



RESEARCH ARTICLE

Estimation of genetic variability parameters and trait association in cherry tomato (*Solanum lycopersicum* L. var. *cerasiforme*)

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Abstract

Cherry tomatoes are the smaller version of classic tomatoes but are valued for their sweet taste and captivating colors. They are highly favored by the urban elite and the chefs catering to high-profile restaurants. To formulate selection criteria for utilization in breeding programs, variability parameters, an association between different characters, and direct and indirect effects of component traits of 29 cherry tomato genotypes were assessed under polyhouse conditions. Sufficient genetic variability was found for the morphological and yield traits studied, as revealed by the variance analysis. Plant height, primary branches per plant, days to 50 percent flowering, flower clusters per plant, flowers per cluster, fruits per cluster, days to first harvest, fruits per plant, fruit length, fruit girth, fruit weight, locules per fruit, pericarp thickness, days to final harvest, yield per plant, total soluble solids, lycopene, ascorbic acid, reducing sugars and non-reducing sugars showed high estimates of heritability and genetic advance as percent of the mean. Correlation analysis demonstrated a significant positive relationship between fruit yield per plant and pericarp thickness (0.727), fruit length (0.685), fruit girth (0.536), fruit weight (0.530) and the number of fruits per cluster (0.386). Principal component analysis identified the primary component (PC1) as the main contributor to variance. Path analysis revealed that fruit length, pericarp thickness, number of fruits per plant, flowers per cluster, and fruit weight had the highest direct effect on yield. These traits were the key factors influencing fruit yield per plant in cherry tomatoes.

Keywords

cherry tomato; correlation; heritability; path analysis; principal component analysis

Introduction

The cherry tomato (*Solanum lycopersicum* L. var. *cerasiforme*) is a widely favored small tomato, presumed to be the most likely ancestor of the cultivated tomato from the Solanaceae family. Initially found in tropical and subtropical regions of America, cherry tomatoes were later introduced to tropical areas of Africa and Asia. The cherry tomato is still regarded as a relatively new or emerging crop in India despite its immense popularity as a high-value crop globally. Cherry tomatoes offer a variety of nutritional

benefits, making them a valuable addition to a balanced diet. In a 100 g serving, the fruit provides 26 kcal of energy, 1.64 g of protein, 4.92 g of carbohydrates, 1.6 g of dietary fiber, 738 IU of vitamin A, 9.3 mg of vitamin C, 33 mg of calcium, 1.18 mg of iron, and 61 mg of sodium (1). Naringin and naringenin, two essential nutrients in cherry tomatoes, play a significant role in fighting diseases, possibly due to their antioxidant and anti-inflammatory properties (2). Cherry tomatoes are small fruited, weighing between 10 and 20 g and having a 1.6 to 2.5 cm diameter. These fruits are highly valued for their appealing color and delightful sweet flavor. While cherry tomatoes are typically red, variations in golden, orange and yellow shades also occur (3). Their small size and pleasing appearance make them famous for garnishing dishes.

The selection of the most appropriate genotypes for enhancing yield and related characteristics relies heavily on the genetic diversity in existing crops. Cherry tomatoes exhibit extensive variability in plant habits, leaf characters, trusses, fruit size, appearance, weight, color and other horticultural traits. This diversity provides an increased opportunity to identify high-yielding varieties with exceptional quality traits. Previous studies (4, 5) have documented significant differences among cherry tomato genotypes.

Evaluating various genetic parameters and understanding the connection between different traits is essential for gaining insight into the genetic variability within the breeding population. Traits with high heritability and genetic advancement are particularly effective for selection. Studies on correlation assess the association between component characters and yield. Path analysis considers the direct and indirect effects of different yield components to identify the key characteristics that significantly affect yield.

Therefore, this study aimed to identify the key characteristics influencing cherry tomato yield and quality by assessing variability, heritability, genetic advance, correlation, path analysis and principal component analysis.

Materials and Methods

Experimental site

The research was conducted in a saw tooth-type polyhouse at the Department of Vegetable Science, College of Agriculture, Vellayani, Thiruvananthapuram, from 2022 to 2023. The polyhouse is situated at 8°43' 20.7" N latitude and 76°98' 75.5" E longitude, at an altitude of 29 meters above mean sea level. The soil of the experiment site is red loam of the Vellayani series, texturally classified as sandy clay loam.

Experimental material

The study utilized 29 cherry tomato genotypes from various regions of India, with Pusa Cherry Tomato-1 as the check for yield and quality characteristics (see Supplementary Table S1). The experiment was laid out in a randomized block design with two replications. Cherry

tomato seedlings were grown in portrays containing a 1:1 mixture of cocopeat and vermicompost. Raised beds of 1 m width and 30 cm height were established inside the polyhouse and supplemented with 100 kg of dried cow dung per 40 m². The beds were leveled and covered with silver on a black polythene sheet for mulching. Holes were punched in the sheet, and thirty days old healthy, uniform seedlings with 4-5 leaves were transplanted in double rows at a spacing of 60 cm × 60 cm. Ten plants per genotype were maintained in each plot. The crop was managed following the Ad-hoc package of practices for precision farming for tomatoes.

Traits evaluated

Twenty different yield, attributing traits, and biochemical parameters were documented. The traits contributing to yield were plant height (cm), primary branches per plant, days to 50 percent flowering, flower clusters per plant, flowers per cluster, fruits per cluster, days to first harvest, fruits per plant, fruit length (cm), fruit girth (cm), fruit weight (g), locules per fruit, pericarp thickness (mm), days to final harvest and fruit yield per plant (kg). The quality parameters included total soluble solids (TSS) (°Brix), lycopene (mg 100 g⁻¹), ascorbic acid (mg 100 g⁻¹), reducing sugars (%) and non-reducing sugars (%).

Statistical analysis

The analysis of variance (ANOVA) (6), phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) (7), heritability in a broad sense and genetic advance as percent of the mean (8), correlation coefficients (9) and path coefficient analysis (10) were calculated using GRAPES, an online R-based tool, <https://www.kaugrapes.com/home> (11). The principal component analysis was carried out using the correlation matrix method (12).

Results

Analysis of variance

The analysis of variance showed that there was a significant difference among the genotypes for all the traits studied (Table 1). This suggests the presence of considerable genetic variability, which is a critical asset for breeding programs. Such variability provides a broad genetic base for further utilization in crop improvement. Furthermore, the low mean sum of squares for error, in contrast to treatments, underscores the dependability of the experimental findings, indicating that the observed differences are predominantly attributable to genetic factors rather than experimental error.

Mean performance of the genotypes

The general mean, range, standard error and critical difference for the quantitative and qualitative traits of the cherry tomato genotypes studied are presented in Table 1. The height of the plants reflects their vigor and can potentially lead to higher yields. Plant height varied from 109.67 to 257.17 cm, with an average of 205.17 cm. The number of primary branches per plant determines the plant architecture, ranging from 5.33 to 15.00, with a mean

Table 1. Range, mean and analysis of variance for various characters in cherry tomato

Characters	Range	Mean	Standard error ±	MSS value	CD at 5%
Plant height (cm)	109.67 - 257.17	205.17	7.852	2779.670**	22.747
Primary branches per plant	5.33 - 15.00	7.94	0.495	8.926**	1.435
Days to 50 percent flowering	20.00 - 34.00	25.50	0.970	18.067**	2.811
Flower clusters per plant	9.33 - 47.17	23.30	2.071	262.954**	6.00
Flowers per cluster	4.17 - 113.17	19.26	1.523	948.813**	4.411
Fruits per cluster	1.00 - 18.00	6.27	0.479	45.123**	1.386
Days to first harvest	59.50 - 103.00	73.98	3.814	194.553**	11.048
Fruits per plant	8.33 - 173.00	80.61	3.196	4050.073**	9.257
Fruit length (cm)	1.07 - 4.40	2.87	0.120	1.751**	0.349
Fruit girth (cm)	0.74 - 4.58	2.40	0.092	1.369**	0.266
Fruit weight (g)	0.67 - 33.17	8.79	0.389	120.703**	1.127
Locules per fruit	2.00 - 3.90	2.49	0.203	0.618**	0.587
Pericarp thickness (mm)	0.50 - 3.60	2.08	0.064	1.982**	0.185
Days to final harvest	114.00 - 164.00	133.59	2.556	394.860**	7.403
Yield per plant (kg)	0.10 - 1.24	0.48	0.026	0.253**	0.076
TSS (°Brix)	4.30 - 7.35	5.57	0.084	0.871**	0.243
Lycopene (mg 100 g ⁻¹)	0.22 - 9.51	5.80	0.101	13.052**	0.292
Ascorbic acid (mg 100 g ⁻¹)	15.82 - 38.58	27.27	0.543	68.367**	1.57
Reducing sugars (%)	1.80 - 5.92	3.19	0.133	2.594**	0.386
Non reducing sugars (%)	0.37 - 1.56	0.75	0.064	0.123**	0.186

**Significant at 1% level

of 7.94. The time taken for 50 percent flowering indicates the earliness of the crop, with an average of 25.50 days and a range of 20.00 to 34.00 days. Flower clusters per plant and flowers per cluster ranged from 9.33 to 47.17 and 4.17 to 113.17, respectively. Days to first harvest highlight the crop earliness, which ranged from 59.50 to 103.00 days, with a mean of 73.98 days. There was a wide range observed in the fruit length (1.07 to 4.40 cm), fruit girth (0.74 to 4.58 cm), fruit weight (0.67 to 33.17 g), locules per fruit (2.00 to 3.90), and pericarp thickness (0.50 to 3.60 mm). Days to final harvest, which indicates the duration of the harvesting period, varied from 114.00 to 164.00 days, with a mean of 133.59 days. The fruit-bearing capacity, measured as the number of fruits per plant and the productivity, reflected in yield per plant, exhibited significant variation among the genotypes. The number of fruits per plant ranged from 8.33 to 173.00, with a mean of 80.61, while the yield per plant varied from 0.10 to 1.24 kg, averaging 0.48 kg. Quality factors such as TSS, lycopene content, ascorbic acid and reducing and non-reducing sugars also exhibited significant variation.

Estimation of variance components and coefficients of variation

In the present evaluation study, an effort was made to analyze the genetic parameters for 29 genotypes, including phenotypic, genotypic variance, PCV and GCV. The estimates are presented in Table 2. The magnitude of PCV was found to be higher than that of GCV for all parameters. High estimates (more than 20%) of both PCV and GCV were observed for primary branches per plant, flower clusters per plant, flowers per cluster, fruits per cluster, fruits per plant, fruit length, fruit girth, fruit weight, locules per fruit, pericarp thickness, yield per plant, lycopene content, ascorbic acid, reducing sugars and non-reducing sugars. Moderate levels (10 to 20%) of PCV and GCV were observed for plant height, days to 50 percent flowering, days to first harvest, days to final harvest and

TSS.

Heritability and genetic advance

Understanding heritability and genetic advancement would enhance the selection of genotypes based on their phenotypic performance. This study detected high heritability (more than 60%) for all the traits examined, ranging from 74.00 to 99.70%. The traits of plant height, primary branches per plant, days to 50 percent flowering, flower clusters per plant, flowers per cluster, fruits per cluster, days to first harvest, fruits per plant, fruit length, fruit girth, fruit weight, locules per fruit, pericarp thickness, days to final harvest, yield per plant, TSS, lycopene, ascorbic acid, reducing sugars and non-reducing sugars exhibited high heritability and significant genetic advance.

Correlation analysis

The association among the traits of cherry tomato genotypes and the genotypic and phenotypic correlation coefficients between yield and yield components was estimated and presented in Table 3. In general, genotypic correlation coefficients were higher than the phenotypic correlation coefficients. Yield per plant had a significant positive association at the genotypic level with pericarp thickness (0.727), fruit length (0.685), fruit girth (0.536), fruit weight (0.530) and fruits per cluster (0.386). Flower clusters per plant (-0.450), primary branches per plant (-0.366) and plant height (-0.364) recorded significant negative correlations with yield per plant. Fruits per plant (-0.050) and flowers per cluster (-0.028) had no significant correlation with yield per plant. Yield per plant had a significant positive phenotypic correlation with pericarp thickness (0.718), fruit length (0.678), fruit weight (0.527), fruit girth (0.526) and fruits per cluster (0.379). Flower clusters per plant (-0.428), primary branches per plant (-0.347) and plant height (-0.343) had significant but negative phenotypic correlation with yield per plant. Fruits per plant (-0.045) and flowers per cluster (-0.028) had no

Table 2. Estimates of genetic parameters for various characters in cherry tomato

Characters	Variance		Coefficient of variation		Heritability	Genetic Advance	GA as % of mean
	Phenotypic	Genotypic	PCV	GCV			
Plant height	1495.59	1372.27	18.85	18.06	91.80	73.10	35.63
Primary branches per plant	4.67	4.18	27.23	25.76	89.50	3.99	50.20
Days to 50 percent flowering	9.75	7.86	12.24	11.00	80.70	5.19	20.35
Flower clusters per plant	137.11	128.53	50.25	48.65	93.70	22.61	97.03
Flowers per cluster	493.64	489	115.36	114.82	99.10	45.34	235.41
Fruits per cluster	22.79	22.33	76.09	75.32	98.00	9.63	153.59
Days to first harvest	111.82	82.73	14.29	12.29	74.00	16.12	21.78
Fruits per plant	2035.25	2014.82	55.97	55.69	99.00	92.00	114.14
Fruit length	0.89	0.86	32.88	32.34	96.70	1.91	65.52
Fruit girth	0.64	0.60	34.75	34.32	97.50	1.68	69.83
Fruit weight	60.50	60.20	88.47	88.25	99.50	15.94	181.34
Locules per fruit	0.35	0.27	23.80	20.82	76.60	0.93	37.53
Pericarp thickness	1.00	0.99	48.03	47.84	99.20	2.04	98.15
Days to final harvest	203.96	190.90	10.69	10.34	93.60	27.54	20.61
Yield per plant	0.13	0.13	74.34	74.05	99.20	0.73	151.94
TSS	0.44	0.43	11.95	11.76	96.80	1.33	23.84
Lycopene	6.54	6.52	44.14	44.07	99.70	5.26	90.64
Ascorbic acid	34.48	33.89	21.53	21.35	98.30	11.89	43.59
Reducing sugars	1.31	1.28	35.93	35.45	97.30	2.30	72.05
Non reducing sugars	0.07	0.06	34.12	31.97	87.80	0.46	61.71

PCV - Phenotypic Coefficient of Variation, GCV - Genotypic Coefficient of Variation

Table 3. Genotypic and phenotypic correlation coefficients between yield and yield components of cherry tomato genotypes

Characters	Plant height (cm)	Primary branches per plant	Flower clusters per plant	Flowers per cluster	Fruits per cluster	Fruits per plant	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	Pericarp thickness (mm)	Yield per plant (kg)	
Plant height (cm)	G	1.000	0.474**	-0.077	0.346*	0.289*	0.077	-0.185	-0.388**	-0.277*	-0.274*	-0.364**
	P	1.000	0.460**	-0.087	0.327*	0.274*	0.075	-0.179	-0.378**	-0.264*	-0.267*	-0.343*
Primary branches per plant	G	1.000	0.601*	0.002	-0.082	0.586*	-	0.594**	-0.708**	0.467**	-0.517**	-0.366**
	P	1.000	0.543*	0.001	-0.065	0.540*	-	0.568**	-0.671**	0.437**	-0.487**	-0.347*
Flower clusters per plant	G		1.000	-0.302*	-0.414**	0.718*	-	0.841**	-0.721**	0.647**	-0.807**	-0.450**
	P		1.000	-0.294*	-0.400**	0.693*	-	0.802**	-0.676**	0.623**	-0.779**	-0.428**
Flowers per cluster	G			1.000	0.738**	-0.046	-0.066	-0.102	-0.161	-0.072	-0.028	
	P			1.000	0.724**	-0.045	-0.063	-0.100	-0.162	-0.074	-0.028	
Fruits per cluster	G				1.000	0.234*	0.149	-0.035	-0.060	0.161	0.386**	
	P				1.000	0.234*	0.141	-0.038	-0.059	0.159	0.379**	
Fruits per plant	G					1.000	-	0.655**	-0.721**	0.612**	-0.607**	-0.050
	P					1.000	-	0.634**	-0.712**	0.608**	-0.604**	-0.045
Fruit length (cm)	G						1.000	0.907**	0.882**	0.942**	0.685**	
	P						1.000	0.880**	0.862**	0.917**	0.678**	
Fruit girth (cm)	G							1.000	0.938**	0.848**	0.536**	
	P							1.000	0.923**	0.833**	0.526**	
Fruit weight (g)	G								1.000	0.835**	0.530**	
	P								1.000	0.832**	0.527**	
Pericarp thickness (mm)	G									1.000	0.727**	
	P									1.000	0.718**	
Yield per plant (kg)	G										1.000	
	P										1.000	

*, ** Significant at 5 and 1% levels respectively

significant correlation with yield per plant.

Path coefficient analysis

Path coefficient analysis provides a more comprehensive understanding of the relationship between various traits, considering the direct and indirect effects of different yield components. Fruit length exhibited the highest positive direct effect on yield per plant (1.2278), followed by pericarp thickness (0.8877), number of fruits per plant (0.6930), flower clusters per plant (0.6094), flowers per cluster (0.4491) and fruit weight (0.0205) (Fig. 1). Conversely, plant height (-0.0539), fruits per cluster (-0.2223), primary branches per plant (-0.4246) and fruit girth (-0.6939) showed negative direct effects on yield per plant. Notably, fruit length, weight and pericarp thickness also demonstrated significant positive correlations with yield per plant.

Principal component analysis

Principal component analysis was conducted on the genotypes for eleven traits. A total of eleven principal components were observed and are given in Table 4. The first three principal components showed an eigenvalue greater than one, accounting for 83.81% of the total variance among 29 genotypes. The PC1 displayed maximum variation at 52.37%, followed by PC2 at 19.66% and PC3 (11.79%). The variability diminished with each subsequent principal component, as demonstrated by the scree plot (Fig. 2). The traits that contributed positively to PC1 were fruit length (0.401), fruit girth (0.396), pericarp thickness (0.391), fruit weight (0.370), yield per plant (0.273) and fruits per cluster (0.049).

In contrast, the traits that contributed negatively were plant height, primary branches per plant, flower clusters per plant, flowers per cluster and number of fruits per plant (Table 5). For PC2, traits like flower clusters per plant, fruit girth and fruit weight showed negative factor loadings, while all the other traits presented positive factor loadings. Yield per plant, number of fruits per plant, fruits per cluster, flower clusters per plant, pericarp thickness, fruit length and primary branches per plant were the traits that contributed to variation in the PC3,

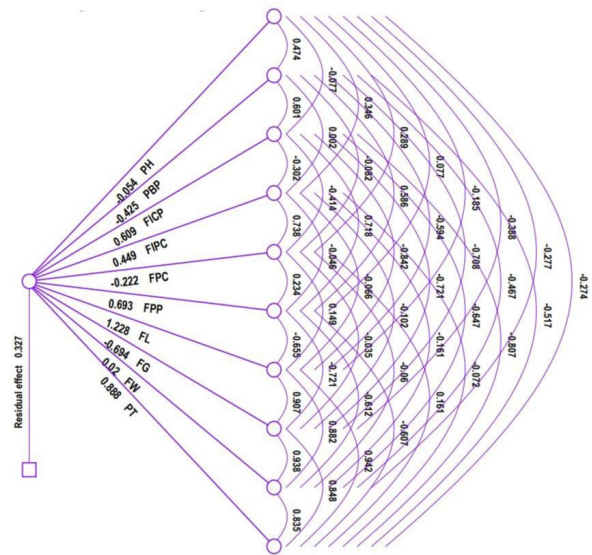


Figure 1. Genotypic path diagram for yield per plant in cherry tomato genotypes

PH - Plant height, PBP - Primary branches per plant, FICP - Flower clusters per plant, FIPC - Flowers per cluster, FPC - Fruits per cluster, FPP - Fruits per plant, FL - Fruit length, FG - Fruit girth, FW - Fruit weight, PT - Pericarp thickness

while fruit weight, fruit girth, flowers per cluster and plant height were negatively contributed.

Discussion

Genetic improvement in cherry tomatoes depends on the extent of genetic variability for yield and its component traits in the germplasm. In the present study, analysis of variance revealed significant differences among the genotypes across all the traits evaluated. The number of fruits per plant showed the highest range of variation, followed by plant height, flowers per cluster, days to final harvest, flower clusters per plant, days to first harvest, and fruit weight. These findings align with previous studies (13-15). Significant variability observed in the mean performances of the genotypes across all traits indicates a broad genetic base among the cherry tomato genotypes studied. Similar variations in horticultural traits and quality parameters have been noted in earlier studies (16-20). This genetic diversity is an invaluable resource for

Table 4. Eigen values, percent variance and cumulative variance percent of the various principal components

Principal components	Eigen value	Variance percent	Cumulative variance percent
PC1	5.76	52.367	52.367
PC2	2.162	19.655	72.022
PC3	1.296	11.785	83.807
PC4	0.902	8.203	92.01
PC5	0.384	3.487	95.497
PC6	0.239	2.176	97.673
PC7	0.142	1.293	98.967
PC8	0.042	0.384	99.351
PC9	0.036	0.327	99.678
PC10	0.021	0.189	99.867
PC11	0.015	0.133	100

Table 5. Factor loadings of the first three principal components

Variables	PC1	PC2	PC3
Plant height	-0.136	0.387	-0.438
Primary branches per plant	-0.294	0.058	0.001
Flower clusters per plant	-0.348	-0.281	0.210
Flowers per cluster	-0.012	0.589	-0.104
Fruits per cluster	0.049	0.620	0.297
Fruits per plant	-0.300	0.068	0.553
Fruit length	0.401	0.033	0.008
Fruit girth	0.396	-0.103	-0.054
Fruit weight	0.370	-0.105	-0.038
Pericarp thickness	0.391	0.025	0.09
Yield per plant	0.273	0.095	0.588

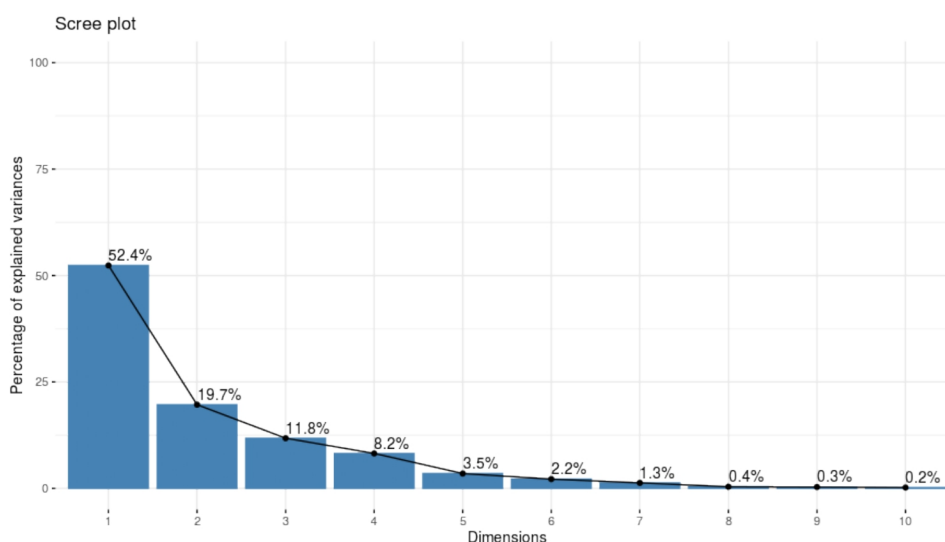


Fig. 2. Scree plot illustrating variance distribution across principal components

breeding programs to improve yield, quality and adaptability to diverse growing environments. Significant genetic variability in quantitative and qualitative traits suggests considerable potential for selection and hybridization strategies, which can lead to the development of superior cherry tomato varieties tailored to specific market and environmental needs.

Using coefficients of variation allows for comparing characters with different units of measurement and serves as good indices. In this analysis, the PCV exceeded the GCV for all traits studied. However, the difference between PCV and GCV was narrow, suggesting a lesser influence by the environment and indicating that selection based on phenotypic performance will be more dependable. High estimates of both PCV and GCV were observed for all the traits except for plant height, days to 50 percent flowering, days to first harvest, days to final harvest, and TSS, which recorded moderate PCV and GCV. These high estimates suggest a high variability of characters in the germplasm. The parameters demonstrating high GCV and PCV values are economically significant, making selection for further improvement of these characters potentially rewarding. These findings are consistent with previous research (19, 21). Moderate PCV and GCV for plant height were also reported (22-24).

The expression of genetic variability in terms of GCV alone does not fully indicate the heritable extent of variation. Heritability measures how much variation in a specific trait within a population can be credited to genetic factors and offers insight into the transmission of traits from parents to offspring. When combined with high genetic advance, high heritability estimates are generally more effective in predicting the potential gains from selection than heritability estimates alone. This study revealed high heritability estimates for all the traits assessed. High heritability suggests that the traits are less affected by the environment and are reliably transmitted to the next generation, highlighting the significant role of genetic makeup in trait expression. Hence, dependable selection based on phenotypic expression can be carried

out for these traits (25). The results indicate that these characters are influenced by additive gene action and phenotypic selection for these traits is advantageous.

Yield is a complicated quantitative attribute that environmental variations can significantly impact. Relying solely on yield performance for selection may not be effective and can lead to uncertainty. Thus, it is important to investigate the relationship between component traits and yield to identify the significant characteristics that influence yield. Correlation coefficient analysis assesses the interrelationships between different traits and is utilized to determine which component trait can be targeted for improving yield. The genotypic correlation coefficient exceeded the phenotypic correlation coefficient in the current research, suggesting that the environment had a smaller impact on the expression of these traits related to yield. At both the genotypic and phenotypic levels, yield per plant showed a strong positive correlation with fruits per cluster, fruit length, fruit girth, fruit weight, and pericarp thickness (26-28). Plant height, primary branches per plant and flower clusters per plant had a significant negative correlation with yield per plant (29). The number of fruits per plant did not significantly correlate with the yield per plant. This could be attributed to the genetic variations among the different genotypes and the variability in fruit sizes produced by each genotype. Some genotypes might yield a higher number of small-sized fruits, leading to lower individual fruit yields, while others may yield a smaller number of large-sized fruits, resulting in similar yields. These findings suggest that selecting more fruits per plant with an average fruit weight could improve the yield per plant (30, 31).

Path coefficient analysis provides a more comprehensive understanding of the relationship between different characteristics, taking into account both direct and indirect influences of various yield components. Out of the yield components, fruit length had the highest positive direct impact on yield per plant, followed by pericarp thickness, number of fruits per plant, flower clusters per plant, flowers per cluster and fruit weight.

Fruit length, weight and pericarp thickness also demonstrated a significant positive correlation with yield per plant. This suggests that focusing on fruit length, weight and pericarp thickness in direct selection would result in substantial enhancements in yield. A previous study stated that fruit weight had the highest positive direct effect on yield, followed by the number of fruits per plant, lycopene content, plant height, number of primary branches, fruit length, pericarp thickness and titrable acidity (32).

Principal component analysis explains complex trait relationships and their contributions to total diversity (33). The significant contribution of fruit length, pericarp thickness, and fruit weight to the first principal component suggests that these traits are critical for improving cherry tomato yield. As a result, selection for these traits will help in enhancing yield. Similar results with positive factor loading for fruit weight, pericarp thickness, fruit diameter, and fruit length have been reported in previous studies (34). Conversely, negative factor loading was observed for the number of fruits per plant.

Conclusion

The present study revealed significant variability among the genotypes for all traits studied. From the results, it can be inferred that fruit length, weight and pericarp thickness are the primary yield contributing characters that showed a high positive direct effect and significant positive correlation with yield per plant. Since these traits also have high heritability and genetic advancement, direct selection for these traits would be beneficial for increasing fruit yield per plant in cherry tomatoes.

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Authors' contributions

Conceptualization of research work and designing of experiments (NSK, NKMB); Execution of field/lab experiments and data collection (NKMB); Analysis of data and interpretation (NKMB, NSK and LSL); Preparation of manuscript (NKMB, NSK, SS, SON, GG)

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interest to declare.

Ethical issues: None

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