

Original Research Article

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Mean Performance of Growth, Earliness and Yield Attributes in Muskmelon (*Cucumis melo* L.)

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ABSTRACT

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Muskmelon (*Cucumis melo* L.) is an important cucurbitaceous vegetable crop grown under arid and semi-arid conditions. However, limited cultivation area and the scarcity of improved varieties necessitate the development of high-yielding hybrids. The present study was conducted to assess the magnitude and direction of heterosis for growth, earliness, and yield traits during late kharif 2021 and early summer 2022. Fifteen hybrids were developed by crossing six parental lines through hand emasculatation and hand pollination. The hybrids were evaluated in a Randomized Block Design with two replications to study their performance for various growth, earliness, and yield parameters. The mean performance reveals that among 15 F₁s, the hybrids VRMM-310×VRMM-37 (3.74), VRMM-35 × VRMM-29 (3.45), VRMM-310×VRMM-7 (2.86), VRMM-7×VRMM-29 (2.82), VRMM-35 × VRMM-7(2.76) has recorded significantly highest fruit yield per vine and other desirable traits compared to other hybrids and over both the checks Arka Siri and Shabrathi.

Introduction

Muskmelon (*Cucumis melo* L.) is a nutritionally rich fruit valued for its high water content, refreshing taste, and health-promoting properties. It is an excellent source of carbohydrates and provides essential vitamins such as vitamin A (in the form of β-carotene) and vitamin C, which play a vital role in maintaining vision, enhancing immunity, and acting as antioxidants. Muskmelon also contains appreciable amounts of minerals including potassium, calcium, magnesium, and iron, which are important for maintaining electrolyte balance, bone health, and proper physiological functioning. The fruit is

low in fat and calories, making it suitable for consumption in balanced and calorie-restricted diets. Its high dietary fiber content aids digestion, prevents constipation, and contributes to overall gut health. In addition, muskmelon possesses antioxidant compounds and phytochemicals that help in reducing oxidative stress and lowering the risk of chronic diseases. Due to its high moisture content, muskmelon is particularly effective in preventing dehydration and is widely consumed during hot summer months.

Owing to its rich nutritional profile and health benefits, muskmelon is considered an important functional food

crop, contributing to nutritional security and dietary diversification, especially in arid and semi-arid regions. In India, muskmelon occupies a significant place among cucurbitaceous vegetables; however, its productivity remains relatively low compared to its potential. This can be attributed to factors such as limited availability of high-yielding varieties and hybrids, narrow genetic base, susceptibility to biotic and abiotic stresses, and inadequate exploitation of heterosis. The development of superior hybrids is therefore essential to enhance yield, earliness, and adaptability under varying environmental conditions.

Materials and Methods

The present investigation entitled “Estimation of heterosis for growth, earliness and yield parameters in muskmelon (*Cucumis melo* L.)” was carried out at Dr. Y.S.R. Horticultural College, Venkataramannagudem, during the period 2021–2022. The study was conducted in two major phases.

Generation of Breeding Material

Seeds of six parental lines were sown in a polyhouse during October 2021 for the development of F₁ hybrids. Hybridization was carried out following a partial diallel mating design excluding reciprocals, resulting in the development of fifteen F₁ hybrids.

For hybrid development, healthy male and female flower buds were selected during the evening prior to anthesis and were covered with butter paper bags to prevent out-crossing and contamination. Pollination was performed on the following morning between 5:30 a.m. and 8:00 a.m., using pollen from the selected male parent. After pollination, the female flowers were re-bagged and properly tagged with details of the cross and date of pollination. Simultaneously, self-pollination of both male and female parental lines was carried out, and the flowers were similarly bagged to ensure genetic purity.

Evaluation of F₁ Hybrids

The developed F₁ hybrids, along with their respective parental lines, were evaluated during the summer season of 2022 following a Randomized Block Design (RBD) with two replications. Observations were recorded on five randomly selected vines from each replication for growth, earliness, and yield-related traits, namely number of branches per vine, days to first male flower

appearance, days to first female flower appearance, number of male flowers per vine, number of female flowers per vine, sex ratio, average fruit weight (g), and fruit yield per vine (kg).

Results and Discussion

Significant variation was observed among the parents, F₁ hybrids, and checks for all growth, earliness, yield, and quality traits studied, indicating the presence of substantial genetic variability in the experimental material.

Growth and Earliness Traits

For number of branches per vine, higher mean values were desirable. Among the parental lines, VRMM-310 recorded the highest number of branches, followed by VRMM-14, VRMM-29, and VRMM-37. Among the hybrids, VRMM-310 × VRMM-7 exhibited the maximum number of branches per vine, followed by VRMM-35 × VRMM-310, VRMM-29 × VRMM-14, and VRMM-35 × VRMM-37, indicating superior vegetative vigour. Among the checks, Arka Siri recorded a higher number of branches compared to Shabrathi.

For days to first male and female flower appearance, lower mean values were considered desirable. Among parents, VRMM-37 recorded the earliest male flowering, while VRMM-14 showed early female flower appearance. Among hybrids, VRMM-35 × VRMM-7 was the earliest for male flowering, whereas VRMM-7 × VRMM-29 recorded the earliest female/hermaphrodite flower appearance. Shabrathi exhibited earlier flowering compared to Arka Siri. Similar results are obtained for Thangamani *et al.* (2013), Bhatt *et al.* (2017) in bitter gourd.

Similarly, for node number at which first female and hermaphrodite flowers appeared, lower node numbers were preferred. Among parents, VRMM-35 showed the earliest appearance of female flowers, while VRMM-310 recorded relatively lower node numbers for hermaphrodite flowers. Among hybrids, VRMM-37 × VRMM-14 showed the lowest node number for first female flower appearance, whereas VRMM-35 × VRMM-37 was earliest for hermaphrodite flower appearance. Arka Siri recorded lower node numbers compared to Shabrathi. Similar results were obtained by Singh and Vashisht (2018) in muskmelon.

Table.1

Sl. No.	Parents	Number of branches per vine	Days to first male flower appearance	Days to first female flower appearance	Number of male flowers per vine	Number of female flowers per vine	Number of hermaphrodite flowers per vine	Node at which 1 st female flower appeared	Node at which 1 st hermaphrodite flower appeared	Sex ratio	Number of fruits per vine	Fruit weight (g)
1	VRMM-35	6.90	21.50	33.10	22.40	6.10	1.20	6.70	15.30	10.41	2.40	611.5
2	VRMM-310	9.10	21.20	32.50	20.80	5.70	2.00	7.90	13.70	9.09	2.50	970
3	VRMM-37	8.30	20.80	32.30	22.50	6.30	0.00	7.60	0.00	9.97	2.20	1026.5
4	VRMM-7	7.70	21.70	31.30	22.20	7.00	1.30	9.00	14.10	9.45	2.40	668.5
5	VRMM-29	8.50	20.90	32.80	21.40	6.30	1.30	8.10	14.00	8.61	2.70	679
6	VRMM-14	8.70	21.10	31.10	21.50	6.70	1.80	10.10	14.40	9.60	2.20	679.5
	PARENT MEAN	8.20	21.20	32.18	21.80	6.35	1.27	8.23	11.92	9.52	2.40	772.5
	Hybrids											
1	VRMM-35 × VRMM-310	9.90	21.40	32.10	20.60	6.60	0.00	7.00	0.00	9.06	2.80	730.5
2	VRMM-35 × VRMM-37	9.50	21.40	30.90	25.30	6.20	1.00	7.30	13.20	9.65	2.90	727
3	VRMM-35 × VRMM-7	8.90	20.10	33.30	21.10	6.60	0.00	7.40	0.00	8.71	2.70	1028.5
4	VRMM-35 × VRMM-29	8.80	21.10	32.30	22.30	6.37	0.70	7.10	13.40	9.46	2.70	774.37
5	VRMM-35 × VRMM-14	8.50	20.50	32.10	22.70	6.80	0.00	7.20	0.00	10.43	3.30	620.5
6	VRMM-310×VRMM-37	8.80	21.10	32.40	22.00	6.90	0.90	6.90	13.70	7.71	3.60	1066
7	VRMM-310×VRMM-7	10.60	20.50	31.00	21.00	6.00	1.10	7.90	13.20	9.42	2.70	1061.5
8	VRMM-310×VRMM-29	9.00	21.00	31.80	18.30	6.70	0.00	7.70	0.00	8.36	3.20	862
9	VRMM-310×VRMM-14	8.90	22.20	32.10	24.10	6.40	0.00	7.90	0.00	10.06	2.80	746.5
10	VRMM-37×VRMM-7	8.90	21.80	32.50	21.30	7.50	0.70	7.20	14.30	9.60	3.00	734
11	VRMM-37×VRMM-29	9.10	20.20	31.70	23.30	7.30	0.70	7.30	14.60	9.89	2.30	666.5
12	VRMM-37×VRMM-14	7.70	20.90	31.60	21.40	5.70	0.00	6.80	0.00	10.54	2.50	947
13	VRMM-7×VRMM-29	9.00	21.40	30.70	24.50	6.70	0.00	7.00	0.00	9.16	2.80	962
14	VRMM-7 × VRMM-14	8.40	21.40	31.60	21.20	6.20	1.30	7.70	14.30	9.38	3.10	662.5
15	VRMM-29×VRMM-14	9.60	21.30	33.10	18.90	6.10	0.90	7.60	14.70	11.09	2.60	638.5
	HYBRID MEAN	9.04	21.09	31.95	21.87	6.54	0.49	7.33	7.43	9.50	2.87	815.15
	Arka Siri	8.60	21.70	32.40	21.50	6.30	1.20	7.30	14.50	9.70	2.30	942
	Shabrathi	7.00	21.50	32.90	21.60	5.80	0.90	7.10	14.30	10.05	2.20	959.9
	G. mean	8.71	21.16	32.07	21.82	6.45	0.74	7.56	9.20	9.54	2.69	815.83
	S. E ±m	0.49	0.40	0.46	1.02	0.50	0.16	0.26	0.33	0.28	0.31	86.005
	C.D @ 5%	1.44	NS	1.36	3.00	NS	0.47	0.75	0.96	0.81	NS	252.24
	C.D @ 1%	1.96	NS	1.85	4.07	NS	0.64	1.02	1.30	1.10	NS	342.84

Table.2

Sl.No	Parents	Fruit field per vine (kg)	Fruit length (cm)	Fruit diameter (cm)	Rind thickness (cm)	Pulp thickness (cm)	Total soluble solids (^o B)	Acidity (%)	Reducing sugars (%)	Totalsugars (%)	Non reducing sugars (%)	Beta Carotene (µg/100 g)
1	VRMM-35	1.17	9.77	12.77	0.28	2.09	5.54	1	8.26	10.23	1.97	63.65
2	VRMM-310	2.4	17.31	14.32	0.25	2.11	7.91	0.63	7.61	9.8	2.18	121.74
3	VRMM-37	2.3	13.53	16.86	0.38	1.38	7.29	0.72	8.38	11.51	3.13	93.15
4	VRMM-7	1.57	8.72	12.67	0.3	2.28	7.44	0.45	9.24	11.98	2.73	90.74
5	VRMM-29	1.9	10.08	16.01	0.29	2.44	7.08	0.73	8.01	9.77	1.76	122.44
6	VRMM-14	1.48	12.41	12.9	0.2	2.33	8.15	0.55	8.71	12.34	3.63	74.97
	PARENT MEAN	1.80	11.97	14.25	0.28	2.10	7.23	0.68	8.36	10.93	2.56	94.44
	Hybrids											
1	VRMM-35 × VRMM-310	2.05	11.8	12.32	0.31	1.87	5.23	1.51	8.32	10.65	2.33	87.75
2	VRMM-35 × VRMM-37	2.1	17.15	13.17	0.39	1.85	8.08	0.65	7.34	9.61	2.27	78.89
3	VRMM-35 × VRMM-7	2.76	12.09	14.79	0.4	1.99	7.76	0.68	7.47	10.74	3.27	74.73
4	VRMM-35 × VRMM-29	3.45	12.72	13.26	0.35	1.95	6.65	0.77	7.85	10.3	2.46	76.28
5	VRMM-35 × VRMM-14	1.98	10.1	12.14	0.33	2.13	5.59	1.46	7.61	11.71	4.09	90.64
6	VRMM-310×VRMM-37	3.74	12.9	15.72	0.25	2.43	12.39	0.22	8.53	13.81	5.27	123.31
7	VRMM-310×VRMM-7	2.86	11.6	18.96	0.38	1.97	7.25	0.68	8.02	9.43	1.4	117.92
8	VRMM-310×VRMM-29	2.73	12.24	17.97	0.27	2.11	9.05	0.49	9.19	11.63	2.44	106.78
9	VRMM-310×VRMM-14	2.13	12.44	13.08	0.42	2.22	6.17	1.3	8.33	9.87	1.54	94.04
10	VRMM-37×VRMM-7	2.19	12.94	11.68	0.39	1.79	11.28	0.34	11.02	12.44	2.74	80.67
11	VRMM-37×VRMM-29	1.52	14.01	16.25	0.32	2.21	9.9	0.57	8.2	10.69	2.49	85.7
12	VRMM-37×VRMM-14	2.36	16.95	13.21	0.27	2.18	6.51	1.26	7.51	11.55	4.03	92.54
13	VRMM-7×VRMM-29	2.82	13.03	12.45	0.39	2.11	5.38	1.36	8.94	12.35	3.41	100.92
14	VRMM-7 × VRMM-14	2.04	10.63	12.17	0.43	2.08	6.33	0.8	7.63	11.7	4.07	112.2
15	VRMM-29×VRMM-14	1.63	10.7	11.97	0.32	2.24	6.47	0.44	6.75	13.39	6.64	105.63
	HYBRID MEAN	2.42	12.75	13.94	0.34	2.07	7.60	0.83	8.18	11.32	3.23	95.2
	Arka Siri	2.17	18.25	17.24	0.35	2.13	10.95	0.41	7.75	11.55	3.79	138.16
	Shabrathi	2.17	17.54	14.43	0.29	2	8.09	0.65	8.77	10.73	1.96	107.18
	G. mean	2.2415	12.99	14.18	0.33	2.08	7.67	0.77	8.23	11.20	3.02	97.39
	S. E ±m	0.3174	1.3594	0.2394	0.044	0.1055	0.1593	0.0574	0.225	0.1852	0.2999	0.2584
	C.D @ 5%	0.931	3.9869	0.7021	NS	0.3096	0.4673	0.1683	0.6602	0.5433	0.8797	0.7579
	C.D @ 1%	1.2654	5.4189	0.9543	NS	0.4207	0.6351	0.2287	0.8973	0.73	1.1957	1.0301

Figure.1 Mean performance of promising hybrids for fruit yield per vine (kg) over Arka Siri.

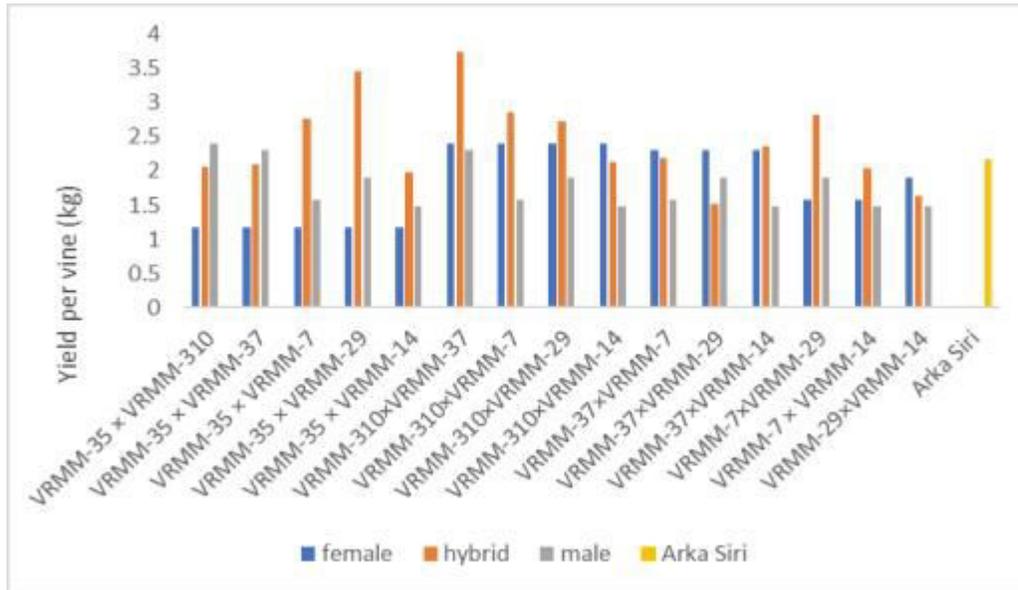
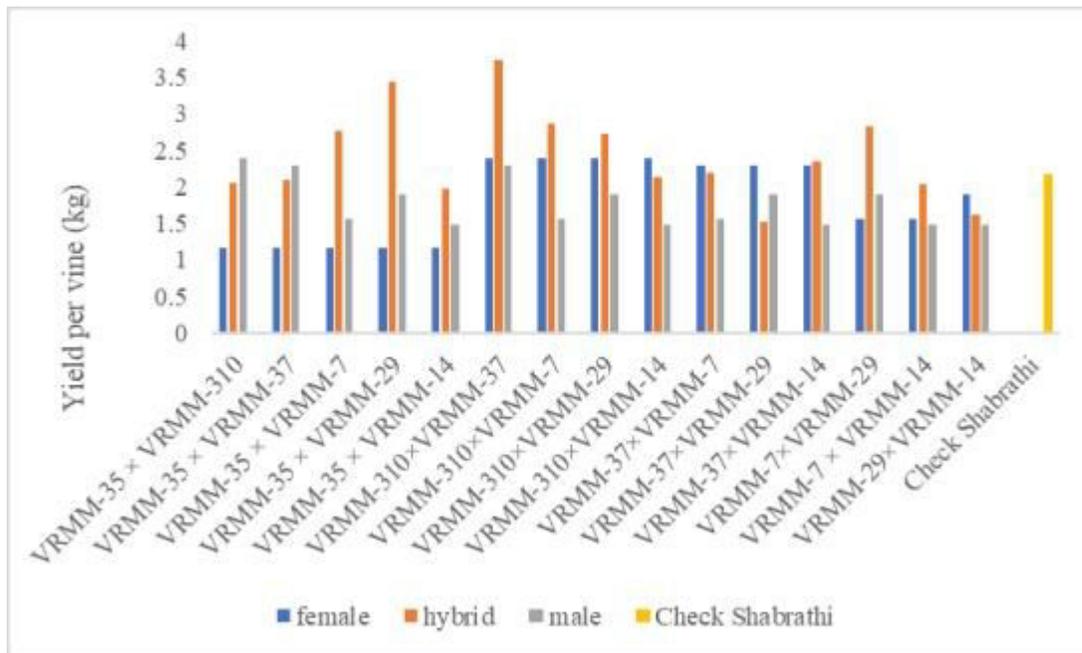


Figure.2 Mean performance of promising hybrids for fruit yield per vine (kg) over Shabrathi.



Sex Expression Traits

For number of male flowers per vine and sex ratio, lower values were desirable, whereas number of female and hermaphrodite flowers per vine required higher mean values. Among parents, VRMM-310 recorded fewer male flowers, while VRMM-7 and VRMM-29 recorded

higher female and hermaphrodite flower numbers, respectively. Among hybrids, VRMM-310 × VRMM-29 recorded the lowest number of male flowers, VRMM-37 × VRMM-7 recorded the highest number of female flowers, and VRMM-7 × VRMM-14 recorded the highest number of hermaphrodite flowers per vine. For sex ratio, VRMM-310 × VRMM-37 recorded the most

desirable (lowest) value. Among the checks, Arka Siri exhibited a comparatively lower sex ratio than Shabrathi. Similar results were obtained for Omprasad *et al.* (2021) in muskmelon and Gograj *et al.* (2015) in cucumber.

Yield and Yield-Contributing Traits

For number of fruits per vine, fruit weight, and fruit yield per vine, higher mean values were preferred. Among the parents, VRMM-310 and VRMM-29 recorded superior performance for fruit yield and number of fruits per vine, while VRMM-37 recorded the highest fruit weight.

Among the hybrids, VRMM-310 × VRMM-37 recorded the highest number of fruits per vine, maximum fruit weight, and the highest fruit yield per vine, followed by VRMM-35 × VRMM-29, VRMM-310 × VRMM-7, and VRMM-7 × VRMM-29. These hybrids significantly outperformed both the standard checks, Arka Siri and Shabrathi, indicating the effective expression of heterosis for yield and its contributing traits.

Fruit Physical and Quality Traits

Considerable variation was also observed for fruit length, diameter, rind thickness, pulp thickness, total sugars, non-reducing sugars, and β-carotene content. Among parents, VRMM-310 and VRMM-37 were superior for fruit size attributes, VRMM-14 recorded the lowest rind thickness, and VRMM-29 and VRMM-14 recorded higher pulp thickness and sugar content. Similar results are obtained by Omprasad *et al.* (2021) in muskmelon and Doloi *et al.* (2018), Khot *et al.* (2018).

Among hybrids, VRMM-310 × VRMM-37 recorded superior performance for fruit weight, pulp thickness, total sugars, and β-carotene content, while VRMM-310 × VRMM-7 recorded maximum fruit diameter and lower non-reducing sugars. Lower rind thickness was observed in VRMM-310 × VRMM-37, which is desirable from a consumer preference standpoint. Among the checks, Arka Siri recorded higher fruit size traits, while Shabrathi recorded better pulp thickness and lower rind thickness.

In conclusion, the analysis of mean performance revealed considerable variation among the fifteen F₁ hybrids for fruit yield and associated traits. Among them, the hybrids VRMM-310 × VRMM-37, VRMM-35 × VRMM-29, VRMM-310 × VRMM-7, VRMM-7 ×

VRMM-29, and VRMM-35 × VRMM-7 exhibited significantly superior fruit yield per vine coupled with favourable performance for other growth and earliness attributes. These hybrids consistently outperformed the standard check varieties Arka Siri and Shabrathi, indicating the effective exploitation of heterosis. The superior performance of these crosses suggests their potential for further evaluation and possible utilization in muskmelon hybrid breeding programmes aimed at enhancing yield and productivity.

Author Contributions

Akhila Srinidhi Pendyala: Investigation, formal analysis, writing—original draft, E. Padma: Validation, methodology, writing—reviewing, Neeraja: Formal analysis, writing—review and editing, Kousalya: Investigation, writing—reviewing. Sushmitha Talla: Resources, investigation writing—reviewing.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

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