,* **34**(14): 44-50.

SANKET, K., VIKAS, S., DUBEY, R. K. AND MUKUL, K., 2020, Screening of tomato hybrids for bacterial wilt (*Ralstonia solanacearum*) resistance under field condition. *Electron. J. Plant Breed*., **11**(3): 945-949.

SANTHOSHA, H. M., INDIRESH, K. M., GOPALAKRISHNAN, C. and SINGH, T. H., 2015, Evaluation of brinjal genotypes against bacterial wilt caused by *Ralstonia solanacearum*. *J. Hort. Sci*., **10**(1): 60-63.

SAWADOGO, B. P., BATIONO-KANDO, N., SAWADOGO, Z., KIEBRE, M., KIEBRE, K. R., NANEMA, R. E., TRAORE, M., SAWADOGO AND ZONGO, J. D., 2016, Variation, correlation and heritability of interest characters for selection of African eggplant. *African Crop Sci. J.,* **24**(2): 213-221.

SHARMA, D. AND BANYAL, S. K., 2016, Evaluation of brinjal genotypes under low hill conditions of Himachal Pradesh. *Progress. Hortic*., **48**(2): 194-197.

SHARMA, J. P. AND KUMAR, S., 2007, Durability of resistant lines of brinjal (*Solanum melongena* L.) for resistance against bacterial wilt (*Ralstonia solanacearum*) under sub-humid condition of Jharkhand. *Indian J. Agri. Sci.,* **54**(6): 457-460.

SHARMA, J. P., JHA, A. K., SINGH, A. K., PAN, R. S., RAI, M. AND KUMAR, S., 2005, Screening of parental lines and their F_1 crosses of brinjal (*Solanum melongena* L.) to *Ralstonia* wilt. *Indian J. Agric. Sci.*, **75**(4): 197-199.

SHARMA, P., NAIR, R., KANCHAN, S., BHAN. AND TIWARI, S., 2022, Genetic variability for quantitative in Brinjal (*Solanum melongena* L.). *Biol. Forum-Int. J.,* **14**(1): 1-5.

SHARMA, S., KATOCH, V., CHADHA, S. AND KUMARI, V., 2020, Screening of F_1 hybrids generated through diallel mating design for bacterial wilt resistance in brinjal under mid-hill conditions of Himachal Pradesh. *Himachal J. Agric. Res.,* **46**(1): 40-43.

SHEKAR, K. C., ASHOK, P. AND SHASHIKALA, K., 2012, Studies on heritability and multivariate analyses in brinjal (*Solanum melongena* L.). *Vegetable Crops Res. Bulletin,* **76**: 79 -88.

SHEKHAWAT, G. S., CHAKRABORTI, S. K. AND GADEWAR, A.V., 1992, Potato bacterial wilt in India. Tech. Bull. No. 38, CPRI, Shimla (India). pp. 43.

SHENDE, R. A., DESAI, S. S. AND LACHYAN, S. T., 2015, Genetic variability and response to selection in brinjal (*Solanum melongena* L.). *Int. J. Curr. Res*., **7**(10): 215-219.

SHILPA, B. M., DHEWARE, R. M. AND KOLEKAR, R. B., 2018, Variability studies in brinjal (*Solanum melongena* L.). *Int. J. Bio-resour. Stress Manag*., **9**(5): 576-579.

SHRUTI, P. G., HANCHINAMANI, C. N., BASAVARAJA, N., KULKARNI, M. S., CHOLIN, S. AND TATAGAR, M. H., 2019, Genetic variability studies for yield and yield attributing traits in brinjal (*Solanum melongena* L.). *Int. J. Curr. Microbiol. App. Sci.,* **8**(7): 2234-2244.

SINGH, L., CHAMROY, T. AND RAJKUMARI, A., 2019, Varietal performance of brinjal (*Solanum melongena* L.) under different growing conditions. *Plant Arch*., **19**(2): 2002-2004.

SINGH, N., MISHRA, A. C. AND PANDEY, V., 2014, Evaluation of brinjal (*Solanum melongena* L.) hybrids for growth and yield characters under rainfed mid hill condition of Uttarakhand. *Ann. Agri-Bio Res.,* **19**(1): 144-146.

SINGH, P. P. AND DHURENDRA, S., 2016, Genetic variability studies for improvement in brinjal under hot arid agro-climate. *Indian J. Hort.,* **73**(3): 449-452.

SINGH, P. P., VERMA, A. K. AND SINGH, D., 2018, Evaluation of brinjal genotype under hot arid agro-climate. *Indian J. Hort.,* **75**(3): 451-456.

SINGH, R., 1995, Seed transmission studies with *Pseudomonas solanacearum* in tomato and eggplant. *ACIAR Bacterial wilt News ltr.,* **11**: 12-13.

SINGH, T. H., LAKSHMANA REDDY, D. C., ANAND REDDY, C., SADASHIVA, A. T, PANDVARAJ and MANOJ, Y. B., 2019, Evaluation of *Solanum species* and eggplant cultivated varieties for bacterial wilt resistance. *J. Hort. Sci*., **14**(1): 13-19.

SINGLETON, V. L. AND ROSSI, J. A., 1965, Calorimetry of total phenolics with phosphomolybdic-phosphotungstic acid reagents. *American J. Enol. Viticult*., **16**: 144-158.

SIVA, M., JYOTHI, K.U., RAO, A.V. D. D., KRISHNA, K. U. AND EMMANUEL, N., 2020, Stability studies for growth and yield attributing characters in brinjal (*Solanum melongena* L.) over coastal Andhra Pradesh conditions. *J. Entomol. Zool. Stud.,* **8**(4): 1934-1939.

SMITH, E. F., 1896, A bacterial disease of tomato, pepper, eggplant and Irish potato (*Bacillus solonacearum sp.*). USDA, *Div. Veg. Physiology Pathol. Bulletin*, **12**: 1-28.

SOLAIMANA, A. H. M., NISHIZAWA, T., KHATUN, M. AND AHMAD, S., 2014, Genetic variability and correlation studies in brinjal. *ISRN Comput. Biol.,* **4**(1): 1-36.

SRIVASTAVA, S., SAIDAIAH, P., SHIVRAJ, N. AND REDDY, K. R., 2019, Study of genetic variability, heritability and genetic advance for yield and yield related components of brinjal (*Solanum melongena* L.) genotypes. *J. Pharmacogn. Phytochem*., **8**(4): 917-919.

SRIVASTAVA, S., SAIDAIAH, P., SHIVRAJ, N. AND REDDY, K. R., 2019, Yield and quality based phenotypic evaluation of germplasm of brinjal (*Solanum melongena* L.) under semi-arid conditions. *Int. J. Curr. Microbiol. App. Sci*., **8**(7): 415-422.

*SUBBAIAH, B. V. AND ASIJA, G. L., 1956, A rapid procedure for the estimation of available nitrogen in soil. *Curr. Sci*., **25**: 259-261.

SUBRATA, B. AND SINGH, N. P., 2012, Effect of host genotypes and cultural practices for the management of bacterial wilt in brinjal (*Solanum melongena* L.). *Indian Phytopathol. Society,* **60**(4): 438-441.

SUJIN, G. S., KARUPPAIAH, P. AND SARAVANAN, K., 2017, Genetic variability and correlation studies in brinjal (*Solanum melongena* L.). *Indian J. Agric. Res.,* **51**(2): 112-119.

SYED, S., REDDY, R. V., BEGUM H. S. K. AND REDDY, T. M., 2018, Performance of brinjal (*Solanum melongena* L.) genotypes for yield and quality traits under southern zone of Andhra Pradesh. *Int. J. Curr. Microbiol. App. Sci*., **7**: 4977-4985.

THAMBURAJ, S. AND SINGH, N., 2018, Texbook of vegetables, tuber crops and spices. Indian Council of Agriculture Research, New Delhi. pp. 30-31.

TIRKEY, M., SARAVANA, S. AND LATA, P., 2018, Studies on variability, heritability and genetic advance for yield and its attributes in brinjal (*Solanum melongena* L.). *J. Pharmacogn. Phytochem*., **1**(1): 1181-1183.

TIWARI, J. K., MEHTA, N., SINGH, M. K. AND TIWARI, P. S., 2012, Screening of tomato genotypes against bacterial wilt (*Ralstonia solanacearum*) under field condition for Chhattisgarh. *Global J. Bio-Sci. Biotechnol.,* **1**(2): 168-170.

TRIPATHY, B., SHARMA, D., JANGDE, B. P. AND BAIRWA, P. L., 2017, Evaluation of brinjal (*Solanum melongena* L.) genotypes for growth and yield characters under Chhattisgarh condition. *The Pharm. Innov*., **6**(10): 416-420.

TRIPATHY, B., TRIPATHY, P., SAHU, G. S., DASH, S. K., PRADHAN, B. D., LENKA, D. AND DAS, S., 2021, Per se performances of brinjal (*Solanum melongena* L.) F_1 crosses for fruit yield and bacterial wilt tolerance. *J. Pharmacogn. Phytochem*., **10**(10): 490-494.

TRIPATHY, B., TRIPATHY, P., SAHU, G. S., DASH, S. K., PRADHAN, B., SAHU, P., NAYAK, N. J., PRADHAN, P., SOURAV, S. AND MISHRA, S., 2020, Evaluation of brinjal (*Solanum melongena* L.) landraces of Odisha for fruit yield and its components. *J. Crop Weed,* **16**(1): 151-154.

UMESH, B. C., PATIL, M. G., PATIL, S. S., KAVITA, K. AND PRASAD, S. S., 2018, Performance of different types of brinjal for their physical fruit parameters and flowering parameters. *J. Pharmacogn. Phytochem*., **7**(4): 2798-2800.

VAISHNAVI, K., DEVARAJU, SRINIVASA, V. LAKSHMANA, D. KANTHARAJ, Y. SINGH, T. H. AND LATHA, G. K. 2023, Genetic variability studies in advanced breeding lines of brinjal (*Solanum melongena* L.) for fruit yield and quality parameters. *Eco. Env. & Cons.,* **29**: 61-64.

*VAVILOV, N. I., 1928, Proceedings of 5th International Congress of Genetics, New York. 342-369.

VERMA, A. K., MISHRA, A. C. AND TRIPATHI, P.K., 2023, Evaluation of brinjal genotypes (*Solanum melongena* L.) for growth, yield and quality characters in Bundelkhand region of U.P, India. *Int. J. Plant Soil Sci.,* **35**(18): 1690-1699.

VERMA, B., SHARMA, D. AND TRIVEDI, J., 2023, Genetic variability and heritability studies in brinjal (*Solanum melongena* L.). *The Pharm. Innov*., **12**(7): 3097-3098.

VERMA, S. R., MISHRA, S. K., ROY, S., SINGH, R. K. AND SINGH, M. K., 2021, Genetic studies for parental selection among brinjal (*Solanum melongena* L.) varieties. *The Pharm. Innov.,* **10**(2): 209-213.

VHANKHANDE, P. AND SINGH, T., 2018, Studies on genetic parameters in brinjal (*Solanum melongena* L.). *J. Pharmacogn. Phytochem*., **7**(4): 1944-1948.

VIDHYA, C. AND KUMAR, N., 2015, Genetic variability studies in Brinjal (*Solanum melongena L.*) for fruit yield and quality. *Electron. J. Plant Breed*., **6**(3): 668-671.

YADAV, P. K., WARADE, S. D., SHAKYWAR, R. C., SINGH, S., DUBEY, R. K. AND PANDEY, A. K., 2017, Screening of brinjal genotypes for bacterial wilt in foot hills of Pasighat, Arunachal Pradesh, India. *Ann. Plant Sci.*, **25**(1): 164-170.

YANKANCHI, P. P., LAKSHMANA, D., DHANALAKSHMI, T. N., ONKARAPPA, S. AND PRAKASH, K., 2020, Genetic variability studies for yield and its components in brinjal *(Solanum melongena* L.) germplasm. *Ecol. Environ. Conserv*., **2**(4): 251-253.

*Originals not seen

APPENDICES

VIII APPENDICES

Appendix - I

Monthly mean meteorological data collected and maintained at KVK, Mudigere for the year 2022 to 2023

Month	Rain fall (mm)	Mean Temperature (ºC)		Mean Relative Humidity (%)	
		Minimum	Maximum	Minimum	Maximum
September - 2022	294.00	18.76	25.79	95.43	99.50
October - 2022	23.50	18.00	28.01	85.80	99.00
November - 2022	7.50	17.04	28.28	75.97	94.07
December - 2022	14.00	15.73	28.05	63.40	92.83
January - 2023	0.50	12.35	29.20	50.07	96.27
February - 2023	4.50	17.84	29.08	77.00	82.71
March - 2023	5.00	23.94	24.21	66.63	78.67
April - 2023	10.00	18.30	33.11	62.70	95.93
May - 2023	76.00	19.93	30.92	81.43	98.07
June - 2023	101.00	20.10	27.23	92.30	97.73
July - 2023	553.00	19.91	24.04	97.03	99.57
August - 2023	61.00	19.01	26.63	90.23	98.97
Total	**1150**	-	-	-	-
Average	**-**	**12.35**	**33.11**	**50.07**	**99.57**

Appendix - II

Physical, chemical properties and fertility status of experimental site

Sl. No.	Particulars	Values	Method employed
Physical properties			
1.	Coarse sand (%)	43.60	International pipette method (Piper, 1966)
2.	Fine sand (%)	23.90	
3.	Silt (%)	19.30	
4.	Clay (%)	13.20	
Chemical properties			
1.	Soil pH	4.88	pH meter (Jackson, 1967)
2.	Electrical conductivity (dsm^{-1})	0.15	Conductivity bridge (Jackson, 1967)
3.	Available nitrogen (kg / ha)	288.00	Alkaline permanganate method (Subbaiah and Asija, 1956)
4.	Available phosphorus (kg / ha)	32.00	Bray's method (Jackson,1967)
5.	Available potassium (kg / ha)	177.00	Neutral Normal Ammonium Acetate method by (Jackson, 1967)

Appendix – III

List of symbols and abbreviations used

Symbols	Abbreviations
et al.	And other
cm	Centimeter
kg	Kilogram
No.	Number
ºC	Degree centigrade
Df	Degree of freedom
g	Gram
%	Per cent
PCV	Phenotypic coefficient of variation
GCV	Genotypic coefficient of variation
h^2 (bs)	Heritability in broad sense
GA	Genetic advance
GAM	Genetic advance over mean
Viz.	For example
i.e.	That is
GV	Genotypic variance
PV	Phenotypic variance
mg	Milligram
mm	Millimeter
DAP	Di-ammonium phosphate
L	Litre
t	Tonnes
ha	Hectare
NPK	Nitrogen, Phosphorus, Potassium
FYM	Farm Yard Manure
ml	Millilitre
DAT	Days after transplanting
@	At the rate of
/	Per
cm^2	Centimeter square
cfu	Colony forming unit