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Quality assessment of different muskmelon genotypes (*Cucumis melo* L.) by chemical and organoleptic analysis

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Abstract
An experiment was carried out to study quality assessment of different muskmelon genotypes (*Cucumis melo* L.) by chemical and organoleptic analysis. The findings indicate that the genotypes RHRMM-3 (13.32 ^{0}Brix), RHRMM-52 (13.13 ^{0}Brix) and RHRMM-90 (12.77 ^{0}Brix) recorded maximum total soluble solids. The genotype RHRMM-3 (11.73%), RHRMM-52 (11.44%) and RHRMM-90 (10.65%) measured higher total sugars. The genotype RHRMM-3 (0.06%), RHRMM-52 (0.08%) and RHRMM-64 (0.09%) recorded low titratable acidity. The genotype RHRMM-3 (9.59%), RHRMM-15 (9.28%) and RHRMM-52 (9.27%) registered high reducing sugar. The genotype RHRMM-92 (2.40%), RHRMM-76 (2.13%) and RHRMM-38 (2.07%) registered high non-reducing sugar during all four environments.
The highest rating for the general appearance of the fruit was recorded in the genotypes RHRMM-8 (8.75), RHRMM-3 (8.73) and RHRMM-15 (8.72). The genotype, RHRMM-3 (8.96), RHRMM-15 (8.95) and RHRMM-64 (8.94) recorded highest rating to flavour. The highest sweetness rating was observed in the RHRMM-3 (8.97), RHRMM-64 (8.87) and RHRMM-76 (8.84). The highest aroma rating was recorded in the genotype RHRMM-3 (8.94), RHRMM-64 (8.91) and RHRMM-8 (8.84). Highest rating to overall acceptability was observed in RHRMM-3 (8.91), RHRMM-64 (8.87) and RHRMM-8 (8.80) based on rating developed through organoleptic test.

Keywords: Muskmelon, biochemical, genotypes, sensory, TSS, total sugars

Introduction

Muskmelon botanically known as *Cucumis melo*. is a species of melon, that belongs to the family cucurbitaceae. It is one of the most demanding cucurbit. A popular and commercial crop in the tropics and subtropics, muskmelon is a stunning, juicy, delectable fruit that is grown all over the world for its nutritional and therapeutic qualities. This species is frequently known as cantaloupe, muskmelon, casaba, sweet melon and melon (Nayar and Singh, 1998) [18]. Although its exact origin is up for debate, most experts agree that melon originated in Africa. Although it favours hot climates, it grows well in all tropical and subtropical regions of the world (Kerge and Grum, 2000) [5]. It contain many vernacular names, like “Kharbooz” (Hindi), “Kharbuz” (Punjabi), “Sakkatoli” (Gujarati), “Kalinga” (Sanskrit), ‘Velapalam’ (Tamil) and ‘Kekkari kai’ (Kannada). The main areas under muskmelon cultivation in India are riverbeds of Jamuna, Ganges, Narmada rivers in the north and Pennar, Kaveri, Krishna and Godavari rivers in the south (Singh, 1998) [8]. The leading muskmelon-producing states include Punjab, Madhya Pradesh, Rajasthan, Haryana, and Uttar Pradesh. The cultivation of muskmelon is favoured in warm and semi-arid conditions, as the plant thrives in well-drained sandy loam soils with a pH range of 6.0 to 7.5. It contains vitamin A, B, C and minerals like magnesium, sodium and potassium.

On an average, muskmelon fruit pulp contains 5.6 to 36 µg/g of β-carotene in fresh fruit pulp. It also provides 42.2 mg of ascorbic acid per 100 g of its edible portion, which supports a healthy immune system, helps fight bacterial infections, and aids in the prevention of cardiovascular diseases. Besides, melon fruit also possesses carbohydrates (8.36 g), proteins (0.88 g), water (89.7 g), dietary fiber (0.8 g), sugar and essential mineral salts. Its seeds are edible and greatly nutritious contain crude protein (34.4%) and oil (40-44%) which is valuable for painful discharge and suppression of urine (Shashikumar and Pitchaimuthu, 2016) [15].

Quality (high TSS and low acidity) of the muskmelon fruit is more important than yield for the local markets and export purpose. Therefore present experiment was carried out for the quality assessment of muskmelon fruits with regard to consumer preference.

Materials and Methods

The present experiment consists of 41 genotypes and one check of muskmelon. The plants were grown in three replications with spacing of 2 m x 60 cm over the four seasons *viz*., 2 February 2022 (summer season), 8 November 2022 (*rabi* season), 10 February 2023 (summer season) and 27 October 2023 (*rabi* season) in a Randomized Block Design with three replications at AICRP on vegetable crops, Department of Horticulture, MPKV,. Rahuri. A successful crop was raised by adhering to advised cultural customs. Five plants were randomly selected from each entry in each replication and observations recorded on quality traits through chemical analysis (Titratable acidity, total soluble solids, total sugar, reducing sugar and non-reducing sugar) and sensory score card (general appearance of fruit, flavour, sweetness, aroma and overall acceptability). The Mean values of the data recorded were analysed statistically adopting the method suggested by (Panse and Sukhatme, 1985) [11].

Results and Discussion

Biochemical parameters

Total soluble solids (^{0}Brix)

From the data presented in the Table. 1. It is seen that the range of variation for total soluble solids among the varieties was from 6.53 to 14.01^{0}Brix in E_1, 5.98 to 12.66 ^{0}Brix in E_2, 6.48 to 14.06 ^{0}Brix in E_3, 5.34 to 12.57 ^{0}Brix in E_4 and 6.25 to 13.32 ^{0}Brix in average mean respectively.

Among the different environments, genotype RHRMM-3 (14.01^{0}Brix) recorded significantly high total soluble solids in E_l which were at par with genotype RHRMM-52 (13.84 ^{0}Brix). In E_2, significantly higher total soluble solids were recorded by the genotypes RHRMM-3(12.66 ^{0}Brix) which were at par with genotypes RHRMM-52 (12.59 ^{0}Brix) and RHRMM-90 (12.24 ^{0}Brix).

In E_3, genotype namely RHRMM-3 (14.06 ^{0}Brix) recorded significantly high total soluble solids which were at par with genotypes RHRMM-52 (13.69 ^{0}Brix), RHRMM-90 (13.35 ^{0}Brix), RHRMM-15 (12.95 ^{0}Brix), RHRMM-76 (12.91 ^{0}Brix), RHRMM-64 (12.81 ^{0}Brix) and RHRMM-56 (12.61 ^{0}Brix). In E_4, significantly the maximum total soluble solids were recorded by the genotype RHRMM-3 (12.57 ^{0}Brix) which was at par with genotype RHRMM-52 (12.41 ^{0}Brix). However, genotype RHRMM-3 (13.32 ^{0}Brix) recorded significantly high total soluble solids which were on par with genotypes RHRMM-52 (13.13 ^{0}Brix) and RHRMM-90 (12.77 ^{0}Brix) in average mean.

The minimum total soluble solids was recorded by the genotype RHRMM-67 in E_l (6.53 ^{0}Brix), genotype RHRMM-125 in E_2 (6.11 ^{0}Brix), genotype RHRMM-67 in E_3 (6.48 ^{0}Brix), genotype RHRMM-17 in E_4 (5.34 ^{0}Brix) and genotype RHRMM-67 (6.25 ^{0}Brix) in average mean.

In muskmelon, Total Soluble Solids (TSS) is a key trait that influences both fruit quality and consumer preference. TSS reflects the concentration of sugars, including the reducing sugar fructose and glucose, as well as the non-reducing sugar sucrose. Higher value of TSS in muskmelon is a desirable character since it contributes to sweetness this result confirmation with the studies conducted by Rastogi and Abidi (2006) [12], Pandey *et al*. (2008) [10], Ohashi *et al*. (2009) [9], Begum *et al*. (2010) [1], Reddy *et al*. (2016) [21], Venkatesan *et al*. (2016) [21], Kaur *et al*. (2017) [4] and Indraja *et al*. (2021) [3] in muskmelon.

Table 1: Mean performance of muskmelon genotypes for Total soluble solids (^{0}Brix)

Sr. No.	Genotypes	Total soluble solids (^{0}Brix)				
		E_1	E_2	E_3	E_4	Mean
1.	RHRMM-1	7.69	6.49	7.48	6.45	7.03
2.	RHRMM-2	7.65	7.18	7.59	7.02	7.36
3.	RHRMM-3	14.01	12.66	14.06	12.57	13.32
4.	RHRMM-4	11.85	10.31	11.79	10.28	11.06
5.	RHRMM-8	11.23	10.26	11.01	10.29	10.70
6.	RHRMM-12	8.18	7.20	8.19	7.14	7.68
7.	RHRMM-15	12.97	11.36	12.95	11.22	12.13
8.	RHRMM-16	10.86	10.09	10.84	10.01	10.45
9	RHRMM-17	7.78	6.38	7.39	5.34	6.72
10.	RHRMM-18	6.63	6.89	6.78	6.79	6.77
11.	RHRMM-22	8.99	7.14	9.05	7.12	8.08
12.	RHRMM-23	10.83	9.86	10.88	9.81	10.35
13.	RHRMM-27	7.41	6.58	7.23	6.52	6.94
14.	RHRMM-28	7.95	6.54	7.85	6.48	7.21
15.	RHRMM-34	10.96	10.15	11.02	10.19	10.58
16.	RHRMM-35	7.68	6.84	7.58	6.76	7.22
17.	RHRMM-38	9.88	8.52	9.79	8.49	9.17
18.	RHRMM-39	9.77	8.24	9.76	8.21	8.99
19.	RHRMM-41	10.68	9.45	10.61	9.41	10.04
20.	RHRMM-46	9.64	9.26	9.66	9.22	9.44
21.	RHRMM-49	9.60	8.28	9.61	8.21	8.93
22.	RHRMM-52	13.84	12.59	13.69	12.41	13.13
23.	RHRMM-53	9.35	6.19	9.28	6.18	7.75
24.	RHRMM-54	11.35	9.31	11.36	9.33	10.33
25.	RHRMM-56	12.63	10.88	12.61	10.79	11.73
26.	RHRMM-64	12.87	11.49	12.81	11.48	12.41
27.	RHRMM-67	6.53	5.98	6.48	6.01	6.25
28.	RHRMM-71	9.97	8.41	9.99	8.38	9.19
29.	RHRMM-76	12.96	11.26	12.91	11.24	12.09
30.	RHRMM-80	9.64	7.47	9.62	7.45	8.55
31.	RHRMM-81	8.96	6.15	8.87	6.17	7.54
32.	RHRMM-83	7.96	6.37	7.95	6.29	7.14
33.	RHRMM-90	13.39	12.24	13.35	12.10	12.77
34.	RHRMM-91	7.79	6.89	7.73	6.84	7.31
35.	RHRMM-92	9.70	8.29	9.71	8.14	8.96
36.	RHRMM-121	8.65	7.18	8.60	7.10	7.88
37.	RHRMM-125	7.66	6.11	7.68	6.14	6.90
38.	RHRMM-127	6.96	6.08	6.79	5.98	6.45
39.	RHRMM-129	8.14	6.84	8.11	6.85	7.49
40.	RHRMM-133	12.54	10.91	12.57	10.87	11.72
41.	Check	12.23	11.43	12.07	11.58	11.83
	Mean	9.86	8.56	9.81	8.48	9.17
	S.E.±	0.21	0.16	0.49	0.15	0.25
	C.D.at 5%	0.61	0.46	1.47	0.45	0.71
	C.D.at 1%	0.80	0.61	1.95	0.60	
	C.V.	3.78	3.31	9.22	3.27	

Titratable acidity (%)

From the data presented in the Table 2. It is seen that the range of variation for titratable acidity among the varieties was from 0.06 to 0.36% in E_1, 0.07 to 0.37% in E_2, 0.05 to 0.35% in E_3, 0.08 to 0.36% in E_4 and 0.06 to 0.36% in average mean, respectively.

Among the different environments, genotype RHRMM-3 (0.06%) recorded significantly low titratable acidity in E_l which were at par with genotypes RHRMM-52 (0.07%), RHRMM-90 (0.08%), RHRMM-64 (0.08%), RHRMM-15

(0.09%), RHRMM-76 (0.09%), RHRMM-8 (0.10%), Rasila Sunhari-2 (C) (0.10%), RHRMM-56 (0.11%),RHRMM-34 (0.12%), RHRMM-4 (0.13%), RHRMM-16 (0.13%), RHRMM-46 (0.14%), RHRMM-133 (0.14%) and RHRMM-23 (0.15%).

In E_2, significantly low titratable acidity was recorded by the genotype RHRMM-3 (0.07%) which were at par with genotypes RHRMM-64 (0.09%), RHRMM-52 (0.09%), RHRMM-15 (0.11%), RHRMM-76 (0.11%), RHRMM-90 (0.10%), RHRMM-133 (0.11%), RHRMM-8 (0.12%), RHRMM-56 (0.13%), Rasila Sunhari-2 (C) (0.13%), RHRMM-4 (0.15%), RHRMM-34 (0.15%), RHRMM-16 (0.16%), RHRMM-23 (0.17%) and RHRMM-46 (0.17%). In E_3, genotype namely RHRMM-3 (0.05%) recorded significantly low acidity RHRMM-64 (0.07%), RHRMM-52 (0.08%), RHRMM-56 (0.09%), RHRMM-90 (0.09%), RHRMM-76 (0.10%), RHRMM-8 (0.11%), RHRMM-15 (0.10%), RHRMM-4 (0.12%), RHRMM-34 (0.13%), Rasila Sunhari-2 (0.12%), RHRMM-133 (0.13%), RHRMM-16 (0.14%) and RHRMM-23 (0.14%).

In E_4, significantly low titratable acidity was recorded by the genotype RHRMM-3 (0.08%) which were at par with genotypes RHRMM-52 (0.09%), RHRMM-56 (0.10%), RHRMM-90 (0.11%), RHRMM-64 (0.11%), RHRMM-15 (0.12%), RHRMM-76 (0.12%), RHRMM-4 (0.14%), RHRMM-8 (0.14%), Rasila Sunhari-2 (0.14%), RHRMM-133 (0.15%), RHRMM-34 (0.15%), RHRMM-46 (0.16%), RHRMM-54 (0.16%) and RHRMM-16 (0.17%).

Table 2: Mean performance of muskmelon genotypes for Titratable acidity (%) and Total sugar (%)

Sr. No.	Genotypes	Titratable acidity (%)					Total Sugar (%)				
		E_1	E_2	E_3	E_4	Mean	E_1	E_2	E_3	E_4	Mean
1.	RHRMM-1	0.25	0.26	0.26	0.28	0.26	6.58	4.92	6.32	4.87	5.67
2.	RHRMM-2	0.30	0.33	0.31	0.32	0.31	5.02	4.71	4.98	3.89	4.65
3.	RHRMM-3	0.06	0.07	0.05	0.08	0.06	12.19	11.40	12.03	11.32	11.73
4.	RHRMM-4	0.13	0.15	0.12	0.14	0.13	9.59	8.44	9.51	8.38	8.98
5.	RHRMM-8	0.10	0.12	0.11	0.14	0.12	9.91	9.20	9.96	9.11	9.55
6.	RHRMM-12	0.28	0.27	0.26	0.27	0.27	6.26	5.74	6.31	5.69	6.00
7.	RHRMM-15	0.09	0.11	0.10	0.12	0.10	11.78	9.91	11.69	9.03	10.60
8.	RHRMM-16	0.13	0.16	0.14	0.17	0.15	9.91	8.99	9.87	8.94	9.43
9	RHRMM-17	0.32	0.34	0.33	0.35	0.33	5.78	3.82	5.24	3.75	4.65
10.	RHRMM-18	0.30	0.33	0.32	0.34	0.32	5.51	4.90	5.44	4.85	5.18
11.	RHRMM-22	0.23	0.26	0.25	0.26	0.24	7.71	6.12	7.84	6.09	6.94
12.	RHRMM-23	0.15	0.17	0.14	0.16	0.15	8.88	6.85	8.91	6.72	7.84
13.	RHRMM-27	0.32	0.33	0.31	0.34	0.34	4.94	3.84	4.86	3.81	4.36
14.	RHRMM-28	0.32	0.34	0.33	0.36	0.32	6.02	4.92	5.96	4.86	5.44
15.	RHRMM-34	0.12	0.15	0.13	0.15	0.13	9.32	8.63	9.54	8.74	9.06
16.	RHRMM-35	0.30	0.31	0.29	0.33	0.30	5.63	4.24	5.41	4.11	4.85
17.	RHRMM-38	0.24	0.25	0.23	0.24	0.23	8.93	7.23	8.77	7.18	8.03
18.	RHRMM-39	0.23	0.25	0.23	0.27	0.25	6.72	5.62	6.70	5.58	6.16
19.	RHRMM-41	0.19	0.21	0.19	0.22	0.20	8.41	7.76	8.37	7.67	8.05
20.	RHRMM-46	0.14	0.17	0.15	0.16	0.15	6.74	5.52	6.59	5.59	6.11
21.	RHRMM-49	0.23	0.25	0.22	0.23	0.22	7.36	5.13	7.30	4.99	6.20
22.	RHRMM-52	0.07	0.09	0.08	0.09	0.08	11.90	10.91	11.98	10.98	11.44
23.	RHRMM-53	0.31	0.32	0.31	0.33	0.31	7.30	4.24	7.10	4.21	5.71
24.	RHRMM-54	0.16	0.18	0.15	0.16	0.16	9.42	7.48	9.45	7.42	8.44
25.	RHRMM-56	0.11	0.13	0.09	0.10	0.12	10.82	9.05	10.59	8.95	9.85
26.	RHRMM-64	0.08	0.09	0.07	0.11	0.09	9.97	7.89	9.91	8.04	8.95
27.	RHRMM-67	0.36	0.37	0.35	0.36	0.36	4.23	3.61	4.16	3.57	3.89
28.	RHRMM-71	0.23	0.25	0.24	0.26	0.25	8.91	7.22	8.96	7.19	8.07
29.	RHRMM-76	0.09	0.11	0.10	0.12	0.10	10.82	9.06	10.75	8.91	9.89
30.	RHRMM-80	0.23	0.25	0.23	0.28	0.25	6.71	5.05	6.65	4.96	5.84
31.	RHRMM-81	0.32	0.34	0.31	0.32	0.32	6.17	5.56	6.05	5.61	5.85
32.	RHRMM-83	0.29	0.31	0.30	0.32	0.30	6.15	3.41	6.12	3.39	4.77
33.	RHRMM-90	0.08	0.10	0.09	0.11	0.09	11.12	10.24	11.08	10.14	10.65
34.	RHRMM-91	0.30	0.31	0.29	0.30	0.30	5.36	4.30	5.32	4.27	4.81
35.	RHRMM-92	0.21	0.23	0.22	0.23	0.22	6.68	6.06	6.70	5.97	6.35
36.	RHRMM-121	0.31	0.34	0.33	0.35	0.32	6.12	5.37	6.05	5.24	5.69
37.	RHRMM-125	0.32	0.33	0.33	0.35	0.33	6.69	4.12	6.72	4.18	5.43
38.	RHRMM-127	0.34	0.36	0.32	0.34	0.34	5.65	3.49	5.59	3.32	4.51
39.	RHRMM-129	0.31	0.33	0.32	0.34	0.33	6.16	4.89	6.03	4.93	5.50
40.	RHRMM-133	0.14	0.11	0.13	0.15	0.13	10.23	8.65	10.33	8.52	9.43
41.	Check	0.10	0.13	0.12	0.14	0.12	11.00	10.11	10.93	10.08	10.53
	Mean	0.22	0.23	0.22	0.21	0.22	7.92	6.53	7.86	6.45	7.18
	S.E.±	0.03	0.03	0.04	0.03	0.03	0.15	0.13	0.15	0.12	0.13
	C.D.at 5%	0.09	0.11	0.10	0.10	0.09	0.46	0.41	0.46	0.37	0.37
	C.D.at 1%	0.12	0.14	0.13	0.13		0.62	0.54	0.61	0.49	
	C.V.	4.41	4.87	4.61	4.38		3.64	3.87	3.62	3.54	

However, genotype RHRMM-3 (0.06%) recorded significantly low titratable acidity which were at par with genotypes RHRMM-52 (0.08%), RHRMM-64 (0.09%), RHRMM-90 (0.09%), RHRMM-76 (0.10%), RHRMM-15 (0.10%), RHRMM-56 (0.12%), RHRMM-8 (0.12%), Rasila Sunhari-2 (0.12%), RHRMM-133 (0.13%), RHRMM-4 (0.13%), RHRMM-34 (0.13%), RHRMM-16 (0.15%), RHRMM-23 (0.15%) and RHRMM-46 (0.15%) in average mean. The maximum titratable acidity recorded by genotype RHRMM-67 (0.36%) in E_1, (0.37%) in E_2, (0.35%) in E_3, (0.36%) in E_4 and (0.36%) during all the environments.

Titratable acidity plays a significant role in determining melon quality. Muskmelon fruits with high total sugar content and low titratable acidity are generally more preferred by consumers. Significantly the minimum titratable acidity obtained in E_3 followed by E_1 environments while, the maximum acidity was recorded in E_4 environment followed by E_2 environment, which may be explained on the basis of cool temperatures prevailing during crop growth as opined by Sushmitha (2013) [20], Shivaprasad (2013) [17], Sudhakara and Manchali (2016) [19], Shivakumara (2019) [16] and Indraja *et al*. (2021) [3] in muskmelon.

Total sugar (%)

Based on the data provided in Table 2. it can be observed that the range of variation for total sugar among the genotypes was from 4.23 to 12.19 (%) in E_1, 3.41 to 11.40 (%) in E_2, 4.16 to 12.03 (%) in E_3, 3.32 to 11.32 (%) in E_4 and 3.89 to 11.73 (%) in average mean, respectively.

Among the different environments, genotype RHRMM-3 (12.19%) registered significantly high total sugar in E_l which was at par with genotype RHRMM-52 (11.90%) and RHRMM-15 (11.78%). In E_2, significantly higher total sugar was recorded by the genotype RHRMM-3 (11.40%) followed by RHRMM-52 (10.91%) and RHRMM-90 (10.24%). In E_3, genotype namely RHRMM-3 (12.03%) recorded significantly high total sugar which was at par with genotype RHRMM-52 (11.98%) and RHRMM-15 (11.69%). In E_4, significantly higher total sugar was recorded by the genotype RHRMM-3 (11.32%) which was at par with genotype RHRMM-52 (10.98%). However, genotype RHRMM-3 (11.73%) measured significantly higher total sugar which was at par with genotype RHRMM-52 (11.44%) during all the environments. The minimum total sugar was recorded by the genotype RHRMM-67 in E_l (4.23%), genotype RHRMM-83 in E_2 (3.41%), genotype RHRMM-67 in E_3 (4.16%), genotype RHRMM-127 in E_4 (3.32%) and genotype RHRMM-67 (3.89%) in average mean.

The variation in the total sugar content of the fruit can be attributed to both the genetic makeup of the specific genotype and the prevailing environmental conditions. A high total sugar content is desirable due to its strong influence on consumer preference. Total sugar content showed a significant positive correlation with the TSS of the fruit. A high concentration of both reducing and non-reducing sugar is considered a desirable quality trait in muskmelon. Sweetness, the first flavour perceived when consuming melon, is primarily influenced by the total sugar content. The sweetness of these genotypes can be attributed to the balance between carbohydrates and organic acids present in the fruit. Significantly the maximum total sugar obtained in E_1 followed by E_3 environments while, the minimum total sugar was recorded in E_4 environment followed by E_2 environment. These results are similar to those obtained by Rastogi and Abidi (2006) [12], Li *et al*. (2010) [7], Sushmitha (2013) [20], Shivaprasad (2013) [17], Sudhakara and Manchali (2016) [19], Shivakumara (2019) [16] and Indraja *et al*. (2021) [3] in muskmelon.

Reducing sugar (%)

The data presented in Table 3. clearly indicates that the range of variation for reducing sugar among the varieties was from 3.26 to 10.65 in E_1, 2.24 to 9.27 in E_2, 3.14 to 10.29 in E_3, 2.33 to 9.08 in E_4 and 2.79 to 9.59 percent in average mean, respectively.

Among the different environments, genotype RHRMM-3 (10.65%) registered significantly high reducing sugar in E_l followed by genotypes RHRMM-15 (10.02%) and RHRMM-52 (9.99%). In E_2, significantly higher reducing sugar was recorded by the genotype RHRMM-3 (9.27%) followed by RHRMM-15 (8.56%) and RHRMM-56 (8.45%).

In E_3, namely RHRMM-3 (10.29%) recorded significantly high reducing sugar which was at par with genotypes RHRMM-52 (10.01%) and RHRMM-15 (9.89%). In E_4, significantly higher reducing sugar was recorded by the genotype RHRMM-3 (9.08%) which was at par with genotype RHRMM-15 (8.64%). However, genotype RHRMM-3 (9.59%) registered significantly high reducing sugar which was at par with genotypes RHRMM-15 (9.28%) and RHRMM-52 (9.27%) during all the environments.

The minimum reducing sugar was recorded by the genotype RHRMM-91 in E_l (3.26%), genotype RHRMM-125 in E_2 (2.24%), genotype RHRMM-91 in E_3 (3.14%), genotype RHRMM-125 in E_4 (2.33%) and genotype RHRMM-91 (2.79%) in average mean.

High value of reducing sugar is desirable because of consumer preference. Presence of high reducing sugar is a preferred quality trait in muskmelon. The sweetness of these genotypes was influenced by the relative levels of carbohydrates and organic acids found in the melon. Significantly the maximum reducing sugar obtained in E_1 followed by E_3 environments while, the minimum reducing sugars was recorded in E_4 environment followed by E_2 environment. These results are similar to those obtained by Rastogi and Abidi (2006) [12], Sudhakara and Manchali (2016) [19] and Shivakumara (2019) [16] in muskmelon.

Table 3: Mean performance of muskmelon genotypes for Reducing sugar (%) and Non-reducing sugar (%)

Sr. No.	Genotypes	Reducing sugar (%)					Non-reducing sugar (%)				
		E_1	E_2	E_3	E_4	Mean	E_1	E_2	E_3	E_4	Mean
1.	RHRMM-1	4.58	3.48	4.30	3.29	3.91	1.90	1.37	1.92	1.50	1.67
2.	RHRMM-2	3.49	3.25	3.38	3.39	3.38	1.45	1.39	1.52	0.48	1.21
3.	RHRMM-3	10.65	9.27	10.29	9.08	9.59	1.82	2.02	1.87	2.13	1.96
4.	RHRMM-4	7.72	6.94	7.60	6.84	7.28	1.77	1.42	1.81	1.46	1.62
5.	RHRMM-8	7.98	6.99	8.03	6.86	7.47	1.83	2.10	1.83	2.14	1.98
6.	RHRMM-12	4.40	3.56	4.56	3.64	4.04	1.76	2.07	1.66	1.95	1.86
7.	RHRMM-15	10.02	8.56	9.89	8.64	9.28	1.67	1.28	1.71	0.37	1.26
8.	RHRMM-16	8.08	6.94	7.98	6.73	7.43	1.73	1.95	1.79	2.10	1.89
9	RHRMM-17	4.02	2.95	3.91	2.78	3.42	1.67	0.84	1.27	0.92	1.17
10.	RHRMM-18	3.38	3.22	3.25	3.13	3.24	2.02	1.60	2.08	1.63	1.83
11.	RHRMM-22	5.77	4.38	5.91	4.28	5.09	1.85	1.65	1.83	1.72	1.76
12.	RHRMM-23	7.29	4.65	7.35	4.51	5.95	1.51	2.09	1.48	2.10	1.80
13.	RHRMM-27	3.46	2.76	3.38	2.71	3.08	1.41	1.02	1.41	1.04	1.22
14.	RHRMM-28	4.47	3.27	4.30	3.12	3.79	1.48	1.57	1.58	1.65	1.57
15.	RHRMM-34	7.34	6.61	7.49	6.89	7.08	1.88	1.92	1.95	1.76	1.88
16.	RHRMM-35	4.04	2.56	3.92	2.51	3.26	1.51	1.60	1.42	1.52	1.51
17.	RHRMM-38	6.19	5.57	6.01	5.62	5.85	2.60	1.58	2.62	1.48	2.07
18.	RHRMM-39	5.23	4.89	5.21	4.75	5.02	1.42	0.69	1.42	0.79	1.08
19.	RHRMM-41	6.55	6.43	6.49	6.34	6.45	1.77	1.27	1.79	1.26	1.52
20.	RHRMM-46	5.91	3.58	5.79	3.64	4.73	0.79	1.84	0.76	1.85	1.31
21.	RHRMM-49	6.60	3.86	6.51	3.79	5.19	0.73	1.21	0.75	1.14	0.96
22.	RHRMM-52	9.99	8.11	10.01	8.03	9.27	1.46	1.99	1.65	2.04	1.79
23.	RHRMM-53	5.54	3.78	5.15	3.73	4.55	1.67	0.44	1.85	0.45	1.10
24.	RHRMM-54	8.36	6.06	8.40	5.98	7.2	1.06	1.35	1.00	1.37	1.89
25.	RHRMM-56	9.09	8.45	8.91	8.38	8.71	1.65	0.57	1.59	0.54	1.09
26.	RHRMM-64	7.66	5.74	7.79	6.04	6.81	2.20	2.04	2.01	1.90	2.04
27.	RHRMM-67	3.44	2.65	3.28	2.54	2.98	0.75	0.91	0.83	0.98	0.87
28.	RHRMM-71	7.28	6.01	7.34	5.98	6.65	1.55	1.15	1.54	1.15	1.35
29.	RHRMM-76	8.69	6.76	8.60	6.51	7.64	2.02	2.18	2.04	2.28	2.13
30.	RHRMM-80	4.60	4.23	4.51	4.12	4.37	2.01	0.77	2.03	0.80	1.40
31.	RHRMM-81	4.28	3.43	4.14	3.58	3.86	1.79	2.02	1.81	1.93	1.89
32.	RHRMM-83	5.26	3.14	5.12	3.05	4.14	0.85	0.25	0.95	0.32	0.59
33.	RHRMM-90	9.80	8.14	9.68	8.01	8.91	1.26	1.99	1.33	2.02	1.65
34.	RHRMM-91	3.26	2.44	3.14	2.34	2.79	1.99	1.76	2.07	1.83	1.92
35.	RHRMM-92	4.25	3.46	4.30	3.29	3.83	2.31	2.47	2.28	2.55	2.40
36.	RHRMM-121	5.14	4.48	4.99	4.32	4.73	0.93	0.84	1.01	0.87	0.91
37.	RHRMM-125	5.03	2.24	5.14	2.33	3.68	1.58	1.78	1.50	1.76	1.66
38.	RHRMM-127	3.80	2.81	3.67	2.76	3.26	1.76	0.64	1.82	0.53	1.19
39.	RHRMM-129	5.53	2.93	5.13	2.97	4.14	0.60	1.86	0.85	1.86	1.30
40.	RHRMM-133	8.18	6.76	8.29	6.62	7.46	1.95	1.79	1.94	1.80	1.87
41.	Check	8.96	8.10	8.81	7.92	8.45	1.94	1.91	2.01	2.05	1.98
	Mean	6.25	4.96	6.05	4.90	5.54	1.58	1.49	1.72	1.47	1.56
	S.E.±	0.14	0.16	0.15	0.17	0.14	0.05	0.06	0.06	0.04	0.05
	C.D.at 5%	0.42	0.53	0.42	0.48	0.43	0.16	0.16	0.18	0.13	0.17
	C.D.at 1%	0.56	0.71	0.56	0.64		0.22	0.21	0.23	0.17	
	C.V.	4.14	6.62	4.30	6.08		6.32	6.52	6.29	5.43	

Non-reducing sugar (%)

From the data presented in the Table 3. it is seen that the range of variation for non-reducing sugar among the genotypes was from 0.60 to 2.60 percent in E_1, 0.25 to 2.47 percent in E_2, 0.75 to 2.62 percent in E_3, 0.32 to 2.55 percent in E_4 and 0.59. 2.40 percent in average mean, respectively.

Among the different environments, genotype RHRMM-38 (2.60%) registered significantly high non-reducing sugar in E_l followed by RHRMM-92 (2.31%) and RHRMM-64 (2.20%). In E_2, significantly high non-reducing sugar was registered by the genotype RHRMM-92 (2.47%) followed by RHRMM-76 (2.18%) and RHRMM-8 (2.10%). In E_3, genotype namely RHRMM-38 (2.62%) registered significantly high non-reducing sugar followed by RHRMM-92 (2.28%) and RHRMM-18 (2.08%), In E_4, significantly high non-reducing sugar was registered by the genotype RHRMM-92 (2.55%) followed by RHRMM-76 (2.28%) and RHRMM-8 (2.14%). However, genotype RHRMM-92 (2.40%) registered significantly high non-reducing sugar followed by RHRMM-76 (2.13%) and RHRMM-38 (2.07%) during all the environments.

The minimum non-reducing sugar was recorded by the genotype RHRMM-129 in E_l (0.60%), genotype RHRMM-83 in E_2 (0.25%), genotype RHRMM-49 in E_3 (0.75%), genotype RHRMM-83 in E_4 (0.32%) and genotype RHRMM-91 (2.79%) in average mean.

A high level of non-reducing sugar is desirable, as it aligns with consumer preference. In muskmelon, the presence of abundant non-reducing sugar is considered a key quality trait. The sweetness observed in these genotypes is a result of the balance between carbohydrates and organic acids present in the fruit. Significantly the maximum non-reducing sugar obtained in E_1 followed by E_3 environments while, minimum non-reducing sugar was recorded in E_4

environment followed by E_2 environment. These results are similar to those obtained by Rastogi and Abidi (2006) [12], Sudhakara and Manchali (2016) [19] and Shivakumara (2019) [16] in muskmelon.

Sensory evaluation (Organoleptic test)

General appearance of fruit

The genotypes of muskmelon differed greatly for the general appearance of fruit (Table 4). The highest rating for the general appearance of the fruit was recorded in the genotypes viz., RHRMM-8 (8.75), RHRMM-3 (8.73), RHRMM-15 (8.72), RHRMM-64 (8.71) and RHRMM-76 (8.71) whereas, RHRMM-67 (3.23) was rated low for this trait.

The appearance of the fruit is a key factor influencing the marketability of muskmelon. The genotypes, RHRMM-8, RHRMM-3, RHRMM-15, RHRMM-64 and RHRMM-76 had good fruit appearance as per the rating given by panellists. The studies made by Guerineau *et al*. (2000) [2] in melons were in line with the present study.

Flavour

The genotypes of muskmelon showed great variation to the trait of flavour (Table 4). The genotype, RHRMM-3 (8.96) recorded highest rating to flavour followed by RHRMM-15 (8.95), RHRMM-64 (8.94), RHRMM-8 (8.87) and RHRMM-76 (8.86). Lowest rating was recorded in the genotype RHRMM-27 (4.28).

Muskmelon fruits with a rich flavour and sweetness are more likely to be accepted by consumers. Sweetness is the first flavour in melons and when a cultivar has high TSS, it receives high flavour ratings from all judges. The strong correlation between TSS and flavour was reported by Guerineau *et al*. (2000) [2] in melons, Senesi *et al*. (2005) [14] in muskmelon and Sushmitha (2013) [20] in muskmelon.

Sweetness

From the Table 4. variation in sweetness was noted among different muskmelon genotypes. The highest sweetness rating was observed in the RHRMM-3 (8.97) followed by RHRMM-64 (8.87), RHRMM-76 (8.84), RHRMM-133 (8.84) and RHRMM-52 (8.68). Low rating in genotype RHRMM-67 (3.62).

The sensory or eating quality of muskmelon fruit is primarily influenced by its sweetness, along with the presence of volatile aromatic compounds, as stated by Yadav and Asati (2005) [22] in water melon, Sushmitha (2013) [20] in muskmelon and Kumar (2017) [6] in muskmelon.

Table 4: Rating of different genotypes of muskmelon for quality parameters based on organoleptic test

Sr. No.	Genotypes	Score				Overall acceptability
		General Appearance of fruit	Flavour	Sweetness	Aroma	
1.	RHRMM-1	7.96	6.36	6.23	4.56	6.28
2.	RHRMM-2	7.85	6.23	6.74	4.78	6.40
3.	RHRMM-3	8.73	8.96	8.97	8.94	8.91
4.	RHRMM-4	8.53	8.41	8.28	8.04	8.32
5.	RHRMM-8	8.75	8.87	8.73	8.84	8.80
6.	RHRMM-12	8.12	5.43	7.16	7.23	6.99
7.	RHRMM-15	8.72	8.95	8.79	8.29	8.69
8.	RHRMM-16	8.52	8.75	8.52	8.63	8.61
9	RHRMM-17	3.86	6.12	5.94	4.21	5.83
10.	RHRMM-18	6.01	7.42	6.14	5.26	6.21
11.	RHRMM-22	3.57	5.86	7.86	6.01	5.83
12.	RHRMM-23	8.2	8.41	8.12	8.25	8.25
13.	RHRMM-27	5.32	4.28	7.36	6.20	5.79
14.	RHRMM-28	6.21	6.24	6.48	6.46	6.35
15.	RHRMM-34	8.67	8.82	8.52	8.62	8.66
16.	RHRMM-35	4.38	5.94	6.14	5.98	5.61
17.	RHRMM-38	7.65	6.25	6.42	6.52	6.71
18.	RHRMM-39	7.26	6.12	6.78	7.24	6.85
19.	RHRMM-41	7.59	7.29	7.19	7.88	7.49
20.	RHRMM-46	6.94	8.32	8.2	7.92	7.85
21.	RHRMM-49	7.23	7.95	7.84	8.42	7.86
22.	RHRMM-52	8.70	8.84	8.68	8.83	8.76
23.	RHRMM-53	5.93	5.89	5.67	5.79	5.82
24.	RHRMM-54	6.2	7.46	7.34	6.63	6.91
25.	RHRMM-56	7.9	8.16	7.32	8.59	7.99
26.	RHRMM-64	8.71	8.94	8.87	8.91	8.87
27.	RHRMM-67	3.23	5.69	3.62	4.96	4.34
28.	RHRMM-71	8.0	7.48	8.48	8.48	8.11
29.	RHRMM-76	8.71	8.86	8.84	8.69	8.78
30.	RHRMM-80	7.63	7.98	7.46	6.42	7.37
31.	RHRMM-81	7.41	7.21	6.62	6.01	6.81
32.	RHRMM-83	6.54	7.36	6.54	6.46	6.73
33.	RHRMM-90	8.59	8.74	8.64	8.46	8.61
34.	RHRMM-91	7.35	7.61	7.43	5.81	7.05
35.	RHRMM-92	7.23	7.54	7.49	7.83	7.52
36.	RHRMM-121	6.78	7.53	7.62	7.56	7.37
37.	RHRMM-125	7.63	7.84	7.64	7.24	7.59

38.	RHRMM-127	5.86	6.32	6.52	6.21	6.23
39.	RHRMM-129	4.89	6.43	6.14	5.94	5.85
40.	RHRMM-133	8.65	8.85	8.84	8.56	8.73
41.	Rasila Sunhari-2 (C)	8.58	8.61	8.37	8.28	8.46

Aroma

A high level of variation in aroma was observed among muskmelon genotypes. The highest aroma rating was recorded in the genotype RHRMM-3 (8.94) followed by RHRMM-64 (8.91), RHRMM-8 (8.84), RHRMM-52 (8.83) and RHRMM-76 (8.69). Low rating in genotype RHRMM-17 (4.21).

Aroma of fruit is the important trait in muskmelon. The genotypes, RHRMM-3, RHRMM-64, RHRMM-8, RHRMM-52 and RHRMM-76 had a pleasant aroma, as rated by the panellists. The studies made by Sushmitha (2013) [20] in muskmelon.

Overall acceptability

Among the 40 genotypes and one check, highest rating to overall acceptability was observed in RHRMM-3 (8.91) followed by RHRMM-64 (8.87), RHRMM-8 (8.80), RHRMM-76 (8.78) and RHRMM-52 (8.73). Lowest rating was recorded in the genotype RHRMM-67 (4.34).

Conclusion

TSS and total sugars, reducing sugars, non-reducing sugars were found maximum and minimum acidity in the genotypes RHRMM-3, RHRMM-52, RHRMM-90, RHRMM-15, RHRMM-64, RHAMM-64 and RHRMM-8 and these were also adjudged best in terms of general appearance of fruit, flavour, sweetness, aroma and overall acceptability. As a result, these genotypes can be used in the hybridization programme may be more advantageous for developing superior quality varieties.

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