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**Anitha R Nadagouda**
Department of Biotechnology and Crop Improvement KRCCH, Arabhavi University of Horticultural Sciences, Bagalkot, Karnataka, India

**Satish D**
Department of Biotechnology and crop Improvement College of Horticulture, Bagalkot University of Horticultural Sciences, Bagalkot, Karnataka, India

**Dileep Kumar Masuthi PS**
Department of Biotechnology and Crop Improvement KRCCH, Arabhavi University of Horticultural Sciences, Bagalkot, Karnataka, India

**Ajjappalavar**
Department of Vegetable Science University of Horticultural Sciences, Bagalkot, Karnataka, India

**Dadapeer A Peerzade**
Department of Biotechnology and Crop Improvement College of Horticulture, Bagalkot University of Horticultural Sciences, Bagalkot, Karnataka, India

**Sandyarani Nishani**
Department of Biotechnology and crop Improvement KRCCH, Arabhavi University of Horticultural Sciences, Bagalkot, Karnataka, India

**Corresponding Author:**
**Satish D**
Department of Biotechnology and Crop Improvement College of Horticulture, Bagalkot University of Horticultural Sciences, Bagalkot, Karnataka, India

# Character association and path analysis studies in $F_2$ population of brinjal (*Solanum melongena* L.)

**Anitha R Nadagouda, Satish D, Dileep Kumar Masuthi PS, Ajjappalavar, Dadapeer A Peerzade and Sandyarani Nishani**

**Abstract**
The experiment was conducted to study the correlation and path analysis in $F_2$ populations brinjal obtained from the cross COH BGK BC-3 x Tester-1. Observations on twelve different morphological traits were recorded on 250 $F_2$ plants. The correlation study indicated that the total fruit yield per plant had a positive and significant association with plant height, number of primary branches, fruit diameter, fruit length, average fruit weight and number of fruits per plant. The genetic improvement in fruit yield can be obtained by selection for these yield components. Path analysis studies revealed that ten out of eleven characters had direct positive effect on fruit yield. Positive direct effects shown by plant height, primary branches, days to first flowering, days to 50 per cent flowering, days to maturity, fruit length, fruit diameter, average fruit weight and number of fruits per plant. Thus, the fruit yield per plant can be improved by making direct selection of these characters.

**Keywords:** Character, association, population, *Solanum melongena* L.

## Introduction
Brinjal (*Solanum melongena* L.) commonly known as eggplant or aubergine is an important solanaceous vegetable crop of tropics and sub-tropics. Brinjal is being cultivated in India over an area of 741ha (1000ha) with an average annual production of 13000MT. It is cultivated in Rajasthan, Orissa, Bihar, Karnataka, West Bengal, Andhra Pradesh, Maharashtra and Uttar Pradesh. Top three states with respect to area are Rajasthan, Sikkim, Tamil nadu. Three states with respect to production are West Bengal, Odisha, Gujarat. Whereas Rajasthan, Sikkim, Tamilnadu stands first in productivity (Anon. 2019) [10]. It is grown for its immature, unripe fruits, which are used as cooked vegetable in variety of ways and dried shoots are used as fuel in rural areas. It is popular among people of all social strata and hence, it is rightly called as vegetable of masses (Patel and Sarnaik, 2003) [1]. However, yield is a complex character; its direct improvement is difficult. Knowledge with respect to the nature and magnitude of associations of yield with various component characters is a pre-requisite to bring improvement in the desired direction. A crop breeding programme, aimed at increasing the plant productivity requires consideration not only of yield but also of its components that have a direct or indirect bearing on yield. The correlation study describes the degree of association between independent and dependent variables. Path coefficient analysis measures the direct influence of one variable upon another and permits the separation of correlation coefficient into components of direct and indirect effects. Hence, the present investigation was undertaken to study the association of characters and their direct and indirect effects with respect to yield and its related traits.

## Material and Methods
The present research was carried out at the research block of Department of Biotechnology and crop improvement, College of Horticulture, University of Horticultural Sciences, Bagalkot Karnataka during the *kharif* season of 2019-20. The experimental material consists of 250 $F_2$ plants derived from the bi-parental cross COH BGK BC-3 x Tester-1. The $F_2$ population along with parents, $F_1$ hybrid and Manjri Gota as a check were evaluated for yield and yield related components. The experiment was laid out in unreplicated trail. The seeds were sown with a spacing of 90 cm × 60 cm and all the cultural practices were followed as per the package of practices. Data was recorded on all the 250 $F_2$ plants, ten randomly selected plants in check, parents and $F_1$ hybrids. The observations were recorded on different yield and yield related

parameters *viz*., plant height at 45 DAT plant height at 90 DAT, plant height at 120 DAT, number of primary branches, days to first flowering, days to 50% flowering, days to fruit maturity, fruit length, fruit diameter, average fruit weight, number of fruits per plants and total fruit yield per plant. Mean data was used to estimate the correlation as well as direct and indirect effects as per the method suggested by of Al-Jiboure *et al*. (1958) [4] and Dewey and Lu (1959) [5] respectively.

## Result and Discussion

### Correlation coefficient analysis

Estimates of correlation coefficient analysis for 12 different characters in $F_2$ segregating population of the bi-parental cross COH BGK BC-3 x Tester-1 are presented in the Table 1. From the table it is evident that total yield per plant had a positive and significant association with plant height at 45 DAT (0.450), plant height at 90 DAT (0.463), plant height at 120 DAT (0.525), number of primary branches (0.469), fruit length (0.524), fruit diameter (0.526), average fruit weight (0.629) and number of fruits per plant (0.745). These could be used as traits of interest for indirect selection to improve total yield per plant in the further breeding programme. These results are in close proximity with the results of Thangamani and Jhansirani (2012) [3], Mamatha *et al.* (2016) [6], Ravali *et al.* (2017) [2], Sujin *et al.* (2017) [2] and Devaraju *et al.* (2020) [6]. However, total yield per plant has shown negative and significant correlation with days to first flowering (-0.326), days to 50 per cent flowering (-0.400) and days to fruit maturity (-0.372). Similar results were reported by Lohakare *et al.* (2008) [8].

### Path coefficient analysis

The path coefficient analysis for 12 different characters in $F_2$ segregating population of the bi-parental cross COH BGK BC-3 x Tester-1 are presented in Table 2. The result of path analysis revealed that the characters, plant height at 45 DAT (0.111), plant height at 120 DAT (0.022), primary branches (0.037), days to first flowering (0.035), days to 50 per cent flowering (0.017), days to maturity (0.032), fruit length (0.041), fruit diameter (0.007), average fruit weight (0.559) and number of fruits per plant (0.682) had maximum positive direct effect on total fruit yield per plant. Thus the higher magnitude of the positive direct effect of these traits explains the higher value of association between these traits and total fruit yield per plant. Therefore, direct selection for these traits would reward for improvement of yield while the plant height at 90 DAT (-0.091) was negatively contributed towards total yield per plant. The results are in accordance with the reports of Muniappan *et al.* (2010) [9].

**Table 1**: Estimates of genotypic correlation coefficients for 12 different characters in F2 segregating population of the cross COH BGK BC-3 x Tester-1

| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 0.730** | 0.693** | 0.542** | -0.639** | -0.553** | -0.579** | 0.280** | 0.334** | 0.299** | 0.351** | 0.450** |
| 2 | | 1 | 0.889** | 0.530** | -0.475** | -0.507** | -0.534** | 0.348** | 0.335** | 0.352** | 0.385** | 0.463** |
| 3 | | | 1 | 0.514** | -0.455** | -0.510** | -0.512** | 0.388** | 0.348** | 0.386** | 0.432** | 0.525** |
| 4 | | | | 1 | -0.411** | -0.416** | -0.339** | 0.210** | 0.304** | 0.245** | 0.430** | 0.469** |
| 5 | | | | | 1 | 0.518** | 0.589** | -0.222** | -0.299** | -0.319** | -0.215** | -0.326** |
| 6 | | | | | | 1 | 0.500** | -0.195** | -0.273** | -0.269** | -0.365** | -0.400** |
| 7 | | | | | | | 1 | -0.254** | -0.343** | -0.386** | -0.242** | -0.372** |
| 8 | | | | | | | | 1 | 0.459** | 0.546** | 0.260** | 0.524** |
| 9 | | | | | | | | | 1 | 0.652** | 0.199** | 0.526** |
| 10 | | | | | | | | | | 1 | 0.077 | 0.629** |
| 11 | | | | | | | | | | | 1 | 0.745** |

Critical value @ 5% = 0.113 @ 1% = 0.148 Significant: @ 5% ** @ 1%

1. Plant height at 45 DAT 2. Plant height at 90 DAT 3. Plant height at 120 DAT 4. Number of primary branches 5. Days to first flowering 6. Days to 50% flowering 7. Days to fruit maturity 8. Fruit length 9. Fruit diameter 10. Average fruit weight 11. Number of fruits per plant 12. Total fruit yield per plant

**Table 2:** Direct and indirect effects of various characters on total fruit yield per plant in $F_2$ Population of the cross COH BGK BC-3 x Tester-1 at genotypic level

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.111 | 0.081 | 0.077 | 0.060 | -0.071 | -0.061 | -0.064 | 0.031 | 0.037 | 0.033 | 0.039 | 0.450 |
| 2 | -0.066 | -0.091 | -0.080 | -0.048 | 0.043 | 0.046 | 0.048 | -0.031 | -0.030 | -0.032 | -0.035 | 0.463 |
| 3 | 0.015 | 0.020 | 0.022 | 0.011 | -0.010 | -0.011 | -0.011 | 0.008 | 0.007 | 0.008 | 0.009 | 0.525 |
| 4 | 0.020 | 0.019 | 0.019 | 0.037 | -0.015 | -0.015 | -0.012 | 0.007 | 0.011 | 0.009 | 0.016 | 0.469 |
| 5 | -0.023 | -0.017 | -0.016 | -0.014 | 0.035 | 0.018 | 0.021 | -0.008 | -0.010 | -0.011 | -0.007 | -0.326 |
| 6 | -0.009 | -0.008 | -0.008 | -0.007 | 0.009 | 0.017 | 0.008 | -0.003 | -0.004 | -0.004 | -0.006 | -0.400 |
| 7 | -0.019 | -0.017 | -0.016 | -0.011 | 0.019 | 0.016 | 0.032 | -0.008 | -0.011 | -0.012 | -0.008 | -0.372 |
| 8 | 0.011 | 0.014 | 0.015 | 0.008 | -0.009 | -0.008 | -0.010 | 0.041 | 0.018 | 0.022 | 0.010 | 0.524 |
| 9 | 0.002 | 0.002 | 0.002 | 0.002 | -0.002 | -0.002 | -0.002 | 0.003 | 0.007 | 0.004 | 0.001 | 0.526 |
| 10 | 0.167 | 0.197 | 0.216 | 0.137 | -0.178 | -0.150 | -0.216 | 0.305 | 0.364 | 0.559 | 0.043 | 0.629 |
| 11 | 0.239 | 0.262 | 0.294 | 0.293 | -0.146 | -0.249 | -0.165 | 0.177 | 0.136 | 0.052 | 0.682 | 0.745 |

Diagonal values indicates direct effects Residual value: 0.328

1. Plant height at 45 DAT 2. Plant height at 90 DAT 3. Plant height at 120 DAT 4. Number of primary branches 5. Days to first flowering 6. Days to 50% flowering 7. Days to fruit maturity 8. Fruit length 9. Fruit diameter 10. Average fruit weight 11. Number of fruits per plant 12. Total fruit yield per plant

## Conclusion

The present investigation revealed that traits like plant height, number of primary branches, fruit diameter, fruit length, average fruit weight and number of fruits per plant showed

significant and positive correlation with the total yield per plant. Whereas characters like plant height, primary branches, days to first flowering, days to 50 per cent flowering, days to maturity, fruit length, fruit diameter, average fruit weight and number of fruits per plant exhibited maximum positive direct effect on fruit yield per plant. Hence, the direct selection may be executed considering these traits as the main selection criteria to reduce indirect effects of the other characters during the development of high yielding brinjal varieties.

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