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Evaluation of Muskmelon (*Cucumis melo* L.) genotypes for growth, yield and quality traits

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Abstract
The present study was carried out to evaluate the performance of muskmelon genotypes for different traits attributing for growth, yield and quality at Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. Among the genotypes used for investigation, early harvest was obtained from Mysore Local (70.35 days) followed by Dharwad Local (70.95 days). Dharwad Local recorded highest number of fruits per vine (5.64) followed by GWL-1 (4.31). The genotype Dharwad Local recorded the highest yield (8.31 kg / plant) followed by Mysore Local (5.15 kg / plant) and Tindivanam Local (4.02 kg / plant). The maximum beta carotene content was observed in the genotypes Kashi Madhu (17.97 µg / g) followed by Yanakandla (16.74 µg / g) and Tindivanam Local (16.30 µg / g). The genotype Yanakandla recorded the highest value of TSS (14.04° Brix) followed by Kashi Madhu (11.60° Brix). Based on their performance Dharwad Local, Kashi Madhu, Yanakandla and Tindivanam Local can be used for further breeding programme to produce promising hybrids that could be exploited for cultivation in muskmelon.

Key words: Muskmelon, growth, yield, quality, Evaluation,

Introduction

India is the second largest producer of vegetables in the world with 9.39 million ha of area, 162.89 million metric tonnes of production and 17.30 tonnes per ha of productivity accounting for about 14 per cent of the world's vegetable production in 2013-14. The per capita consumption of vegetables in India must be 295 g per day as per ICMR recommendation. However, the per capita intake of vegetable is only 145 g. Therefore, there is a need for increasing the production of vegetable by growing high yielding genotypes/ varieties/ hybrids with high nutritive value and adopting improved production technologies. By the end of 2020, the vegetable demand will be around 220 million tonnes. Muskmelon is very popular in developed countries where the per capita calorie consumption is high. In India, muskmelon occupies an area of about 36.70 thousand hectare with annual production of about 760.81 thousand metric tonnes during the year 2013-14 (Indian Horticulture Database, 2015). In India there are several muskmelon cultivars and varieties grown in different regions and dessert type muskmelon is very popular, particularly in Uttar Pradesh and Punjab. The main areas of muskmelon cultivation are the riverbeds of Yamuna, Ganges and Narmada in the North and Kaveri, Krishna and Godavari in the South (Singh, 1998). In Tamilnadu, muskmelon is mostly grown in Tindivanam, Kanchipuram, Dharmapuri, Villupuram, Pudukottai and Theni districts. The fruits are extremely variable in size and shape. They may be ellipsoid to globose, with or without longitudinal grooves. The fruits are sweet and musky in flavour and relished by millions with good export potential. It is used for both salad and table purpose. The fruit flesh inside varies from white to cream-yellow, orange or green. At present, most of the commercial types have thin skin and thick orange pulp. Fruits are very good source of dietary fiber, vitamins and minerals. The edible portion of muskmelon contains water (92.8 g / 100 g), carbohydrates (5.4 g) and protein (0.6 g / 100 g). The carbohydrates are essentially all sugars. Certain melons are good source of vitamin A. The yellow and orange fleshed muskmelons contain more than 2020 µg 100 g^{-1} of beta carotene, a precursor of vitamin A. Cantaloupe contains 26.7 mg and honey dew melon contains 9.7 mg of vitamin C per 100 g of edible portion (Lisa and Li Tian, 2011). Muskmelon being monoecious is a cross pollinated crop and offers considerable variation. A systematic study of the extent of variation in the native germplasm is highly

warranted not only to increase the yield potential but also to improve quality traits, pests and disease resistance. Generally, muskmelon requires relatively shorter growing season with a warm climate. Sufficient variability in respect of earliness, fruit number, weight, colour, shape, size, flavour, sweetness and disease resistance is observed in the crop, which offers great scope for improvement of this crop through the application of genetic principles.

Materials and Methods

The experiment was carried out in the year 2013-2015 at the college orchard, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. A total of 51 accessions were collected from different regions *such as* NBPGR (National Bureau of Plant Genetic Resources), IIVR (Indian Institute of Vegetable Research), CIAR (Central Institute for Arid Horticulture), IIHR (Indian Institute of Horticulture Research), TNAU (Tamil Nadu Agricultural University) and its research stations and landraces from Tamil Nadu, Andhra Pradesh, Karnataka, Gwalior and Rajasthan. Among them , twenty two accessions of muskmelon were chosen for the present study. The experiment was laid out in Randomised Block Design with two replications in pits of 60 cm diameter and 30 cm depth were taken at a spacing of 1.5 x 1.0 m. The 22 genotypes in each replication were raised in five pits and two to three seeds were sown in each pit. The cultural and management practices were adopted according to the package of practices recommended by Tamil Nadu Agricultural University, Coimbatore. The observations were recorded from five randomly selected plants in each genotype per replication. Vine length (cm), number of primary branches, node at which first male flower appearance, node at which first female flower appearance, days to first male flower anthesis, days to first female flower anthesis, days to first harvest, fruit length (cm), fruit diameter (cm), fruit weight (g), number of fruits per vine, flesh thickness (cm), sex ratio and yield per plant (kg). Analysis of variance of the data from each attribute was computed using the GENRES computer program. The Least Significant Difference test at 5 per cent level of probability was used to test the differences among mean values.

Results and Discussion

Significant differences among genotypes were observed for all characters. Earliness is one of the main attribute which is measured in terms of node at which first male and female flower appearance. The genotype Mysore Local produced male flower at lowest node (4.55) followed by GWL-1 (4.70) and Tindivanam Local (5.45) (Table 2). The genotype Tindivanam Local produced female flower at lowest node (3.55) followed by Yaganti (3.98) and GWL-1 (4.05) and Arka Jeet (4.05). Similar trend of earliness was reported by Rakhi and Rajamony (2005), Hossain *et al.* (2010) and Hanchinamani *et al.* (2011). Early harvest is also one of the important desirable traits for crop improvement programme. The present study also brought out certain genotypes with significant early harvest. The genotypes Mysore Local (70.35) had the earliest harvest followed by Dharwad Local (70.95) and Tindivanam Local (71.35). This is in accordance with the findings of Ahmed *et al.* (2005). Fruit length indirectly increases yield and is therefore considered to be an important trait in selecting a muskmelon genotype. Longer fruits were observed in the genotypes VRMM-9 (27.56 cm) and Tindivanam Local (26.90 cm) followed by Mysore Local (25.31 cm) and Dharwad Local (24.04 cm). Studies conducted by Rakhi and Rajamony (2005), Rad *et al.* (2010) and Pandey *et al.* (2010) also observed similar trend of results for fruit length. Greater fruit diameter was recorded in the round type fruits in the GWL-1 (19.05 cm) followed by Dharwad Local (18.85 cm), Mysore Local (17.21 cm) and Kashi Madhu (13.66 cm). Similar trend of results was reported by Pandey *et al.* (2010). The highest average fruit weight was observed in the genotypes Mysore Local (1.96 kg) and Dharwad Local (1.61 kg) followed by Tindivanam Local (1.27 kg). Generally smaller size (0.75 kg-1.25 kg) muskmelon fruits are preferred in South Indian markets, which are well established in selecting genotypes with lesser fruit weight like all genotypes except Dharwad Local and Mysore Local. Similar pattern of results was reported by Singh and Ram (2003), Rad *et al.* (2010) and Pandey *et al.* (2010). In respect of number of fruits per vine, the genotypes Dharwad Local (5.64) and GWL-1 (4.31) were the best performing genotypes among twenty two genotypes. Similar pattern of results was reported by Shanmuga Sundaram (2006), Dhillon *et al.* (2007), Rad *et al.* (2010) and Cheema *et al.* (2011). Maximum flesh thickness was observed in the genotypes Kashi Madhu (5.03 cm) followed by Anantpur (4.67 cm), and Yanakandla (4.23 cm). This is in corroboration with the findings of Singh and Ram (2003), Rad *et al.* (2010) and Pandey *et al.* (2010). Sex ratio is considered as one of the important characters in cucurbits crop improvement programme. The genotypes GWL-4 (4.54), GWL-5 (3.81) and Dharwad Local (3.79) recorded satisfactory mean values for sex ratio. Similar trend was recorded by Shanmuga Sundaram (2006). In respect of fruit yield per plant the genotypes, Dharwad Local (8.31 kg / plant) and Mysore Local (5.15 kg / plant) excelled in comparison with all other genotypes. High marketable fruit yield per

plant recorded by these genotypes might have been due to the presence of maximum number of fruits per plant and maximum average fruit weight. These two characters directly influenced the marketable fruit yield per plant. The similar trend of result of high marketable fruit yield was obtained by Pandey *et al.* (2010) and Cheema *et al.* (2010). Generally, the higher beta carotene and total soluble solids content would increase the nutritive value and sweetness of the fruits, respectively. In the present study the genotypes Kashi Madhu (17.97 µg g^{-1}) and Yanakandla (16.74 µg g^{-1}) followed by Tindivanam Local (16.30 µg g^{-1}) recorded higher beta carotene. In the present study the genotypes Kashi Madhu (2.89 mg 100 g^{-1}) and Pusa Madhuras (2.97 mg 100 g^{-1}) recorded lowest ascorbic acid content. The consumers prefer high sweetness in muskmelon fruits. In the present study, the genotypes Yanakandla (14.04^0 brix) and Kashi Madhu (11.60^0 brix) recorded higher total soluble solids, followed by GWL-3 (10.41^0 brix) and Villupuram Local (10.02^0 brix). Similar findings have also been reported by Singh and Ram (2003), Glala *et al.* (2008), Rad *et al.* (2010) and Cheema *et al.* (2011). The highest amount of total sugar was recorded in the genotype Yanakandla (5.52 per cent) and Kashi Madhu (4.44 per cent) followed by GWL-3 (3.89 per cent). This is in conformity with the findings of Glala *et al.* (2008).

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Table 1. Geographical origin of muskmelon (*Cucumis melo* L.) accessions used in the study

Treatments	Name of the genotypes / varieties	Source
T_1	GWL-1	Gwalior
T_2	GWL-2	Gwalior
T_3	RM-43	CIAH, Rajasthan
T_4	Passur Local	Annur, Tamil Nadu
T_5	AU-1	Chidambaram, Tamil Nadu
T_6	Arka Jeet	IIHR, Bangalore
T_7	Pusa Madhuras	IARI, New Delhi
T_8	GMM-3	Gujarat
T_9	RM-50	CIAH, Rajasthan
T_{10}	Villupuram Local	Villupuram, Tamil Nadu
T_{11}	GWL-3	Gwalior
T_{12}	Kanchipuram Local	Kanchipuram, Tamil Nadu
T_{13}	Dharwad Local	UAS, Bangalore
T_{14}	GWL-5	Gwalior
T_{15}	GWL-4	Gwalior
T_{16}	VRMM-9	NBPGR-IIVR, Varanasi
T_{17}	Tindivanam Local	Tindivanam, Tamil Nadu
T_{18}	Mysore Local	UAS, Bangalore
T_{19}	Kashi Madhu	IIVR, Varanasi
T_{20}	Anantpur	Anantpur, Andhra Pradesh
T_{21}	Yanakandla	Yanakandla, Andhra Pradesh
T_{22}	Yaganti	Yaganti, Andhra Pradesh

Table 2. Evaluation of muskmelon genotypes for growth, yield and quality traits

Genotypes / varieties	Vine length (cm)	Number of primary branches	Node at which first male flower appearance	Node at which first female flower appearance	Days to first male flower anthesis	Days to first female flower anthesis	Days to first harvest	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (kg)	Number of fruits per vine	Flesh thickness (cm)	Sex ratio	Yield per plant (kg)	TSS (^{0}brix)	Ascorbic acid (mg 100 g^{-1})	Total sugar (per cent)	Beta carotene (µg g^{-1})
GWL-1	160.10	3.35	4.70*	4.05	46.25	45.45	71.80*	17.07	19.05*	0.75	4.31*	3.40	1.55	3.63	6.85	5.14	2.77	3.53
GWL-2	178.50	3.25	5.95	4.80	48.25	48.50	72.05	22.46	11.65	1.19	2.79	3.03	2.36	2.51	6.43	3.90	3.31	3.29
RM-43	203.55*	3.38	7.25	5.30	48.10	48.85	75.30	16.11	12.22	0.82	2.78	3.38	2.29	2.21	9.07	3.98	3.64	1.64
Passur Local	181.95	2.95	7.25	5.70	49.05	50.80	72.85	20.10	11.26	0.82	2.98	3.10	2.75	2.39	7.47	5.27	3.25	1.73
AU-1	198.40*	3.09	7.00	4.20	48.75	48.55	72.75	19.32	11.26	1.08	2.73	3.21	2.66	2.43	7.56	4.09	3.13	4.79
Arka Jeet	173.40	3.19	6.78	4.05	47.40	49.20	73.10	20.28	10.81	1.09	3.61	3.52	2.03	3.45	9.07*	3.57	3.48	11.56
Pusa Madhuras	185.80	3.30	6.40	4.15	51.70	46.10	73.60	20.51	10.55	1.05	3.10	3.33	2.31	3.12	7.40	2.97	3.36	13.64*
GMM-3	187.85	2.78	7.20	4.90	51.55	50.55	73.15	16.94	11.24	0.95	3.25	3.28	2.48	2.11	7.08	8.13*	3.47	1.46
RM-50	199.15*	3.00	6.55	4.65	49.40	48.30	72.95	16.05	11.50	0.75	3.56	3.54	1.75	1.94	7.28	5.48	3.06	1.55
Villupuram Local	183.45	2.40	7.55	5.10	49.95	50.40	75.85	20.95	11.80	1.02	3.07	3.02	2.37	2.71	10.02*	4.50	3.54	0.99
GWL-3	178.60	3.39	6.95	4.95	49.75	48.05	77.35	17.95	10.02	0.90	3.31	3.38	2.24	2.37	10.41*	6.39*	3.89*	10.20*
Kanchipuram Local	172.10	2.80	7.20	4.95	50.65	45.25	74.25	21.96	10.78	0.94	2.92	3.51	2.44	2.37	6.00	7.30	3.22	8.05
Dharwad Local	172.65	3.29	6.55	4.65	49.85	42.20*	70.95*	24.04*	18.85*	1.61*	5.64*	3.67	3.79*	8.31*	9.35*	3.49	2.32	3.42
GWL-5	171.50	2.79	7.45	4.85	45.35	48.55	74.15	18.80	11.43	0.99	3.15	3.21	3.81*	2.67	6.39	5.77	3.62	1.60
GWL-4	169.25	3.25	7.40	4.45	48.20	47.75	74.40	17.81	10.07	0.87	2.80	3.35	4.54*	2.71	9.17*	5.39	3.16	0.75
VRMM-9	144.55	3.28	7.45	4.25	48.50	45.15	73.35	27.56*	11.13	0.95	3.63	2.92	2.34	2.99	4.23	6.13*	2.96	8.09
Tindivanam Local	187.30	3.92	5.45	3.55	50.15	43.80	71.35*	26.90*	10.40	1.27	2.80	3.69	2.57	4.02*	8.22	3.55	2.92	16.30*
Mysore Local	190.80	3.57	4.55*	5.25	47.05	43.25*	70.35*	25.31*	17.21*	1.96*	3.73	4.00	2.26	5.15*	5.54	6.54*	2.85	5.89
Kashi Madhu	122.10	4.10	5.83	4.18	47.33	46.00	76.55	16.17	13.66	0.83	2.78	5.03*	2.87	2.52	11.60*	2.89	4.44*	17.97*
Anantpur	164.28	3.48	6.28	4.30	48.53	46.75	73.55	14.38	10.67	0.78	3.10	4.67*	2.42	2.37	9.56*	6.82*	1.08	3.39
Yanakandla	173.63	4.05	6.63	4.18	49.75	49.33	85.38	21.02	12.10	1.24	2.67	4.23	2.31	3.07	14.04*	5.84	5.52*	16.74*
Yaganti	203.88*	3.63	6.55	3.98	49.20	43.10*	73.85	15.24	11.07	0.83	4.05	3.25	2.39	2.27	9.65*	4.93	3.23	4.81
Mean	177.40	3.28	6.59	4.56	48.85	47.09	74.04	19.86	12.21	1.03	3.31	3.53	2.57	3.06	8.29	5.09	3.27	6.43
SEd	7.55	0.43	0.89	0.63	1.92	1.94	1.61	1.86	1.19	0.14	0.36	0.41	0.42	0.39	0.36	0.49	0.29	0.07
CD (0.05)	13.53	0.86	1.88	1.27	3.86	3.82	2.855	3.74	2.38	0.29	0.74	0.76	0.87	0.79	0.73	0.96	0.58	0.14

* **Significant at 5 per cent level**