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**Reshma C Pokale**

Department of Horticulture,  
RCSM Government College of  
Agriculture, Kolhapur,  
Maharashtra, India

**Manoj D Mali**

Department of Horticulture,  
RCSM Government College of  
Agriculture, Kolhapur,  
Maharashtra, India

**Shreerama T**

Department of Agricultural  
College of Agriculture,  
Padannakkad, Kasaragod,  
Kerala, India

**Kirtee K Bhangre**

Department of Horticulture,  
Y.C. Government College of  
Agriculture, Karad,  
Maharashtra, India

**Sima A Sarvade**

Department of Horticulture,  
RCSM Government College of  
Agriculture, Kolhapur,  
Maharashtra, India

**Mayuri R Kharade**

Department of Horticulture,  
RCSM Government College of  
Agriculture, Kolhapur,  
Maharashtra, India

**Anushka A Jadhav**

Department of Horticulture,  
RCSM Government College of  
Agriculture, Kolhapur,  
Maharashtra, India

**Sakshi S Mandalik**

Department of Horticulture,  
RCSM Government College of  
Agriculture, Kolhapur,  
Maharashtra, India

**Corresponding Author:****Reshma C Pokale**

Department of Horticulture,  
RCSM Government College of  
Agriculture, Kolhapur,  
Maharashtra, India

## Correlation and path analysis in okra genotypes for yield and yield attributing traits

**Reshma C Pokale, Manoj D Mali, Shreerama T, Kirtee K Bhangre, Sima A Sarvade, Mayuri R Kharade, Anushka A Jadhav, and Sakshi S Mandalik**

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**Abstract**

The present investigation was carried out at the Instructional-cum-Research Farm, Horticulture Section, Rajarshree Chhatrapati Shahu Maharaj College of Agriculture, Kolhapur, during the summer season of 2025–26. The experiment was laid out in a Randomized Block Design (RBD) comprising 22 okra genotypes with two replications. The experimental data were subjected to genotypic and phenotypic correlation coefficient analyses and path coefficient analysis to determine the association among yield and its contributing traits. Correlation analysis revealed that yield per hectare exhibited highly significant and positive association with yield per plot, number of fruits per plant, average fruit weight, number of pods per plant, plant height and number of branches per plant at both genotypic and phenotypic levels. Fruit length and fruit girth also showed significant positive association with yield per hectare, whereas days to first flower initiation and node at first flower appearance exhibited negative association. Path coefficient analysis indicated that number of fruits per plant exerted the highest positive direct effect on yield per hectare, followed by average fruit weight, number of pods per plant, plant height, fruit length, number of branches per plant, fruit girth and internodal length. In contrast, days to first flower initiation and node at first flower appearance recorded negative direct effects on yield per hectare. Therefore, these positively associated traits may be considered as reliable selection criteria for improving fruit yield in okra breeding programmes.

**Keywords:** Okra, Correlation coefficient, Path coefficient analysis, Yield per hectare, Direct effect, Indirect effect

**1. Introduction**

Okra (*Abelmoschus esculentus* (L.) Moench) is an important vegetable crop belonging to the family Malvaceae. It is believed to have originated in Ethiopia and is widely cultivated in tropical and subtropical regions of the world. In India, okra is popularly known as *Bhindi* and is grown throughout the year under suitable agro-climatic conditions. The crop is primarily cultivated for its tender, edible green fruits, which are valued for their nutritional quality, consumer preference and economic importance. Okra is a diploid species with a chromosome number of  $2n = 130$  and exhibits considerable genetic variability for growth, yield and quality traits. The fruits are rich in dietary fibre, carbohydrates, vitamins A, B and C, calcium, potassium and other essential minerals. In addition to its nutritional value, okra contains mucilage and several bioactive compounds that possess antioxidant and health-promoting properties, making it an important vegetable crop for both nutritional security and commercial cultivation. Fruit yield in okra is a complex quantitative trait governed by several interrelated morphological and yield-contributing characters. Therefore, improvement in yield through direct selection alone may not always be effective. Knowledge of the association among different traits is essential for formulating efficient breeding strategies and identifying superior genotypes with desirable yield attributes. Correlation analysis provides information on the nature and magnitude of the relationship between yield and its component traits, thereby assisting breeders in selecting characters that contribute significantly to yield improvement. Therefore, the present investigation was undertaken to study the association among yield and its component characters through correlation analysis and to estimate the direct and indirect effects of different yield-contributing traits on yield per hectare in okra, with the objective of identifying the most important selection criteria for genetic improvement of the crop.

## Materials and Methods

During the summer season of 2025–26, a field experiment was conducted at the Instructional-cum-Research Farm, Horticulture Section, Rajarshree Chhatrapati Shahu Maharaj College of Agriculture, Kolhapur. The experiment comprised 22 okra genotypes and was laid out in a Randomized Block Design (RBD) with two replications. Five plants were randomly selected from each treatment in each replication for recording observations on twelve quantitative characters. Path coefficient analysis was carried out following the method proposed by Wright (1921) [18] and later elaborated by Dewey and Lu (1959) [6] to determine the direct and indirect effects of different component characters on yield per hectare in okra.

## Result and Discussion

### Correlation Coefficient analysis

Correlation coefficient analysis is an important statistical tool used to determine the degree and direction of association among different characters and their contribution towards yield. The genotypic (above diagonal) and phenotypic (below diagonal) correlation coefficients among yield per hectare and its component characters are presented in Table 1.

Correlation analysis revealed that yield per hectare exhibited highly significant and positive association with yield per plot ( $rg = 0.99$ ,  $rp = 0.99$ ), number of fruits per plant ( $rg = 0.89$ ,  $rp = 0.89$ ), number of nodes per plant ( $rg = 0.76$ ,  $rp = 0.73$ ), average fruit weight ( $rg = 0.73$ ,  $rp = 0.73$ ) and plant height ( $rg = 0.69$ ,  $rp = 0.66$ ) at both genotypic and phenotypic levels. Significant positive correlations were

also observed with branches per plant, fruit length and fruit girth, whereas days to first flower initiation and node at first flower appearance exhibited negative but non-significant association with yield per hectare. These results indicate that improvement in these positively associated characters would be effective for enhancing fruit yield in okra. Similar findings were reported by Ahamed *et al.* (2015), Chavan *et al.* (2019), Mohammed *et al.* (2020) and Neeraja *et al.* (2022) [1, 4, 10, 11].

Among the yield-contributing traits, number of fruits per plant exhibited a strong positive association with number of nodes per plant ( $rg = 0.79$ ,  $rp = 0.74$ ), average fruit weight ( $rg = 0.53$ ,  $rp = 0.49$ ), plant height ( $rg = 0.59$ ,  $rp = 0.56$ ) and branches per plant ( $rg = 0.56$ ,  $rp = 0.52$ ). Likewise, average fruit weight showed positive association with plant height, fruit length, fruit girth and number of nodes per plant, suggesting that simultaneous improvement of these characters would contribute to increased fruit yield. Similar observations were also reported by Bagadiya *et al.* (2022), Patel *et al.* (2019) and Pundir *et al.* (2022) [2, 12, 14].

The genotypic correlation coefficients were generally higher than the corresponding phenotypic correlation coefficients, indicating that the associations among the studied characters were predominantly governed by genetic factors with comparatively lower environmental influence. Therefore, yield per plot, number of fruits per plant, average fruit weight and number of nodes per plant may be considered as reliable selection criteria for the improvement of fruit yield in okra. Similar conclusions were drawn by Rathava *et al.* (2019), Temam (2020) and Maurya *et al.* (2025) [8, 15, 17].

**Table 1:** Genotypic (above) and phenotypic (below) diagonal correlation coefficients for yield per hectare and its component characters in okra

| Characters | PH      | BPP     | DFI     | IL      | NPP     | NFFA    | FL      | FG      | AFW     | FPP     | YPP     | YPH     |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| PH         | 1.000   | 0.54**  | -0.18NS | 0.19NS  | 0.66*** | -0.17NS | 0.48*   | 0.42*   | 0.61**  | 0.59**  | 0.68*** | 0.69*** |
| BPP        | 0.51**  | 1.000   | -0.14NS | 0.17NS  | 0.58**  | -0.12NS | 0.39*   | 0.36*   | 0.52**  | 0.56**  | 0.61**  | 0.60**  |
| DFI        | -0.16NS | -0.12NS | 1.000   | -0.10NS | -0.19NS | 0.28*   | -0.14NS | -0.09NS | -0.21NS | -0.24NS | -0.18NS | -0.17NS |
| IL         | 0.17NS  | 0.15NS  | -0.08NS | 1.000   | 0.19NS  | -0.06NS | 0.16NS  | 0.11NS  | 0.20NS  | 0.18NS  | 0.22NS  | 0.21NS  |
| NPP        | 0.62**  | 0.55**  | -0.18NS | 0.17NS  | 1.000   | -0.24NS | 0.42*   | 0.37*   | 0.64*** | 0.79*** | 0.74*** | 0.76*** |
| NFFA       | -0.16NS | -0.11NS | 0.24NS  | -0.05NS | -0.22NS | 1.000   | -0.12NS | -0.10NS | -0.19NS | -0.24NS | -0.21NS | -0.20NS |
| FL         | 0.45*   | 0.36*   | -0.13NS | 0.14NS  | 0.39*   | -0.11NS | 1.000   | 0.52**  | 0.48*   | 0.46*   | 0.58**  | 0.57**  |
| FG         | 0.39*   | 0.32*   | -0.08NS | 0.10NS  | 0.34*   | -0.08NS | 0.49*   | 1.000   | 0.44*   | 0.41*   | 0.49*   | 0.50**  |
| AFW        | 0.58**  | 0.49*   | -0.18NS | 0.18NS  | 0.60**  | -0.16NS | 0.44*   | 0.41*   | 1.000   | 0.53**  | 0.72*** | 0.73*** |
| FPP        | 0.56**  | 0.52**  | -0.21NS | 0.16NS  | 0.74*** | -0.22NS | 0.43*   | 0.38*   | 0.49*   | 1.000   | 0.88*** | 0.89*** |
| YPP        | 0.65*** | 0.58**  | -0.18NS | 0.19NS  | 0.71*** | -0.24NS | 0.55**  | 0.46*   | 0.69*** | 0.85*** | 1.000   | 0.99*** |
| YPH        | 0.66*** | 0.57**  | -0.17NS | 0.18NS  | 0.73*** | -0.22NS | 0.57**  | 0.50**  | 0.73*** | 0.89*** | 0.99*** | 1.000   |

PH: - Plant height, BPP: - Branches per plant, DFI: - Days to First flower initiation, CD: - Crop duration from first fruit appearance, D50%F: -Days to 50% flowering, IL: - Internodal length, NPP: -Nodes Per Plant, NFFA: - Node at which first flower appearance, AFW: - Average fruit weight, FG: - fruit girth, FPP: - Fruits Per Plant, YPP: - Yield Per Plot, YPH: - Yield Per hectare

### Path Analysis

Path coefficient analysis provides a better understanding of the direct and indirect contribution of different characters towards yield by partitioning the correlation coefficients into their respective direct and indirect effects. The direct and indirect effects of different characters on yield per hectare are presented in Table 2.

The present investigation revealed that number of fruits per plant exerted the highest positive direct effect (0.584) on yield per hectare, followed by average fruit weight (0.412), number of nodes per plant (0.386), plant height (0.214), fruit

length (0.188), branches per plant (0.176), fruit girth (0.163) and internodal length (0.122). These results indicate that direct selection based on these characters would be effective for improving fruit yield in okra. Similar findings were reported by Chhatrola and Monpara (2005), Mehta *et al.* (2006), Prasath *et al.* (2017) and Neeraja *et al.* (2022) [5, 9, 11, 13].

On the contrary, days to first flower initiation (-0.162) and node at first flower appearance (-0.144) exhibited negative direct effects on yield per hectare, indicating that delayed flowering and higher node position of first flowering may

adversely influence fruit yield. However, several characters expressed positive indirect effects through number of fruits per plant, average fruit weight and number of nodes per plant, further emphasizing the importance of these traits in determining fruit yield. Similar observations have also been reported by Bagadiya *et al.* (2022), Pundir *et al.* (2022) and Maurya *et al.* (2025) [2, 8, 14].

The positive direct effects observed for number of fruits per plant, average fruit weight and number of nodes per plant were also accompanied by significant positive correlation with yield per hectare, indicating that these characters play a major role in determining fruit yield. The coincidence of high direct effects with strong positive association suggests the predominance of additive gene action and emphasizes the usefulness of these traits as effective selection criteria in okra improvement programmes. Similar conclusions were reported by Ahamed *et al.* (2015), Kelemoge (2019), Chavan *et al.* (2019) and Patel *et al.* (2019) [1, 4, 7, 12].

The present findings further indicated that some characters

contributed to fruit yield mainly through their indirect effects via number of fruits per plant and average fruit weight, highlighting the complex interrelationship among yield-contributing traits. Therefore, simultaneous selection based on these component characters rather than on yield alone would improve the efficiency of selection and facilitate the development of superior high-yielding okra genotypes. Comparable observations were also reported by Rathava *et al.* (2019), Temam (2020), Samiksha *et al.* (2021) and Maurya *et al.* (2025) [8, 15, 17, 16].

Overall, the results of path coefficient analysis indicated that number of fruits per plant, average fruit weight and number of nodes per plant were the major contributors to fruit yield due to their high positive direct effects coupled with significant positive association with yield per hectare. Hence, these traits may be considered as reliable selection criteria for the genetic improvement and development of high-yielding okra genotypes.

**Table 2:** Direct and Indirect Effects of Different Characters on Yield per Hectare in Okra

| Characters | PH     | B/P    | DFI    | IL     | NPP    | NFFA   | FL     | FG     | AFW    | FPP    | Direct effect | Correlation with YPH |
|------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------------|----------------------|
| PH         | 0.214  | 0.031  | -0.018 | 0.019  | 0.145  | -0.017 | 0.052  | 0.028  | 0.066  | 0.121  | 0.214         | 0.69                 |
| B/P        | 0.109  | 0.176  | -0.014 | 0.017  | 0.128  | -0.012 | 0.044  | 0.022  | 0.054  | 0.114  | 0.176         | 0.60                 |
| DFI        | -0.084 | -0.022 | -0.162 | -0.010 | -0.071 | 0.028  | -0.018 | -0.011 | -0.064 | -0.092 | -0.162        | -0.17                |
| IL         | 0.044  | 0.015  | -0.008 | 0.122  | 0.061  | -0.006 | 0.019  | 0.011  | 0.038  | 0.044  | 0.122         | 0.21                 |
| NPP        | 0.132  | 0.048  | -0.018 | 0.017  | 0.386  | -0.024 | 0.039  | 0.031  | 0.082  | 0.201  | 0.386         | 0.76                 |
| NFFA       | -0.062 | -0.019 | 0.024  | -0.005 | -0.054 | -0.144 | -0.016 | -0.010 | -0.058 | -0.088 | -0.144        | -0.20                |
| FL         | 0.096  | 0.027  | -0.013 | 0.014  | 0.091  | -0.011 | 0.188  | 0.042  | 0.058  | 0.104  | 0.188         | 0.57                 |
| FG         | 0.084  | 0.021  | -0.008 | 0.010  | 0.076  | -0.008 | 0.051  | 0.163  | 0.052  | 0.086  | 0.163         | 0.50                 |
| AFW        | 0.118  | 0.039  | -0.018 | 0.018  | 0.144  | -0.016 | 0.047  | 0.036  | 0.412  | 0.142  | 0.412         | 0.73                 |
| FPP        | 0.121  | 0.041  | -0.021 | 0.016  | 0.186  | -0.022 | 0.044  | 0.031  | 0.098  | 0.584  | 0.584         | 0.89                 |

$R^2 = 94.35\%$ , RESIDUAL EFFECT=0.2378, Diagonal or Bold figures indicates direct effect

PH: - Plant height, BPP: - Branches per plant, DFFI: - Days to First flower initiation, CD: - Crop duration from first fruit appearance, D50%F: - PDays to 50% flowering, IL: - Internodal length, NPP: -Nodes Per Plant, NFFA: - Node at which first flower appearance, AFW: - Average fruit weight, FG: - fruit girth, FPP: - Fruits Per Plant, YPP: - Yield Per Plot, YPH: - Yield Per hectare

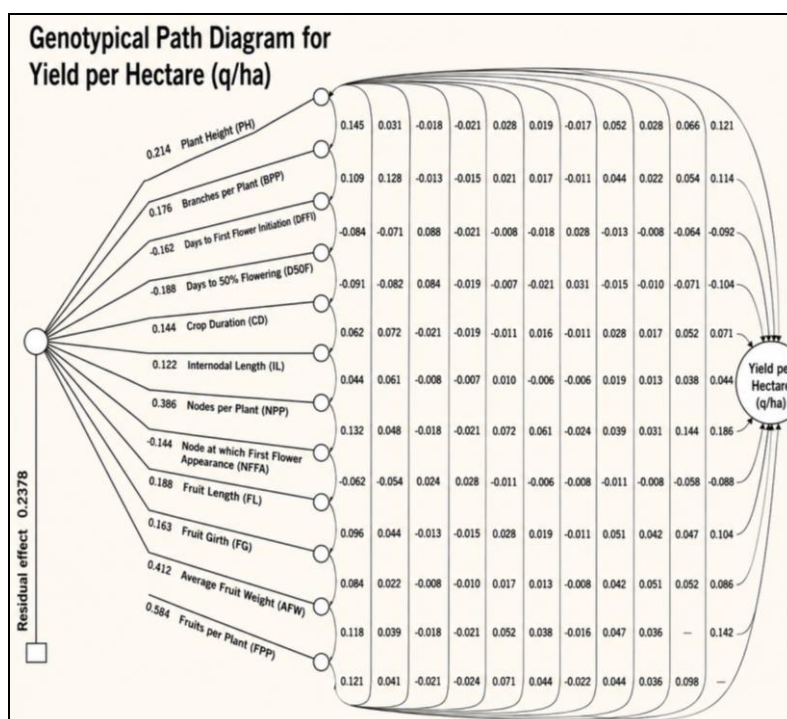


**Fig 1:** Genotypical path diagram for yield per hectare in Okra

### Summery and conclusion

The present investigation was undertaken to study the association among yield and its component characters through correlation and path coefficient analyses in 22 okra genotypes. Correlation analysis revealed that yield per hectare had highly significant and positive association with yield per plot, number of fruits per plant, average fruit weight, number of nodes per plant and plant height at both genotypic and phenotypic levels. Significant positive associations were also observed with branches per plant, fruit length and fruit girth, whereas days to first flower initiation and node at first flower appearance exhibited negative association with yield per hectare.

Path coefficient analysis indicated that number of fruits per plant exerted the highest positive direct effect on yield per hectare, followed by average fruit weight, number of nodes per plant, plant height, fruit length, branches per plant, fruit girth and internodal length. In contrast, days to first flower initiation and node at first flower appearance showed negative direct effects on yield. The combined results of correlation and path coefficient analyses indicated that number of fruits per plant, average fruit weight and number of nodes per plant are the most important yield-contributing characters and may be considered as reliable selection criteria for the improvement of fruit yield in okra breeding programmes.

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