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Comparative Assessment of Muskmelon Hybrids, Parents and Standard Hybrid Checks for Growth and Flowering Traits Under Summer Conditions

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Abstract

The present investigation entitled "Mean performance of muskmelon hybrids, parents and standard checks for growth and flowering traits in Summer season." was carried out during Summer-2024 and Summer 2025 seasons, at All India Coordinated Research Project on Vegetable Crops, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri. The study was undertaken on 45 crosses made by 10 x 10 half diallel method and their parents of muskmelon along with one commercial hybrid check namely Chandan by using Randomized Block Design with two replications. A total of 45 F_1 hybrids were generated and evaluated along with one standard hybrid check over two growing seasons i.e. Summer-2024 and summer-2025 season. Nine quantitative traits *viz*., length of vine (m), number primary branches per vine, internodal length, number of nodes per vine, days to 1st male flower appearance, days to 1st female flower appearance, node at which 1st female flower appeared, days to 50% flowering, days to 1st fruit harvest were assessed. It was concluded from the present investigation that among parents, P_4 (RHRMM-318), P_6 (RHRMM-34) and P_9 (RHRMM-355), P_{10} (RHRMM-04) and hybrids, P_1 x P_{10}, P_4 x P_6, P_4 x P_{10}, P_6 x P_7, P_6 x P_9, P_9 x P_{10} performed significantly better for most of the growth and flowering contributing characters during both the seasons. whereas, new hybrid combinations could be further evaluated in yield traits for commercial exploitation.

Key words : Mean performance, yield, hybrids, superior variety, commercial exploitation.

Muskmelon (*Cucumis melo* L. 2n = 2x = 24) popularly known as 'kharbuja' in India, is an economically important fruit vegetable species of the cucurbitaceae family (Pitrat *et al*., 2000). It is subdivided into 6 cultivar groups: cantaloupensis, inodorus, flexuosus, conomon, chito-dudaim and momordica (Munger and Robinson, 1991). It is an annual cucurbit and is highly cross-pollinated. It is considered to be originated in Africa. India is secondary center of diversity of muskmelon. At present, it is an important dessert fruit in India, muskmelon production is concentrated in the tropical and sub-tropical regions (Ariesta and Rifah, 2016).

Muskmelon is a good source of health promoting compounds, such as, β-carotene and ascorbic acid. β-carotene helps in reducing the risk of chronic heart disease and in prevention of night blindness. On an average, muskmelon fruit pulp contains 5.6 to 36 µg g^{-1} of -carotene in fresh fruit pulp (Lester and Eischen 1996). It also contains 42.2 mg of ascorbic acid per 100 g of edible portion which helps in maintaining a healthy immune system, reducing bacterial infection and prevention of cardiovascular diseases (Lester and Lester 2015). 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). Muskmelon exhibits great polymorphism for fruit traits, such as fruit size, shape, TSS, β-carotene and flesh colour. Owing to this diversity *Cucumis melo* L has been classified into 16 intraspecific groups (Pitrat *et al* 2000). Melon also exhibits varied pollination control mechanisms such as, male sterility, gynoecism and monoecism which could be utilized for breeding programs. Male sterile line MS-1 and MS-5 have already been utilized at PAU through development of hybrids, Punjab hybrid, MH-27 and MH-51 (Singh *et al.*, 2019). Heterosis breeding has been extensively explored and utilized in muskmelon. Conventional breeding methods in melon have improved melon genetics significantly. Melon improvement through conventional hybridization is relatively slow and narrow to a restricted 2 gene pool. Through heterosis breeding, it is possible to obtain viable intraspecific melon hybrids between wild-type genotypes and commercial melon varieties, to facilitate the transfer of the genetic traits of certain melon groups (Kamer *et al.*, 2015). The development of F_1 hybrids is the quickest way for improving important economic traits of muskmelon and an easy way of introducing disease resistance governed by dominant genes. Hybrids are developed by crossing superior inbred lines in possible combination. Therefore, for developing hybrids, information about combining ability and per se performance of inbred lines is necessary (Sandha and Lal 1999). Combining ability analysis is one of the powerful tools available, which offers an estimate of combining ability effects and help in selecting desirable parents and crosses for further course of action (Chadha and Nandpuri, 1980).

Among the mating designs, the diallel analysis (half diallel design) proposed by Griffing (1956a) provides the information about the performance of parents and their F1 hybrids. In the half diallel design each parent is crossed with each other in all possible combinations (apart from the reciprocals). It involves half matings and requires a less experimental area for estimation of material (Varinder and Vashisht, 2018).

Materials and Methods

In the present investigation ten genetically diverse parental lines of muskmelon were used as the experimental material *viz.*, (P_1) RHRMM-01, (P_2) RHRMM-217, (P_3) RHRMM-250, (P_4) RHRMM-318, (P_5) RHRMM-325, (P_6) RHRMM-34, (P_7) RHRMM-28, (P_8) RHRMM-340, (P_9) RHRMM-355 and (P_{10}) RHRMM-04 were crossed in all the possible combinations to get 45 F_1 hybrids in diallel mating system without reciprocals for the study of heterosis or yield and its contributing traits in muskmelon.

All the ten parents and 45 F_1s with standard check (Chandan) were evaluated during summer 2024 and Summer-2025 season in randomized block design with two replications at AICRP on Vegetable Crops, Department of Horticulture, MPKV Rahuri. All standard cultivation practices were implemented to ensure the healthy growth of the crop for evaluation. The data were analysed for nine quantitative characters. Data were collected on various parameters, including length of vine (m), number primary branches vine^{-1}, internodal length, number of nodes vine^{-1}, days to 1st male flower appearance, days to 1st female flower appearance, node at which 1st female flower appeared, days to 50% flowering, days to 1st fruit harvest five plants per treatment were randomly selected from each replication (three).

Results and discussion

The mean values of parents, hybrids and standard hybrid check for quantitative, morphological, yield and yield contributing attributes, per cent intensity of diseases and pest and biochemical parameters are displayed in Table 1. Out of all the parents, P10 (RHRMM-04) recorded significantly maximum length of vine (2.19 m) in summer-2024 season. During summer-2025, P10 (RHRMM-04) (2.39 m) recorded significantly maximum length of vine. Among 45 hybrids, cross combination P_9 x P_{10}

(3.11 m) recorded significantly maximum length of vine in summer-2024 season. Similarly, the cross P_9 x P_{10} (3.31 m) recorded a significant maximum length of vine during summer-2025 season. Muskmelon bears fruits at 5-7th node onwards on main stem and primary branches that's length of vine is important character, maximum length of vine more the yield. From mean values of hybrids and their parents, it is observed that the crosses in general had higher mean values in case of length of vine than parents due to the presence of hybrid vigour. Similar results of parents and hybrids for length of vine were reported by Tomar and Bhalala (2006), Jagtap and Musamade (2014), Pornsuriya *et al*. (2013), Kamer *et al*. (2015), Shashikumar and Pitchaimuthu (2016) and Hassan *et al*. (2018).

Among the parents, P_4 (RHRMM-318) recorded significantly maximum number of primary branches per vine (3.40) in summer-2024. During summer-2025, P_4 (RHRMM-318) again recorded significantly maximum number of primary branches vine^{-1} (3.54) followed by P10 (RHRMM-34) (3.52), P9 (RHRMM-355) (3.50) and P6 (RHRMM-34) (3.46). Among the 45 hybrids, the cross P_4 x P_6 (4.83) recorded significantly maximum number of primary branches per during summer-2024. Similarly, the cross P_4 x P_{10} (4.86) recorded significantly higher number of primary branches vine^{-1} during summer-2025. The number of primary branches vine^{-1} are directly correlated with the yield and the subsequent assessment of plant spacing and also with other traits considered during crop management to optimize fruit yield. Under present investigation, hybrids have shown higher performance in number of primary branches vine^{-1} as compared to their respective parents which denoted presence of hybrid vigour for number of primary branches vine^{-1}. Similar result obtained by Aravindakumar *et al*. (2005), Kumar (2005), Pornsuriya *et al*. (2013) Jagtap and Musamade (2014) and Badami *et al*. (2020).

Out of all the parents, P_4 (RHRMM-318) recorded significantly minimum internodal length (8.96 cm) in summer-2024 and in summer-2025, P_4 (RHRMM-318) recorded significantly minimum internodal length (7.95 cm), respectively. Among the 45 hybrids, the cross combination P_4 x P_{10} recorded significantly minimum internodal length (6.82 cm) in summer-2024. In summer-2025, the hybrid P_4 x P_{10} recorded significantly lowest internodal length (6.96 cm), respectively. The character minimum inter nodal length is indirectly related to the yield character, minimum the inter-nodal length more the number of nodes which directly related to the number of female flowers on the vine. From mean values of F_1 hybrids and their parents, it is evident that the crosses had higher and lower mean values in case of inter nodal length than parents due to the presence of heterosis. These findings are also in agreement with Badami *et al*. (2020), Duradundi *et al*. (2022) and Saha *et al*. (2022).

Among the parents, P_4 (RHRMM-318) recorded significantly maximum number of nodes per vine (24.61) during summer-2024 season. In summer-2025, P_4 (RHRMM-318) exhibited maximum number of nodes per vine (27.23), respectively. Out of the 45 hybrids, the hybrids P_4 x P6 (33.79) recorded significantly maximum number of nodes per vine during summer-2024. In summer-2025, the maximum number of nodes per vine was observed in P_4 x P_6 (33.76), respectively. The number of nodes plant^{-1} is directly proportional to the production of fruits, which ultimately leads to higher fruit yield. From per se performance of crosses and parents, it is observed that the crosses had higher mean values in case of nodes plant^{-1} than parents due to the presence of variability. Similar results were found by Tomar and Bhalala (2006), Pornsuriya *et al*. (2013), Jagtap and Musamade (2014), Kamer *et al*. (2015).

Table 1. Mean performance of parents and their crosses in 10 x 10 half diallel for various character in muskmelon (Summer Season)

Parents/ Hybrids	Length of vine (cm)		No. of primary branches vine^{-1}		Internodal length (cm)		No. of nodes vine^{-1}	
	2024	2025	2024	2025	2024	2025	2024	2025
Parents								
P_1	2.18	2.37	3.21	3.36	9.67	10.06	23.66	24.38
P_2	1.95	1.94	2.29	3.40	10.01	8.87	19.94	21.89
P_3	2.11	2.28	3.09	3.14	10.80	9.99	19.54	22.84
P_4	2.10	2.17	3.40	3.54	8.96	7.95	24.61	27.23
P_5	2.01	2.13	2.22	2.50	9.68	9.86	20.83	21.61
P_6	2.08	2.31	3.37	3.46	9.17	8.91	23.39	25.99
P_7	1.97	2.27	2.72	2.89	10.62	10.84	18.55	20.95
P_8	1.60	1.95	1.95	2.14	9.62	9.16	18.67	21.34
P_9	2.13	2.35	3.28	3.50	9.57	9.57	22.32	24.62
P_{10}	2.19	2.39	3.34	3.52	9.21	9.30	23.80	25.72
Mean	2.03	2.21	2.89	3.14	9.69	9.45	21.53	23.65
Hybrids								
P_1 x P2	2.19	2.33	3.35	3.49	8.98	9.32	24.44	25.02
P_1 x P3	2.16	2.30	3.75	3.89	8.97	9.36	24.17	24.61
P_1 x P4	2.07	2.24	3.95	4.09	8.03	9.02	25.84	24.82
P_1 x P5	2.19	2.32	3.25	3.92	8.20	8.93	26.73	26.05
P_1 x P6	2.05	2.26	3.05	3.19	8.98	9.32	22.88	24.26
P_1 x P7	2.38	2.34	3.53	3.67	9.84	10.34	24.22	22.64
P_1 x P8	2.39	2.51	2.82	2.96	11.61	11.43	20.60	21.97
P_1 x P9	2.34	2.42	3.20	3.34	11.33	10.97	20.71	22.09
P_1 x P10	2.97	3.22	3.56	3.85	9.09	8.76	32.78	32.39
P_2 x P3	1.94	2.07	3.46	3.33	8.15	8.24	23.83	25.21
P_2 x P4	1.56	1.69	3.17	3.31	8.09	8.20	19.27	20.64
P_2 x P5	1.92	1.95	3.25	3.17	7.98	8.20	24.07	23.84
P_2 x P6	1.84	1.98	3.28	3.42	7.73	7.84	23.88	25.26
P_2 x P7	1.95	2.02	4.06	3.99	7.59	8.00	25.78	24.73
P_2 x P8	2.00	2.14	4.14	4.02	7.79	7.90	25.72	27.10
P_2 x P9	2.04	2.18	4.02	4.16	7.57	7.67	27.04	28.43
P_2 x P10	2.01	2.14	2.92	3.06	10.85	10.78	18.54	19.91
P_3 x P4	2.74	2.97	4.31	4.36	8.74	8.01	31.38	32.78
P_3 x P5	2.43	2.59	4.01	4.15	8.73	8.59	27.84	29.23
P_3 x P6	2.50	2.28	3.62	3.76	9.34	8.75	26.83	26.06
P_3 x P7	2.49	2.18	3.05	3.19	10.84	8.94	22.99	24.37
P_3 x P8	2.03	2.17	3.55	3.69	8.18	8.26	24.88	26.27
P_3 x P9	2.78	2.95	4.34	4.36	8.99	8.02	30.94	32.34
P_3 x P10	2.43	2.58	2.94	3.08	12.42	10.91	19.58	20.95
P_4 x P5	1.75	1.88	4.39	4.44	7.38	7.51	23.71	25.10
P_4 x P6	2.39	2.58	4.83	4.84	7.08	6.97	33.79	33.76
P_4 x P7	2.10	2.10	4.33	4.24	7.26	7.02	28.99	30.38
P_4 x P8	2.03	1.97	4.39	4.31	7.40	6.98	27.51	28.90
P_4 x P9	2.00	2.21	4.22	4.36	6.86	7.22	29.22	30.62
P_4 x P10	2.27	2.54	4.75	4.86	6.82	6.96	33.38	33.74
P_5 x P6	2.29	2.42	4.06	4.20	7.98	8.06	28.73	30.13
P_5 x P7	2.06	2.20	3.67	3.81	9.12	9.16	22.65	24.03

Table 1. Contd..

Parents/ Hybrids	Length of vine (cm)		No. of primary branches vine^{-1}		Internodal length (cm)		No. of nodes vine^{-1}	
	2024	**2025**	**2024**	**2025**	**2024**	**2025**	**2024**	**2025**
P_5 x P8	2.01	2.14	3.72	3.86	9.17	9.21	21.94	23.32
P_5 x P9	2.08	2.22	2.72	2.85	11.98	11.83	17.38	18.74
P_5 x P10	2.00	2.13	2.87	3.01	10.08	10.06	19.83	21.20
P_6 x P7	2.59	2.89	4.44	4.53	8.92	8.15	29.05	32.31
P_6 x P8	2.36	2.46	3.73	3.87	8.75	8.67	27.01	28.40
P_6 x P9	2.20	2.43	3.35	3.49	8.84	8.52	24.88	24.79
P_6 x P10	3.05	3.27	4.11	4.14	9.63	7.79	31.72	33.13
P_7 x P8	1.88	2.00	3.32	3.46	8.22	8.25	22.90	24.28
P_7 x P9	2.69	2.82	4.17	4.27	9.03	8.24	29.83	31.23
P_7 x P10	2.39	2.49	3.57	3.71	12.97	10.28	18.44	14.73
P_8 x P9	1.83	1.85	3.95	4.09	8.47	8.02	21.67	23.05
P_8 x P10	1.85	1.99	3.99	4.13	9.08	9.13	20.43	21.80
P_9 x P10	3.11	3.31	4.25	4.48	10.54	8.44	29.54	30.93
S.Em. ±	0.17	0.18	0.20	0.20	0.08	0.18	0.82	0.61
C.D. 5%	0.48	0.52	0.58	0.56	0.23	0.50	2.33	1.73

Out of all the parents, P_4 (RHRMM-318) recorded significantly minimum number of days to 1st male flower appearance (31.32 days) during summer-2024. In summer-2025, P_4 (RHRMM-318) required the minimum number of days to 1st male flower appearance (31.19 days). Among the 45 hybrids, the cross P_4 x P_6 (28.78 days) recorded significantly minimum number of days to 1st male flower appearance in summer-2024. During summer-2025, the cross P_4 x P_6 (27.94 days) recorded the minimum number of days to 1st male flower appearance. Days to first male flower appearance is crucial trait for earliness in muskmelon, mean values of parents and crosses indicated that presence of hybrid vigour for days to first male flower appearance. Similar results were obtained by Jagtap and Musamade (2014), Pornsuriya *et al*. (2013), Kamer *et al*. (2015), Hassan *et al*. (2018).

Out of all the parents, P_4 (RHRMM-318) recorded significantly minimum number of days to 1st female flower appearance (35.11 days) in summer-2024 season. In summer-2025 season, P_4 (RHRMM-318) required the minimum number of days to 1st female flower appearance (36.04 days), respectively. Out of the 45 hybrids, the cross P_4 x P_6 (32.90 days) recorded significantly minimum number of days to 1st female flower appearance in summer-2024 season. During summer-2025, the cross P_4 x P_6 (32.05 days) recorded the minimum number of days to 1st female flower appearance. Days to 1st female flower appearance is crucial trait for earliness in muskmelon, mean values of parents and crosses indicated that presence of hybrid vigour for days to first female flower appearance. Similar results were obtained by Jagtap and Musamade (2014), Pornsuriya *et al*. (2013), Kamer *et al*. (2015), Hassan *et al*. (2018).

Out of all the parents, the minimum days to 50% flowering (40.02 days) were recorded in P_4 (RHRMM-318) in summer-2024 and minimum days to 50% flowering was recorded in P_4 (RHRMM-318) (41.46 days) during summer-2025. Among 45 hybrids, the cross P_4 x P_6 noticed the minimum days to 50% flowering

Table 1. cont….

Parents/ Hybrids	Days to 1st male flower appearance		Days to 1st female flower appearance		Days to 50% flowering		Node at which 1st female flower appeared		Days to 1st fruit harvest	
	2024	**2025**	**2024**	**2025**	**2024**	**2025**	**2024**	**2025**	**2024**	**2025**
Parents										
P1	32.19	31.88	32.19	31.88	41.07	41.95	5.35	5.78	74.34	76.61
P2	35.14	34.39	35.14	34.39	45.12	44.47	5.87	5.89	80.67	80.44
P3	38.26	38.06	38.26	38.06	47.21	47.18	6.40	6.28	81.62	82.56
P4	31.32	31.19	31.32	31.19	40.02	41.46	5.20	5.53	74.72	75.84
P5	34.14	34.29	34.14	34.29	43.84	44.18	7.13	7.01	78.05	78.34
P6	34.37	33.19	34.37	33.19	42.72	42.20	6.71	6.59	77.33	76.95
P7	34.01	32.82	34.01	32.82	42.84	43.22	5.70	5.58	78.01	78.43
P8	37.15	36.79	37.15	36.79	46.22	45.90	6.45	6.33	83.88	82.94
P9	32.64	32.05	32.64	32.05	41.06	41.72	5.40	5.55	75.01	76.19
P10	33.30	33.12	33.30	33.12	42.49	42.46	6.25	6.13	79.05	78.48
Mean	34.25	33.78	34.25	33.78	43.26	43.47	6.05	6.06	78.27	78.68
Hybrids										
P1 x P2	32.95	30.82	32.95	30.82	42.44	39.40	5.61	5.48	74.68	74.09
P1 x P3	32.72	31.88	32.72	31.88	42.12	41.38	5.38	5.25	75.41	74.82
P1 x P4	31.43	30.60	31.43	30.60	41.11	39.90	5.64	5.52	73.84	73.26
P1 x P5	30.91	30.07	30.91	30.07	40.55	39.80	6.66	6.53	74.62	74.04
P1 x P6	32.01	31.18	32.01	31.18	41.56	40.81	6.38	6.25	75.50	74.92
P1 x P7	32.55	31.09	32.55	31.09	41.94	41.20	5.11	4.98	75.12	75.34
P1 x P8	31.83	31.00	31.83	31.00	42.26	41.52	5.34	5.21	76.12	75.54
P1 x P9	31.98	30.82	31.98	30.82	40.61	41.57	5.26	5.13	74.40	76.22
P1 x P10	30.23	29.39	30.23	29.39	39.51	38.75	5.33	5.14	74.02	73.44
P2 x P3	38.27	37.47	38.27	37.47	47.64	46.46	5.22	5.09	78.98	79.18
P2 x P4	36.72	35.21	36.72	35.21	44.82	44.98	6.57	6.45	78.44	80.04
P2 x P5	35.77	35.73	35.77	35.73	44.74	45.22	5.71	5.59	78.08	79.61
P2 x P6	37.34	37.84	37.34	37.84	45.88	46.17	6.35	6.23	79.72	79.43
P2 x P7	36.70	36.77	36.70	36.77	45.36	45.56	5.56	5.43	79.43	81.50
P2 x P8	38.18	38.20	38.18	38.20	46.94	46.73	6.05	5.93	80.44	80.06
P2 x P9	35.27	35.61	35.27	35.61	45.25	45.07	6.27	6.14	78.94	80.80
P2 x P10	37.82	36.31	37.82	36.31	47.11	44.44	5.84	5.72	80.61	78.67
P3 x P4	30.77	29.94	30.77	29.94	38.89	38.14	4.66	4.53	73.52	72.05
P3 x P5	37.63	36.14	37.63	36.14	46.02	43.45	5.88	5.75	78.48	77.51
P3 x P6	37.82	36.33	37.82	36.33	46.85	44.73	6.06	5.94	78.24	77.10
P3 x P7	36.76	35.27	36.76	35.27	45.59	44.18	5.22	5.10	79.19	78.38
P3 x P8	36.15	36.75	36.15	36.75	46.92	46.11	5.29	5.16	80.26	79.43
P3 x P9	35.55	34.83	35.55	34.83	45.09	42.40	5.07	4.94	76.98	73.47
P3 x P10	37.22	35.79	37.22	35.79	44.87	44.84	5.24	5.04	78.17	78.17
P4 x P5	31.28	30.45	31.28	30.45	40.61	39.86	5.23	5.11	72.90	72.31
P4 x P6	28.78	27.94	28.78	27.94	37.95	37.19	4.55	4.42	70.84	70.25
P4 x P7	31.11	30.28	31.11	30.28	40.77	40.02	5.52	5.40	71.51	72.48
P4 x P8	30.07	29.23	30.07	29.23	39.72	38.38	4.91	4.78	71.23	71.99
P4 x P9	30.52	29.68	30.52	29.68	39.67	38.12	4.72	4.59	72.21	71.61
P4 x P10	31.00	29.67	31.00	29.67	39.60	38.85	4.64	4.52	69.65	69.06
P5 x P6	32.68	31.85	32.68	31.85	42.51	41.76	6.72	6.60	76.83	75.36
P5 x P7	32.07	32.05	32.07	32.05	41.88	40.98	6.73	6.61	75.95	75.61
P5 x P8	34.67	30.67	34.67	30.67	43.62	41.33	7.06	6.94	77.57	77.84

Table 1. cont….

Parents/ Hybrids	Days to 1st male flower appearance		Days to 1st female flower appearance		Days to 50% flowering		Node at which 1st female flower appeared		Days to 1st fruit harvest	
	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025
P5 x P9	33.75	33.42	33.75	33.42	44.01	43.27	4.89	5.23	75.79	75.20
P5 x P10	33.45	31.11	33.45	31.11	41.17	41.26	6.95	6.82	75.04	73.55
P6 x P7	31.39	30.50	31.39	30.50	39.95	39.20	5.51	5.38	73.94	72.58
P6 x P8	35.27	34.45	35.27	34.45	44.11	43.36	5.90	5.77	75.79	75.20
P6 x P9	32.83	30.83	32.83	30.83	41.79	40.61	6.56	6.44	74.73	74.15
P6 x P10	32.68	31.85	32.68	31.85	39.93	39.94	5.34	5.22	73.89	73.30
P7 x P8	31.01	30.80	31.01	30.80	41.61	40.01	6.27	6.15	75.22	74.63
P7 x P9	31.27	30.62	31.27	30.62	40.78	40.03	4.97	4.84	73.83	73.25
P7 x P10	36.14	35.34	36.14	35.34	44.64	45.32	5.73	5.61	81.98	78.43
P8 x P9	37.42	37.58	37.42	37.58	46.79	47.06	6.48	6.36	80.46	80.94
P8 x P10	37.17	37.11	37.17	37.11	46.66	46.88	6.22	6.09	80.50	80.72
P9 x P10	31.27	31.18	31.27	31.18	40.98	40.23	4.55	4.42	74.11	73.52
S.Em. ±	0.94	1.10	0.94	1.10	0.69	1.48	0.33	0.20	0.77	1.88
C.D. 5%	2.65	3.11	2.65	3.11	1.96	4.20	0.94	0.57	2.17	5.32

(37.95 days) in the summer-2024 and cross P_4 x P_6 with 37.19 days in summer-2025 season. Days to 50% flowering is an essential trait for earliness to flowering, extended fruiting period and early harvest which are directly proportional to the yield. According to the mean performance, it is evident that hybrids had taken lesser number of days to reach 50 % flowering as compared to their respective parents which denoted presence of hybrid vigour for days to 50 % flowering. Similar results were obtained by Jagtap and Musamade (2014), Pornsuriya *et al*. (2013) and El-Sayed *et al*. (2019).

Among the parents, the earliest node for 1st female flower appearance was observed in P4 (RHRMM-318) (5.20) during Summer-2024, whereas in summer-2025, the earliest node for 1st female flower appearance was observed P_4 (RHRMM-318) (5.53), respectively. Among 45 hybrids, the minimum node for 1st female flower appearance was recorded in P_4 x P_6 and P_9 x P_{10} (4.55) in Summer-2024. Whereas, in Summer-2025, the minimum node for 1st female flower appearance was recorded in P_4 x P_6 and P_9 x P_{10} (4.42). Early female flowering node is crucial trait for earliness in muskmelon, mean values of parents and crosses indicated that presence of heterosis for early female flowering node. Similar results were obtained by Jagtap and Musamade (2014), Hassan *et al*. (2018) and El-Sayed *et al*. (2019).

Among the parents, the earliest 1st fruit harvest was recorded in P_1 (RHRMM-01) (74.34 days) during Summer-2024, whereas in Summer-2025, the minimum days to 1st fruit harvest was recorded in P_4 (RHRMM-318) (75.84 days), respectively. Among 45 hybrids, the earliest 1st fruit harvest was recorded in P_4 x P_{10} (69.65 days) during Summer-2024. While in Summer-2025, the earliest 1st fruit harvest was observed in P_4 x P_{10} (69.06 days), respectively. Days to first harvesting is important trait for early harvesting in muskmelon which is important to catch early market, mean values of parents and crosses indicated that presence of hybrid vigour for days to first harvesting. Similar results were obtained by Jagtap and Musamade (2014), Hassan *et al*. (2018) and Saha *et al*. (2022).

Conclusion

It was concluded from the present investigation that among parents, P_4 (RHRMM-318), P_6 (RHRMM-34) and P_9 (RHRMM-355), P_{10} (RHRMM-04) and hybrids, P_1 x P_10, P_4 x P_6, P_4 x P_{10}, P_6 x P_7, P_6 x P_9, P_9 x P_{10} performed significantly better for most of the yield and yield contributing characters during both the seasons. Therefore, the best performing parents could be utilized for development of superior variety or could also be involved in further breeding programme, whereas, new hybrid combinations could be further evaluated in yield traits for commercial exploitation.

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Disclaimer (artificial intelligence)

Author(s) here by declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during writing or editing of this manuscript.

Competing interests

Authors have declared that no competing interests exist.

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