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Graft compatibility between ridge gourd grafted on pumpkin, bottle gourd and ridge gourd rootstocks in summer season 2025 (*Luffa acutangula* L.)

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ABSTRACT

The present investigation was conducted during Summer 2025 to evaluate the compatibility of different ridge gourd scions with pumpkin, bottle gourd and ridge gourd rootstocks and their influence on grafting performance. The experiment was conducted in a Factorial Randomized Block Design with three replications using two scions, Phule Kiran (S_1) and commercial hybrid (S_2), six rootstocks, viz., *Pusa Samridhi*, *Samrat*, *Arka Chandan*, *Arka Suryamukhi*, *Pusa Nasdar* and *Konkan Harita*, along with non-grafted controls. Single-cotyledon grafting was employed. The results revealed significant variation among scion–rootstock combinations for graft healing, grafting success and transplanting time. The results showed that S_{1R6} combination Phule Kiran (S_1) grafted on *Konkan Harita* (R_6) recorded the earliest graft healing (7.26 days), highest graft success (94.55%) and earliest transplanting (22.33 days). Overall, ridge gourd rootstocks, particularly *Konkan Harita* and *Pusa Nasdar*, showed better grafting performance with ridge gourd scions than the evaluated pumpkin and bottle gourd rootstocks under the conditions of the present study, indicating their potential for improving grafting efficiency and early establishment of ridge gourd plants.

Keywords: Grafting, Scion, Rootstock, Cucurbitaceae, Ridge gourd, Graft compatibility etc

Introduction

Ridge gourd (*Luffa acutangula* L.) belongs to the genus *Luffa* under the Cucurbitaceae family and is extensively cultivated across India (Chandan *et al.*, 2018). It is a cross-pollinated diploid crop ($2n = 26$), with South and Southeast Asia serving as the primary centers of diversity. Ridge gourd is widely grown in India during the *kharif* and Summer seasons. Ridge gourd has a wide range of uses and is commonly grown in tropical and subtropical regions for its edible fruits, which are rich in carbohydrates, minerals and vitamin C (Yadav *et al.*, 2022) [1].

Cucurbit cultivation under abiotic stresses such as low temperature, excess moisture, drought and low-light conditions often results in reduced growth and productivity and increased susceptibility to diseases. Climate change, coupled with the growing global population, is further intensifying the demand for sustainable and nutritious vegetable production. Conventional intensive cultivation practices involving excessive use of fertilizers, pesticides and irrigation can adversely affect soil health, water quality and the environment. Therefore, sustainable approaches that minimize chemical inputs and promote soil health are increasingly being emphasized. Vegetable grafting, involving the union of a rootstock and scion, is a promising technique for improving crop tolerance to environmental stresses and enhancing productivity.

Thus, owing to the importance of Ridge gourd cultivation in India and the beneficial effects incurred by grafting over the rootstock, the present experiment was planned to check the graft compatibility of ridge gourd with different rootstocks.

Material and Methods

Experiment material

The experimental materials consisted of six rootstocks of cucurbitaceous species which were R_1 , R_2 (Bottle gourd), R_3 , R_4 (Pumpkin) and R_5 , R_6 (Ridge gourd) and two scions those were S_1 (Phule Kiran) and S_2 (Commercial hybrid). Seeds of Phule Kiran (S_1) and commercial hybrid (S_2) were sown 15 days before rootstock seeds in sterilized coco-peat-filled protrays. Seedlings were supplied with 19:19:19 NPK (5 g/l) and maintained with adequate irrigation and plant protection measures. Rootstock and scion seedlings became ready for grafting at 9 to 12 and 19 to 24 days after sowing, respectively.

Procedure of single cotyledonary grafting in ridge gourd

Two scions, Phule Kiran (S₁) and commercial hybrid (S₂), were grafted on six rootstocks, viz., *Pusa Samridhi*, *Samrat*, *Arka Chandan*, *Arka Suryamukhi*, *Pusa Nasdar* and *Konkan Harita*, using the single-cotyledon grafting method. Rootstock seedlings were grafted at the cotyledon to first true-leaf stage, while scions were used at the true-leaf stage. A slant cut at approximately 35–45° was made on both rootstock and scion hypocotyls, ensuring a close match in cut length and stem diameter. The scion was carefully inserted onto the rootstock and secured with a grafting clip to maintain firm contact and facilitate graft union formation. Grafting was performed during the morning and evening hours, and the grafted seedlings were maintained under transparent polythene moist chambers to promote successful healing and establishment.

(A) Rootstock and scion parameters

Days taken for germination: The mean number of days required for germination was calculated.

Days taken to reach grafting stage: Seedlings were randomly selected and evaluated based on stem diameter, leaf number and time required to attain the appropriate grafting stage.

Stem diameter at grafting: The stem diameter of both scions and rootstocks was measured at the time of grafting using a digital Vernier calliper.

(B) Observations on grafted plants

Days taken for graft healing: Grafted seedlings were randomly selected and examined after five days of grafting by removing the grafting clips. The average number of days required for complete healing of the graft union was recorded.

Graft success (%): Grafting success was assessed 15 days after grafting (DAG). The percentage of successful grafts was calculated as:

$$\text{Graft success percentage} = \frac{\text{Number of successful grafts}}{\text{Total number of plants grafted}} \times 100$$

Days required for transplanting: The number of days from grafting to transplanting was recorded for each treatment, and the mean duration required for transplanting was calculated.

Results and Discussion

(A) Rootstock and scion parameters days to germination, days to reach grafting stage and diameter of scion and rootstock

The mean data about days to germination, days to reach the grafting stage and diameter of scion and rootstock in ridge gourd are depicted in Table 1.

The scion and rootstock showed significant difference for days to germination, days taken to reach grafting stage and for diameter of scion and rootstock. In scion, Phule Kiran (S₁) recorded minimum number of days to germination (4.87). Whereas, Commercial hybrid (S₂) recorded maximum number of days to germination (5.30). In rootstock, *Pusa Nasdar* (R₅) recorded minimum number of days to germination (3.87). Whereas, maximum (5.63) number of days to germination was recorded in *Arka Suryamukhi* (R₄).

In scion, Phule Kiran (S₁) recorded minimum number of days (17.40) to reach grafting stage. Whereas, Commercial hybrid (S₂) recorded maximum number (18.60) of days to reach grafting stage. In rootstock, *Pusa Nasdar* (R₅) recorded the minimum number (11.20) of days to reach grafting stage. Whereas, *Arka Suryamukhi* (R₄) has recorded maximum number (12.27) of days to reach grafting stage. These results are in agreement with Rathod (2017) [2], Shipepe *et al.* (2018) [3], Sharma *et al.* (2019b), Balaji *et al.* (2021) [4], respectively. In scion, Phule Kiran (S₁) recorded maximum diameter (2.25 mm) and minimum diameter (2.18 mm) was recorded in Commercial hybrid (S₂). In rootstock, *Arka Suryamukhi* (R₄) recorded the maximum diameter (2.48 mm). Whereas, *Samrat* (R₂) recorded minimum diameter (2.23 mm).

(B) Observations of grafted plants

The observations of grafted plants were recorded after grafting and before the transplanting.

Days taken for graft healing

The mean data about the effect of ridge gourd scion varieties grafted on different rootstocks on days taken to graft healing is presented in Table 2.

The individual scion showed non-significant difference for the days taken for graft healing. In scion, Phule Kiran (S₁) recorded minimum number of days (8.14) for graft healing. Whereas, Commercial hybrid (S₂) recorded maximum number of days (8.17) for graft healing.

The individual rootstock showed significant difference for the days taken for graft healing. In rootstock *Konkan Harita* (R₆) recorded minimum number of days (7.30) for graft healing. While, rootstock *Arka Chandan* (R₃) recorded maximum days (8.90) for graft healing. The interaction effect of scion and rootstock showed a significant difference for days taken for graft healing. In interaction S₁R₆ recorded minimum days (7.26) for graft healing and which was at par with S₂R₆ (7.33), S₁R₅ (7.50), S₂R₅ (7.53), and S₁R₄ (8.03). While, maximum number of days (9.40) were recorded with the interaction S₁R₃. The results are similar to findings of Maurya *et al.* (2019) [5], Rajashree *et al.* (2021) [6] and Snehal (2025) [7].

Graft success (%)

The mean data about the effect of ridge gourd scion varieties grafted on different rootstocks on days taken to graft success (%) is presented in Table 3.

The individual scion and rootstock showed a significant difference for graft success (%). In scion Phule Kiran (S₁) recorded highest (86.83 %) graft success. While, lowest graft success (85.85 %) was recorded in Commercial hybrid (S₂). In rootstock *Konkan Harita* (R₆) recorded highest (93.81%) graft success. While, lowest were recorded in (R₂) *Samrat* (79.45%).

The interaction effect of scion and rootstock showed a significant difference for graft success. In interaction S₁R₆ recorded highest (94.55 %) graft success and which was at par with S₁R₅ (93.44%) and S₂R₆ (93.06%). While, lowest graft success (78.63%) was recorded in interaction S₂R₂. These results are in conformity with Shehata *et al.* (2000) [8], Tamilselvi *et al.* (2015) [9], Sabatino *et al.* (2018) [10], Balaji *et al.* (2021) [4] and Rajashree *et al.* (2021) [6].

Days required for transplanting

The mean data about the effect of ridge gourd scion varieties grafted on different rootstocks for days required for transplanting is presented in Table 4.

The individual scion showed non-significant difference for days required for transplanting. In scion, Phule Kiran (S₁) recorded lowest (23.88) days for transplanting and highest days for transplanting (24.18) was recorded in Commercial hybrid (S₂).

The interaction effect of scion and rootstock showed a significant difference for days required for transplanting. In interaction S₁R₆ recorded minimum (22.33) days for transplanting and which was at par S₁R₅ with (22.87). While, interaction S₁R₃ was recorded maximum (25.47) days for transplanting.

The rootstocks *Arka Chandan* and *Samrat* taken maximum number of days to graft healing and sprouting so that they were taken somewhat more number of days to attain transplanting when compared to other

rootstocks. The results are similar to findings of Hossain *et al.* (2019) [11], Maurya *et al.* (2019) [5], Shirisha *et al.* (2022) [12] and Dolas *et al.* (2023) [13].

Table 1. Number of days to germination, days taken to reach grafting stage and diameter of scion and rootstock (mm)

Varieties		Days to germination	Days to reach grafting stage	Diameter of Scion (mm)
A. Scion				
S ₁	Phule Kiran	4.87	17.40	2.25
S ₂	Commercial hybrid	5.30	18.60	2.18
	S.E.m. (±)	0.32	0.61	0.02
	C.D at 5%	1.26	2.40	0.07
Rootstock				Diameter of rootstock (mm)
R ₁	Pusa Samridhi	5.40	11.87	2.24
R ₂	Samrat	5.47	11.93	2.23
R ₃	Arka Chandan	5.23	11.53	2.40
R ₄	Arka Suryamukhi	5.63	12.27	2.48
R ₅	Pusa Nasdar	3.87	11.20	2.25
R ₆	Konkan Harita	4.20	11.53	2.26
	S.E.m. (±)	0.17	0.38	0.04
	C.D at 5%	0.51	1.18	0.12

Scion		S ₁	S ₂	Mean
Rootstock				
	R₁	8.60	8.37	8.49
	R₂	8.07	9.20	8.64
	R₃	9.40	8.40	8.90
	R₄	8.03	8.20	8.12
	R₅	7.50	7.53	7.52
	R₆	7.26	7.33	7.30
	Mean	8.14	8.17	
		R	S	S x R
	S.E.m. (±)	0.11	0.19	0.26
	C.D at 5%	0.32	NS	0.78

Scion		S ₁	S ₂	Mean
Rootstock				
	R₁	83.20	81.40	82.30
	R₂	80.27	78.63	79.45
	R₃	83.29	85.59	84.44
	R₄	86.25	84.23	85.24
	R₅	93.44	92.18	92.81
	R₆	94.55	93.06	93.81
	Mean	86.83	85.85	
		R	S	S x R
	S.E.m. (±)	0.21	0.37	0.52
	C.D at 5%	0.62	1.08	1.54

Table 2. Effect of grafting on days Table 3: Effect grafting on graft success (%) taken for graft healing

Scion Rootstock		S ₁	S ₂	Mean
	R₁	24.54	24.30	24.42
	R₂	24.00	25.04	24.52
	R₃	25.47	24.36	24.92
	R₄	24.12	24.20	24.16

(continued on next page)

Scion Rootstock	S ₁	S ₂	Mean
R ₅	22.87	23.80	23.33
R ₆	22.33	23.43	22.88
Mean	23.88	24.18	
	R	S	S x R
S.E.m. (±)	0.23	0.13	0.31
C.D at 5%	0.66	NS	0.93

Conclusion

From this study, it was concluded that Phule Kiran (S₁) showed better compatibility with Konkan *Harita* (R₆) and *Pusa Nasdar* (R₅) rootstocks. The minimum days required for graft healing and transplanting, along with the highest graft success, were recorded in S₁R₆ (Phule Kiran × Konkan *Harita*), followed by S₁R₅ (Phule Kiran × *Pusa Nasdar*). Thus, these combinations exhibited better grafting performance and compatibility under the conditions of the present study.

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