



Research Paper

ASSESSMENT OF TOMATO CULTIVARS FOR SALAD PURPOSE IN MID-HILLS OF NEPAL

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Abstract

Salad tomato varietal trial was conducted in Horticulture Research Division, Khumaltar with eleven cultivars including check cultivar; these were collected and characterized in the previous years. Three weeks old seedlings of these cultivars were planted in open field on first week of April, 2014 with spacing of 60 X 60 cm line to line and plant to plant distance in three replications. Plants were fertilized with 200:150:120 kg NPK and 30 ton farm yard manure per hectare and minimum pesticide was applied. The main objective of this experiment was to select suitable open pollinated tomato cultivars for salad; either sliced or cherry type to fulfill the demand of consumers. Data were recorded on vegetative growth, flowering and fruiting, disease response, yield and quality parameter, fruit characteristics and consumers preference. Varietal effect was significant. On the basis of overall characteristics, HRA-13 which had average fruit weight 167 gm, yield 2376 gm per plant, juicy, fleshy and superior taste for slice type and HRA-33 which had average fruit weight 10 gm, yield 1689 gm per plant, juicy, higher vitamin C content and superior taste followed by HRA-23 for cherry type were selected and recommended for further evaluation in farmer's field condition.

Key words: Cherry, nutrition, salad, slice, taste, tomato cultivars, yield.

INTRODUCTION

Tomato (*Solanum lycopersicon* L.) is one of the most consumed vegetables in the world and is the second most important vegetable crop after potato [6]. In Nepal tomato covers 21,981 ha. As compared to India (25 t/ha) the productivity of this area (19 t/ha) is quite low [3] [4]. It is a source of vitamin A, B, and C [1]. It improves the income of the growers, generates employment in rural and urban areas and expands export potential [5]. Tomato produced from mid June to November months in the hills (400-1800 m) fetches higher market price ranging from Rs. 20 to Rs. 35kg-1 in domestic and external markets [2].

Tomato is a good source of vitamins A, C and E and minerals that are very good for body and protect the body against diseases [7]. Habit of fresh tomato eating as a salad is already adopted in city area and cherry tomato is also introducing. Some special farmers are cultivating salad type and rarely cherry type tomato mostly hybrid cultivars targeting to the hotels and restaurants. Consumers are buying big sized tomatoes from the market for sliced salad purpose whatever the varieties it is. Hence, our own suitable cultivars are required for reliable cultivation. Therefore, some potential cultivars were selected from the available germplasms in Horticulture Research Division in the last years and evaluated in this study.

The main objective of this study was to select suitable tomato open pollinated cultivars in Kathmandu valley condition for salad and cherry tomato purpose.

MATERIALS AND METHODS

Three-week-old tomato seedlings of eleven cultivars; seven salad type cultivars and four cherry type cultivars were planted in April 6, 2015 at Horticulture Research Division, Khumaltar on open field condition. The experiment was laid out in randomized complete block design with three replications with 60x60 cm row to row and plant to plant distance. Plants were grown with fertilizers 200:150:100 kg NPK and 20 t compost per hectare during spring season. Pesticide was sprayed as necessary to save plants from heavy damage of late-blight disease and fruit borer. Tomato fruits were harvested frequently as fruits ripened fully. Plants of each cultivar were visually observed during their growth period for vegetative parameter; plant uniformity, plant vigor, plant height and days to flowering and fruit ripening. Likewise, fruit parameters; fruit characteristics, fruit quality, maturity and fruit yield in number and weight were recorded.

RESULTS AND DISCUSSION

Vegetative and flowering characters

Plant uniformity ranged from 7.5 to 9.5 scores where cv. HRA-23, HRA-34 HRA-43 showed excellent plant uniformity. As far as plant vigor is concerned, the most vigorous cultivar was HRA-23 and HRA-34 (9.5) followed by HRA-14, HRA-15 and HRA-33 (9.0). Likewise, most of the cherry type cultivars were taller than slice type where HRA-43 was the tallest (150 cm) in height followed by HRA-23 (139.4 cm) and shortest was HRA-20 (46.3 cm). Among the tested cultivars, days to first fruit harvesting was earlier HRA-15, HRA-20, Yellow salad (79 days) whereas HRA-43 and HRA-33 were late in maturity (Table 1).

Table 1. Vegetative and flowering characters of 11 tomato cultivars at Khumaltar

Type	Cultivar	Plant uniformity ^x	Plant vigor ^y	Plant height (cm)	Days to flowering	Days to fruit set	Days to first harvest
Slice type cultivars	HRA-13	9.0	8.5	71.2	34.5	51.5	84
	HRA-14	8.5	9.0	57.3	34.5	47.0	82
	HRA-15	9.0	9.0	52.5	34.5	43.5	79
	HRA-16	8.5	8.5	58.7	35.0	41.5	84
	HRA-17	9.0	8.5	53.5	36.0	50.5	86
	HRA-20	9.0	7.5	46.3	35.5	45.0	78
	Yellow Salad	7.5	7.5	52.7	34.0	46.5	79
Cherry type cultivars	HRA-23	9.5	9.5	139.4	32.5	52.5	78
	HRA-33	9.0	9.0	109.8	31.0	46.0	98
	HRA-34	9.5	9.5	134.5	30.5	44.5	93
	HRA-43	9.5	7.5	150.0	31.5	47.0	98
CV%		5.35	7.23	14.68	3.41	3.44	2.23
F-test (0.05)		*	*	**	**	**	**
LSD (0.05)		1.062	1.377	27.53	2.549	3.593	4.239

^xPlant uniformity ; 1: unacceptable, 10: excellent ^y Plant vigor ; 1: poor, 10: vigorous

Yield attributing characteristics

Number of fruits per plant was highest in HRA-33 (319) followed by HRA-34 (223) and HRA-43 (185) whereas the least number of fruits per plant was in HRA-15 (12). Generally the trend was as higher the number of fruits per plant, smaller the size of fruits (Table 2). Cherry type cultivars provided more number of fruits per plant as compared to slice type cultivars. The highest tomato yield (31.05 t/ha) was obtained from HRA-17 followed by Yellow Salad (24.285 t/ha) and HRA-13 (22.00 t/ha) whereas the least yield was obtained from HRA-43 (9.018 t/ha) followed by HRA-20 (9.091 t/ha) respectively. However, in cherry type cultivars, HRA-34 gave highest yield (18.952 t/ha) followed by HRA-33 (15.642 t/ha). Slice type cultivars should have a habit of bearing bigger size fruits whereas in cherry type smaller size. Among the tested cultivars, HRA-13 gave bigger sized fruits (166.7g) followed by HRA-17 (166.5 g) and HRA-14 (163 g) respectively, whereas the smallest size fruits were obtained in HRA-43 (8.0 g) (Table 2). HRA-13 had an average weight of fruit 166.7 g and number of fruits per plant 17 in Slice

type and HRA-33 with 10.3 g average weight of fruit and 319 number of fruits per plant in cherry type cultivars respectively. Most of the cultivars had less fruit quality as compared to the abroad (green house condition) because the crops were grown in open field at Khumaltar where the plants suffered frequently from drought and no any pruning and training done on plants properly. Similarly, on the basis of yield per plant, HRA-17 was recorded as highest yielder (3353 g) followed by Yellow Salad (2622 g) and HRA-23 (2091 g) respectively whereas the lowest yield per plant was obtained from HRA-43 (974 g) followed by HRA-20 (981 g) respectively (Table 2). Number of fruits per cluster were highest in HRA-34 (10.6) followed by HRA-43 (9.2) and least was in HRA-17 (2.4) where number of flowers per cluster was also higher. Fruit set percent was highest in HRA-43 (88.9) followed by HRA-34 (86.5) and least was in HRA-17 (61.3) respectively (Table 2).

Table 2. Yield attributing characters of 11 tomato cultivars at Khumaltar

Type	Cultivar	Fruits /cluster (no.)	Flowers/cluster (no.)	Fruit set (%)	Yield (g/plant)	Fruits /plant (no.)	Yield (t/ha)	Av.fruit wt.(g)
Silice type cultivars	HRA-13	3.2	4.3	73.6	2376	17	22.000 ab	166.7
	HRA-14	3.3	4.2	77.6	1402	13	12.983 b	163.0
	HRA-15	3.7	4.8	77.3	1830	12	16.946 ab	141.5
	HRA-16	3.8	5.1	73.8	1826	16	16.915 ab	66.4
	HRA-17	2.4	4.0	61.3	3353	22	31.050 a	166.5
	HRA-20	3.2	4.5	72.2	981	17	9.091 b	74.9
	Yellow Salad	3.7	5.6	66.1	2622	31	24.285 ab	106.9
Cherry type cultivars	HRA-23	4.5	7.0	65.0	2091	185	19.364 ab	45.8
	HRA-33	7.9	9.4	84.1	1689	319	15.642 ab	10.3
	HRA-34	10.6	12.2	86.5	2046	223	18.952 ab	12.0
	HRA-43	9.2	10.3	88.9	974	72	9.018 b	8.0
CV%		17.79	12.12	9.4	45.2	28.9	45.2	22.17
F-test (0.05)		**	**	ns	*	**	*	**
LSD (0.05)		2.02	1.77	15.9		54.1		39.1

Cherry type tomato cultivars are higher in plant height, more number of flowers, fruits and fruit set per cluster but little bit late in days to first fruit harvesting (Fig.1).

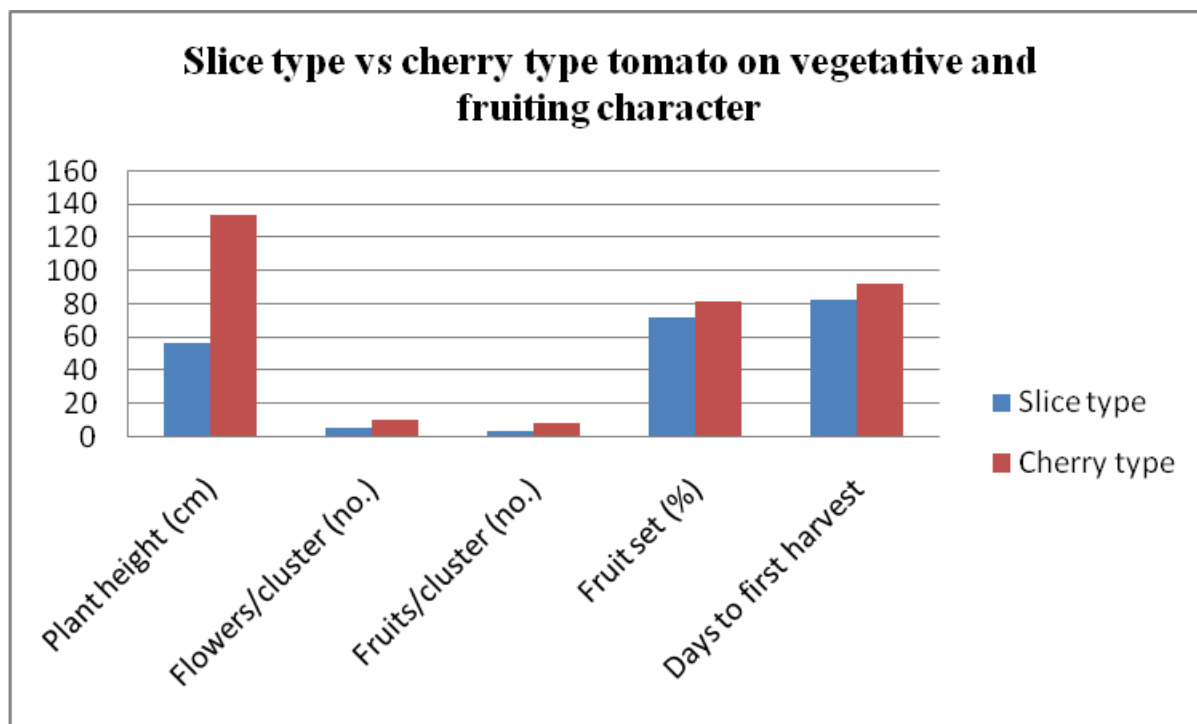


Fig. 1. Slice type vs Cherry type tomato on vegetative and fruiting characters

Fruit Characteristics

Fruits of cv. HRA-13, HRA-14, HRA-15 and HRA-20 was oblate in shape whereas HRA-16 and HRA-17 globose, Yellow Salad oval and the rest were round shaped. Generally consumers prefer oblate shaped fruits for slice and round for cheery type. Fruit bearing habit of HRA-13, HRA-15, HRA-16 and HRA-17 was bigger size. Color of matured fruits was red in all the cultivars except in HRA-23 and Yellow Salad cultivars. Fruit shoulder was distinct in HRA-15, HRA-20 and feebly developed in HRA-13, HRA-14, HRA-16, HRA-17 and HRA-23, and the rest were without shoulder. Most of the cultivars had flat fruit end shape except HRA-20 and Yellow Salad. (Table 3).

Table 3. Fruit characters of 11 tomato cultivars at Khumaltar

Type	Cultivar	Length (cm)	Width (cm)	Pericarp thickness (mm)	Shape	Size ^y	Color ^x	Shoulder shape ^z	End shape
Slice type cultivars	HRA-13	5.8±0.5	6.6±1.4	6.0±1.5	Oblate	VB	R	2	Flat
	HRA-14	5.7±0.74	7.1±0.57	6.5±0.4	Oblate	B	R	2	Flat
	HRA-15	5.3±0.55	6.9±0.29	6.3±0.5	Oblate	VB	R	3	Flat

	HRA-16	4.3±0.19	5.0±0.45	4.1±1.4	Globose	VB	R	2	Flat
	HRA-17	7.8±3.2	6.7±1.1	7.0±1.1	Globose	VB	R	2	Flat
	HRA-20	4.1±1.1	5.3±0.6	3.5±0.4	Oblate	M	LR	3	Intended
	Yellow Salad	5.5±2.4	5.8±0.4	8.6±0.5	Oval	B	O	1	Depressed
Cherry type cultivars	HRA-23	3.8±0.2	4.4±0.4	3.9±0.4	Round	M	LR	2	Flat
	HRA-33	2.5±0.2	2.5±0.2	2.9±0.3	Round	S	R	1	Flat
	HRA-34	2.5±0.2	2.6±0.2	2.9±0.8	round	S	R	1	Flat
	HRA-43	2.2±0.6	2.3±1.5	2.4±0.6	round	S	DR	1	Flat

×R:red, LR:light red, O:orange √S:small, M:medium, B:big, VB:very big

∗1:none, 2:feebly developed, 3:distinct

Fruit quality characters

Highest total soluble solid content (7.2 brix score) was obtained in HRA-33 followed by HRA-23 (7.1) whereas the lowest was in HRA-16 (3.3). Similarly, the highest titratable acidity (1.19) was recorded in HRA-14 followed by HRA-33 (0.82) and lowest (0.34) in Yellow Salad. Likewise, highest vitamin C content (57.29 mg/100g) was noticed in HRA-33 and lowest in HRA-15 (27.77). The juice percent was highest (83.2) in HRA-15 followed by HRA-34 (82.3) and minimum in HRA-14 (65.4) respectively. As far as taste is concerned, HRA-13, HRA-17 and HRA-33 had excellent taste followed by HRA-23, HRA-34, HRA-16 and HRA-14 respectively (Table 4).

Slice type tomato cultivar were higher in average fruit weight, fruit length, fruit width and pericarp thickness but cherry type tomato cultivars were higher in total soluble solid (Brix), titratable acidity (%), Vitamin C and juice content (Fig 2).

Table 4. Fruit quality characteristics of 11 tomato cultivars

Type	Cultivar	Total soluble solid (Brix)	Titratable acidity (%)	Vitamin C (mg/100g)	Juice (%)	Taste
Slice type cultivars	HRA-13	4.1	0.48	29.51	80.3	Excellent
	HRA-14	4.8	1.19	38.19	65.4	Very Good
	HRA-15	4.5	0.46	27.77	83.2	Good

	HRA-16	3.3	0.44	32.11	71.6	Very good
	HRA-17	3.4	0.41	29.51	80.8	Excellent
	Yellow Salad	4.2	0.34	26.04	74.0	Fair
Cherry type cultivars	HRA-23	7.1	0.62	50.3	80.7	Very good
	HRA-33	7.2	0.82	57.29	77.9	Excellent
	HRA-34	6.0	0.44	39.93	82.3	Very good
	HRA-43	7.0	0.64	52.08	77.5	Good

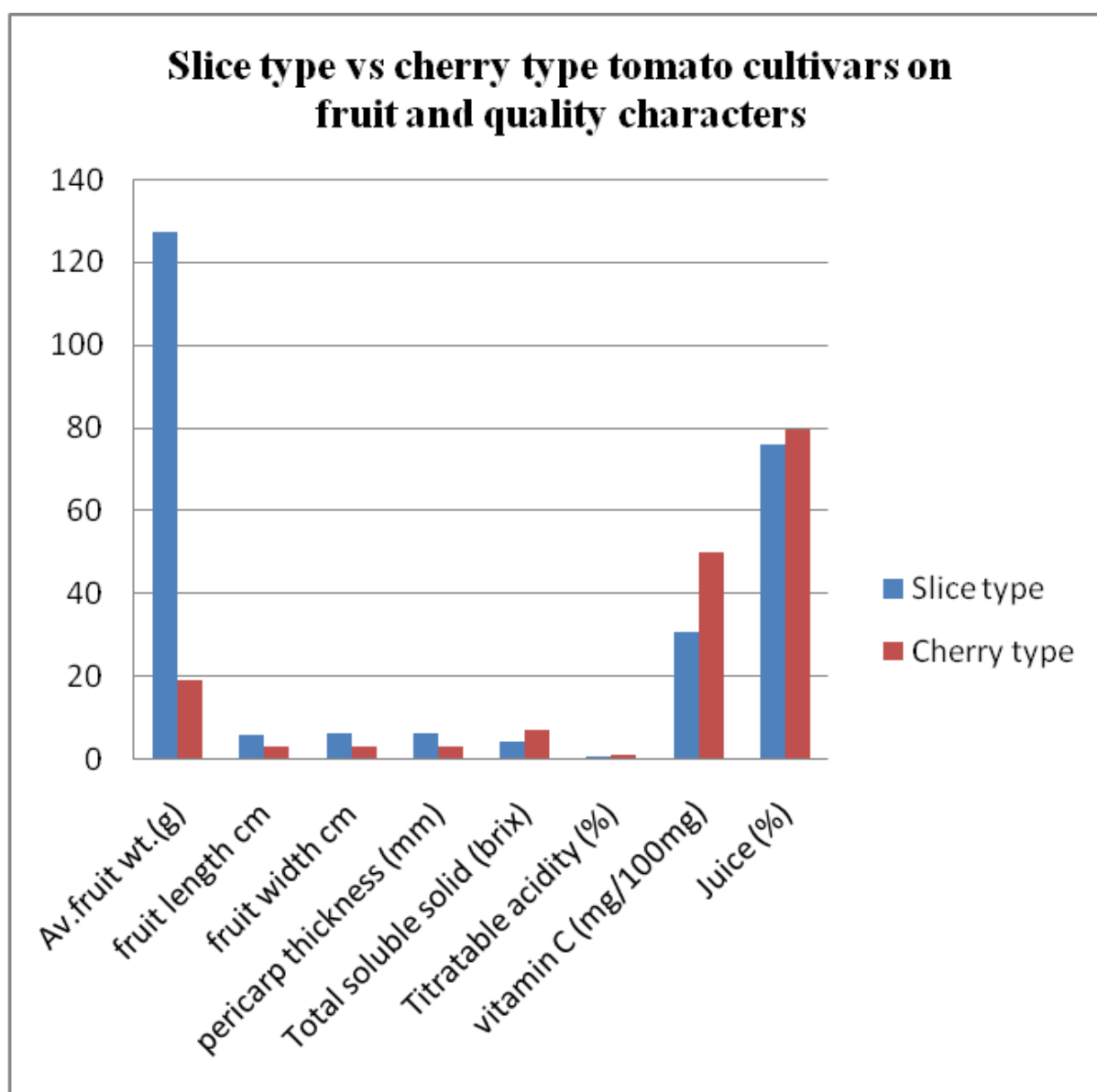


Fig. 2. Slice type vs Cherry type tomato on fruit and quality characters

CONCLUSION

On the basis of overall characteristics, HRA-13 which had average fruit weight 167 g, yield 2376 g per plant, juicy, fleshy and superior taste for slice type and HRA-33 which had average fruit weight 10 g, yield 1689 g per plant, juicy, higher vitamin C content and superior taste followed by HRA-23 for cherry type were selected and recommended for further evaluation in farmer's field condition.

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