Journal of Genetics, Genomics & Plant Breeding 9(4)173-177(October, 2025)
ISSN (Online): 2581-3293 10.63551/jggpb.vol.9.issue04.006

RESEARCH ARTICLE

Correlation analysis of yield and yield contributing traits in chilli (*Capsicum annuum* L)

S. M. Pathare, S. N. Varpe, V.K Raut, U. H. Patil

College of Agriculture, Loni, Tal – Rahata, 413736, District.- Ahilyanagar Maharashtra, India

Corresponding authors email: sandeeppathare.1207@gmail.com

Manuscript received: October1, 2025; Decision on manuscript, October 12,2025; Manuscript accepted: October15, 2025

Abstract

Chilli (*Capsicum annuum* L.) is an economically important spice crop widely cultivated for its culinary and industrial value. Understanding the association among yield and yield contributing traits is essential for developing effective breeding strategies. The present investigation was conducted to study the phenotypic correlation among fifteen quantitative and qualitative traits in chilli using hybrids developed through a Line × Tester mating design. The selected three female lines were identified as promising general combiners for yield and yield-related traits based on their superior performance in earlier evaluations. These lines exhibited desirable attributes such as higher fruit number, better fruit weight, and overall productivity, indicating their strong genetic potential for transmission of favourable traits. Owing to their consistent performance and combining ability, they were utilized as female parents in the present study to develop hybrids. The crossing was intitated with three female lines and seven male testers, resulting in twenty-one hybrids evaluated for traits including days to 50% flowering, plant height, number of primary and secondary branches, days to first harvest, number of fruits per plant, fruit length, fruit diameter, moisture content, stalk length, average fruit weight, number of seeds per fruit, 1000 seed weight, wet red chilli yield per plant, and fruit yield per hectare. Correlation analysis revealed that fruit yield had a strong positive association with wet red chilli yield per plant, average fruit weight, number of seeds per fruit, and 1000 seed weight. Number of fruits per plant showed significant positive correlations with plant height, primary branches, and secondary branches. The use of such elite lines is expected to enhance the efficiency of hybridization programmes and facilitate the development of high-yielding chilli genotypes with improved agronomic traits. These findings indicate that improvement in these component traits can effectively enhance yield in chilli breeding programmes.

Keywords: Chilli, correlation analysis, yield components and plant breeding

Introduction

Chilli (*Capsicum annuum* L.) is one of the most significant spice crops cultivated globally, valued for its pungency, vibrant colour, flavour, and rich nutritional content, including vitamins A and C. It is extensively grown in tropical and subtropical regions and contributes substantially to the agricultural economy of many countries, particularly in Asia and Latin America (Bosland and Votava, 2012). In India, as well as in world chilli occupies a prominent position among spice crops and is cultivated both for green

Journal of Genetics, Genomics & Plant Breeding 9(4)173-177(October, 2025)
ISSN (Online): 2581-3293 10.63551/jggpb.vol.9.issue04.006

consumption and dried spice production, supporting farmers' livelihoods and agro-based industries. Yield in chilli is a complex and quantitatively inherited trait influenced by several interrelated morphological, physiological, and reproductive components. Traits such as plant architecture, fruit characteristics, and seed attributes collectively determine the overall productivity. Therefore, understanding the nature and extent of relationships among these traits is essential for formulating efficient selection strategies in crop improvement programmes (Falconer and Mackay, 1996). Correlation analysis serves as a powerful statistical tool to assess the degree and direction of association between different traits. It enables plant breeders to identify key yield-contributing characters and facilitates indirect selection, especially when direct selection for yield is less effective due to its polygenic nature. Positive correlations among traits can be exploited to simultaneously improve multiple characters, whereas negative associations may reveal potential trade-offs that require careful consideration (Johnson *et al.,* 1955; Dudhe, et al., 2019). The success of any breeding programme largely depends on the identification and utilization of traits that exhibit strong and favourable associations with yield. In this context, studying phenotypic correlations among yield and its component traits provides valuable insights into the underlying relationships and helps in the development of superior hybrids. Therefore, the present investigation was undertaken to evaluate the phenotypic correlations among important growth, yield, and quality traits in chilli hybrids developed through a Line × Tester mating design. The primary objective was to identify key traits influencing fruit yield and to provide a scientific basis for effective selection and hybrid development in chilli breeding programmes.

Materials and methods

The experimental material for the present study comprised three carefully selected female lines and seven male testers of chilli (*Capsicum annuum* L.), chosen based on their diverse genetic background and desirable agronomic traits. These parental genotypes were crossed in a systematic manner using a Line × Tester mating design, resulting in the development of twenty-one F_1 hybrids. This mating design is widely employed in plant breeding to assess combining ability and to generate variability for selection. Both the parental lines and their derived hybrids were evaluated under field conditions to study the nature and extent of association among yield and yield-contributing traits. The experimental genotypes were grown in a well-structured experimental layout with appropriate agronomic practices to ensure uniform crop growth and reliable observations. A comprehensive assessment was carried out by recording data on fifteen important quantitative and qualitative characters encompassing plant growth parameters, flowering behaviour, fruit attributes, and yield performance. This detailed evaluation enabled a thorough understanding of trait relationships and provided a strong basis for identifying key characters influencing yield, thereby supporting effective selection and hybrid development in chilli breeding programmes. Observations were systematically recorded on fifteen important growth, yield, and yield-attributing traits in chilli to assess their contribution and interrelationships. Days to 50% flowering (DFF) was recorded as the number of days from transplanting to the stage when 50% of plants in a plot flowered. Plant height (PH) was measured in centimetres from the base to the apical tip at maturity, while the number of primary (NPB) and secondary branches (NSB) per plant were counted to assess plant architecture and vigour. Days to first harvest (DFH) indicated earliness and was noted from transplanting to the first picking of mature fruits. Yield components included number of fruits per plant (NFP), fruit length (FL), and fruit diameter (FD), which reflect fruit size and productivity. Moisture content

(MC) at harvest was estimated as the percentage of water in fresh fruits, and stalk length (SL) was measured in centimetres. Average fruit weight (AFW), number of seeds per fruit (NSF), and 1000 seed weight (TSW) were recorded to evaluate fruit and seed traits. Finally, wet red chilli yield per plant (WRY) and fruit yield per hectare (FY) were computed to determine overall productivity. These observations provide a comprehensive basis for selection and improvement in chilli breeding programmes. Phenotypic correlation coefficients were calculated to determine the degree and direction of association among yield and yield contributing traits. The correlation analysis helped in identifying the traits that significantly influence fruit yield in chilli. The significance of correlation coefficients was tested at 5% and 1% probability levels. Statistical analysis was performed following the standard biometrical procedures described by Singh and Chaudhary (1985).

Results and discussion

The correlation analysis revealed significant relationships among several growth and yield components (Table 1a and b). Days to 50% flowering exhibited a positive and significant correlation with days to first harvest (r = 0.61**), indicating that genotypes flowering later also tended to have delayed harvesting. However, days to 50% flowering showed a negative correlation with number of fruits per plant (r = –0.44*), suggesting that early flowering genotypes may produce more fruits. Plant height showed positive and significant correlations with number of primary branches (r = 0.36*), number of secondary branches (r = 0.41*), number of fruits per plant (r = 0.49**), and fruit length (r = 0.32*). This indicates that taller plants generally produced more branches and fruits, which ultimately contributes to yield improvement. The number of primary branches exhibited a strong positive correlation with number of secondary branches (r = 0.58**), and both traits showed significant positive associations with number of fruits per plant (r = 0.56** and r = 0.62**, respectively). This finding suggests that branching architecture plays a crucial role in determining fruit production in chilli plants. Fruit length and fruit diameter exhibited a positive and significant correlation (r = 0.46**), indicating that longer fruits tend to have greater thickness. Fruit length also showed a positive correlation with number of fruits per plant (r = 0.37*), suggesting that genotypes producing more fruits may also produce longer fruits. Average fruit weight displayed a strong positive correlation with number of seeds per fruit (r = 0.42*) and 1000 seed weight (r = 0.35*). These relationships indicate that heavier fruits tend to contain more seeds and higher seed weight. Fruit yield per hectare exhibited a highly significant positive correlation with wet red chilli yield per plant (r = 0.89**), indicating that plant-level productivity strongly influences overall yield. Fruit yield also The observed correlations suggest that traits such as number of fruits per plant, average fruit weight, number of seeds per fruit, and 1000 seed weight play a significant role in determining fruit yield. Therefore, these traits can be considered as reliable selection criteria in chilli breeding programmes.

The study also supports the findings of previous researchers who reported strong positive associations between yield and fruit number, fruit weight, and branching characteristics in chilli (Pandey *et al.*, 2013; Sharma *et al.*, 2017). Selection for these traits may therefore lead to substantial yield improvement. The correlation analysis revealed that fruit yield in chilli is strongly influenced by several yield contributing traits such as number of fruits per plant, average fruit weight, number of seeds per fruit, and 1000 seed weight. Positive associations among branching traits and fruit number indicate that plant architecture plays a crucial role in yield determination. The results suggest that these

Journal of Genetics, Genomics & Plant Breeding 9(4)173-177(October, 2025)
ISSN (Online): 2581-3293 10.63551/jggpb.vol.9.issue04.006

traits can be effectively utilized as selection criteria in breeding programmes aimed at improving chilli productivity. Additionally, hybrids showing superior combining ability effects may be further exploited for developing high yielding chilli cultivars.

Table 1a: Phenotypic correlation coefficients among yield and yield contributing traits

Traits	Days to 50% flowering	Plant height	No. of primary branches	No. of secondary branches	Days to first harvest	No. of fruits per plant	Fruit length	Fruit diameter
Days to 50% flowering	1.00							
Plant height	0.42*	1.00						
No. of primary branches	-0.18	0.36*	1.00					
No. of secondary branches	-0.12	0.41*	0.58**	1.00				
Days to first harvest	0.61**	0.22	-0.10	-0.08	1.00			
No. of fruits per plant	-0.44*	0.49**	0.56**	0.62**	-0.35*	1.00		
Fruit length	-0.09	0.32*	0.21	0.28	-0.04	0.37*	1.00	
Fruit diameter	-0.15	0.18	0.12	0.15	-0.06	0.29	0.46**	1.00

** and * indicates significant at 1% and 5%, respectively

Table 1b: Phenotypic correlation coefficients among yield and yield contributing traits

Traits	Moisture content	Stalk length	Average fruit weight	No. of seeds per fruit	1000 seed weight	Wet red chilli yield per plant	Fruit yield (q/ha)
Moisture content	1.00						
Stalk length	0.03	1.00					
Average fruit weight	-0.07	0.29	1.00				
No. of seeds per fruit	0.05	0.16	0.42*	1.00			
1000 seed weight	0.02	0.10	0.35*	0.41*	1.00		
Wet red chilli yield per plant	-0.09	0.28	0.61**	0.43*	0.39*	1.00	
Fruit yield (q/ha)	-0.11	0.30	0.64**	0.46**	0.42*	0.89**	1.00

** and * indicates significant at 1% and 5%, respectively

References

1. Bosland, P.W., and Votava, E.J. 2012. Peppers: Vegetable and Spice Capsicums. CABI Publishing.
2. Dudhe, M,Y., Mulpuri, S., Meena, H.P. Ajjanavara, R.R.G., Kodeboyina,, V.S. and Adala, V.R. 2020. Genetic variability, diversity and identification of trait-specific accessions from the conserved sunflower germplasm for exploitation in the breeding programme. Agric Res 9:9–22.
3. Falconer, D.S., and Mackay, T.F.C. 1996. Introduction to Quantitative Genetics. Longman.
4. Johnson, H.W., Robinson, H.F., and Comstock, R.E. 1955. Estimates of genetic and environmental variability in soybeans. Agronom. J., 47: 314–318.
5. Pandey, V., Choudhary, B.R., and Bhardwaj, M.L. 2013. Correlation and path coefficient analysis in chilli (*Capsicum annuum* L.). Vegetable Sci., 40(1): 51–54.
6. Sharma, V.K., Semwal, C.S., and Uniyal, S.P. 2017. Genetic variability and correlation studies in chilli (*Capsicum annuum* L.). J. Spices Aromatic Crops, 26(2): 120–125.
7. Singh, R.K., and Chaudhary, B.D. 1985. Biometrical Methods in Quantitative Genetic Analysis. Kalyani Publishers.

.