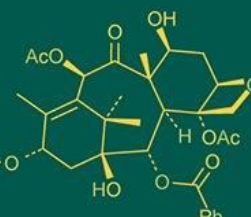
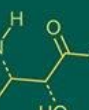
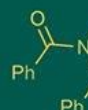


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Performance evaluation of cherry tomato hybrids under open field conditions in Southern Kerala

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Abstract

Cherry tomato is an economically important vegetable valued for its high consumer appeal, nutritional quality and suitability for fresh consumption and processing. The present investigation was undertaken to assess the performance of cherry tomato hybrids and parents for growth, yield and fruit quality traits under open field conditions. Five high yielding cherry tomato genotypes were crossed with three bacterial wilt resistant genotypes following a Line $\times$ Tester mating design to generate 15 hybrids. The hybrids, along with eight parents and one check, were evaluated in a randomized block design with three replications at the Department of Vegetable Science, College of Agriculture, Vellayani, during October 2024 to February 2025. Analysis of variance revealed significant differences among genotypes for all characters studied, indicating the presence of substantial genetic variability. Plant height among hybrids ranged from 101.67 to 214.67 cm, while days to 50 per cent flowering varied from 20.33 to 31.67 days. The hybrid Pusa Cherry Tomato 1 $\times$ IIHR 2857 recorded the highest number of fruits per plant (266.00) and maximum yield per plant (2.40 kg), followed by VL Cherry Tomato 1 $\times$ SL 19 (2.38 kg). Although maximum fruit weight was observed in VL Cherry Tomato 1 $\times$ SL 19, the hybrid Pusa Cherry Tomato 1 $\times$ IIHR 2857 was more desirable considering consumer preference for medium-sized fruits. Total soluble solids (TSS) ranged from 4.97 to 7.10 °Brix, with the highest TSS recorded in Pusa Cherry Tomato 1 $\times$ IIHR 2857. Overall, the hybrid Pusa Cherry Tomato 1 $\times$ IIHR 2857 emerged as the most promising genotype, combining superior yield and quality attributes, and is well suited for open field cultivation under the agroclimatic conditions of southern Kerala.

Keywords: Cherry tomato, evaluation, hybrids, line, tester

Introduction

Cherry tomato [*Solanum lycopersicum* L. var. *cerasiforme* (Dunal) A. Gray] is a botanical variety of cultivated tomato belonging to solanaceae family with chromosome number $2n = 24$. The fruits are highly appreciated for their sweet taste and attractive colour. Cherry tomatoes are rich in antioxidants and phytochemicals such as lycopene, β -carotene, flavonoids, vitamin C and other essential nutrients (Thapa *et al.*, 2014) [17]. Fruits have powerful anti-cancer properties, useful against mouth cancer and sour mouth (Omprasad *et al.*, 2018) [11]. Owing to these nutritional benefits and attractive appearance, cherry tomato has gained premium market value, especially in urban and metropolitan markets.

Considerable genetic variability exists in cherry tomato for growth habit, fruit size, shape, weight and colour (Naveen *et al.*, 2024) [10]. Plants may be determinate, semi-determinate, or indeterminate, while fruit shape ranges from spherical to oblong or pear-shaped, with fruit colours varying from red and pink to yellow, green and brown (Gharezi *et al.*, 2012) [7]. Such variability offers significant scope for genetic improvement through selection and hybridization aimed at enhancing yield, quality and adaptability. However, the expression of these traits is markedly influenced by genotype $\times$ environment interactions, particularly under the hot and humid agroclimatic conditions of Kerala, necessitating region-specific evaluation of genotypes.

With the rising consumer demand and expanding market potential of cherry tomato in Kerala, farmers increasingly prefer hybrid seeds owing to their higher productivity, uniformity, vigour, and superior fruit quality. Despite this preference, well adapted cherry tomato hybrids developed through the public sector breeding programmes are presently limited or unavailable, leading to dependence on private sector hybrids. Therefore, the development and evaluation of high yielding, quality hybrids suited to local agroclimatic

conditions assume considerable importance for strengthening sustainable and cost effective production systems. In this context, the present investigation was undertaken to assess the mean performance of cherry tomato hybrids and parents for growth, yield and fruit quality traits and to identify superior hybrids adapted to the agroclimatic conditions of southern Kerala.

Materials and Methods

The experiment was conducted at the Department of Vegetable Science, College of Agriculture, Vellayani, Thiruvananthapuram, from October 2024 to February 2025 under open field conditions. The experimental site is located in the southern agro-climatic zone of Kerala characterized by humid tropical climate. Five cherry tomato genotypes possessing high yield potential and desirable quality traits were crossed with three bacterial wilt resistant genotypes, previously confirmed through artificial screening, to generate 15 hybrids following the Line $\times$ Tester mating design. The resulting hybrids, along with their eight parents and one check IIHR 2862, constituted the experimental material.

The field trial was laid out in a Randomized Block Design with three replications. Each treatment was accommodated in plots of 3.6 m² at a spacing of 60 cm $\times$ 60 cm, with ten plants maintained per plot for recording observations. The crop was raised in accordance with the recommended package of practices of Kerala Agricultural University for tomato (KAU, 2024). The data recorded on various growth, yield and quality parameters were statistically analysed using RAISIN, an R programming based software.

Results and Discussion

The genotypes evaluated in the present study exhibited significant differences for all growth, yield and quality traits, indicating the existence of ample genetic variability among the hybrids and parents (Table 1). The results obtained for individual traits are discussed below.

Significant variation was observed for plant height among lines, testers and hybrids. Among the lines, Pusa Golden Cherry Tomato 2 recorded the highest plant height (245.67 cm) and was on par with Punjab Kesar Cherry (240.67 cm), while VL Cherry Tomato 1 registered the lowest value (175.67 cm) with a line mean of 224.00 cm. Among the testers, IIHR 2863 exhibited maximum plant height (155.33 cm), whereas SL 19 recorded the minimum (108.33 cm) with a tester mean of 126.44 cm. Plant height of hybrids ranged from 101.67 cm (VL Cherry Tomato 1 $\times$ SL 19) to 214.67 cm (Punjab Kesar Cherry $\times$ IIHR 2863) with a hybrid mean of 163.98 cm. The hybrid Punjab Kesar Cherry $\times$ IIHR 2863 was the tallest, while VL Cherry Tomato 1 $\times$ SL 19 was the shortest. The check IIHR 2862 recorded a plant height of 192.33 cm. Among the hybrids, Punjab Kesar Cherry $\times$ IIHR 2863 and Punjab Kesar Cherry $\times$ SL 19 surpassed the check for plant height, whereas the remaining hybrids recorded comparatively lower values. Similar wide variability for plant height in cherry tomato was earlier reported by Gharezi *et al.* (2012) [7] and Venkadeswaran *et al.* (2018) [18] indicating strong genetic influence on growth habit and adaptability. Although indeterminate genotypes are often preferred in protected cultivation owing to their prolonged harvest period and high cumulative yield, such types are difficult to manage under open field conditions, especially in humid tropical regions.

Excessive vine growth necessitates intensive staking and pruning, leading to higher production cost and increased susceptibility to lodging and diseases. In the present study, the hybrid Pusa Cherry Tomato 1 $\times$ IIHR 2857, with semi-determinate growth and moderate plant height (165.67 cm), was identified as promising hybrid. Semi-determinate architecture provides an appropriate balance between vegetative and reproductive growth, resulting in better assimilate distribution, concentrated harvest and easier field management.

Genotypes exhibited significant variation for days to 50 per cent flowering. Among the lines, Punjab Red Cherry was the earliest to flower (23.67 days), while VL Cherry Tomato 1 recorded the maximum duration (29.67 days) with a line mean of 26.20 days. Among the testers, IIHR 2857 flowered earliest (19.67 days), whereas SL 19 was late (23.67 days) with a tester mean of 22.00 days. In hybrids, days to 50% flowering ranged from 20.33 days (Pusa Cherry Tomato 1 $\times$ IIHR 2857) to 31.67 days (Punjab Kesar Cherry $\times$ IIHR 2863) with a hybrid mean of 24.69 days. Hybrids such as Pusa Cherry Tomato 1 $\times$ IIHR 2857, Punjab Red Cherry $\times$ IIHR 2857 and Pusa Golden Cherry Tomato 2 $\times$ IIHR 2857 flowered earlier than the parental mean (24.63 days). Earliness in flowering might be due to the greater efficiency of certain genotypes in channeling photosynthates to the growing apex during the sensitive phase prior to floral initiation (Prema *et al.*, 2011a) [14]. The role of parental lines in imparting earliness to tomato hybrids has also been emphasized by Peires (2002) [13], Anand (2007) [1] and Patwary *et al.* (2014) [12]. Similar findings on the genetic contribution of parents towards early flowering in cherry tomato were earlier reported by Prema *et al.* (2011b) [15] and Kumar *et al.* (2014) [5].

The number of fruits per plant is one of the most important yield determining traits, as it directly influences the economic productivity of the crop. Significant variation was observed among lines, testers and hybrids for number of fruits per plant (Fig 1). Among the lines, Punjab Red Cherry (162.67) recorded the highest number of fruits, whereas Punjab Kesar Cherry (97.00) registered the lowest with a line mean of 118.07 fruits. Among testers, IIHR 2863(135.00) produced the maximum number of fruits per plant followed by IIHR 2857 (118.00) with a tester mean of 127.89. Among the hybrids, Pusa Cherry Tomato 1 $\times$ IIHR 2857 (266.00) recorded the highest number of fruits per plant and was significantly superior to all other hybrids, while Punjab Kesar Cherry $\times$ IIHR 2857 (72.33) expressed the lowest value with a hybrid mean of 130.44 fruits. The hybrid Pusa Cherry Tomato 1 $\times$ IIHR 2857 surpassed both of its parents, Pusa Cherry Tomato 1 (113.00) and IIHR 2857 (118.00), demonstrating considerable heterotic expression. The check IIHR 2862 recorded 71.67 fruits per plant, and all hybrids were superior than the check. The increased fruit number in superior hybrids could be the result of favourable parental combinations leading to better flower retention, enhanced fruit set and efficient assimilate distribution to reproductive organs. The present findings on variation in fruit number per plant are in agreement with the reports of Kumar *et al.* (2014) [5] and Ramya *et al.* (2016) [16] in cherry tomato.

Fruit weight, an important determinant of market preference in cherry tomato, differed significantly among the genotypes evaluated. Significant variation was observed among parents and hybrids for this trait. Among the parental lines, fruit

weight ranged from 6.19 g in Punjab Red Cherry to 7.29 g in VL Cherry Tomato 1 with a mean of 6.86 g. Testers recorded comparatively higher fruit weight with a mean of 10.37 g, the maximum being in IIHR 2863 (11.13 g). Among the hybrids, fruit weight varied widely from 6.40 g (Pusa Golden Cherry Tomato 2 × IIHR 2863) to 16.98 g (VL Cherry Tomato 1 × SL 19). The hybrid VL Cherry Tomato 1 × SL 19 produced the highest fruit weight (16.98 g), followed by Punjab Kesar Cherry × IIHR 2863 (15.59 g), and both were significantly superior to the check IIHR 2862 (13.87 g). The observed variation in fruit weight among hybrids could be attributed to inherent genetic differences influencing cell size, pericarp thickness and efficiency of assimilate accumulation in developing fruits. Similar genotypic differences for fruit weight in cherry tomato have been documented by Macua *et al.* (2009) [6], Boches *et al.* (2011) [2] and Ramya *et al.* (2016) [16]. Consumers generally prefer medium sized cherry tomatoes due to their attractive appearance, ease of handling and uniformity in retail packaging. Hence, despite the higher fruit weight recorded in VL Cherry Tomato 1 × SL 19, the hybrid Pusa Red Cherry Tomato × IIHR 2857, possessing moderate fruit size, can be considered more market oriented and commercially desirable for fresh consumption and premium markets. Yield per plant represents the ultimate expression of genetic potential and is the most important criterion for assessing the performance of cherry tomato genotypes. Significant

variation was observed among the genotypes for yield per plant. Among the lines, yield ranged from 0.70 kg in Punjab Kesar Cherry to 1.01 kg in Punjab Red Cherry. In testers, yield varied from 1.20 kg in IIHR 2857 to 1.50 kg in IIHR 2863, where IIHR 2863 (1.50 kg) was on par with SL 19 (1.28 kg). The hybrids exhibited a wide range from 0.54 kg to 2.40 kg per plant. Among the hybrids, Pusa Cherry Tomato 1 × IIHR 2857 recorded the maximum yield per plant (2.40 kg) and was on par with VL Cherry Tomato 1 × SL 19 (2.38 kg). Several hybrids including Pusa Golden Cherry Tomato 2 × IIHR 2857 (1.75 kg), Pusa Cherry Tomato 1 × SL 19 (1.69 kg), Punjab Kesar Cherry × IIHR 2863 (1.82 kg) and VL Cherry Tomato 1 × SL 19 (2.38 kg) recorded higher yield than the check IIHR 2862 (0.99 kg). Similar variation in yield per plant among cherry tomato genotypes was also documented by Naveen *et al.* (2024) [10]. The superior performance of Pusa Cherry Tomato 1 × IIHR 2857 could be attributed to its earliness, higher number of fruits per plant and favourable semi-determinate plant architecture, which might have facilitated efficient partitioning of assimilates towards developing fruits. Yield in cherry tomato is largely governed by component traits such as fruit number and fruit weight, and the present findings corroborate this relationship. Comparable ranges of yield and genotypic differences in cherry tomato were earlier reported by Najeema *et al.* (2018) [9] and Mahmood *et al.* (2021) [8].

Table 1: Mean performance of cherry tomato hybrids for growth, yield and quality parameters

Treatments		Plant height (cm)	Days to 50% flowering	Fruits per plant	Fruit weight (g)	Yield per plant (kg)	TSS (°Brix)
Lines							
L ₁	Pusa Golden Cherry Tomato 2	245.67	25.67	103.33	7.21	0.74	6.03
L ₂	Punjab Red Cherry	225.67	23.67	162.67	6.19	1.01	6.37
L ₃	Pusa Cherry Tomato 1	232.33	25.33	113.00	6.41	0.72	5.27
L ₄	Punjab Kesar Cherry	240.67	26.67	97.00	7.21	0.70	6.40
L ₅	VL Cherry Tomato 1	175.67	29.67	114.33	7.29	0.83	6.30
Mean		224	26.20	118.07	6.86	0.80	6.07
T ₁	IIHR 2863	155.33	22.67	135.00	11.13	1.50	6.70
T ₂	SL 19	108.33	23.67	130.67	9.79	1.28	5.47
T ₃	IIHR 2857	115.67	19.67	118.00	10.18	1.20	7.10
Mean		126.44	22.00	127.89	10.37	1.33	6.42
Mean (Parents)		187.42	24.63	121.75	8.18	1.00	6.20
Hybrids							
L ₁ X T ₁	Pusa Golden Cherry Tomato 2 X IIHR 2863	119.33	26.67	84.33	6.40	0.54	4.97
L ₁ X T ₂	Pusa Golden Cherry Tomato 2 X SL 19	163.67	22.67	118.67	6.73	0.80	5.87
L ₁ X T ₃	Pusa Golden Cherry Tomato 2 X IIHR 2857	191.33	21.67	200.67	8.71	1.75	6.13
L ₂ X T ₁	Punjab Red Cherry X IIHR 2863	160.33	28.67	73.33	8.55	0.63	6.13
L ₂ X T ₂	Punjab Red Cherry X SL 19	162.67	22.33	127.33	9.76	1.24	7.03
L ₂ X T ₃	Punjab Red Cherry X 2857	182.67	20.67	117.67	9.76	1.22	5.83
L ₃ X T ₁	Pusa Cherry Tomato 1 X IIHR 2863	184.33	22.33	162.67	6.77	1.10	6.93
L ₃ X T ₂	Pusa Cherry Tomato 1 X SL 19	152.33	22.67	169.67	9.90	1.69	6.00
L ₃ X T ₃	Pusa Cherry Tomato 1 X 2857	165.67	20.33	266.00	9.03	2.40	7.10
L ₄ X T ₁	Punjab Kesar Cherry X IIHR 2863	214.67	31.67	116.67	15.59	1.82	7.03
L ₄ X T ₂	Punjab Kesar Cherry X SL 19	203.33	28.33	106.67	14.75	1.58	6.67
L ₄ X T ₃	Punjab Kesar Cherry X 2857	164.67	25.33	72.33	8.30	0.60	6.33
L ₅ X T ₁	VL Cherry Tomato 1 X IIHR 2863	166.67	24.67	112.00	12.46	1.40	6.07
L ₅ X T ₂	VL Cherry Tomato 1 X SL 19	101.67	24.67	140.00	16.98	2.38	5.70
L ₅ X T ₃	VL Cherry Tomato 1 X IIHR 2857	126.33	27.67	88.67	11.33	1.00	5.67
Mean (Hybrids)		163.98	24.69	130.44	10.38	1.34	6.23
Check- IIHR 2862		192.33	23.67	71.67	13.87	0.99	5.55
Grand mean		172.97	24.63	125.10	9.79	1.21	6.19
SEm (±)		3.16	0.74	4.67	0.36	0.08	0.10
CD		8.99	2.1	13.29	1.02	0.24	0.3

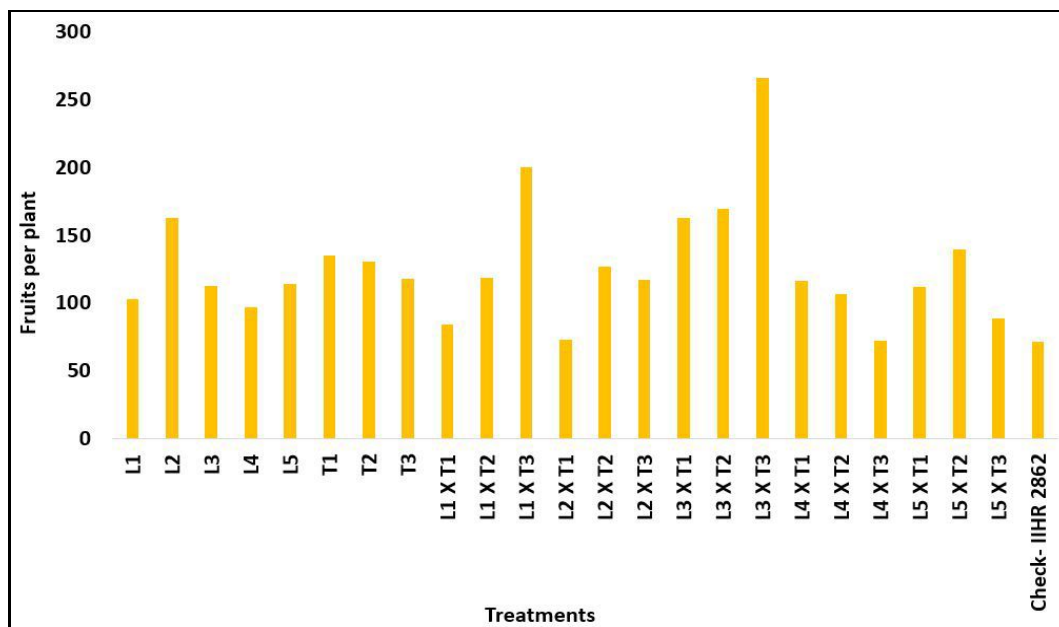


Fig 1: Mean performance of cherry tomato genotypes for fruits per plant

Total soluble solids (TSS) is a key quality parameter in cherry tomato, as it directly influences sweetness and suitability for fresh consumption as well as processing. Significant variation was observed among the genotypes for total soluble solids. Among the lines, TSS ranged from 5.27 °Brix in Pusa Cherry Tomato-1 to 6.40 °Brix in Punjab Kesar Cherry. In testers, TSS varied from 5.47 °Brix in SL 19 to 7.10 °Brix in IIHR 2857. The hybrids exhibited a range of 4.97 to 7.10 °Brix. Among the hybrids, Pusa Cherry Tomato 1 × IIHR 2857 recorded the maximum TSS (7.10 °Brix) and was on par with Punjab Red Cherry × SL 19 (7.03 °Brix) and Punjab Kesar Cherry × IIHR 2863 (7.03 °Brix). The check IIHR 2862 recorded a TSS of 5.55 °Brix. The higher TSS observed in certain hybrids may be attributed to efficient accumulation of sugars and soluble metabolites in the fruits and better translocation of photosynthates, which are largely governed by genetic factors. Similar variation for TSS in cherry tomato genotypes has been reported by Chandni *et al.* (2020) [3], Venkadeswaran *et al.* (2018) [18], Mahmood *et al.* (2021) [8] and Naveen *et al.* (2024) [10].

Conclusion

The present study revealed substantial genetic variability among cherry tomato parents and hybrids for growth, yield and quality traits under open field conditions of southern Kerala. Among the hybrids, Pusa Cherry Tomato 1 × IIHR 2857 emerged as the most promising with superior yield per plant, higher number of fruits, desirable earliness, semi-determinate plant architecture and highest total soluble solids. The hybrids VL Cherry Tomato 1 × SL 19 and Punjab Kesar Cherry × IIHR 2863 also showed good performance for yield attributes. The identified superior hybrids can be effectively utilized for commercial cultivation and the parents can be used in breeding programmes aimed at developing high yielding and quality cherry tomato cultivars suited to the humid tropical conditions of Kerala.

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