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Evaluation of Tomato Hybrids for Growth, Yield and Quality Attributes under the Climatic Conditions of Kerala

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ABSTRACT: Commercial cultivation of tomatoes in Kerala is very limited due to the prevailing tropical humid climatic conditions and acidic soil, which make it a hotspot for various biotic and abiotic stresses. Tomato production in the state can be improved by identifying and promoting the hybrids tailored to thrive in these challenging conditions. So, the present study was undertaken to identify F1 hybrids of tomato suitable for growing in Kerala. Ten F1 hybrids of tomato collected from various research institutes, SAUs and private companies were evaluated for their yield and quality to find the suitability of growing them in climatic conditions of Kerala. The experiment was laid out in CRD with four replications. Observations were taken from five plants in each replication. Hybrids were evaluated for growth, yield and quality traits. The results revealed significant variation among the hybrids for all the traits studied. Plant height was highest in the hybrid Arka Apeksha. days to flowering and days to harvest was minimum in Lakshmi which was on par with Sampurna and COTH3. Highest fruit shape index and pericarp thickness was recorded in Arka Apeksha. Average fruit weight was highest in Arka Abhed. Number of fruits/plant was highest in Sampurna. Fruit yield/plant was highest in Lakshmi which was on par with Arka Rakshak, Arka Samrat, Arka Abhed and Arka Apeksha. Longest crop duration was recorded in Arka Abhed, Arka Apeksha, Arka Samrat which was on par with Arka Rakshak, Sampurna and Lakshmi. Arka Apeksha was superior to other hybrids for quality traits such as TSS, vitamin C and lycopene. Whereas titrable acidity was highest in Sampurna and highest total phenol content was recorded in COTH3. Based on the overall performance of the hybrids for yield and yield contributing traits hybrids Lakshmi, Arka Samrat and Arka Abhed was found best performing among the ten hybrids evaluated. These hybrids are well adapted for growing in Kerala's climatic conditions, and popularizing them among farmers will aid in enhancing the state's tomato production.

Keywords: Tomato, *Solanum lycopersicum*, hybrid, yield, quality.

INTRODUCTION

Tomato (*Solanum lycopersicum*) is an important solanaceous vegetable grown worldwide for its nutrient-rich edible fruits. Tomato fruits consist of about 90% water and 5-7% soluble and insoluble solids (Pedro and Ferreira 2007). They are rich in vitamins, carotenoids, and phenolic compounds (Palop *et al*., 2010). Considered a protective food due to antioxidants like lycopene and beta carotene, tomatoes rank as the second most important vegetable globally, following potatoes. In India, they hold the position of the third most important vegetable after potatoes and onions. According to the first advance estimate from the Union Ministry of Agriculture and Farmers Welfare, the tomato production for 2021-22 was approximately 20.69 million tonnes. Major tomato growing states in India include Madhya Pradesh, Andhra Pradesh Karnataka, Tamil Nadu and Orissa. The fruits are consumed fresh and also find use in processing industries producing items such as dried tomatoes, candies, ketchups, sauces, soups, purees, powders, pastes, and canned tomato fruits. Unripe fruits are commonly used in chutneys and pickles. It is a common ingredient in Indian cuisine as it infuse a tangy flavour and sweetness into the dishes.

Even though tomato cultivation is undertaken in large scale in different parts of India, it is very limited in Kerala. Kerala's contribution to the total tomato production is only 0.02% (APEDA, 2022). (APEDA, 2022). One of the major reason for low production in

Kerala is the lack of availability of suitable high yielding resistant varieties or hybrids of tomato.

Heterosis for earliness, fruit weight, total yield and resistance was reported in tomato. A yield increase of 300% is reported by hybrids over commercial varieties. Extend of heterosis of hybrids of tomato over the better parent in India is reported to be about 263% (Dhaliwal, 1986). Adoption of a hybrid by farmers depends on its superiority over the presently grown cultivars. Superiority can be in terms of total yield, early yield, nutritional quality, post-harvest life, insect pest and disease resistance, adaptability, external appearance etc. Cultivating hybrids with desirable traits stands as an effective strategy to enhance tomato production (Islam *et al.,* 2012). Several research institutes and private companies across India have developed tomato hybrids tailored to diverse agro-climatic conditions. Adopting these hybrids for cultivation holds promise for improving tomato production in Kerala. The state grapples with a warm, humid tropical climate, posing various biotic and abiotic stress challenges. Therefore, the identification and promotion of hybrids well adapted to Kerala's growing conditions stand crucial for enhancing tomato production. In this context, the current study aims to identify tomato hybrids suitable for cultivation in Kerala.

MATERIALS AND METHODS

The present study to identify hybrids suitable for growing in Kerala was undertaken during 2021-2022 at Department of Vegetable Science, College of Agriculture, Vellanikkara, Kerala Agricultural University, Thrissur. Ten hybrids collected from various research institutes, SAUs and private companies were evaluated for their growth, yield and quality traits. Hybrids used in the study were Arka Samrat, Arka Rakshak, Arka Abhed, Arka Apeksha, COTH3, Kashi Abhiman, NSC 620B, Lakshmi, Sampurna and Shivam. The experiment was laid out in CRD with four replication. Hybrids were planted in pots filled with growing medium and observations on growth, yield and quality traits were recorded from five random plants selected in each treatment per replication. The data was subjected to statistical analysis.

RESULT AND DISCUSSION

Evaluation of hybrids for growth, yield and yield contributing traits.

Significant difference was observed among the hybrids for growth, yield and yield contributing traits. The data on the mean performance of hybrids for growth, yield and yield contributing characters are presented in Table 1.

Plant height (cm). Plant height is an important trait which contribute to the vigour of the plant. Plant height significantly varied among the evaluated hybrids. Arka Apeksha (103.29cm) recorded the highest plant height, followed by the NSC hybrid 620B (103.00cm). On the other hand the lowest plant height was recorded in COTH3 (69.23 cm). Plant height in tomato varies according to the growth habit *i.e* whether the plant is determinate or indeterminate. Difference in the genetic makeup of the hybrids and the influence of external environment might have resulted in the significant difference among the hybrids for plant height. Variation in plant height of hybrids in different climatic conditions were reported by Muna *et al*., 2019; Kumar-Ch *et al*. (2023).

Days to flowering. Days to flowering determine the earliness of the hybrids. Days to flowering exhibited significant variability among the hybrids. It varied from 22.20 DAP (Days after Planting) to 30.40 DAP. Among the hybrids Lakshmi recorded minimum days for flowering (22.20 DAP) which was on par with COTH3 (24.60 DAP), Sampurna (25.40 DAP) and Arka Rakshak (26.60 DAP) and the maximum days to flowering was observed in Shivam (30.40 DAP). This is in line with the findings of Malathi *et al*. (2021).

Days to first harvest. Earliness in fruit production and marketable yield is influenced by days to first harvest. So, minimum days to first harvest is preferred in tomato. Significant variation was observed among the hybrids for days to first harvest. It was minimum in Lakshmi (63.80 DAP) which was on par with Sampurna (67.40 DAP) and COTH3 (68.10 DAP). Maximum days to first harvest was recorded in NSC 620 B (80.60 DAP). (Bamaniya *et al*., 2019; Athulya and Anitha, 2022) also reported similar variations for days to first harvest in tomato hybrids.

Fruit shape Index. Fruit shape Index is the ratio between polar and equatorial diameter of the fruit. Arka Apeksha recorded the highest fruit shape Index of 1.18 among the hybrids which was followed by Arka Rakshak (1.13). Lakshmi recorded the lowest fruit shape Index of 0.90. Highest fruit shape index in Arka Apeksha and Arka Rakshak is mainly attributed to their high polar diameter compared to other hybrids. Lowest fruit shape index was observed in Lakshmi this due to its high equatorial diameter compared to the polar diameter. Fruits with elongated shape were having high fruit shape index and fruits with low fruit shape index were having flat round shape. Processing industries prefer elongated, blocky medium sized tomato fruits and they are also amenable for mechanical harvesting (Spetale *et al.,* 2020). For cooking purpose large round fruits are preferred (Tieman *et al.,* 2012).

Table 1: Overall performance of hybrids for growth, yield and yield attributing characters.

Hybrid	Plant height (cm)	Days to flowering (DAP)	Days to first harvest (DAP)	Fruit shape Index	Pericarp thickness (mm)	Average fruit weight (g)	No. of fruits per plant	Yield /plant (kg)	Crop duration (Days)	BW incidence (%)	ToLCV incidence (%)
Arka Samrat	92.48	28.40	80.40	1.06	6.14	89.69	35.37	2.97	125.6	42.5(40.70)	0.00(9.10)
Arka Rakshak	92.19	26.60	72.60	1.13	5.93	74.89	40.53	2.89	125.3	45.0(42.15)	0.00(9.10)
Arka Abhed	95.57	27.60	79.40	0.97	6.68	97.56	30.45	2.76	128.8	0.00 (9.10)	0.00(9.10)
Arka Apeksha	103.29	27.20	75.20	1.18	6.94	78.84	37.06	2.77	128.8	10.0(18.25)	0.00(9.10)
COTH3	69.23	24.60	68.10	0.96	4.36	47.27	52.85	2.50	115.6	57.5(49.34)	41.7(40.23)
Kashi Abhiman	78.95	27.80	73.60	0.91	4.28	54.25	46.27	2.53	120.2	57.8(49.52)	10.5(18.75)
NSC 620B	103.00	29.80	80.60	1.00	5.30	55.74	35.72	1.80	115.1	22.5(28.31)	32.5(34.76)
Lakshmi	90.35	22.20	63.80	0.90	5.95	69.85	48.95	3.24	123.6	0.00 (9.10)	0.00(9.10)
Sampurna	86.28	25.40	67.40	0.94	5.57	62.53	55.19	2.72	125.3	10.0(18.25)	0.00 (9.10)
Shivam	78.22	30.40	76.60	0.95	4.76	51.32	23.60	2.00	115.6	72.5(58.38)	18.2(25.22)
CD (0.05)	3.22	4.34	5.58	0.03	0.18	9.49	6.21	0.48	5.26	2.75	2.03

*Values in parenthesis are transformed

Table 2: Overall performance of hybrids for quality characters.

Hybrid	TSS (°B)	Vitamin C (mg/100g)	Lycopene (mg/100g)	Acidity (%)	Total Phenol (mg/100g)
Arka Samrat	4.62	20.43	6.13	0.59	2.48
Arka Rakshak	4.84	18.24	6.85	0.50	2.30
Arka Abhed	4.82	18.72	6.54	0.52	2.39
Arka Apeksha	5.12	20.67	7.40	0.37	2.63
COTH3	3.81	14.36	5.11	0.63	2.67
Kashi Abhiman	3.95	15.27	4.94	0.70	2.53
NSC 620B	4.00	16.90	6.15	0.45	2.25
Lakshmi	4.62	17.59	6.25	0.69	2.32
Sampurna	4.39	18.45	5.71	0.75	2.62
Shivam	4.20	14.36	6.36	0.53	2.27
CD(0.05)	0.34	1.35	0.56	0.06	0.23

Pericarp thickness (mm). High pericarp thickness of tomato is preferred in processing industries. Significant variation was observed for pericarp thickness among the evaluated hybrids. Pericarp thickness was highest in Arka Apeksha (6.94mm) and minimum in Kashi Abhiman (4.28 mm) which was on par with COTH3 (4.36 mm). Similar variation for pericarp thickness in tomato hybrids was reported. Fruits with high pericarp thickness are suitable for long distance transport and have long shelf life (Bhutani and Kalloo 1991).

Average fruit weight. Average fruit weight can affect the consumer preference and yield of a hybrid. Significant variation was observed among the hybrids for average fruit weight. It varied from 47.27 g to 97.56 g. Among the hybrids significantly high average fruit weight was recorded in Arka Abhed (97.56g) and Arka Samrat (89.69 g) and lowest average fruit weight was recorded by COTH3 (47.27g). This in confirmation with the findings of (Cheema *et al*., 2013; Ashok *et al*., 2020; Kumar *et al*., 2022; Basumatary *et al.,* 2022) for average fruit weight in Tomato.

Number of fruits per plant. Number of fruits per plant recorded significant difference among the hybrids. It varied from 23.60 to 55.19. Significantly high number of fruits per plant was recorded in hybrid Sampurna (55.19) which was on par with COTH3 (52.85). Lowest number of fruits per plant was recorded in Shivam (23.60). Similar variation in number of fruits per plant among hybrids of tomato was reported by (Ashok *et al*., 2020; Basumatary *et al*., 2022)

Fruit yield per plant. Fruit yield of a hybrid is the prime factor influencing adoption of a hybrid by farmers. Fruit yield per plant varied significantly among the evaluated hybrids. It ranged from 1.80 kg/plant to 3.24 kg/plant. Significantly high fruit yield per plant of 3.24 kg was recorded in Lakshmi. This was on par with Arka Samrat (2.97 kg/plant), Arka Rakshak (2.89 kg/plant), Arka Apeksha (2.77 kg/plant) and Arka Abhed (2.76 kg/plant). Lowest average fruit yield per plant was recorded in NSC 620B (1.80 kg/plant). Similar variation in yield of tomato hybrids under different environmental conditions were reported by (Ashok *et al*., 2020; Kumar *et al*., 2022; Basumatary *et al*., 2022; Singh *et al*., 2022).

Crop duration. Crop duration influence the harvest duration of the crop, increase in crop duration increases the number of harvests. Thereby improves the yield of hybrid. Significant difference was observed for crop duration among the hybrids It ranged from 115.10 days to 128.8 days. Longest duration was observed in the hybrid Arka Abhed (128.80days) Arka Apeksha (128.80 days) and Arka Samrat (125.60 days) which was on par with Arka Rakshak (125.30 days), Sampurna (125.3 days) and Lakshmi (123.6 days). Shortest duration was observed in NSC 620B (115.10 days).

Bacterial wilt and Tomato leaf curl virus incidence (ToLCV). Bacterial wilt disease incidence varied from 0.00 % (9.10) to 72.50% (58.38). Hybrid Shivam recorded the highest bacterial wilt incidence of 72.50% (58.38) and hybrids Lakshmi and Sampurna were completely free from bacterial wilt with zero per cent incidence.

Incidence of ToLCV varied from 0.00% to 41.70%. Tomato hybrids Sampurna, Arka Rakshak, Arka Samrat, Arka Apeksha, and Arka Abhed recorded zero (0.00%) incidence of ToLCV. Highest ToLCV incidence was observed in COTH3 (47.1% (40.23). Zero percent incidence in Sampurna, Arka Rakshak, Arka Samrat, Arka Apeksha, and Arka Abhed is attributed to the inherent resistance of these hybrids to Tomato Leaf Curl Virus.

Evaluation of hybrids for quality traits. Significant difference was observed among the hybrids for all quality traits studied. The data on the mean performance of hybrids for quality characters are presented in Table 2.

TSS (Total Soluble Solids). Analysis of variance revealed significant difference among the hybrids for Total Soluble Solids (TSS). It varied from 3.81°Brix to 5.12 °Brix. Arka Apeksha recorded significantly high TSS of 5.12°Brix which was on par with Arka Rakshak (4.84°Brix) and Arka Abhed (4.82°Brix). Minimum TSS was recorded in COTH3 (3.81°Brix). This is in accordance with (Chattopadhyay *et al*., 2013) who reported that the TSS of tomato hybrids varied from 3.7°B to 5.4°B. (Numah *et al*., 2018) also reported a TSS range of 2.7°B to 4.2°B for fresh tomatoes. TSS range of 4.08°B to 8.68°B was recorded in processing tomatoes by (Rodriguez *et al*., 1994).

Acidity. Tomato hybrids exhibited significant difference in the acid content of the fruits. It varied from 0.37% to 0.75%. Significantly high titrable acidity was recorded in Sampurna (0.75%) which was on par with Kashi Abhiman (0.70%). Fruits of Arka Apeksha recorded the lowest acidity (0.37%). This is in confirmation with findings of (Lambeth *et al*., 1966) who observed a range of 0.41 to 0.95% for acidity in tomato. Dhyani *et al*. (2018), also recorded similar variations for titrable acidity in tomato hybrids.

Vitamin C. Increase in vitamin C content enhances the nutritional quality of the hybrid. Significant variation was observed among the hybrids for vitamin C content. It varied from 14.36 mg/100g to 20.67mg/100g. (Toor and Savage, 2006) also reported similar range for vitamin C in tomato at the time of harvest. Arka Apeksha recorded highest vitamin C content of (20.67 mg/100g) among the evaluated hybrids which was on par with Arka Samrat (20.43 mg/100g). Lowest vitamin C content among the evaluated hybrid was recorded in COTH3 (14.36 mg/100g) and Shivam (14.36 mg/100g). Similar variation for vitamin C content of tomato hybrids were reported by (Sworo *et al*., 2021).

Lycopene. Red colour in tomato is imparted by carotenoid pigment lycopene. Wide variability was observed for lycopene content in tomato (Mangels *et al*., 1993). Significant variation was recorded among the hybrids for lycopene content. It varied from 4.94 to

7.40 mg/100g. Arka Apeksha recorded significantly high lycopene content of 7.40 mg/100g. Which was on par with Arka Rakshak (6.85mg/100g). Kashi Abhiman recorded lowest lycopene content (4.94 mg/100g) (Chattopadhyay *et al*., 2013) reported similar variations for lycopene content in tomato hybrids.

Total Phenol. Total phenol content varied significantly among evaluated hybrids. It was significantly high in COTH3 (2.67 mg/100g) which was on par with Arka Apeksha (2.63 mg/100g) and Sampurna (2.62 mg/100g). Lowest total phenol content was recorded in NSC 620B (2.25 mg/100g) which was on par with Shivam (2.27mg/100g) and Arka Rakshak (2.30mg/100g). This is in line with findings of Marsic *et al.*, (2011) for total phenol content in tomatoes grown in open field conditions.

To select superior hybrids among the evaluated hybrids a ranking was given to the evaluated hybrids based on a method suggested by (Arunachalam and Bandyopaddhyay, 1984). Yield and yield contributing traits such as fruit yield per plant, average fruit weight, number of fruits per plant, and crop duration were considered for ranking. The analysis revealed that hybrids Lakshmi, Arka Samrat and Arka Abhed performed superior among the evaluated hybrids for yield and yield contributing traits (Table 3).

Table 3: Ranking for selection of hybrids.

Hybrid	Average fruit weight (g)	Score	No. of fruits/plant	Score	Yield/plant (kg/plant)	score	Crop duration (Days)	Score	Total score	Ranking
Arka Samrat	89.69	0.20	35.37	0.78	2.97	0.50	125.6	0.33	1.81	2
Arka Rakshak	74.89	0.40	40.53	0.64	2.89	0.50	125.3	0.50	2.04	6
Arka Abhed	97.56	0.20	30.45	0.85	2.76	0.50	128.8	0.33	1.88	3
Arka Apeksha	78.84	0.40	37.06	0.71	2.77	0.50	128.8	0.33	1.94	4
COTH3	47.27	1.00	52.85	0.21	2.50	0.66	115.6	1.00	2.87	7
Kashi Abhiman	54.25	0.90	46.27	0.50	2.53	0.66	120.2	0.83	2.89	8
NSC 620B	55.74	0.90	35.72	0.78	1.80	1.00	115.1	1.00	3.68	9
Lakshmi	69.85	0.50	48.95	0.36	3.24	0.33	123.6	0.50	1.69	1
Sampurna	62.53	0.70	55.19	0.14	2.72	0.66	125.3	0.50	2.00	5
Shivam	51.32	1.00	23.60	1.00	2.00	1.00	115.6	1.00	4.00	10

Fig. 1. Lakshmi.

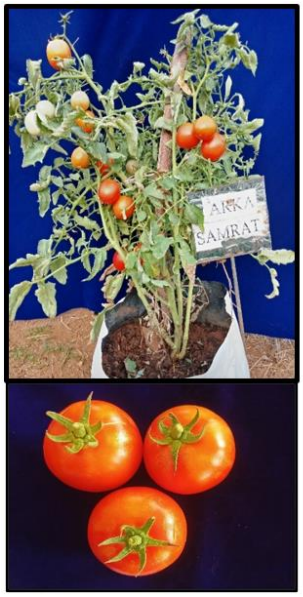

Fig. 2. Arka Samrat.

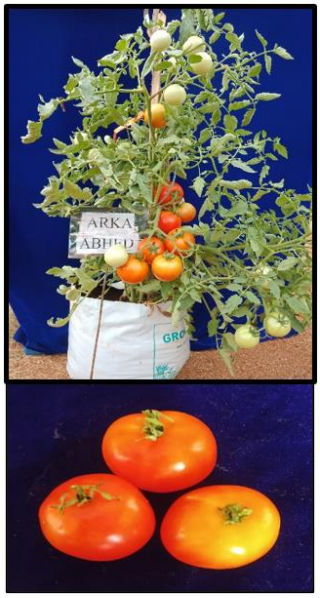

Fig. 3. Arka Abhed.

CONCLUSIONS

From the present study it can be concluded that among the evaluated ten hybrids Lakshmi (Fig. 1) Arka Samrat, (Fig. 2) and Arka Abhed (Fig. 3), performed better for yield and yield contributing traits and Arka Apeksha was superior to other hybrids for quality traits. Based on the overall performance of the hybrids Lakshmi, Arka Samrat and Arka Abhed is suitable for cultivation in the tropical humid climatic conditions of Kerala. These hybrids also recorded low incidence of Tomato leaf curl virus.

FUTURE SCOPE

The performance of the selected hybrids could be evaluated in different locations in the state and also in

different seasons for their yield stability. These hybrids can also be used as scions in grafting studies.

REFERENCES

APEDA [Agricultural and Processed Food Products Export Development Authority]. (2022). Indian Production of tomato [on-line].

Arunachalam, V. and Bandyopadhyay. A (1984). A method to make decisions jointly on a number of dependent characters. *Indian Journal of Genetics and Plant Breeding, 44*(3), 419-424.

Ashok, A. D., Kayalvizhi, K. and Ravivarman, J. (2020). Functional performances of tomato hybrids under polyhouse conditions at Tiruchirappalli, Tamil Nadu. *International Journal of Chemical Studies, 8*(4), 1664-1666.

Athulya, M. P. and Anitha, P. (2022). Genetic Diversity and Morphological characterization in Tomato (*Solanum lycopersicum*). *Biological Forum – An International Journal*, *14*(2), 806-811.

Basumatary, P., Dutta, S., Bhuyan, M. K. and Neog, M. (2022). Evaluation of tomato hybrids for yield and attributing traits under agroclimatic conditions of Kokrajhar district, Assam. *Indian Journal of Hill Farming, 35*, 129-133.

Bamaniya, B., Ali, A., Ramgiri, S. R., Shrivastava, A. and Bain, R. P. (2019). Performance of Tomato Hybrids for Growth, Yield and Quality under Western Track of Vindhyan Plateau of Madhya Pradesh, India. *International Journal of Current Microbiology and Applied Science, 8*(12), 2226-2232.

Bhutani, R. D. and Kalloo, G. (1991). Inheritance studies of locule number in tomato. *Haryana Journal of Horticultural Science, 20*, 119-124.

Chattopadhyay, A., Chakraborty, I. V. I. and Siddique, W. (2013). Characterization of Determinate Tomato Hybrids: Search for Better Processing Qualities. *Journal of Food Processing Technology*, *4*, 4.

Cheema, D. S., Singh, N., and Jindal, S. K. (2013). Evaluation of indeterminate tomato hybrids for fruit, yield and quality traits under net house and open field conditions. *Vegetable Science, 40*(1), 45-49.

Dhaliwal, M. S. (1986). Heterosis breeding in tomato. Theory and practice. *Seeds and Farms*, *3*(12), 37-39.

Dhyani, S., Misra, A. C. and Verma, P. (2018). Assessment of tomato hybrids for fruit quality and yield characters in the hill regions of Uttarakhand. *International Journal of Science and Research, 7*(9), 691-695.

Islam, M. R., Ahmad, S. and Rahman, M. M. (2012). Heterosis and qualitative attributes in winter tomato (*Solanum lycopersicum* L.) Hybrids. *Bangladesh Journal of Agricultural Research*, *37*(1), 39-48.

Kumar, M., Chaudhary, V., Dwivedi, P. K., Dubey, S., Raghav, R. S., Suryawansi, A. K. and Singh, A. K. (2022). Evaluation of Tomato varieties for growth and yield components in Madhya Pradesh. *Ecology Environment & Conservation, 28*(4), 1984-1986.

Kumar Ch, D. H., Naidu L. N., Babu M. R., Rajani, A., Gopal, K. and Rao M. P. (2023). Per se Performance of Hybrids and Parents for various Growth and Yield characteristics in Tomato (*Solanum lycopersicon* L.). *Biological Forum – An International Journal, 15*(10), 1167-1169.

Lambeth, V. N., Stratenand, E. F. and Fields, M. L. (1966). Fruit quality attributes of 250 foreign and domestic tomato accessions. *Research Bulletin Agriculture Experiment Station University of Mossuri* No. 908.

Malathi, G., Vijayakumar, M., Kohila, P., Malarkodi, M. and Sukanyakanna, S. (2021). Assessment of *per se* performance of tomato (*Solanum lycopersicum* L.) hybrids TNAU Tomato Hybrid CO_4 and Arka Vishesh in Salem District of Tamil Nadu. *International. Advanced Research Journal in Science Engineering and Technology*, *8*(8), 483-487.

Mangels, A. R., Holden, J. M., Beecher, G. R., Forman, M. R. and Lanza, E. (1993) Carotenoid content of fruits and vegetables: an evaluation of analytic data. *Journal of American Dietic Association, 93*, 284-296.

Marsic, N. K., Gasperlin, L., Abram, V., Budic, M., and Vidrih, R. (2011). Quality parameters and total phenolic content in tomato fruits regarding cultivar and microclimatic conditions. *Turkish Journal of Agriculture and Forestry, 35*, 185-194.

Muna, S., Mallick, B. and Taria, B. (2019). Performance of Kharif hybrid tomato varieties in plateau agro-ecosystems of Odisha. *e-planet, 17*(2), 123-126.

Nuamah, A. F., Hussein, Y. A. and Ackun, A. (2018). Biochemical properties of six varieties of tomato From Brong Ahafo region of Ghana as influenced by the ripening condition and drying. *African. Journal of Food Agriculture Nutrition and Development, 18*(1), 13095-13109.

Palop, S., Ozdikicierler, O., Kostekli, M., Escriva, M., Esteve, M. J. and Frigola, A. (2010). Ascorbic acid in tomatoes during refrigeration storage with absorbing sheet of ethylene. *International Conference on Food Innovation*, 25-29 de Octubre. Universidad Politecnica de Valencia pp: 1-4.

Pedro, A. M. K. and Ferreira, M. M. C. (2007) simultaneously calibrating solids, sugars and acidity of tomato products using PLS2 and NIR spectroscopy. *Analytica Chimica Acta*, *595*, 221.

Rodriguez, A., Leoni, S., Bussieres, P., Dadomo, M., Christou, M., Macua, I. J. and Cornillon, P. (1994). The influence of water and nitrogen levels on the quality of the processing tomato grown in the European Union countries. *Acta Horticulturae*, *376*, 275–278.

Sepatale, F. E., Murillo, J., Vazquez, D. V., Cacchiarelli, P., Rodríguez, G. R. and Tapia, E. (2020). *LocAnalyzer*: A computer vision method to count locules in tomato fruits. *Computers and Electronics in Agriculture, 173*, 105382.

Singh, N., Ram, C. N., Singh, V. and Yadav, G. C. (2022). Analyzing the yield and attributional Features of the F1 hybrids produced by the parental lines and their tomato-producing parents (*Solanum lycopersicon* L.). *Biological Forum – An International Journal*, *14*(2a), 302-310.

Tieman, D., Bliss, P., McIntyre, L., Blandon-Ubeda, A., Bies, D., Odabasi, A., Rodríguez, G., van der Knaap, E., Taylor, M., Goulet, C., Mageroy, M., Snyder, D., Colquhoun, T., Moskowitz, H., Clark, D., Sims, C., Bartoshuk, L. and Klee, H. (2012). The chemical interactions underlying tomato flavor preferences. *Current Biology, 22*(11), 1035–1039.

Toor, R. K. and Savage, G. P. (2006). Changes in major antioxidant components of tomatoes during post-harvest storage. *Food Chemistry*, *99*, 724–727.

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