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Genetic variability studies in muskmelon (*Cucumis melo* L.) genotypes under hill zone of Karnataka

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Abstract
Twenty-one genotypes of muskmelon (*Cucumis melo* L.) were assessed during the summer of 2023-24 at the Department of Vegetable Science, College of Horticulture, Mudigere, to evaluate genetic variability, heritability, and genetic advance as a percentage of the mean. The analysis of variance revealed highly significant differences among all genotypes for the traits studied. High heritability combined with a high genetic advance as a percentage of the mean was observed for traits such as vine length, number of nodes per vine, internode length, node at which the first male and female flowers appeared, days to first male and female flowering, days to 50% flowering, male-to-female flower ratio, total number of fruits per vine, fruit length, average fruit weight, fruit yield per vine, flesh thickness, rind thickness, cavity length, cavity width, total soluble solids (TSS), β-carotene content and titratable acidity. These findings suggest that these traits can be enhanced through direct selection, primarily due to additive gene action.

Keywords: Muskmelon, genetic variability, heritability and genetic advance

Introduction
Muskmelon (*Cucumis melo* L., 2n = 2x = 24) belongs to the Cucurbitaceae family, also known as Kharbuja in India, and is thought to have originated in Tropical Africa (Chadha, 1993) [3]. Muskmelon cultivation in India covers 70,000 hectares, with an annual production of 15.09 lakh metric tons. Karnataka stands tenth in muskmelon production, with a total of 22.33 metric tons (Anon., 2022) [1]. Muskmelon fruits are sweet and have a musky flavor. They are primarily cultivated as a dessert crop and have a high export potential. Muskmelon is heavily cross-pollinated due to its andromonoecious sex form. Muskmelon is heavily cross-pollinated due to its andromonoecious sex form. The fruit is referred to as pepo in botanical term. Manchali and Murthy (2020) [11] found that this fruit is high in vitamins A, C, β-carotene, carbohydrates, sugars, proteins, and trace levels of vitamins K, B1, B2, B6, and niacin. It also contains over 40 mg of ascorbic acid per 100 g of fresh weight.
Crop yield enhancement is determined by the nature and degree of genetic variability, as well as the heritability of desired features (Dudley and Moll, 1969) [5]. As a result, any yield increase effort must efficiently and strategically utilize genetic diversity. The genotypes included in a breeding population determine the level of genetic variation within it, as does their historical selection. In this context, it is critical to evaluate the available beneficial variability and comprehend the interactions between different plant features (Johnson *et al.*, 1955) [9].

Materials and Methods
The current study was conducted at the College of Horticulture, Mudigere, during the summer of 2023-2024, with twenty-one muskmelon genotypes (Table 1). The experiment was set up in a Randomized Block Design, with three replications. Ten plants were maintained in each treatment, with rows and plants spaced 2.0 × 1.0 m apart. All suggested cultural procedures were followed, and observations were made on five randomly selected plants per replication for each genotype.

Observations for individual plants were recorded for yield and yield related traits that include vine length (m), number of branches per vine, number of nodes per vine, internode length (cm), node at first male flower appears, days to first male flower appears, node at first female flower appears, days to first female flower appears, days to 50 per cent flowering, male to female ratio, days to first harvest, total number of fruits per vine, fruit length(cm), average fruit weight (g), fruit yield per vine (kg), flesh thickness (cm), rind thickness (mm), cavity length (cm), cavity width (cm), TSS (°Brix), β-Carotene (mg / 100g) and Titratable acidity (%).

The overall variability of the twenty-one genotypes for each quantitative characteristic was partitioned into sources of genotype, replication, and error using the ANOVA technique (Panse and Sukhatme, 1967) [13]. Genetic variability factors such as genotypic and phenotypic co-efficients of variation (GCV and PCV) were calculated according to Burton and Vane (1953) [2]. Johnson *et al*., (1955) [9] approach was used to calculate heritability in a wide sense and genetic advance as a per cent of the mean.

Results and Discussion

The analysis of variance for the different characteristics (Table 2) revealed that the mean sum of squares due to genotypes was very significant for all characters, indicating that there is a high level of genetic variability among the genotypes. Isolation of superior genotypes is mostly dependent on a more thorough examination of genetic variation. This highlights the relevance of variability in crop improvement. The analysis of variance revealed that the mean sum of squares due to genotypes was highly significant for all traits, indicating the presence of significant variation for the majority of the characters useful for muskmelon improvement.

The presence of variability in twenty-one muskmelon genotypes was assessed in terms of range, phenotypic coefficient of variation (PCV), genotypic coefficient of variance (GCV), heritability (broad sense), and genetic advance (Table 3). The range of variability for vine length (0.87 to 1.86 m), number of branches per vine (5.00 to 7.67), number of nodes per vine (13.83 to 26.67), internode length (3.65 to 6.68cm), Node at first male flower appears (2.67 to 4.80), days to first male flower appears (26.73 days to 42.00 days), node at first female flower appears (4.50 to 9.40), days to first female flower appears (34.47 days to 55.80 days), days to fifty per cent flowering (36.33 days to 64.33 days), male to female ratio (13.83 to 31.55), days to first harvest (67.07 days to 87.67 days), total number of fruits per vine (3.23 to 5.00), fruit length (7.21 cm to 16.40 cm), average fruit weight (298.53 g to 764.53 g), fruit yield per vine (1.02 kg to 3.22 kg), flesh thickness (1.35 cm to 2.95 cm), rind thickness (6.15 mm to 11.17 mm), cavity length (3.38 cm to 9.43 cm), cavity width (2.57 cm to 7.07 cm), TSS (5.33 °Brix to 8.53 °Brix), β-carotene (1.31 mg to 5.80 mg), and titratable acidity (0.26% to 0.78%).

High GCV and PCV (>20%) have been identified for the number of nodes per vine, node at which the first female flower appears, male to female ratio, average fruit weight, fruit yield per vine, cavity length, cavity width, β-carotene, and titratable acidity. High GCV and PCV levels indicate a large degree of genetic variation in these factors. As a result, choosing for these characteristics is likely to be effective, because the response to selection is directly related to the degree of variation in the experimental materials. The results correspond with the results of Muthuselvi *et al.* (2019) [12] for number of branches per vine, Sulochana *et al.* (2021) [15] for number of nodes per vine, Gaikwad *et al.* (2020) [6] for node at first female flower appears, Tara *et al.* (2023) [16] for average fruit weight, Kalaiselvan *et al.* (2024) [10] for fruit yield, Prajapati *et al.* (2022) [14] for β-carotene, and Chaitra *et al*. (2020) [4] for titratable acidity.

Moderate GCV and PCV (10-20%) were found for number of branches per vine, internode length, node at first male flower appears, days to first male flower appears, days to first female flower appears, days to 50 per cent flowering, total number of fruits per vine, fruit length, flesh thickness, rind thickness, and TSS. This demonstrates that additive and non-additive gene action are equally important in these qualities. These findings are consistent with Muthuselvi *et al.* (2019) [12] for internode length and TSS, Chaitra *et al.* (2020) [4] for days to first female flower appears, Gaikwad *et al.* (2020) [6] for flesh thickness and rind thickness, Prajapati *et al.* (2022) [14] for fruit length, and low GCV and PCV (<10%) for days to first harvest. It shows that the characteristics have a limited genetic basis. Because of their low variation, the attributes are ineffective for crop selection and future improvement. This observation is consistent with the findings of Kalaiselvam *et al*. (2024) [10] regarding days to first harvest.

The study found high heritability and genetic advance in vine length, number of nodes per vine, internode length, node at first male and female flower appears, days to first male and female flower appears, days to 50% flowering, male to female ratio, total number of fruits per vine, fruit length, average fruit weight, fruit yield per vine, flesh thickness, rind thickness, cavity length, cavity width, TSS, β-carotene and titratable acidity. These findings revealed that character inheritance is mostly determined by additive gene activity, and so improvement may be achieved by phenotypic selection. Previous studies have reported similar findings, including Janghel *et al.* (2018) [8] for rind thickness, Jagtap and Bhuktar (2021) [7] for vine length, average fruit weight, and the first female flowering node, Prajapati *et al.* (2022) [14] for primary branches per plant, fruit length, fruit weight, fruits per plant, flesh thickness, β-carotene, and fruit yield per plant, and Tara *et al.* (2023) [16] for TSS and flesh thickness.

Table 1: List of muskmelon genotypes

Treatments	Details	Source
T_1	Thar Mahima	CIAH, Bikaner
T_2	GMM-3	CIAH, Bikaner
T_3	Arka Rajhans	CIAH, Bikaner
T_4	Arka Jeet	CIAH, Bikaner
T_5	Hara Madhu	CIAH, Bikaner
T_6	Pusa Madhuras	CIAH, Bikaner
T_7	Punjab Sunheri	CIAH, Bikaner
T_8	Kashi Madhu	CIAH, Bikaner
T_9	MHY-5	CIAH, Bikaner
T_{10}	RM-43	CIAH, Bikaner
T_{11}	RM-50	CIAH, Bikaner
T_{12}	Durgapura Madhu	CIAH, Bikaner
T_{13}	PGUHS-2	COH, Bengaluru
T_{14}	PGUHS-10	COH, Bengaluru
T_{15}	PGUHS-11	COH, Bengaluru
T_{16}	PGUHS-45	COH, Bengaluru
T_{17}	PGUHS-50	COH, Bengaluru
T_{18}	Ganjam	COH, Bengaluru
T_{19}	Banaspathre	COH, Bengaluru
T_{20}	Honnali Local	Honnali, Davanagere
T_{21}	Arka Siri	IIHR, Bengaluru

Table 2: Analysis of variance (mean sum of squares) for different characters in muskmelon

Sl. no.	Characters	Replication	Treatment	Error
	Degrees of freedom	**2**	**20**	**40**
1.	Vine length (m)	0.01	0.22**	0.003
2.	Number of branches per vine	0.73	1.74**	0.48
3.	Number of nodes per vine	1.32	61.56**	1.73
4.	Internode length (cm)	0.05	2.03**	0.02
5.	Node at first male flower appears	0.14	1.13**	0.20
6.	Days to first male flower appears	0.43	42.25**	1.53
7.	Node at first female flower appears	0.28	7.48**	0.22
8.	Days to first female flower appears	1.85	157.34**	1.83
9.	Days to 50 per cent flowering	4.04	184.43**	1.86
10.	Male to female ratio	0.19	106.69**	0.37
11.	Days to first harvest	0.20	111.93**	1.72
12.	Total number of fruits per vine	0.04	0.65**	0.04
13.	Fruit length (cm)	0.03	11.72**	0.07
14.	Average fruit weight (g)	102.35	59719**	80.51
15.	Fruit yield per vine (kg)	0.01	1.03**	0.02
16.	Flesh thickness (cm)	0.0006	0.35**	0.001
17.	Rind thickness (mm)	0.002	5.77**	0.002
18.	Cavity length (cm)	0.03	11.77**	0.02
19.	Cavity width (cm)	0.03	6.11**	0.03
20.	TSS (°Brix)	0.02	2.05**	0.01
21.	β-Carotene (mg / 100g)	0.02	6.79**	0.01
22.	Titrable acidity (%)	0.00011	0.06**	0.00005

Table 3: Genetic parameters of variation for fruit yield and its component characters in muskmelon

Characters	Mean	Range		GCV (%)	PCV (%)	h^2 (%)	GA	GAM (%)
		Minimum	Maximum					
Vine length (m)	1.38	0.87	1.86	19.71	20.12	95.94	0.55	39.76
Number of branches per vine	6.31	5.00	7.67	10.27	15.00	46.86	0.91	14.48
Number of nodes per vine	20.66	13.83	26.67	21.62	22.54	92.02	8.82	42.72
Internode length (cm)	5.25	3.65	6.68	15.55	15.83	96.50	1.65	31.46
Node at first male flower appears	3.67	2.67	4.80	15.21	19.44	61.24	0.90	24.52
Days to first male flower appears	34.21	26.73	42.00	10.77	11.36	89.86	7.19	21.03
Node at first female flower appears	6.49	4.50	9.40	23.99	25.04	91.78	3.07	47.34
Days to first female flower appears	44.54	34.47	55.80	16.17	16.45	96.60	14.58	32.73
Days to 50 per cent flowering	47.18	36.33	64.33	16.54	16.79	97.04	15.83	33.56
Male to female ratio	22.33	13.81	31.55	26.66	26.80	98.96	12.20	54.63
Days to first harvest	78.05	67.07	87.67	7.77	7.95	95.53	12.20	15.64
Total number of fruits per vine	3.82	3.23	5.00	11.79	12.95	82.79	0.84	22.09
Fruit length (cm)	12.21	7.21	16.40	16.13	16.27	98.29	4.02	32.95
Average fruit weight (g)	591.48	298.53	764.53	23.84	23.89	99.60	289.87	49.01
Fruit yield per vine (kg)	2.26	1.02	3.22	25.69	26.43	94.53	1.16	51.46
Flesh thickness (cm)	2.12	1.35	2.95	16.01	16.11	98.74	0.69	32.76
Rind thickness (mm)	7.96	6.15	11.17	17.41	17.43	99.86	2.85	35.85
Cavity length (cm)	7.38	3.38	9.43	31.61	31.69	99.50	4.07	64.96
Cavity width (cm)	5.78	2.57	7.07	28.38	28.59	98.55	2.91	58.05
TSS (°Brix)	6.69	5.33	8.53	12.23	12.33	98.33	1.67	24.98
β-Carotene (mg / 100g)	3.23	1.31	5.80	46.42	46.52	99.60	3.08	95.44
Titratable acidity (%)	0.44	0.26	0.78	31.25	31.29	99.73	0.28	64.28

Conclusion

In conclusion, the study of twenty-one muskmelon genotypes revealed significant genetic variability for various traits crucial for crop improvement. High genotypic and phenotypic coefficients of variation, along with notable heritability and genetic advance, indicate the potential for effective selection in breeding programs. Traits such as vine length, average fruit weight, and fruit yield demonstrated particularly high variability, suggesting a promising path for enhancing muskmelon production. This research underscores the importance of genetic diversity in developing superior muskmelon varieties, which can contribute to improved yields and nutritional quality, thereby enhancing the crop's economic viability in India.

References

1. Anonymous. National Horticultural Data Base. National Horticulture Board. Ministry of Agriculture and Farmer Welfare. Government of India; c2022.
2. Burton GW, Vane De EM. Estimating heritability in tall fescue (*Festuca arundinacea*) from replicated clonal material. Agronomy Journal. 1953;45:478-481.
3. Chadha KL. Advances in horticulture (13 volume series) & index. Malhotra Publishing House; c1993. p. 3-4.
4. Chaitra S, Shivapriya M, Ravishankar KV, Kattegoudar J, Sadanand GK, Peerjade DA. Genetic variability, heritability and genetic advance of melons from different botanical groups (*Cucumis melo* L.). International Journal of

Chemical Studies. 2020;8(4):2532-2537.
5. Dudley JW, Moll RH. Introduction and use of estimates of heritability in soybean. Agronomy Journal. 1969;47:314-318.
6. Gaikwad SD, Chandanshive AV, Bhalekar MN, Ranpise SA. Genetic variability in F5 generation progenies of muskmelon (*Cucumis melo* L.). Journal of Agricultural Research and Technology. 2020;45(2):071-075.
7. Jagtap BR, Bhuktar A. Variability study in watermelon (*Citrullus lanatus*). International Journal of Botany Studies. 2021;6(6):788-791.
8. Janghel AK, Trivedi J, Sharma D, Lodhi YK, Kumar L. Genetic variability in muskmelon (*Cucumis melo* L.) under protected condition. International Journal of Current Microbiology and Applied Sciences. 2018;6:211-217.
9. Johnson HW, Robinson HF, Comstock RE. Estimate of genetic and environmental variability in soybeans. Agronomy Journal. 1955;47(7):314-318.
10. Kalaiselvan S, Lenin AR, Padmanaban J, Dhanasekaran K. Studies on genetic variability for quantitative and qualitative traits in muskmelon (*Cucumis melo* L.). Indian Journal of Applied and Pure Biology. 2024;39(1):21-28.
11. Manchali S, Murthy KNC. Muskmelon in nutritional composition and antioxidant properties of fruits and vegetables. Academic Press; c2020. p. 533-546.
12. Muthuselvi R, Praneetha S, Kennedy J, Uma D. Assessment of variability in snap melon (*Cucumis melo* var. *Momordica*) genotypes. Journal of Pharmacognosy and Phytochemistry. 2019;8(4):654-657.
13. Panse VG, Sukhatme PV. The application of genetics to plant breeding. IV. The inheritance of quantitative characters and plant breeding. Journal of Genetics. 1957;40:283-302.
14. Prajapati PJ, Acharya RR, Patel ND, Pandya MM. Studies on genetic variability, heritability and genetic advance in muskmelon (*Cucumis melo* L.) genotypes. Journal of Pharmacognosy and Innovation. 2022;11(3):1683-1686.
15. Sulochana, Hadimani HP, Hachinamani CN, Kukanoor L, Lakshmidevamma TN, Ashok. Assessment of genetic variability for yield and quality traits in snap melon (*Cucumis melo* var. *Momordica* Duth. and Full.). Journal of Pharmacognosy and Innovation. 2021;10(11):161-164.
16. Tara KK, Choudhary H, Yadav RK, Kumari J, Mishra DC, Shankar K. Deciphering genetic variability in melon (*Cucumis melo* L.) using morphological characters. Vegetable Science. 2023;50(1):104-109.