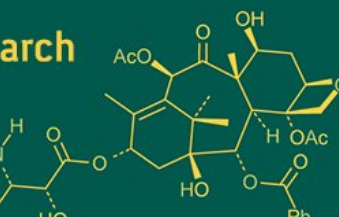
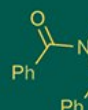


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; SP-10(9): 1908-1910
www.biochemjournal.com
Received: 09-07-2026
Accepted: 12-08-2026

Rohini G Dethe
Department of Horticulture,
Mahatma Phule Krishi
Vidyapeeth (MPKV), Rahuri,
Maharashtra, India

Dr. BT Patil
Senior Vegetable Breeder, All
India Coordinated Research
Project (AICRP), Mahatma
Phule Krishi Vidyapeeth
(MPKV), Rahuri,
Maharashtra, India

Parimal S Kumbhar
Department of Horticulture,
Mahatma Phule Krishi
Vidyapeeth (MPKV), Rahuri,
Maharashtra, India

Dr. SR Shinde
Assistant Professor of
Horticulture, All India
Coordinated Research Project
(AICRP) on Vegetable Crops,
Mahatma Phule Krishi
Vidyapeeth (MPKV), Rahuri,
Maharashtra, India

Dr. DB Kshirsagar
Associate Professor of
Horticulture, Department of
Horticulture, Mahatma Phule
Krishi Vidyapeeth (MPKV),
Rahuri, Maharashtra, India

Ashvin S Gajbhiye
Department of Horticulture,
Mahatma Phule Krishi
Vidyapeeth (MPKV), Rahuri,
Maharashtra, India

Corresponding Author:
Rohini G Dethe
Department of Horticulture,
Mahatma Phule Krishi
Vidyapeeth (MPKV), Rahuri,
Maharashtra, India

Heritability for growth, flowering and yield characters in pumpkin (*cucurbita moschata* duch ex poir)

Rohini G Dethe, BT Patil, Parimal S Kumbhar, SR Shinde, DB Kshirsagar and Ashvin S Gajbhiye

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i9Sx.10114>

Abstract

The present investigation was conducted to assess the magnitude of narrow-sense heritability and genetic advance for growth, flowering, fruit, yield and disease resistance traits in pumpkin (*Cucurbita moschata* Duch. ex Poir.) under *kharif* and summer seasons. Narrow-sense heritability estimates ranged from 8.83 to 70.38 per cent during the *kharif* season and from 7.13 to 52.91 per cent during Summer-2026. The highest narrow-sense heritability was recorded for number of nodes per vine (58.39%) and node at which first male flower appeared (53.55%). During summer, the highest heritability was observed for fruit diameter (52.91%), followed by fruit cavity width (50.96%), number of nodes per vine (48.87%) and flesh thickness (48.25%). Genetic advance as per cent of mean ranged from 1.29 to 57.00 per cent during *kharif* and from 1.82 to 48.72 per cent during summer. High genetic advance was recorded for fruit fly infestation, powdery mildew incidence, fruit cavity length, rind thickness, yield per vine, yield per plot and yield per hectare. Traits such as fruit cavity length, rind thickness and yield-related traits showed relatively favourable combinations of heritability and genetic advance in at least one season, indicating the presence of exploitable additive genetic variation and scope for selection. In contrast, traits with low heritability and low genetic advance, particularly flowering-time traits and sex ratio, appeared to be more strongly influenced by environmental and non-additive genetic effects. The results demonstrated that simultaneous consideration of narrow-sense heritability and genetic advance is more informative than either parameter alone for identifying traits amenable to selection in pumpkin breeding programmes.

Keywords: Pumpkin, narrow-sense heritability, additive genetic variance, selection, yield

Introduction

Pumpkin is one of the most popular summer vegetables grown all over India. It is commonly known as 'butternut squash', and vegetable of immense value or lalkaddu. *Cucurbita* is one of the most economically important genus of cucurbitaceae family with 27 species. In which five species *Cucurbita moschata*, *Cucurbita pepo*, *Cucurbita maxima*, *Cucurbita mixta*, *Cucurbita ficifolia* are cultivated all over tropical and subtropical world (Hazra, 2006; Whitkar, 1947) [2]. The basic chromosomal number is $2n=40$. *Cucurbita lundeliana* is recognized as wild progenitor of pumpkin. *Cucurbita moschata*, is a widely grown species of *Cucurbita* that is prized for its excellent nutritional value and long shelf life (Jahan *et al.*, 2012) [4].

Narrow-sense heritability refers to the proportion of phenotypic variance attributable to additive genetic variance. Since additive genetic effects are transmitted from parents to their progeny, narrow-sense heritability is particularly relevant for predicting the response to selection. However, a high heritability estimate alone does not necessarily indicate substantial progress through selection. Narrow-sense heritability estimates in pumpkin may, however, be considerably lower than broad-sense estimates because narrow-sense heritability specifically reflects additive genetic variance. A study involving pumpkin hybrids reported narrow-sense heritability ranging from 8.30 to 34.80 per cent for several yield and quality traits and suggested an important contribution of non-additive gene action.

Therefore, the present investigation was undertaken to estimate narrow-sense heritability for important growth, flowering, fruit, yield and disease resistance traits in pumpkin under *kharif*

and summer environments, and to identify traits having greater potential for genetic improvement through selection.

Materials and Methods

In the present investigation, eleven genetically diverse parental genotypes of pumpkin comprising seven lines and four testers were used as the experimental material, viz., lines (L₁) RHRPUM-9-3-1, (L₂) RHRPUM-19-2-1, (L₃) RHRPUM-12-1, (L₄) PTK-23-01, (L₅) RHRPUM-18-3-1, (L₆) Arka Chandan and (L₇) Kashi Harit, and testers (T₁) Nagalwadi, (T₂) 21-PUMMAR-04, (T₃) Narendra Agrim and (T₄) Local Selection. These parents were crossed in a line × tester mating design to generate 28 F₁ hybrids for the study of heritability for growth, flowering, yield and yield-attributing traits in pumpkin.

All the eleven parents and 28 F₁s with standard check were evaluated during *kharif* 2025 and Summer-2026 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.

Heritability

Heritability is defined as the ratio of genotypic to phenotypic variance. The percentage of heritability in a narrow sense was calculated for a variety of characters, as shown below (Falconer, 1981) [1].

$$h^2(\text{ns}) = \frac{\sigma^2 A}{\sigma^2 A + \sigma^2 D + \sigma^2 e} \times 100$$

Where,

$\sigma^2 A$ = Additive genetic variance

$\sigma^2 D$ = Dominance variance

$\sigma^2 e$ = Environmental variance

The heritability in narrow sense values is categorized by Robinson's *et al.* (1966) [8]. as follows, Low: 5–10 %, Moderate: 10 – 30 %, High: 30 – 60 %.

Results and Discussion:

Narrow-sense heritability

The estimates of narrow-sense heritability (h^2_{ns}) for various growth, flowering, yield and disease resistance traits are presented in Table no. 1. The narrow-sense heritability varied from 8.83 to 70.38 per cent during *kharif* season and from 7.13 to 52.91 per cent during summer season.

Among all the characters, the highest narrow-sense heritability was recorded for fruit fly infestation (70.38 %) during *kharif* season, followed by number of nodes per vine (58.39 %) in *kharif* season, node at which first male flower appearance (53.55 %) in *kharif* season, diameter of fruit 52.91 % during summer season, fruit cavity width (50.96 %) during summer season, number of nodes per vine (48.87 %) during summer season, flesh thickness (48.25 %) during summer season, number of fruits per vine (46.17 %) and (45.91 %) in *kharif* and summer season respectively, fruit cavity length (44.47 %) during *kharif* season, flesh thickness (39.75 %) during *kharif* season, rind thickness (38.79 %) during *kharif* season, yield per vine (37.25 %) during *kharif* season, yield per hectare (36.54 % and 35.47 %) in *kharif* and summer season respectively, weight of fruit (33.02 %) during summer season, yield per plot (33.75 % and 33.91 %) in *kharif* and summer season respectively, diameter of fruit (31.44 %) during *kharif* season,

Table 1: Estimation of narrow sense heritability and genetic advance (% of mean) for different characters of pumpkin

Sr. No.	Character	Season	Heritability $h^2(\text{ns})$ %	Genetic Advance
1	Length of vine (m)	<i>Kharif</i> season	23.55	20.07
		Summer- 2026	20.26	17.51
2	Number of nodes per vine	<i>Kharif</i> season	58.39	8.47
		Summer- 2026	48.87	8.94
3	Number of primary branches per vine	<i>Kharif</i> season	13.55	9.64
		Summer- 2026	10.50	8.74
4	Days to 1 st male flower appearance	<i>Kharif</i> season	15.67	4.24
		Summer- 2026	19.26	5.43
5	Days to 1 st female flower appearance	<i>Kharif</i> season	26.62	1.29
		Summer- 2026	22.23	2.94
6	Nodes at which 1st male flower appearance	<i>Kharif</i> season	53.55	23.22
		Summer- 2026	20.90	12.09
7	Node at which 1st female flower appearance	<i>Kharif</i> season	8.83	3.30
		Summer- 2026	19.87	3.00
8	Days to 50 % flowering	<i>Kharif</i> season	9.18	3.73
		Summer- 2026	7.13	1.82
9	Sex ratio (%)	<i>Kharif</i> season	30.34	5.97
		Summer- 2026	20.42	8.03
10	Days to 1st harvest	<i>Kharif</i> season	11.12	8.94
		Summer- 2026	27.54	6.86
11	Length of fruit (cm)	<i>Kharif</i> season	25.57	16.13
		Summer- 2026	24.38	14.43
12	Diameter of fruit (cm)	<i>Kharif</i> season	31.44	14.92
		Summer- 2026	52.91	11.07
13	Average weight of fruit (kg)	<i>Kharif</i> season	21.59	16.59
		Summer- 2026	33.02	16.81
14	Number of fruit per vine	<i>Kharif</i> season	46.17	21.03
		Summer- 2026	45.91	17.86
15	Fruit cavity length (cm)	<i>Kharif</i> season	44.47	38.51
		Summer- 2026	22.99	17.18

16	Fruit cavity width (cm)	<i>Kharif</i> season	29.96	15.39
		Summer- 2026	50.96	12.31
17	Flesh thickness (cm)	<i>Kharif</i> season	39.75	14.05
		Summer- 2026	48.25	13.65
18	Rind thickness (mm)	<i>Kharif</i> season	38.79	31.68
		Summer- 2026	25.45	37.43
19	Yield (kg/vine)	<i>Kharif</i> season	37.25	35.49
		Summer- 2026	29.52	26.48
20	Yield (kg/plot)	<i>Kharif</i> season	33.75	21.40
		Summer- 2026	33.91	28.57
21	Yield (t/ha)	<i>Kharif</i> season	35.47	34.97
		Summer- 2026	36.54	33.68

sex ratio (30.34 %) during *kharif* season, fruit cavity diameter (29.96 %) during *kharif* season and yield per vine (29.52 %) during summer season. The remaining characters length of vine,

days to first male flower appearance, days to first female flower appearance, node at which first female flower appearance, days to first harvest, length of fruit, weight of fruit, fruit cavity length, rind thickness, number of primary branches per vine and days to 50 per cent flowering exhibited comparatively low heritability estimates in one or both seasons.

The estimates of narrow-sense heritability are directly associated with additive genetic variance. Higher estimates of narrow-sense heritability indicate a greater contribution of additive gene effects in the inheritance of a trait, whereas lower estimates suggest the predominance of non-additive gene effects and a greater influence of environmental factors. The present investigation revealed low to moderate heritability for most of the characters, indicating that environmental factors considerably influenced their expression. Moderate to relatively high heritability observed for a few traits such as number of nodes per vine, node at which first male flower appearance, number of fruits per vine, diameter of fruit, fruit cavity diameter and flesh thickness suggested that these characters could be improved through selection. The present findings are in close agreement with the reports of Jagtap and Musmade (2014) [3], Kaur *et al.* (2022) [5], and Mhaske *et al.* (2026) [6], in muskmelon, Muthal *et al.* (2018) [7], and Wamiq *et al.* (2024) [9], in pumpkin.

Conclusion

The present investigation demonstrated substantial variation in narrow-sense heritability among growth, flowering, fruit and yield traits of pumpkin across *kharif* and summer environments. Number of nodes per vine recorded the highest narrow-sense heritability during *kharif*, while fruit diameter recorded the highest estimate during summer. Number of fruits per vine, fruit cavity length, rind thickness and yield-related traits showed comparatively favourable combinations of heritability and genetic advance in one or both seasons.

References

1. Falconer DS. Introduction to quantitative genetics. 2nd ed. Harlow, England: Longman Group Ltd., Longman House; 1981. p. 350.
2. Hazra P. Vegetable science. New Delhi: New India Publishing Agency; 2006.
3. Jagtap VS, Musmade AM. Heterosis for yield and quality components in muskmelon (*Cucumis melo* L.). Trends Biosci. 2014;7(24):4130–4135.

4. Jahan TA, Islam AK, Rasul MG, Mian MAK, Haque MM. Heterosis of qualitative and quantitative characters in sweet gourd (*Cucurbita moschata* Duch. ex Poir). Afr J Food Agric Nutr Dev. 2012;12(3):6186–6199.
5. Kaur S, Sharma SP, Sarao NK, Deol JK, Gill R, Abd-Elsalam KA, *et al.* Heterosis and combining ability for fruit yield, sweetness, β -carotene, ascorbic acid, firmness and Fusarium wilt resistance in muskmelon (*Cucumis melo* L.) involving genetic male sterile lines. Horticulturae. 2022;8(1):82–87.
6. Mhaske SM, Kshirsagar DB, Kshirsagar AV, Patil MR. Comparative assessment of muskmelon hybrids, parents and standard hybrid checks for growth and flowering traits under summer conditions. J Agric Res Technol. 2026;51(1):126–134.
7. Muthal KM, Bhalekar MN, Ranpise SA, Musmade AM, Kulkarni SS. Combining ability studies for earliness and yield in pumpkin (*Cucurbita moschata*) in *kharif* season. Int J Chem Stud. 2018;6(4):2440–2444.
8. Robinson HF. Quantitative genetics in relation to breeding on centennial of Mendelism. Indian J Genet. 1966;26(1):171–187.
9. Wamiq Mohd, Singh MK, Singh A, Singh B, Kumar M, Alam K, *et al.* Estimation of gene action for yield and its contributing traits through line $\times$ tester analysis in pumpkin (*Cucurbita moschata* L.). Plant Arch. 2024;24(2):2058–2062.
10. Whitaker TW. American origin of the cultivated cucurbits. Ann Mo Bot Gard. 1947;34(2):101–111. doi:10.2307/2394459.