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Characterization of Climate Resilient Juicy Traditional Mango (Mangifera indica) Varieties

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ABSTRACT

Mango's flowering and fruit set are highly dependent on climatic conditions prevailing in a that particular area. Recently climate change studies have become increasingly important for understanding the flowering of mango under different climatic conditions. Many traditional mango cultivars are seemed to resist the change in climatic situations. Most of the introduced varieties and hybrids are not performing well under changed climatic situations and also highly susceptible to pests and diseases. Hence, a study was conducted at the Farming Systems Research Station, Sadanandapuram, Kerala Agricultural University with an objective of identifying, characterization and evaluation of climate resilient mango varieties from Southern Kerala. Twenty five juicy type traditional mangoes were identified during the study. Fruit weight of these mangoes varied from 93g to 552g, number of fruits varied from 100 to 1500 numbers. Highest TSS (26.20^0 brix) was reported from accession PTA-1 and lowest acidity of 0.306 % was reported from KLM-10. Highest carotenoid content of 5.21 mg/100g was reported from KLM- 5, highest ascorbic acid content of 28.21 mg/100g was reported from KLM-1. The study also revealed that highest total sugar content of 16.01 % was reported from KLM-1.

Key Words: Characterization, Climate, Juicy, Mango, Resilience, Traditional.

INTRODUCTION

Mango is one of the most popular fruit crops of Kerala. Its flowering and fruit set are highly dependent on climatic conditions prevailing in that area. Recently climate change studies have become increasingly important for understanding the flowering of mango under different climatic conditions (Bhalekar *et al*, 2016). Air temperature and rainfall influence vegetative and phenological phases in mango and are two of the most important factors determining suitability of an area's climate for mango production. Varietal responses to the environment within and between mango cultivars account for their relative performance at different locations (Bora *et al*, 2019). Thus, phenological patterns are strongly under environmental control in mango. Visualizing the potentiality of rich genetic diversity of mango, effort should be made to collect and evaluate these elite traditional genotypes from selected homesteads, which are tolerant to climate changes. Hence, evaluation of mango varieties for climate resilience will be a boon to the farmers. The seasonal cyclic changes of growth in shoot, root, flower, fruit and their development of mango depends on cultivars and climatic conditions (Whiley *et al*, 2019). Unpredictable rains and flooding during pre-flowering and flowering periods may cause poor fruit set and low pollinator activities.

In the changing climatic scenario, a major portion of the harvest may be wiped out by heavy rains during later fruit development stage in mango. Changes in rainfall patterns can adversely affect the quality and appearance of ripe mango fruits (Krishnamoorthy and Noorjehan, 2015). Unseasonal rains encourage pests, which also lowers fruit yield. Anthracnose can become a serious problem

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for mango cultivation in humid, high rainfall environments. Very little work has been done so far to examine the effects of climate change on fruits in terms of yield, quality, pest and disease incidence. Two of the most important factors determining suitability of an area's climate for mango are air temperature and rainfall. The sequence of phenological changes is either advanced or retarded with the rise and fall in temperature and the onset of wet and dry seasons. However, a few varieties are still existing in some homesteads are found resistant to abiotic stresses.

Most of the introduced varieties and hybrids are not performing well under changed climatic situations and also highly susceptible to pests and diseases (Samanta *et al*, 2018). Many traditional mango cultivars are seemed to resist the change in climatic situations. Most of them are in the verge of extinction. There is an urgent need to conserve these traditional mango varieties. Concerted efforts should be employed for long-term safeguarding and conservation of the valuable mango genetic resources (Subedi *et al*, 2015). Hence, the present study is conducted with an objective of identifying, characterization and evaluation of climate resilient mango varieties from Southern Kerala.

MATERIALS AND METHODS

A random survey was conducted to locate the indigenous/native mango varieties in different parts of Kollam, Thiruvananthapuram, Pathanamthitta and Alapuzha districts. Data collection and field visits of farmers having traditional mango varieties was conducted in these districts. Elite traditional mango trees which wer superior with respect to important economic characters like yield, fruit size, organoleptic qualities, regularity in bearing, offseason bearing, pest and disease resistance even under changed climatic scenario of Kerala were selected. Effect of changed climate on performance of traditional mango varieties of South Kerala was noted.

For the study descriptive characters of leaf, inflorescence, fruit and stone were recorded as per IPGRI descriptor. Quantitative characters like leaf length, leaf width, petiole length, inflorescence length, inflorescence width, fruit length, fruit width, fruit weight, fruit volume was noted. Quality characters like acidity, ascorbic acid content, total carotenoids, total soluble solids, total sugar and reducing sugar and crude fibre content were studied. The selected traditional mango varieties were characterized based on morphological markers. Physiological changes during different phenophases were conducted. Abiotic stress tolerant studies were also carried out.

RESULTS AND DISCUSSION

It was seen that (Table.1) the fruit weight ranges from 93 g (KLM-3) to 552 g (KLM 7), fruit length varied from 9.0 cm (KLM 15) to 14.2 cm (KLM 1), fruit width varied from 7.3 cm (PTA 1) to 12cm (KLM 1), fruit diameter varied from 23.30 cm (PTA 1) to 30.00 cm (ALA 4), fruit volume varied from 309 cc (KLM 15) to 550.00 cc (KLM 1), pulp weight varied from 218.00 g (KLM 15) to 407.00g (ALA 5), peel weight varied from 18.28 g (PTA 1) to 72.67 g (KLM 8).

Results of the experiment (Table.2) showed that fruit weight from different accessions of climate resilient traditional mango varieties varies from 93.0 g (KLM 3) to 552.0 g (KLM 7), number of fruits per tree varies from 100.0 (KLM 4) to 1500 (KLM 12), yield per tree varies from 10.7 Kg (KLM 4) to 275.25 kg (ALA 1). Overall acceptability of these juicy type traditional mangoes based of organoleptic analysis, varies from lowest score of 6 (KLM 4) to highest score of 9 (KLM 5) and (PTA 2).

The study of fruit quality characters showed significant difference among different accessions (Table 3). TSS value varied from 12 ^{0} Brix (ALA 5) to (PTA 1) 26.2^0 Brix, acidity varied from 0.306 % (KLM 10) to 1.5 % (PTA 2 and ALA 2). Carotenoid content varied from 1.12 mg 100/ g^1 (KLM 12) to

Table 1. Fruit characters of juicy type traditional mangoes.

Acc. No.	Fruit Weight (g)	Fruit Length (cm)	Fruit width (cm)	Fruit diameter (cm)	Fruit volume (cc)	Pulp weight (g)	Peel weight (g)
KLM1	120.00	14.20	12.00	26.00	550.00	340.17	38.93
KLM 2	150.00	13.00	9.50	26.00	350.00	319.00	40.00
KLM 3	93.00	11.00	8.00	25.50	300.67	247.00	35.00
KLM 4	107.00	13.50	10.00	29.33	520.00	350.00	69.00
KLM 5	155.00	11.00	10.00	26.00	381.00	293.00	49.00
KLM 6	210.00	10.50	8.50	24.00	320.00	198.00	42.00
KLM 7	552.00	12.00	10.50	27.00	440.00	320.00	62.00
KLM 8	126.00	11.00	8.50	25.60	320.00	238.00	72.67
KLM9	180.00	10.30	8.80	25.50	350.00	256.33	38.07
KLM 10	280.00	12.00	9.20	26.00	410.00	330.00	38.17
KLM 11	283.00	11.50	9.00	27.00	391.67	310.00	38.00
KLM 12	115.00	11.00	7.90	24.00	320.00	261.00	29.00
KLM 13	193.00	10.00	8.40	26.47	318.33	242.00	42.00
KLM 14	130.00	12.00	9.20	29.17	475.33	396.00	46.00
KLM 15	210.00	9.00	9.00	27.00	309.00	218.00	27.00
ALA 1	384.00	11.50	8.60	25.67	400.00	307.00	46.00
ALA 2	367.00	10.00	10.00	26.80	375.00	284.00	44.00
ALA 3	342.00	10.50	8.47	24.80	319.00	250.00	31.07
ALA 4	488.00	12.80	10.50	30.00	500.00	390.00	50.00
ALA 5	490.00	12.50	10.43	29.50	486.00	407.00	52.00
ALA 17	413.00	11.50	9.27	27.00	420.00	327.00	37.67
ALA 26	370.00	11.00	9.00	27.00	369.00	310.00	34.00
PTA1	403.00	9.80	7.30	23.30	390.00	357.00	18.28
PTA 2	433.00	13.00	9.00	26.00	420.00	330.00	40.00
TVM 10	430.00	12.00	9.50	28.50	460.00	335.00	38.00
CD (0.05)	22.34	1.32	1.64	2.08	23.52	16.62	4.22

5.21 mg 100/g (KLM -5), ascorbic acid varied from 10.60 mg 100/ g (TVM 10 and ALA 3) to 28.21 mg 100/g (KLM 1), total sugar content varied from 7.82 % (KLM 14) to 16.01 % (KLM 1), reducing sugar content varied from 1.30 % (ALA 17) to 4.9 % (KLM 1), non reducing sugar content varied from 4.02 %(KLM 3) to 12.16% (KLM 13 and PTA 1).

CONCLUSION

The climate and weather play critical roles in the economic success or failure of tropical fruit tree species including commercial mango production. Climate-related changes have already brought widespread changes in flowering and fruiting patterns of mango. This is adversely affecting fruit production in some areas. The study on climate

Table 2. Yield characters of juicy type traditional mangoes.

Acc no.	Fruit Weight (g)	Number of fruits	Yield per tree (Kg)	Overall acceptability (organoleptic)
KLM1	120.00	200	24.00	8
KLM 2	150.00	350	52.50	8
KLM 3	93.00	500	46.50	8
KLM 4	107.00	100	10.70	6
KLM 5	155.00	250	38.75	9
KLM 6	210.00	300	63.00	7
KLM 7	552.00	450	248.40	7
KLM 8	126.00	300	37.80	8
KLM9	180.00	250	45.00	8
KLM 10	280.00	600	168.00	8
KLM 11	283.00	500	141.50	8
KLM 12	115.00	1500	172.50	7
KLM 13	193.00	750	144.75	8
KLM 14	130.00	930	120.90	8
KLM 15	210.00	800	168.00	8
ALA 1	384.00	750	275.25	8
ALA 2	367.00	200	68.40	7
ALA 3	342.00	250	122.00	7
ALA 4	488.00	200	98.00	8
ALA 5	490.00	600	247.80	8
ALA 17	413.00	450	166.50	8
ALA 26	370.00	350	151.55	8
PTA1	403.00	250	107.50	7
PTA 2	433.00	300	95.19	9
TVM 10	430.00	350	168.00	7
CD(0.05)	32.50	58.74	22.42	1.04

resilient juicy type mangoes revealed that fruit weight of the selected mangoes varied from 93g to 552g. Highest TSS (26.20^0 brix) was reported from accession PTA 1 and lowest acidity of 0.306 % was reported from KLM 10. Highest carotenoid content of 5.21 mg/100g was reported from KLM 5, highest ascorbic acid content of 28.21 mg/100g was reported from KLM 1. The study also revealed that highest total sugar content of 16.01 % was reported from KLM1.

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Table 3. Fruit quality analysis of juicy type traditional mangoes.

Acc no.	TSS (◦brix)	Acidity (%)	Carotenoid (mg/ 100 g)	Ascorbic Acid (mg/ 100g)	Total Sugar (%)	Reducing Sugar (%)	Non Reducing Sugar (%)
KLM1	16.00	0.420	1.40	28.21	16.01	4.90	11.00
KLM 2	17.00	0.320	4.91	24.00	7.90	1.60	6.38
KLM 3	15.0	0.320	2.27	15.00	8.31	4.13	4.02
KLM 4	13.00	0.640	4.20	15.00	9.22	3.00	6.30
KLM 5	21.00	0.640	5.21	15.20	14.20	3.03	11.06
KLM 6	19.00	1.900	2.26	15.00	10.40	2.50	8.00
KLM 7	18.00	0.960	3.00	30.00	8.21	2.27	5.83
KLM 8	14.00	0.640	2.04	24.00	13.27	3.60	9.43
KLM9	20.00	0.640	3.15	17.01	8.29	3.00	5.29
KLM 10	15.00	0.306	3.36	24.00	13.02	2.94	9.97
KLM 11	19.00	0.640	3.20	12.00	14.70	2.96	11.51
KLM 12	16.00	0.320	1.12	17.05	8.06	1.78	6.19
KLM 13	18.00	0.627	2.91	24.00	13.95	2.00	12.16
KLM 14	12.00	1.433	1.88	16.54	7.82	1.90	5.91
KLM 15	20.00	0.600	1.55	13.98	8.44	3.28	5.16
ALA 1	19.00	0.627	2.54	18.00	10.00	2.63	6.38
ALA 2	16.00	1.500	2.20	17.38	12.55	2.77	9.72
ALA 3	13.00	0.640	2.59	10.60	9.92	2.77	6.99
ALA 4	19.00	0.320	2.65	13.32	12.91	3.57	9.23
ALA 5	12.00	1.227	2.01	17.33	9.02	1.42	8.52
ALA 17	15.00	1.493	2.32	12.87	8.60	1.30	7.28
ALA 26	17.00	0.943	3.20	12.00	15.64	3.50	12.00
PTA1	26.20	0.627	2.91	24.00	13.95	2.00	12.16
PTA 2	17.00	1.500	2.20	17.38	12.55	2.77	9.72
TVM 10	17.00	0.640	2.59	10.60	9.92	2.77	6.99
CD (0.05)	1.14	0.166	0.26	2.42	2.86	0.24	2.06

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