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Assessing the Growth, Yield, and Quality of Different Varieties of Cherry Tomato (*Solanum lycopersicum Mill. Var. Cerasiforme*) Under Polyhouse

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Authors' contributions

This work was carried out in collaboration among all authors. Author NNH wrote the first draft of the manuscript. Author UT designed the study, performed the statistical analysis, wrote the protocol, and Authors SKK and SK managed the analyses of the study and managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aim: Cherry tomatoes (*Solanum lycopersicum* Mill. var. cerasiforme) are highly favored for their delectable flavor and plentiful small-sized fruits that form clusters on the plant's stems and branches. This study focused on examining the "Assessing the Growth, Yield, and Quality of Different Varieties of Cherry Tomato (*Solanum lycopersicum* Mill. var. cerasiforme) under Polyhouse".
Study Design: In the first and second years of varietal evaluation, the experiment was set up using a Complete Randomized Block Design (C.R.B.D.) with nine treatments (varieties) and three replications Nine cherry tomato are collected from different sources and the varieties are BSS-834, Nagmani, Nagmoti, Rosa, Sheeja, Laila, Darjeeling Local, Ken and Red Cherry.

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Place and Duration of Study: The current study was carried out in the naturally ventilated arched sawtooth polyhouse at the Bidhan Chandra Krishi Viswavidyalaya in Mohanpur, Nadia (West Bengal) in the years 2021–2022 and 2022–2023.
Methodology: The dimensions of the experimental plot were 2.5 m x 1 m^2, with a row spacing of 50 cm and a plant spacing of 50 cm. The tests used the ridge bed approach, with two rows per bed. During the two years of the experiment, a number of significant characteristics were noted, such as the number of primary branches and the plant height (in centimeters) related to vegetative development. For every replication, a statistical analysis of the mean values was performed.
Results: Out of all the cultivars evaluated, BSS-834 and Laila showed the best yield and yield-related attributes.
Conclusion: It is therefore advised to cultivate these two excellent kinds, "BSS-834" and "Laila," in light of the findings.

Keywords: Cherry tomato; growth; yields; quality characters; polyhouse.

1. INTRODUCTION

Cherry tomatoes are popular for their delicious taste and abundant small-sized fruits that grow in clusters along the plant's stems and branches. They are smaller garden varieties of tomatoes, ranging in size from a thumb-tip to the size of a golf ball, with shapes varying from spherical to slightly oblong [1]. The cherry tomato variety known as *Solanum lycopersicum Mill. var. cerasiforme* is well-suited for tropical and subtropical regions due to its ability to flower and fruit in warm and wet conditions. It's likely ancestor is the wild var. cerasiforme, native to tropical and subtropical America. While the ancestral forms of tomatoes were found in the Peru-Ecuador area, extensive domestication is believed to have taken place in Mexico [2] making cherry tomatoes a suitable choice for hotter areas.

Wild cherry tomatoes are the predecessors of many of the tomato varieties enjoyed today [3]. Due to their small size, they are less susceptible to blossom end rot compared to other varieties [4]. Most cherry tomato varieties are indeterminate, meaning their vines continue to grow larger over time, which extends the harvest period [5]. They tend to produce fruit on long trusses. Additionally, cherry tomatoes are rich in thiamin, niacin, vitamin B6, folate, magnesium, phosphorus, copper, dietary fiber, potassium, and manganese [6]. Cherry cultivars are known to have higher levels of ascorbic acid, dry matter, and soluble solids compared to normal-sized fruits [7].

To explore the potential of cherry tomatoes in West Bengal, it is crucial to evaluate different varieties for growth and yield quality under polyhouse conditions. The present research aims to identify the best-performing cherry tomato variety in West Bengal's specific conditions.

2. MATERIALS AND METHODS

The experiment was carried out to study of "Assessing the Growth, Yield, and Quality of Different Varieties of Cherry Tomato (*Solanum lycopersicum Mill. var. cerasiforme*) under Polyhouse" in the naturally ventilated arched saw teeth type polyhouse, Bidhan ChandraKrishi Viswavidyalaya, Mohanpur, Nadia (West Bengal) during the year 2021-22 and 2022-23. The location of the experimental site is 23.5^0N latitude and 80^0E Longitude with average altitude of 9.75m above the mean sea levels. The experimental site was on a high land with assured irrigation facilities as well as good drainage facilities. All the facilities including labour and resources which were needed for normal vegetable cultivation were available here in the experimental field. The experiment was laid out in simple Complete Randomized Block Design (C.R.B.D.) with 9 treatments (varieties) and three replications in 1st and 2nd year of varietal evaluation. Nine cherry tomato are collected from different sources and the varieties are, BSS-834, Nagmani, Nagmoti, Rosa, Sheeja, Laila, Darjeeling Local, Ken and Red Cherry. The experimental plot size was 2.5 x 1 m^2, row to row spacing and plant to plant spacing was 50cm. Ridge bed method with 2 rows/bed were followed in the experiments. Several important traits were observed in two year of experiments including, vegetative growth observations (plant height (cm), number of primary branches, days required for first flowering, days required for 50% flowering, days required for fruit set, days required for first picking of truss, crop period), yield and yield attributing observations (average number of fruits/ plant, average number of

fruits/truss, average number of trusses/ plant, yield per plant (kg), yield (kg/ sq. m.), quality characters of fruit (equatorial diameter (mm), polar diameter (mm), Average fruit weight (g), dry weight (g/100g), thickness of pericarp (mm), ascorbic acid (mg/100g), total chlorophyll (mg/100g, lycopene content (mg/100g), β Carotene (mg/100g) T.S.S. (°brix), total and reducing sugar (%), titrable acidity (%). Mean value of the parameters in each replication were statistically analyzed following Complete Randomized Block Design (C.R.B.D.) and (3 factor factorial) with Split-Split arrangement as suggested by Panes and Sukhatme (1985) and Gomez & Gomez (1984). The 'Table' formulated by Fisher and Yaten (1974) were consulted for the purpose of comparison of 'F' values and for determination of critical differences (C.D. values) at the probability of 0.05.

3. RESULTS AND DISCUSSION

3.1 Vegetative Growth Characters

Plant height (cm): The plant height data of nine different cherry tomato varieties were analyzed, and the results showed that, the plant height ranged from 93.90 cm to 298.13 cm, 97.13 cm to 263.69 cm, and 95.52 cm to 280.69 cm in 2021-22 and 2022-23, and the pooled data of both years, respectively. The variety Nagmoti exhibited the tallest plant height (298.13 cm and 263.69 cm), followed by Nagmani (289.90 cm and 246.39 cm) and BSS-834 (249.13 cm and 236.73 cm). In contrast, Darjeeling local had the shortest plant height (93.90 cm and 97.13 cm), followed by Red cherry (121.41 cm and 124.59 cm) and Ken (149.76 cm and 143.04 cm) in 2021-22 and 2022-23 (Table 1). When considering the pooled data, Nagmoti had the maximum plant height (280.91 cm), while Darjeeling local had the minimum (95.52 cm). The variation in plant height among the varieties could be attributed to genetic factors and temperature-related factors influencing plant growth and development. Differences observed between the two years might be attributed to variations in the growing season and environmental conditions during plant growth. Similar results were recorded by Prema et al. [8], Renuka et al. [9] in cherry tomato.

Number of primary branches: The number of primary branches in different cherry tomato varieties grown in a polyhouse was significantly diverse. Among the nine cherry varieties, Darjeeling local produced the highest number of primary branches (10.27 and 9.87) during the years 2021-22 and 2022-23, respectively. On the other hand, Ken had the lowest number of primary branches (5.33 and 5.20) during the same period. When the data from both years were pooled together, the number of primary branches ranged from 5.27 to 10.07. Darjeeling local exhibited the highest number of primary branches (10.07), followed by Red cherry (8.70) in second place, and Nagmoti (7.77) in third place. Conversely, Ken had the lowest number of primary branches (5.27), followed by Nagmani (6.30) and Rosa (6.47) (Table 1).

Days required for first flower: Statistical analysis revealed significant variation among the cherry tomato varieties in terms of the number of days required for first flowering. In the 2021-22 season, Ken exhibited the maximum time for flowering (42.80 days), followed by Nagmani (41.20 days) and Red cherry (40.60 days). Conversely, BSS-834 had the shortest flowering time (32.20 days), followed by Rosa (32.27 days) and Laila (35.40 days). Similar results were observed in the 2022-23 season. When the data from both years were combined, the range for days required for first flowering among the selected cherry tomato varieties in protected conditions varied from 32.47 to 42.03. Among the cherry tomato varieties, Ken required the maximum number of days for flowering (42.33 days), while BSS-834 exhibited the shortest flowering time (32.47 days) (Table 1).

Days required for 50% flowering: The time taken for 50% flowering in cherry tomato varieties was an important factor influencing yields. Ken exhibited the longest duration for 50% flowering (48.67 days), significantly longer than Nagmani and Red cherry, which had similar flowering times. BSS-834 had the shortest duration (37.00 days) for 50% flowering during the 2021-22 season. Similar results were observed in the 2022-23 season (Table 2). Among the nine cherry varieties, Ken required the maximum time (48.83 days) for 50% flowering, while BSS-834 had the shortest duration (37.33 days). Statistically, there was no significant difference in flowering times between Ken and Nagmani, Nagmani and Red cherry, Nagmoti and Sheeja, Laila and Darjeeling local, as well as Rosa and BSS-834.

Days required for fruit set: The analysis of variance revealed significant differences among the cherry tomato varieties for this trait (Table 2). Varieties with early flowering also exhibited early

Table 1. Performance of different cherry tomato varieties on plant height (cm), number of primary branch and days required for first flower.

Varieties	Plant height (cm)			Number of primary branch			Days required for First flower		
	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
Rosa	167.89	161.70	164.80	6.60	6.33	6.47	32.27	33.33	32.80
Darjeeling local	93.90	97.13	95.52	10.27	9.87	10.07	35.53	36.13	35.83
Laila	199.39	213.59	206.49	7.27	7.33	7.30	35.40	33.93	34.67
Sheeja	159.72	165.15	162.44	6.73	6.87	6.80	38.27	39.47	38.87
Nagmani	289.90	246.39	268.14	6.40	6.20	6.30	41.20	42.87	42.03
BSS-834	249.13	236.73	242.93	7.40	7.40	7.40	32.20	32.73	32.47
Nagmoti	298.13	263.69	280.91	7.87	7.67	7.77	38.00	40.00	39.00
Ken	149.76	143.04	146.40	5.33	5.20	5.27	42.80	41.87	42.33
Red cherry	121.41	124.59	123.00	8.40	9.00	8.70	40.60	41.60	41.10
S.Em (±)	10.162	4.830	5.538	0.131	0.179	0.101	1.617	1.127	0.922
CD (P=0.05)	30.19	14.35	16.45	0.39	0.53	0.30	4.80	3.35	2.74

Table 2. Performance of different cherry tomato varieties on days required for 50% flowering, days required for fruit set and days required for first picking of truss

Varieties	Days required for 50% flowering			Days required for fruit set			Days required for first picking of truss		
	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
Rosa	38.00	37.67	37.83	38.63	39.70	39.17	82.57	83.27	82.92
Darjeeling local	39.33	39.33	39.33	42.03	42.80	42.41	79.63	80.07	79.85
Laila	39.67	40.33	40.00	41.36	40.65	41.00	90.63	88.57	89.60
Sheeja	43.67	43.33	43.50	45.13	46.02	45.57	86.77	86.47	86.62
Nagmani	44.67	47.33	46.00	47.82	49.64	48.73	87.16	88.43	87.79
BSS-834	37.00	37.67	37.33	39.54	39.61	39.57	86.25	88.37	87.31
Nagmoti	42.00	44.33	43.17	44.68	46.61	45.64	92.19	91.12	91.66
Ken	48.67	47.33	48.00	50.05	49.01	49.53	97.37	95.75	96.56
Red cherry	44.67	45.00	44.83	47.53	47.53	47.53	92.43	90.21	91.32
S.Em (±)	1.633	1.370	0.916	1.516	1.077	0.850	0.067	0.039	0.039
CD (P=0.05)	4.85	4.07	2.72	4.50	3.20	2.53	0.20	0.12	0.12

Table 3. Performance of different cherry tomato varieties on fruit per plant, number of fruits/truss, number of truss per plant

Varieties	Number of fruits/plant			Number of Fruits/truss			Number of truss/plant		
	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
Rosa	286.67	294.67	290.67	9.37	9.43	9.40	103.45	105.21	104.33
Darjeeling local	152.67	160.67	156.67	6.50	6.80	6.65	65.45	66.20	65.82
Laila	316.00	305.33	310.67	18.60	16.61	17.60	138.71	141.19	139.95
Sheeja	296.00	283.33	289.67	26.21	24.50	25.35	110.71	111.35	111.03
Nagmani	246.00	262.00	254.00	12.03	12.27	12.15	131.18	134.19	132.69
BSS-834	376.67	348.67	362.67	21.35	20.61	20.98	170.19	165.27	167.73
Nagmoti	286.67	292.00	289.33	9.06	9.40	9.23	191.33	187.23	189.28
Ken	156.67	180.00	168.33	8.40	9.18	8.79	78.27	81.03	79.65
Red cherry	138.00	127.33	132.67	7.21	6.42	6.82	84.32	84.65	84.49
S.Em (±)	1.792	1.846	1.272	0.099	0.069	0.062	0.025	0.105	0.051
CD (P=0.05)	5.32	5.48	3.78	0.29	0.21	0.18	0.07	0.31	0.15

Table 4. Performance of different cherry tomato varieties on yield (kg/plant), yield (kg/per sq. m) and crop period (days)

Varieties	Yield (kg/plant)			Yield (kg/per sq. m)			Crop period (days)		
	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
Rosa	2.18	2.23	2.20	8.72	8.91	8.81	142.43	144.21	143.32
Darjeeling local	2.21	2.07	2.14	8.82	8.29	8.56	138.25	140.29	139.27
Laila	3.17	3.11	3.14	12.66	12.43	12.55	173.03	170.42	171.72
Sheeja	2.29	2.51	2.40	9.16	10.05	9.60	153.63	157.21	155.42
Nagmani	2.24	2.55	2.39	8.94	10.18	9.56	160.24	163.41	161.82
BSS-834	4.26	4.13	4.20	17.06	16.53	16.80	164.39	168.20	166.30
Nagmoti	2.86	2.86	2.86	11.46	11.46	11.46	166.93	162.41	164.67
Ken	1.47	1.65	1.56	5.86	6.59	6.23	139.60	144.81	142.20
Red cherry	1.96	1.84	1.90	7.82	7.37	7.59	169.27	161.61	165.44
S.Em (±)	0.007	0.007	0.005	0.029	0.027	0.022	0.026	0.022	0.022
CD(P=0.05)	0.02	0.02	0.02	0.08	0.08	0.06	0.08	0.07	0.07

Table 5. Performance of different cherry tomato varieties on equatorial diameter of fruit (mm) and polar diameter of fruit (mm)

Varieties	Equatorial diameter of fruit (mm)			Polar diameter of fruit (mm)		
	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
Rosa	24.69	24.30	24.50	39.66	39.42	39.54
Darjeeling local	32.43	32.62	32.53	41.23	41.09	41.16
Laila	23.72	23.33	23.53	33.65	34.27	33.96
Sheeja	25.19	24.72	24.96	39.31	38.26	38.79
Nagmani	29.41	29.19	29.30	34.50	34.38	34.44
BSS-834	24.65	24.50	24.58	27.65	27.40	27.53
Nagmoti	29.07	28.62	28.84	33.02	33.59	33.31
Ken	30.03	29.37	29.70	36.07	36.46	36.27
Red cherry	32.80	32.54	32.67	31.32	32.44	31.88
S.Em (±)	0.091	0.116	0.060	0.086	0.092	0.061
CD (P=0.05)	0.27	0.35	0.18	0.26	0.27	0.18

Table 6. Performance of different cherry tomato varieties on average fruit weight (g), dry weight (g/100g) and pericarp thickness (mm)

Varieties	Average fruit weight (g)			Dry weight (g/100g)			Pericarp thickness (mm)		
	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
Rosa	7.96	8.24	8.10	6.08	5.94	6.01	3.34	3.55	3.44
Darjeeling local	15.93	14.09	15.01	5.29	5.47	5.38	4.50	4.38	4.44
Laila	10.86	10.92	10.89	6.50	6.84	6.67	3.18	3.25	3.22
Sheeja	8.54	9.04	8.79	8.63	8.18	8.41	3.67	3.47	3.57
Nagmani	10.44	10.34	10.39	7.51	7.60	7.55	2.85	2.95	2.90
BSS-834	13.46	13.29	13.37	6.36	6.50	6.43	3.17	3.33	3.25
Nagmoti	10.32	10.26	10.29	7.21	7.39	7.30	2.66	2.64	2.65
Ken	9.61	9.60	9.61	9.10	9.30	9.20	4.06	3.85	3.96
Red cherry	15.14	14.87	15.01	5.75	5.81	5.78	3.67	3.84	3.75
S.Em (±)	0.026	0.037	0.023	0.042	0.039	0.028	0.027	0.018	0.017
CD (P=0.05)	0.08	0.11	0.07	0.13	0.12	0.08	0.08	0.05	0.05

Table 7. Performance of different cherry tomato varieties on ascorbic acid (mg/100g of fruit weight), total Chlorophyll (mg/100g of fruit weight) and lycopene (mg/100g of fruit weight)

Varieties	Ascorbic acid (mg/100g of fruit weight)			Total Chlorophyll (mg/100g of fruit weight)			Lycopene (mg/100g of fruit weight)		
	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
Rosa	31.37	31.28	31.33	2.50	2.40	2.45	2.74	2.60	2.67
Darjeeling local	37.57	36.40	36.98	2.80	2.50	2.65	1.69	1.59	1.64
Laila	36.50	35.68	36.09	1.96	1.87	1.91	2.74	2.51	2.63
Sheeja	24.62	24.61	24.62	2.20	2.18	2.19	1.85	1.60	1.72
Nagmani	28.53	28.40	28.47	3.21	3.11	3.16	3.69	3.51	3.60
BSS-834	32.58	31.80	32.19	2.16	2.15	2.15	2.82	2.80	2.81
Nagmoti	32.40	33.20	32.80	3.50	3.60	3.55	6.14	6.07	6.10
Ken	34.62	34.89	34.75	2.06	2.08	2.07	2.31	2.20	2.25
Red cherry	40.38	41.23	40.81	2.79	2.70	2.75	1.37	1.40	1.39
S.Em (±)	0.044	0.033	0.029	0.020	0.025	0.016	0.022	0.025	0.016
CD (P=0.05)	0.13	0.10	0.09	0.06	0.08	0.05	0.07	0.07	0.05

Table 8. Performance of different cherry tomato varieties on β- carotene content (mg/100g of fruit weight), TSS (º brix) and total sugar (%).

Varieties	β- carotene content (mg/100g of fruit weight)			TSS (º brix)			Total sugar (%)		
	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
Rosa	0.42	0.46	0.44	8.14	7.85	8.00	2.91	2.91	2.91
Darjeeling local	0.23	0.27	0.25	4.77	5.26	5.02	2.11	2.13	2.12
Laila	0.54	0.49	0.51	6.87	6.81	6.84	3.25	3.19	3.22
Sheeja	0.33	0.35	0.32	7.95	7.55	7.75	3.70	3.48	3.59
Nagmani	0.40	0.39	0.39	6.35	6.54	6.45	2.92	2.80	2.86
BSS-834	0.29	0.26	0.28	6.74	6.45	6.60	3.64	3.68	3.66
Nagmoti	0.65	0.69	0.65	5.91	6.03	5.97	2.91	2.80	2.86
Ken	0.24	0.28	0.24	7.62	7.27	7.45	3.39	3.19	3.29
Red cherry	0.25	0.20	0.23	5.01	5.26	5.14	2.31	2.09	2.20
S.Em (±)	0.020	0.46	0.013	0.024	0.019	0.018	0.035	0.023	0.025
CD (P=0.05)	0.06	0.27	0.04	0.07	0.06	0.05	0.10	0.07	0.07

Table 9. Performance of different cherry tomato varieties on reducing sugar (%) and titratable acidity content (%)

Varieties	Reducing sugar (%)			Acidity (%)		
	2021-22	2022-23	Pooled	2021-22	2022-23	Pooled
Rosa	2.03	2.08	2.06	0.55	0.58	0.57
Darjeeling local	1.44	1.50	1.47	0.74	0.74	0.74
Laila	2.38	2.31	2.35	0.47	0.46	0.47
Sheeja	2.64	2.60	2.62	0.34	0.41	0.38
Nagmani	2.20	2.20	2.20	0.53	0.54	0.54
BSS-834	2.38	2.40	2.39	0.37	0.44	0.41
Nagmoti	2.04	2.02	2.03	0.51	0.47	0.49
Ken	2.09	1.96	2.02	0.77	0.71	0.74
Red cherry	1.68	1.61	1.65	0.80	0.79	0.79
S.Em (±)	0.018	0.018	0.013	0.013	0.015	0.009
CD (P=0.05)	0.05	0.05	0.04	0.04	0.04	0.03

Plate 1. Showing site view

Plate 2. Field preparation

Plate 3. Seedling ready for transplanting

Plate 4. Transplanting in zigzag manner

Plate 5. Promising variety of cherry tomato

maturity. In the 2021-22 investigation, the Ken variety showed delayed maturity, taking 50.05 days for first fruit set. Nagmani (47.82 days) and Red cherry (47.53 days) followed closely, while Rosa exhibited early maturity, taking only 38.63 days for first fruit set. BSS-834 (39.54 days) was also an early maturing variety. Similar results were observed in the 2022-23 experiment, with Rosa taking 39.17 days for first fruit maturity and Ken requiring the most time (49.01 days) for first fruit maturity.

Days required for first picking: Early flowering and fruit setting directly influenced the timing of cherry tomato picking, which varied among different varieties. Darjeeling local exhibited the earliest picking of fruits at 79.63 and 80.07 days, followed by Rosa at 82.57 and 83.27 days. Ken and Nagmoti had later picking times, with Ken taking 97.37 and 95.75 days, and Nagmoti taking 92.19 and 91.12 days during the years 2021-22 and 2022-23, respectively (Table 2, Fig. 1). Overall, when considering all cherry tomato varieties, Darjeeling local had the earliest average picking time at 79.85 days, while Ken had the latest average picking time at 96.56 days.

Crop period (days): The final harvesting duration of cherry tomato in different varieties under polyhouse conditions was examined. During 2021-22, the crop period ranged from 138.25 to 173.03 days. The shortest duration was observed in Darjeeling local (138.25 days), Ken (139.60 days), and Rosa (142.43 days), while the longest duration was noticed in Laila (173.03 days), Red cherry (169.27 days), and Nagmoti (166.93 days). In 2022-23, the harvesting period ranged from 140.29 (Darjeeling local) to 170.42 (Laila) days. When pooled data from both years were analyzed, the total crop period varied between 139.27 and 171.72 days across different varieties (Table 4, Fig. 2). The shortest crop duration was observed in Darjeeling local, followed by Ken and Rosa, while the longest crop period was observed with Laila, followed by BSS-834 and Red cherry based on the pooled data from 2021-22 and 2022-23.

3.2 Yields and Yield Attributing Characters

Number of fruits per plant: The results, presented in Table 3 and Fig. 3, showed statistically significant differences (at a 5% level) among the nine varieties. Among them, BSS-834, Laila, and Sheeja produced the highest number of fruits per plant, with 376.67, 316.00, and 296.00 respectively. On the other hand, Red cherry (130.00 fruits/plant), Darjeeling local (152.67 fruits/plant), and Ken (156.67 fruits/plant) had the lowest fruit yields during the 2021-22 season. Similar trends were observed in the 2022-23 season. The pooled data confirmed the significant difference (p=0.05) in fruit yield among all cherry varieties, with Laila recording the highest yield of 310.67 fruits/plant, and Red Cherry exhibiting the lowest yield of 132.67 fruits/plant.

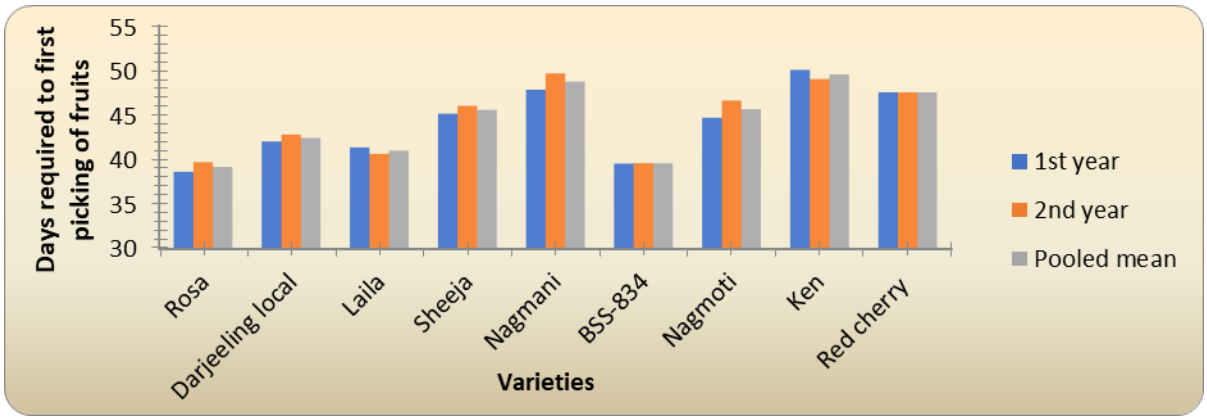

Fig. 1. Performance of different cherry tomato varieties on days required to first picking of fruits

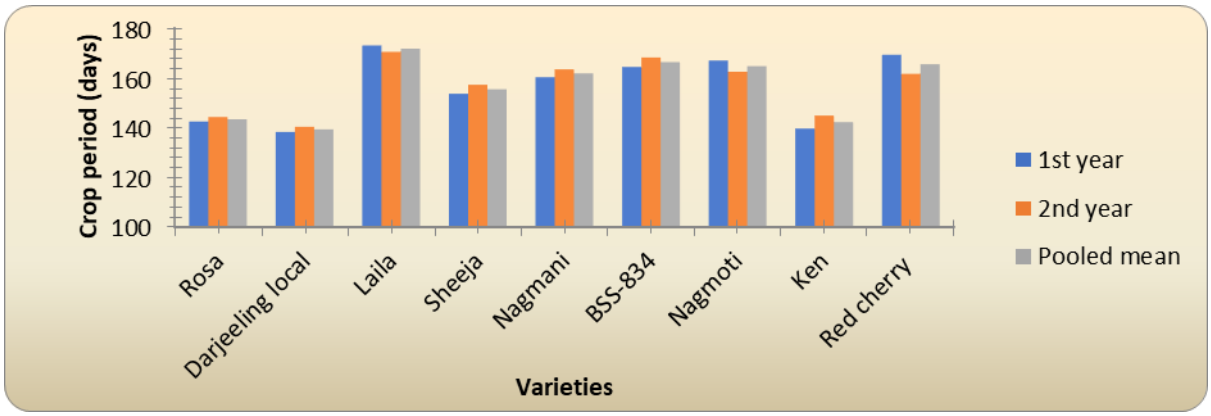

Fig. 2. Performance of different cherry tomato varieties on crop period (days)

Number of fruits per truss: Numbers of fruits per truss were ranged between 6.50 to 26.21, 6.42 to 24.50 and 6.65 to 25.35 during 2021-22, 2022-23 and pooled of both years respectively (Table 3, Fig. 4). Sheeja highest number of fruits per truss 26.21 and the lowest fruits per truss were obtained in Darjeeling local (6.50) during 2021-22. In 2022-23, highest (24.50) and lowest (6.42) fruits per truss were found in Sheeja and Red cherry respectively. There was significant difference within the variety during the both years of instigation and pooled data, revealed that the Sheeja in apex ranked followed by BSS-834 and Laila whereas Darjeeling local was in low ranked followed by Red cherry and Ken.

Number of trusses per plant: Number of trusses was directly influenced by vegetative growth characters of particular variety. Statistically significant difference was found in all cherry tomato varieties during 2021-22, 2022-23 and pooled on number of trusses per plant. Among the nine cherry tomato varieties grown in polyhouse, Nagmoti produced 191.33 trusses per plant followed by BSS-834 (170.19) and Laila (138.71), while lowest 65.45, 78.27 and 84.32 trusses per plant were produced by Darjeeling local, Ken and Red cherry respectively during 2021-22. Similar trends were found in 2022-23 investigation also. In pooled data of first and second year, showed that the maximum truss per plant in Nagmoti (189.28) while minimum was observed in Darjeeling local (65.82) (Table 3).

Fruit yield (kg/plant): The analysis of variance for this trait showed significant difference among the cherry tomato varieties in reference to marketable yield (Table 4, Fig. 5). The yields varied from 1.47 – 4.26 kg/plant, 1.65 – 4.13 kg/plant and 1.56 – 4.20 kg/plant during 2021-22, 2022-23 and pooled respectively. During the investigation of both years, it was found statistically significant difference in varieties. Maximum yields were obtained from BSS-834, Laila and Nagmoti with numerical values 4.26, 3.17 and 2.86 kg/plant respectively whereas minimum marketable yield obtained in Ken (1.47 kg/plant) followed by Red cherry (1.96 kg/plant) and Rosa (2.18 kg/plant) during 2021-22. Similar results were observed in 2022-23 also. From the pooled data it indicates that highest fruit yield of 4.20 kg/plant was observed from variety BSS-834 and the lowest yield of 1.56 kg/plant was obtained from Ken. The variation in years within the varieties might be due to different genetic inheritance characters with the variety. Sirigu *et. al.*, [10] also reported similar result on fruity yields.

Yield (kg/sq. m.): Analysis of variance for this trait showed significant difference among the cherry tomato varieties in reference to marketable yield (g/sq. m.) (Table 4). The yields varied from 5.86 – 17.06 g/sq. m; 6.59 – 16.53 g/sq.m. and 6.23 – 16.80 g/sq.m. during 2021-22, 2022-23 and pooled respectively. Maximum yields were obtained in BSS-834, Laila and Nagmoti with numerical values as 16.80, 12.55 and 11.46 g/sq.m. respectively whereas, minimum marketable yield obtained in Ken (6.23 g/sq.m.) followed by Red cherry (7.59 g/sq.m.) and Darjeeling local (8.56 g/sq.m.) in pooled data. Similar results were observed in both the years of investigation.

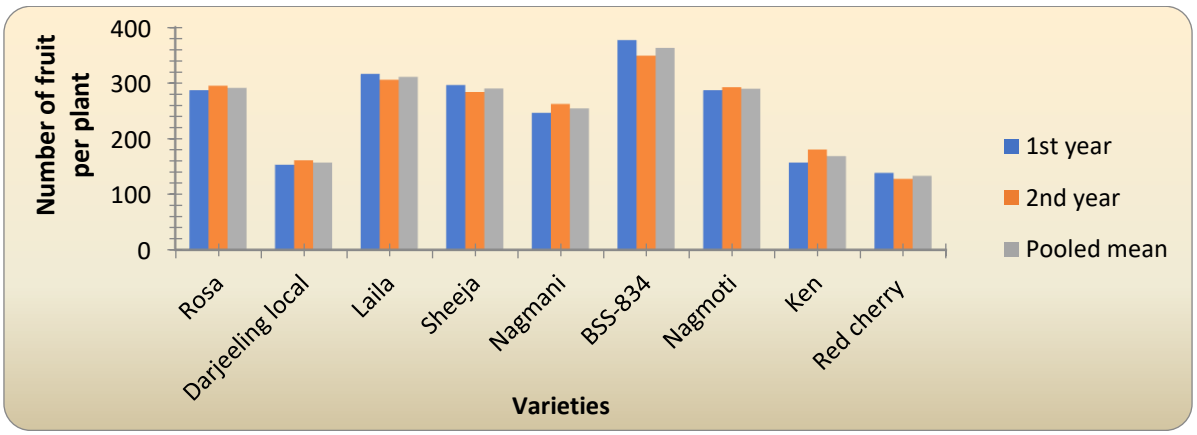

Fig. 3. Performance of different cherry tomato varieties on number of fruit per plant

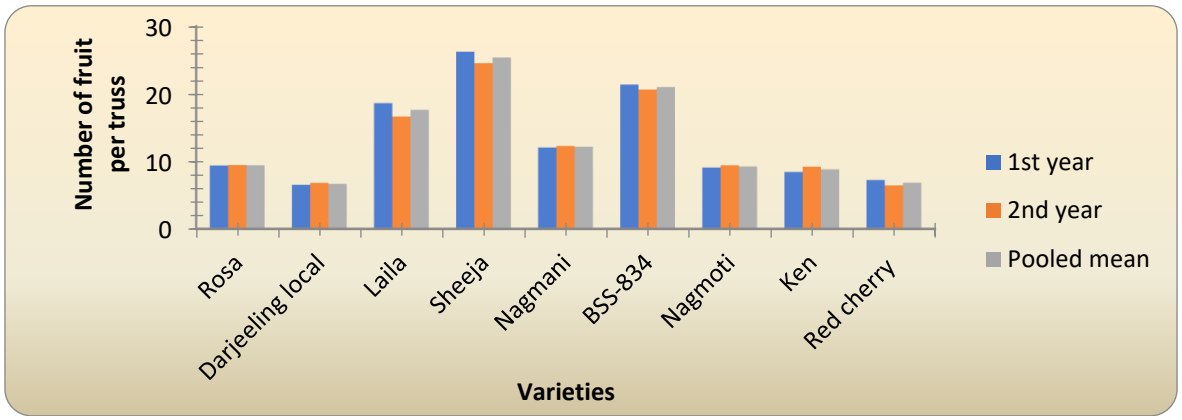

Fig. 4. Performance of different cherry tomato varieties on number of fruit per truss

3.3 Quality Characters

Equatorial diameter of fruit (mm): It has found from the experimental trials that minimum equatorial diameter of cherry tomato was computed in Laila (23.72 mm and 23.33 mm) while wider equatorial diameter was measured in Red cherry (32.80 mm) and Darjeeling local (32.54 mm) during 2021-22 and 2022-23 respectively. The pooled data of first and second year indicated that the fruit of Laila (23.53 mm) was thinnest in diameter followed by Rosa (24.50 mm) and BSS-834 (24.58 mm) whereas wider equatorial diameter was observed in fruit of Red cherry (32.67 mm) followed by Darjeeling local (32.53 mm) and Ken (29.70 mm) presented in Table 5. Equatorial diameter was diverse in varieties due to their genetic performance for different fruit shapes & sizes.

Polar diameter of fruit (mm): The analysis of variance for this trait showed significant difference among the cherry tomato varieties on polar diameter of the fruits. Significantly longest polar diameter was found in Darjeeling local (41.23 mm and 41.09 mm) followed by Rosa (39.66 mm and 39.42 mm) and Sheeja (39.31 mm and 38.26 mm) whereas shortest polar diameter was found in BSS-834 (27.65 mm and 27.40 mm) followed by Red cherry (31.32 mm and 32.44 mm) and Nagmoti (33.02 mm and 33.59 mm) during 2021-22 and 2022-23 respectively. Table 5, indicated that the maximum and minimum polar diameter (41.16 mm and 27.53 mm) was measured in Darjeeling local and BSS-834 respectively (pooled of both years). Polar diameter was diverse in variety to variety depends on its genetic character.

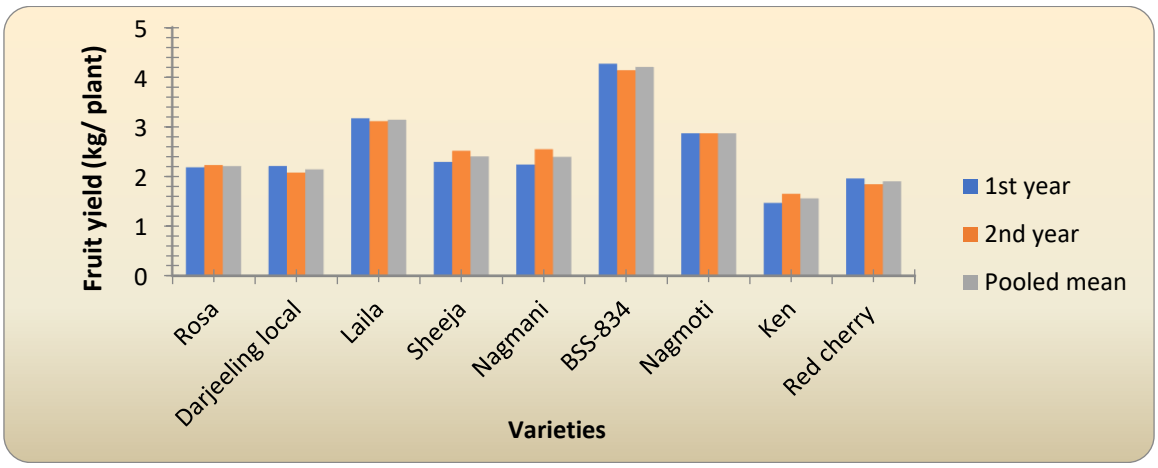

Fig. 5. Performance of different cherry tomato varieties on fruit yield (kg/ plant)

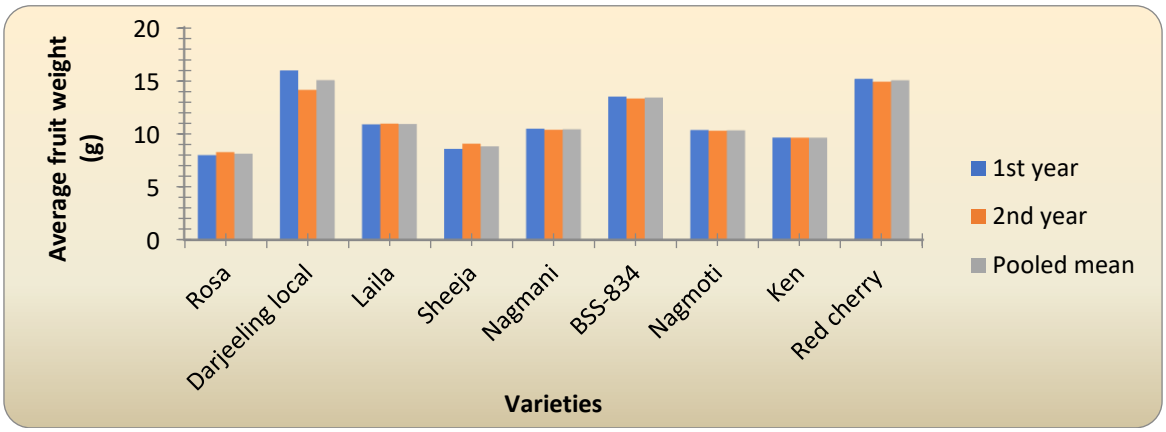

Fig. 6. Performance of different cherry tomato varieties on average fruit weight (g)

Average fruit weight (g): The maximum fruit weight was observed in Darjeeling local as 15.93 (2021-22), Red cherry as 14.87and 15.01(2022-23 and pooled data respectively), whereas in pooled data Darjeeling local (15.01g) was at par with Red cherry. Minimum fruit weight was found in Rosa (7.96, 8.24 and 8.10 g) followed by Sheeja (8.54, 9.04 and 8.79 g) and Ken (9.61, 9.60 and 9.61 g) during 2021-22, 2022-23 and pooled of both years respectively (Table 6, Fig. 6). The fresh average fruit weight of a variety is depending probably on combined interaction of size, shape & thickness of pericarp of fruit.

Dry weight (g): Among the nine different cherry tomato varieties, Ken exhibited statistical significantly highest (9.10 g) dry weight followed by Sheeja (8.63 g) and Nagmani (7.51 g) while significantly lowest dry weight found in Darjeeling local (5.29 g) followed by Red cherry (5.75 g) and Rosa (6.08 g) during 2021-22. Similar results were recorded in 2022-23 too. The pooled data of both years were exhibited maximum dry weight in Ken (9.20 g) whereas, minimum in Darjeeling local (5.38 g) (Table 6).

Pericarp thickness (mm): The data revealed from the Table 6, that fruit pericarp of variety Darjeeling local (4.50 mm) was found best scorer in respect to width followed by Ken (4.06 mm) and Red cherry (3.67 mm) and thinner pericarp of fruit was recorded with variety Nagmoti in 2021-22. Similar trends were recorded in 2022-23 season produce, where variety ken (3.85 mm) and Red cherry (3.84 mm) was observed at par with each other. Pooled data also indicated the same finding as wider pericarp thickness was observed with Darjeeling local and Nagmoti with numeric value as 4.44 mm and 2.65 mm respectively.

Ascorbic acid (mg/100g of fruit weight): Among the nine varieties highest amount of 40.38 mg, 41.23 mg and 40.81 mg were found in Red cherry of 100 g fruit weight while lowest amount in 24.62 mg and 24.62 mg in Sheeja of 100 g fruit weight during 2021-22, 2022-23 and pooled of both the years respectively (Table 7). Fruits grown under pearl shade nets have higher levels of ascorbic acid at harvest and maintain these levels better during postharvest storage, possibly due to delayed ripening [11].

Total Chlorophyll of unripe fruit (mg/100 g of fruit weight): Total chlorophyll in 100 g of unripe fruit weight were found significantly maximum in Nagmoti (3.50 mg) and in its supremacy followed by Nagmani (3.21 mg) and Red cherry (2.79 mg) with others, whereas minimum total chlorophyll was recorded in Laila (1.96 mg) followed by ken (2.06 mg) and BSS-834 (2.16 mg) during 2021-22. Similar trends were found in 2022-23 investigation also. The pooled data revealed that the highest and lowest total chlorophyll noticed in Nagmoti (3.55 mg) and Laila (1.91 mg) respectively. Remaining seven cherry tomato varieties value were significantly influenced and the values were found in between Nagmoti and Laila (Table 7)

Lycopene content (mg/100g): The lycopene content in 100 g fruit weight was ranged in between 6.14 to 1.37 mg in 2021-22, 6.07 mg to 1.4 mg in 2022-23 (Table 7). The maximum amount of lycopene in pooled data of each year was recorded in Nagmoti variety and minimum was in Red Cherry with their numerical value as 6.10 mg and 1.39 mg/ 100 g fresh ripe fruit weight. The lycopene content from rest of other variety of cherry tomato varieties were found in between range of Nagmoti and Red cherry on

lycopene content. The diverse lycopene content in red cherry tomatoes was observed in similar studies conducted by Prema *et al.* [8] and Brunele *et al.* [12] in tomatoes cultivated under shade net conditions.

β- carotene content (mg/100g): The performance of different nine cherry tomato varieties was found significant effect in reference to β- carotene in100 g fruit weight. Highest value of β- carotene was recorded Nagmoti (0.65 mg) while lowest β- carotene was in Darjeeling local (0.23 mg) during 2021-22. In 2022-23 data presented in (Table 8) was revealed the maximum & minimum lycopene content was observed in Nagmoti& Red cherry and its numerical value was 0.69 mg and 0.20 mg respectively. In pooled performance of varietal evaluation found that the highest β- carotene content was obtained in Nagmoti (0.65 mg) followed by Laila (0.51 mg) and Rosa (0.44 mg) while lowest β- carotene was obtained in Red cherry (0.23 mg). β- carotene content in cherry tomato variety depend on its genetic variability and environmental factors.

TSS (^{o}brix): The highest TSS reading was noticed in Rosa (8.14 ^{o}brix) while lowest was in Darjeeling local (4.77 ^{o}brix) during 2021-22. In second year (2022-23), Darjeeling local and Red cherry was noticed at par performance regarding TSS (Table 8) the pooled data of first and second years expressed that the highest TSS found in Rosa (8.00 ^{o}brix) followed by Sheeja(7.75 ^{o}brix) and Ken (7.45 ^{o}brix) whereas lowest Darjeeling Local (8.02^{o}brix) followed by Nagmoti (5.97^{o}brix) and Red cherry (5.14^{o}brix). The increased total soluble solids (TSS) in the Rosa and Sheeja varieties could be attributed to enhanced solid deposition and greater conversion of organic acids into sugars. Similar result was also reported by Islam et al. [13] in polyhouse grown cherry tomato.

Total sugar (%): Total sugar was observed in ranged between 2.11 and 3.70% and variety Sheeja performed better than the rest of other varieties. Rosa and Nagmoti was performed statistically at par regarding total sugar (%) during 2021-22. In second year (2022-23) all varieties performed significantly different than first year. Laila and Ken, Nagmani and Nagmoti were found at par performance. Here 2.09 to 3.68% ranged was found in cherry tomato varieties. The pooled data revealed that variety BSS-834 was performed better regarding total sugar followed by Sheeja and Ken and their numeric value were 3.60%, 3.59% and 3.29% respectively. The minimum TSS was recorded in Darjeeling local (2.12%) followed by Red cherry (2.20%). Among the all nine varieties it was revealed from the Table 8, that Nagmani and Nagmoti was statistically performed at par effect.

Reducing sugar: The reducing sugar content was ranged between 1.44 to 2.64% in 2021-22 and between 1.50 to 2.60 in 2022-23. The maximum amount of reducing sugar was recorded with variety Sheeja (2.64%) followed by BSS-834 (2.38%) and Ken (2.09%) whereas minimum reducing sugar contained in Darjeeling local followed by Red Cherry and Rosa with numeric value as 1.44%, 1.68% and 2.03% respectively during 2021-22. Similar results were found in 2022-23 too. The pooled data also indicated that maximum reducing sugar was obtained in Sheeja (2.62%) while minimum in Darjeeling local (1.47%) (Table 9).

Acidity (%): Percent of acidity was varied in variety-to-variety performance and found significant in 2021-22, 2022-23 and pooled performance. The nine-cherry tomato variety fruit acidity was ranged between 0.34 to 0.80% in 2021-22, 0.41 to 0.79 in 2022-23 and 0.38 to 0.79% in pooled. It was observed from the Table 9, in 2021-22 and 2022-23 that Red cherry was performed better than all other varieties for acidity%. The pooled of both the years was indicated that the Red cherry (0.79%) recorded maximum acidity percentage followed by Darjeeling local and Ken as same numeric value (0.74%) means, were at par with each other. The minimum acidity was recorded in fruit of variety Sheeja (0.38%) followed by BSS-834 (0.41%) and Laila (0.47%).

4. CONCLUSION

Nine different varieties were taken into study to evaluate growth, yield and quality. The main aim of this investigation was to find out the best performing varieties. Amongst the varieties the longest crop period of 171.72 days was recorded in Laila variety and in Darjeeling Localshortest crop period of 139.27 days was noticed. The maximum number of fruits per plant (362.67) was obtained from the variety BSS-834, which was significantly highest than other varieties. Variety BSS-834 produced superior yield of 4.20 kg per plant and 16.80 kg. /sq. m. followed by Laila variety (3.14 kg / plant and 12.55kg / sq. m.) whereas lowest yield of 1.56 kg. /Plant and 6.23 kg. /sq. m. was obtained from Ken variety. From the overall point of view, it may be concluded that

among varieties investigated, most of the yield and yield attributing characters was superior in two varieties viz. BSS-834 and Laila. So, from this investigation, two best performing varieties "BSS-834" and "Laila", were further selected for second experiment.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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