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Screening /characterization for determination of different genotypes of Tomato (*Solanum lycopersicum* L.) suitable for processing under the gird region of Madhya Pradesh

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ABSTRACT

The overall aim of this study was to assess tomato genotypes suitable for processing purposes under the gird region of Madhya Pradesh. The genotype Kasi Vishesh recorded maximum Fruit firmness with 2.667 and genotype Pusa Rohini recorded the minimum Fruit thickness with 6.53 and Money Maker recorded the maximum Pericarp thickness with 3.963. Punjab Chhuuara recorded maximum average amount of Lycopene fruit with 3.56 and Kasi Hemanth recorded minimum Average amount of fruit Lycopene with 1.080. The physio-chemical parameters such as pH, firmness, fruit wall thickness, moisture content, juice viscosity, soluble solids ratio, and titratable total acidity determine the physicochemical and nutritional properties of the fruit in tomato products.

Keywords: *Solanum lycopersicum* L. polar diameter; Pericarp thickness; Titrable acidity (%); Total soluble solids (%)

INTRODUCTION

Tomato (*Solanum lycopersicum* L.), it comes under family Solanaceae and is widely grown vegetable crop in the world. Generally known as the **poor man's orange.** The chromosome no was 2n = 2x = 24. Originated from Andes of South America. In 2021, global periodic product reached 41.52 million tons. Tomatoes are highly nutritious and considered as healthy food. Tomatoes have a variety of uses, both raw and

reused, similar as ketchups, gravies, pastes, and authorities. We're fastening on relating bioactive constituents in food. Lycopene is the major carotenoid in tomatoes and is abundant in ripened fruits. Tomatoes reduce the threat of certain cancers and heart complaint (Rao *et al.,* 2000). It has an excellent source of minerals and vitamins (Akinfasoy *et al.,* 2011). Tomatoes are an important source of lycopene, ascorbic acid and beta- carotene and are prized for their colour and taste. Desirable characteristics of tomato varieties used for processing include high total soluble solids content (4-8° Brix), acidity of at least 0.4%, pH of less than 4.5, uniform red colour, smooth surface, and exception for the stains. Wrinkles and pebbles, firm meat, even ripening productivity depend not only on cultural practices and growing regions, but also on high-yielding genotypes that adapt well to growing regions (Asiya *et al*, 2017). Including genetically diverse parents in any breeding program is essential to create new diversity and desirable recombinants. Evaluation of tomato genotypes is therefore of great importance to identify potential genotypes and to confirm genotypic performance regarding their adaptability and agricultural performance such as growth and yield characteristics.

Material and Method

The experiment was conducted at ITM University's Vegetable Research Centre in Sithouli, Gwalior, Madhya Pradesh, from February to June 2023. The survey site was located in the Indian grid at a 211.5 m altitude. The experiment was designed in a randomized block design with three replications. The study used 20 genotypes of tomato (*Solanum lycopersicum* L.) *viz* Kasi Amman; Kasi Hemanth; Kasi Amul; Pusa Sadabahar; Pussa Upahar; Kashi Sharad; Pusa Rohini; Kashi Amrit; Pusa Shital; Punjab Chuhura; Kashi Adharsh; Pussa Rubby; Kasi Vishesh; Pusa Guvrav; Kasi Anupam; Money Maker; Ec-620424; Deshi Red; H-24; Nf-54 this genotype taken from the source of Indian institute of vegetable research Varanasi and used a titration principle to determine ascorbic acid, acidity, fruit pH, and lycopene content. Data was recorded over 17 characters, and observations were recorded during the survey. Statistical interpretation and correlation information were presented.

RESULTS AND DISCUSSION

Fruit weight (g) was recorded maximum in the genotype Kasi Hemanth (72g) and followed by the remaining genotypes. And the mean value for the character recorded was 9.094g. The values of the present findings were similar with the results reported by Mehta and Asati (2008), Bhat et al., (2021), kumara (2017) and Jatav P. K.

(2017). Fruit length (mm)/ Polar diameter was recorded maximum for the genotype Pusa Sadabahar (66.38) mm and followed by the remaining genotypes. The mean value for this character was recorded like (48.53). Similar results were reported earlier by Kumari et al., (2010), Vinay et al., (2012) and Souza et al., (2012). Equatorial diameter (mm) was recorded maximum for the genotype Kashi Anupam (73.4) and followed by the remaining genotypes. The mean value of this character was recorded like (52.5). Similar results were reported earlier by Mishra et al., (2021) also been reported by Gul et al., (2011) Islam et al., (2012), Singh et al., (2012) Droka et al., (2013), Kumar and Singh (2016) and Kumar et al., (2016).

Fruit firmness recorded maximum for the genotype Kasi Vishesh (2.6) and followed by the remaining genotypes. The mean value was recorded 3.5. Similar results were reported earlier by Prakash E. et al., (2019) These results were consonance with Bharathkumar et al., (2017) and Farooq et al., (2013) for fruit firmness. High pericarp thickness and a smaller number of locules gives high firmed fruit. The high fruit firmness influences the shipping ability and keeping quality.

Fruit Pericarp thickness recorded maximum for the genotype Kasi Amman (6.53) and followed by the remaining genotypes. And mean value for that character was recorded (5.4). Similar results were reported earlier by Prakash E. et al., (2019). Number of locules per fruit recorded maximum for the genotype Pussa Rubby (2.3) and followed by the remaining genotypes. The mean value of this character was recorded like 1.74. Similar findings have been also reported by Singh et al., & some other workers Khuntia et. Al. (2019), Prakash et al., (2019) and Akhter et al., (2021).

Number of seeds recorded maximum for the genotype Nf-54 (65) and followed by remaining genotypes. The mean value was recorded (39). Quantity of ascorbic acids recorded maximum for the genotype Pusa Sadabahar (33.8) and followed by the remaining genotypes. The mean value was recorded (22.7). Similar findings have been reported by Anupama Lakra et al., (2020) & other workers Gupta et al., (2011) who studied two genotypes and reported the amount of ascorbic acid as 31.33 and 27.82 mg. Moneruzzaman et al., (2008), Rai et al., (2012), Abushita et al., (2000) and Nagar et al., (2015). Quantity of Titrable acidity (%) was recorded maximum for the genotype Punjab Chuhura (0.84) and followed by the remaining genotypes. The mean value of this character showed (0.48). Similar findings have been also reported by Suresh kumara et al., (2017) & other workers.

Quantity of Total soluble solids (%) was recorded maximum value for the genotype Money Maker (5.1) and followed by the remaining genotypes. The mean value of this character was recorded (4.15). Similar findings have been also reported by Manoj Kumar et al., (2021) & other workers. These results are in conformity with the finding of Swaroop and Suryanarayana (2005) and Ahmed et al., (2007).

Quantity of fruit pH was recorded maximum for the genotype Pussa Sadabahar (5.23) and followed by the remaining genotypes. The mean value recorded for this character was (4.4). Similar findings have been also reported by other workers.

Quantity of fruit carotenoids was recorded maximum for the genotype Pusa Guvrav (16.9) and followed by the remaining genotypes. The mean value for this character was recorded like (5.6). Similar findings have been also reported by Praksh et al., (2019) & other workers. (Cheema et al., (2013), Lekshmi and Celine (2015) and Omprasad et al., (2018).

Quantity of fruit lycopene was recorded for the genotype Punjab Chuhura (3.56) and followed by the remaining genotypes. The mean value was recorded for this character was like (2.1). Similar findings have been also reported by Lakra et al., (2020). Quantity of fruit Shelf -life was measured by weight loss percentage (%) for 3days ;5 days & 7days. The genotype Kasi Anupam recorded maximum amount of weight loss with 20.2 (Room temperature) amount of weight loss. The genotype Pusa Rubby recorded maximum amount of weight loss with 24.067 (Brown paper). The genotype Pusa Shital recorded maximum amount of fruit weight loss with 24.2 (shrinking wrapping paper). Study further revealed that the amount of fruit Shelf-life mean value 48.4; (Room temperature) 50.4 (Brown paper) 54 (shrinking wrapping paper) Similar findings have also been reported

SI. No.	Genotypes/ Characters	Average fruit weight (g)	Fruit polar diameter (mm)	Fruit equatorial diameter (cm)	Fruit firmness	Pericarp thickness	Number of locules per fruit	Number of seeds per fruit	Determination of ascorbic acids	Determination of Titrable acidity (%)	Total soluble solids (%)	fruit pH	Total carotenoids	Lycopene Content
1	Kasi Amman	66.0	54.4	52.5	2.3	6.5	1.5	26.7	17.1	0.2	3.6	4.7	6.0	1.4
2	Kasi Hemanth	72.0	45.9	52.2	2.4	4.5	1.3	33.3	26.5	0.5	4.1	4.8	3.4	1.1
3	Kasi Amul	60.3	58.5	62.7	2.4	6.2	1.9	37.0	18.4	0.5	3.0	4.6	2.9	1.4
4	Pusa Sadabahar	56.7	66.4	44.1	2.4	4.6	1.1	31.3	33.8	0.4	4.1	5.2	0.5	1.8
5	Pussa Upahar	59.3	61.5	43.1	2.6	5.3	1.6	51.0	21.6	0.3	4.2	4.5	3.5	1.3
6	Kashi Sharad	66.0	59.2	52.6	2.4	4.8	1.2	34.0	21.6	0.5	4.6	3.7	3.6	2.0
7	Pusa Rohini	65.7	58.0	63.8	1.6	6.1	1.9	44.7	19.5	0.3	3.2	4.0	8.9	2.1
8	Kashi Amrit	63.8	56.3	55.1	2.3	6.1	2.0	21.7	14.7	0.5	3.0	4.0	5.8	2.2
9	Pusa Shital	48.0	40.4	46.9	2.0	5.1	2.1	44.7	21.5	0.8	4.6	4.3	4.5	3.1
10	Punjab Chuhura	58.3	48.5	50.3	2.3	6.3	2.2	19.7	21.7	0.8	4.5	4.3	3.0	3.6
11	Kashi Adharsh	64.7	33.4	34.8	2.5	6.3	1.8	61.7	24.0	0.6	3.5	4.3	15.9	3.4
12	Pussa Rubby	64.7	26.9	57.0	2.4	4.0	2.2	60.7	26.7	0.8	4.8	4.3	9.0	3.5
13	Kasi Vishesh	66.0	37.1	36.6	2.7	5.6	2.0	45.3	28.6	0.8	4.4	4.3	5.4	2.1
14	Pusa Guvrav	55.0	43.4	42.4	2.4	5.3	1.1	64.3	20.8	0.8	2.7	4.8	16.9	2.0
15	Kasi Anupam	54.0	55.2	73.4	2.6	5.3	1.3	36.3	18.4	0.3	4.6	4.0	6.2	3.0
16	Money Maker	60.0	43.7	45.1	2.3	4.0	1.3	19.7	25.5	0.3	5.1	3.9	0.4	1.5
17	Ec-620424	48.7	42.9	57.3	2.4	4.7	2.0	21.7	20.4	0.4	4.7	4.1	2.4	1.4
18	Deshi Red	57.3	44.7	50.6	2.6	5.6	2.0	35.0	33.5	0.3	4.7	4.1	3.7	2.0
19	H-24	57.3	44.6	72.1	2.6	5.8	2.1	26.7	19.4	0.1	4.7	4.5	6.4	1.9
20	Nf-54	54.0	49.5	58.2	2.3	6.1	2.2	65.0	21.8	0.3	4.9	4.4	3.8	1.6
	Mean	59.9	48.5	52.5	2.4	5.4	1.7	39.0	22.8	0.5	4.2	4.4	5.6	2.1
	S.E.(m)	3.2	1.9	3.4	0.1	0.4	0.1	1.1	0.4	0.0	0.1	0.1	0.0	0.0
	C.D. at 5%	9.1	5.5	9.7	0.3	1.3	0.2	3.3	1.2	0.0	0.3	0.2	0.1	0.1
	C.V. %	9.2	6.8	11.2	9.3	14.1	5.5	4.9	3.2	3.0	4.3	3.1	1.1	3.2
	Range Maximum	72.0	66.4	73.4	2.7	6.5	2.2	65.0	33.8	0.8	5.1	5.2	16.9	3.6
	Range Minimum	48.0	26.9	34.8	1.6	4.0	1.1	19.7	14.7	0.1	2.7	3.7	0.4	1.1

Shelf life

Sl.	Genotypes/Characters	Weight loss % Room temperature				Weight loss % Brown paper				Weight loss % Shrinking polyethylene			
No.		On 3rd day	On 5-th day	On 7th day	Mean	On 3rd day	On 5-th day	On 7th day	Mean	On 3rd day	On 5th day	On 7th day	Mean
1	Kasi Amman	3.5	4.1	7.5	5.03	1.32	0.67	6.6	2.863	4.62	2.42	2.15	3.063
2	Kasi Hemanth	2.2	3.3	6.6	4.03	3.75	1.3	6.3	3.783	6.94	1.49	1.52	3.317
3	Kasi Amul	0.7	2	2	1.56	3.21	0.66	4.5	2.79	2.17	0.74	0.75	1.22
4	Pusa Sadabahar	7	18.7	32.6	19.43	4.55	0.95	6.4	3.967	11.54	13.04	11	11.86
5	Pussa Upahar	1	3.9	4.9	3.26	4.26	4.44	13.2	7.3	5.88	3.13	3.66	4.223
6	Kashi Sharad	4	12	26.5	14.16	3.85	6.13	17.3	9.093	2.89	7.82	8.21	6.307
7	Pusa Rohini	5.9	18	31.9	18.6	2.3	0.82	4.4	2.507	7.89	14.29	25	15.727
8	Kashi Amrit	2.7	11.4	20.2	11.43	5.17	9.45	28.8	14.473	6	17.29	20.58	14.623
9	Pusa Shital	6	15.2	26.4	15.867	9.74	15.34	43.3	22.8	10.71	24	37.89	24.2
10	Punjab Chuhura	2.9	5.7	8.5	5.7	12.96	6.38	23	14.113	5.33	14.55	15.66	11.847
11	Kashi Adharsh	6.3	9.4	14.2	9.967	3.75	1.95	8.1	4.6	5.45	2.88	4.95	4.427
12	Pussa Rubby	4.5	7.8	10.7	7.667	11.11	17.19	43.9	24.067	10	20.37	31.16	20.51
13	Kasi Vishesh	4	14.8	27.9	15.567	4.76	9.17	25.7	13.21	6.67	10.71	17.87	11.75
14	Pusa Guvrav	2.7	4.7	7.9	5.1	5.88	2.5	13.3	7.227	4.76	2	3.91	3.557
15	Kasi Anupam	7	18.2	35.4	20.2	5	12.89	35.5	17.797	5	3.51	2.18	3.563
16	Money Maker	3.6	12.5	26.4	14.167	5.08	3.57	11.4	6.683	6.67	4.76	3	4.81
17	Ec-620424	5.2	9.8	13.4	9.467	6.38	13.18	36	18.52	5.36	3.4	2.73	3.83
18	Deshi Red	5.2	1.58	30	12.26	3.65	10.69	23.3	12.547	5.66	3.6	2.9	4.053
19	H-24	4.1	8	10.4	7.5	3.45	2.68	9	5.043	5.36	2.64	2.91	3.637
20	Nf-54	3.4	6.45	8.9	6.25	4	11.46	29	14.82	5.45	3.46	2.79	3.9
	Mean	_	_	_	8.719	_	_	_	9.906	_	_	_	8.183
	C.D. at 5%	_	_	_	3.034	_	_	_	3.447	_	_	_	2.847
	C.V. %	_	_	_	4.29	_	_	_	4.874	_	_	_	4.027
	S.E.	_	_	_	50.709	_	_	_	57.347	_	_	_	61.484
	Range Maximum	_	_	_	20.2	_	_	_	24.067	_	_	_	24.2
	Range Minimum	_	_	_	1.567	_	_	_	2.507	_	_	_	1.22

CONCLUSION

The study reveals various genotypes with significant variations in fruit hardness, pod thickness, and ascorbic acid content. Kasi Vishesh and Pusa Rohini genotypes have the highest and lowest mean fruit hardness, respectively. The Kasi Amman genotype has the highest pod thickness, while the Money Maker genotype has the lowest. The Pussa Ruby genotype has the highest mean number of cells. The study also reveals the highest and lowest ascorbic acid levels, total soluble solids, carotenoids, and lycopene levels. The fruit shelf-life varies between genotypes, with Kasi Anupam having the longest shelf life at 20.2°C, while Kasi Vishesh has the lowest at 1.567°C. The Pusa Rubby genotype has the highest weight loss, while Pusa Rohini has the lowest.

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