Vegetable Science (2025) 52(2): 318-325
doi: 10.61180/vegsci.2025.v52.i2.12
ISSN- 0970-6585 (Print), ISSN- 2455-7552 (Online)
www.isvsvegsci.in

RESEARCH ARTICLE

Assessment of heterografts and homografts for compatibility, morpho-phenology and yield performance of tomato scion cv. Kashi Aman

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Abstract

A research study was carried out at Vegetable Research Centre, Maharajpur, Department of Horticulture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.), during the Rabi season of 2023-2024, consisting of six different rootstocks of brinjal and tomato, and cleft grafting with the common scion tomato cv. Kashi Aman. Thus, the treatments encompassed one ungrafted and six grafted variations evaluated for graft compatibility, morpho-phenological and yield attributing characters, including correlation among them. Results revealed significant differences in graft success rates with Tomato cv. Kashi Aman (scion) grafted on Brinjal cv. Jawahar Baigan 20-14 (rootstock) exhibited the highest graft success, i.e., 87.50%. Rootstock-scion interaction between brinjal cv. Jawahar Baigan 20-14 and tomato cv. Kashi Aman had significantly influenced morpho-phenological parameters, producing the highest number of primary branches (15.67), the maximum number of inflorescences per plant (35.87) and the earliest picking of fruits (70.67 DAT). Tomato cv. Kashi Aman grafted on Tomato cv. SPS 1 produced the maximum number of flowers per inflorescence (5.79). Yield parameters showed significant improvement through grafting with Tomato cv. Kashi Aman grafted on Brinjal cv. Jawahar Baigan 20-14 producing the highest number of fruits per plant (35.20), fruit set percentage (78.85%), yield per plant (3.48 kg) and yield per hectare (430.78 q). Graft success positively correlated with vegetative growth and higher fruit yield, while negatively correlated with early flowering and harvesting. Fruit yield was strongly linked to graft success, primary branch numbers, and early flowering and fruiting traits, emphasizing the benefits of using brinjal rootstocks for enhanced growth and yield attributes. Hence, Jawahar Baigan 20-14 could be better utilized as a potential rootstock to enhance the productivity of tomato.

Keywords: Tomato-Brinjal Grafting, Heterografts, Graft compatibility, Morpho-phenology, Yield attributes, rootstock.

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Citation: Yadav, A., Tiwari, A., Kumar, L., & Dongre, H. (2025). Assessment of heterografts and homografts for compatibility, morpho-phenology and yield performance of tomato scion cv. Kashi Aman. Vegetable Science 52(2), 318-325.

Source of support: Nil

Conflict of interest: None.

Received: 02/07/2025 **Revised:** 13/12/2025 **Accepted:** 14/12/2025

Introduction

Tomato (*Solanum lycopersicum* L.) is a warm-season vegetable of South American origin that belongs to the order Solanales and family Solanaceae (González et al., 2011). It is considered an important model crop in plant genetics and genomics. It is considered a 'protective food' since it has many nutrients, such as carbohydrates (2.9–7%), vitamins A, B, B2, B6 and C, important minerals such as K, P, Fe, Ca, I and Mg salts, and organic acids ranging from 0.5 to 1.5% (Lagunovschi-Luchian et al., 2016). In India, during the year 2022–23, the total area occupied by tomato crops was 848.71 thousand ha, yielding 20,425.32 thousand MT. Out of this, the area occupied by Madhya Pradesh was 113.77 thousand ha with a production of 3,249.82 thousand MT (Department of Agriculture & Farmers Welfare, 2024).

In terms of productivity, India, with a productivity of 24.3 tonnes/ha, is far behind many countries, and even the world's average (35.9 tonnes/ha) (FAOSTAT, 2021). Tomato farmers face numerous climate change-related challenges, including increased pests, diseases, and extreme weather events. High rainfall, waterlogging, heat stress, and soil

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pathogens reduce crop yields and quality (Bahadur et al. 2016; Bahadur & Kumar, 2024). Environmental and biological factors affect the production of tomato, and thus it becomes difficult to satisfy the increasing demand (Bhandari et al., 2021). Chemical solutions have been discovered, but they are risky for the health of consumers and workers. There is indeed an urgent need to adopt other methods, like grafting, to deal with various abiotic and biotic stresses. Grafting is a technique of joining a short section or part of one plant, the scion, to the root system of another plant, the rootstock. This usually takes place between closely related species or genera. The combined creation results in a genetically composite plant with vascular continuity between the joined parts, allowing it to act as a whole organism, with all the combined traits of both plants (Edelstein et al. 2015; Bahadur et al. 2024). This technique has been found to increase nutrient absorption (Leonardi and Giuffrida, 2006), increase water use efficiency (Rouphael et al., 2008), and improve photosynthetic processes and antioxidant enzyme functions (He et al., 2009). Therefore, grafted plants tend to produce higher harvest yields, irrespective of standard growth conditions (Di Gioia et al., 2010). Grafted plants are commonly used in greenhouses, but their adoption in open-field vegetable cultivation remains limited (Kubota et al., 2008). While some tomato rootstocks offer strong disease resistance (Louws et al., 2010), few studies assess their impact on scion growth and yield in pathogen-free open-field conditions (Suchoff et al., 2018). Recent findings show that in about 65% of cases, grafted plants yield similarly or less than non-grafted ones (Grieneisen et al., 2018).

This study addresses a key research gap in vegetable grafting, focusing on developing effective rootstocks for tomatoes to boost productivity. Due to limited data on suitable scion-rootstock combinations, grafting remains underutilized in commercial tomato farming. To bridge this gap, the study evaluated six grafted treatments and one ungrafted control using the tomato cv. Kashi Aman, including three novel rootstocks. The findings aim to offer insights that could transform tomato cultivation in terms of morpho-phenology and yield.

Materials and Methods

Experimental site, plant preparation and cultivation practices

The present investigation was conducted at Vegetable Research Centre, Maharajpur, Department of Horticulture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.) during Rabi season in the year 2023-2024 in open-field conditions with 7 treatments and 3 replications. The site is located at 23°13'26" North latitude and 79°57'52" East longitude at an altitude of 400 m above mean sea level. Six rootstock cultivars, of which three brinjal (Jawahar Baigan 20-14, Kashi Sandesh, IC311300) and three tomato (Kashi Adarsh, SPS-1, SPS-2) were utilized in this experiment. Tomato cv. Kashi Aman served as a common scion for all grafted treatments. The seeds of brinjal cv. Jawahar Baigan 20-14 and IC311300, and Tomato cv. SPS-1 and SPS-2 were obtained from the Department of Horticulture, JNKVV, Jabalpur. The seeds of the tomato cv. Kashi Aman and Kashi Adarsh, and brinjal cv. Kashi Sandesh was bought from ICAR-Indian Institute of Vegetable Research, Jakhini, Varanasi, UP.

Rootstock seeds were sown in 104-cell trays containing a 1:1 mixture of sterilized coco-peat and vermicompost. Brinjal rootstocks were sown 10 to 15 days before the scion, while tomato rootstocks were sown 5 to 7 days prior. Seedlings were fertilized with a 19:19:19 NPK water-soluble fertilizer (@2 g/L) 10-15 days post-germination. Cleft grafting was performed when brinjal rootstocks reached 35–40 days (4-leaf stage), tomato rootstocks 30 to 35 days (4–6 leaf stage), and scions 23 to 28 days (2–4 leaf stage). The rootstock stem was cut below the cotyledonary leaves and incised vertically (1.5 cm) with the help of a grafting blade. Scions were pruned to 1-3 apical leaves and the lower stem was cut into a 1.5 cm wedge (V) shape and inserted into the rootstock incision. A 2 mm diameter silicon clip secured the graft union. This clip helps stabilize the graft, lowers the risk of infection, and promotes proper vascular connection between the two plant parts. Sanitary measures such as latex or nitrile gloves, sanitizer, etc., were used while grafting to reduce the risk of infection and infestation.

Grafted seedlings were placed in a custom-built grafting chamber (bamboo, galvanized iron wires, 22-micron black polythene) for 10 days. Environmental conditions were maintained at 85 to 95% relative humidity and 25 to 30°C. Seedlings were kept in darkness for the initial 3 to 4 days. Humidity was gradually decreased and light increased over the 10-day period. Copper oxychloride (50% @ 1 g/L) was applied on day 6, and NPK 19:19:19 (@2 mL/L) on day 7. After the chamber period, plants were kept under a green shade net-house for 12 to 15 days, followed by 3 to 5 days of direct sunlight exposure for hardening, and then were ready to transplant (Figure 1).

Assessment of graft and morpho-phenological characters

For the assessment of graft success percentage, 100 grafted plants were evaluated per treatment per replication. The graft success percentage was calculated by recording the number of successfully established grafts out of the total grafted plants. Ten plants were randomly taken and tagged per replication for measuring the number of primary branches, days taken for 50% flowering, number of inflorescences per plant, number of flowers per inflorescence and days taken for first picking.

First picking of mature fruits was done in April, 2024. Pickings continued at a regular interval of 6 to 7 days. There was a total of 13 pickings. Yield attributes such as number

Figure 1: Ungrafted and grafted seedlings with different rootstocks ready for transplanting. 1) Kashi Aman (Ungrafted). 2-7 are grafted seedlings with common scion Kashi Aman with: (2) Rootstock Jawahar Baigan 20-14, (3) Rootstock Kashi Sandesh, (4) Rootstock IC311300, (5) Rootstock Kashi Adarsh, (6) SPS 1, (7) Rootstock SPS 2

of fruits per plant, fruit set percentage (number of fruits per inflorescence/number of flowers per inflorescence), fruit weight per plant (kg/plant) from selected tagged plants from each replication and fruit yield per hectare (q/ha) were recorded.

Statistical analysis

The analysis of individual observed traits was done using MS-Excel and OPSTAT software packages. Mean values were examined through randomized block design methods, as outlined by Gomez and Gomez (1984). The importance of various variation sources was evaluated using the error mean square and F value. Critical differences at a 5% significance level were determined by referencing the Fisher & Yates table. Pearson correlation coefficients among the recorded graft success percentage, morpho-phenological and yield attributes were computed using R statistical software (version 4.4.3). A correlation matrix was generated along with a heatmap, network graph and significance levels were tested at 1% (p <0.01) and 5% (p <0.5) probability levels.

Results and Discussion

Effect of grafting on growth and morpho-phenological characters

Growth and morpho-phenological characters were found to be significantly influenced by grafting (Table 1). Among the different rootstocks used for grafting, the maximum graft success (87.50%) was achieved by Brinjal rootstock cv. Jawahar Baigan 20 to 14 grafted with Tomato cv. Kashi Aman, which was closely followed by Brinjal rootstock cv. IC311300 grafted with Tomato cv. Kashi Aman at 83.65% success. Similarly, the significantly maximum number of primary branches (15.67) was observed in the graft combination with Brinjal rootstock cv. Jawahar Baigan 20-14 grafted with Tomato cv. Kashi Aman as compared to ungrafted plants (Table 1). However, significantly earlier flowering was observed when using Brinjal rootstock cv. Kashi Sandesh with Tomato cv. Kashi Aman, where 50% flowering arose at 7.66 days earlier than in ungrafted plants. Besides, Brinjal rootstock cv. Jawahar Baigan 20-14 + Tomato cv. Kashi Aman and Brinjal rootstock cv. IC311300 + Tomato cv. Kashi Aman was at par and showed early flowering in 38.33 days after transplanting. The number of inflorescences per plant increased significantly with a maximum (35.87) in treatment with Brinjal rootstock cv. Jawahar Baigan 20-14 + Tomato cv. Kashi Aman as compared to ungrafted plants. Tomato rootstock cv. SPS 1 + Tomato cv. Kashi Aman resulted in the highest number of flowers per inflorescence versus ungrafted plants of the Tomato cv. Kashi Aman. Using Brinjal rootstock cv. Jawahar Baigan 20-14 + Tomato cv. Kashi Aman, Brinjal rootstock cv. IC311300 + Tomato cv. Kashi Aman and Brinjal rootstock cv. Kashi Sandesh + tomato cv. Kashi Aman led to earlier fruit development in the grafted scion and were significantly at par with each other. The first picking occurred 9.33 days to 15.33 days in advance of ungrafted plants (Table 1).

Table 1: Graft success, growth and morpho-phenological characteristics of grafted and ungrafted plants

Treatment	*Graft Success (%)*	*Number of primary branches*	*Days taken for 50% flowering*	*Number of inflorescence per plant*	*Number of flowers per inflorescence*	*Days taken for first picking*
Tomato cv. Kashi Aman (Ungrafted)	NA	11.47	45.33	25.60	4.91	86.00
Grafted Treatments (Rootstock+Scion)						
Brinjal cv. Jawahar Baigan 20-14 + Tomato cv. Kashi Aman	87.50	15.67	38.33	35.87	5.43	70.67
Brinjal cv. Kashi Sandesh + tomato cv. Kashi Aman	81.73	15.47	37.67	35.33	5.39	73.33
Brinjal cv. IC311300 + Tomato cv. Kashi Aman	83.65	15.13	38.33	34.47	5.69	73.00
Tomato cv. Kashi Adarsh + tomato cv. Kashi Aman	82.69	13.40	42.67	29.13	5.47	79.00
Tomato cv. SPS 1 + Tomato cv. Kashi Aman	77.88	14.07	43.67	33.27	5.79	79.33
Tomato cv. SPS 2 + Tomato cv. Kashi Aman	76.92	13.87	45.33	28.27	5.71	81.33
SE ±	1.18	0.60	0.76	1.27	0.14	2.33
CD @ 5%	3.65	1.86	2.35	3.93	0.42	7.17
CV	2.93	7.38	3.17	6.96	4.32	5.20
Significance[#]	**	**	**	**	*	**

[#]** and ** represent P<0.05 and 0.01, respectively. SE ± = Standard error, CD = Critical difference and CV = Coefficient of variation; NA = Not applicable

Table 2: Yield attributes of grafted and ungrafted plants

Treatment	*Number of fruits per plant*	*Fruit set (%)*	*Fruit weight (kg/plant)*	*Fruit yield (q/ha)*
Tomato cv. Kashi Aman (Ungrafted)	23.13	64.02	1.93	295.00
Grafted Treatments (Rootstock+Scion)				
Brinjal cv. Jawahar Baigan 20-14 + Tomato cv. Kashi Aman	35.20	78.85	3.48	430.78
Brinjal cv. Kashi Sandesh + tomato cv. Kashi Aman	32.60	77.87	3.01	402.12
Brinjal cv. IC311300 + Tomato cv. Kashi Aman	33.87	77.80	3.20	405.83
Tomato cv. Kashi Adarsh + tomato cv. Kashi Aman	28.00	73.24	2.10	311.16
Tomato cv. SPS 1 + Tomato cv. Kashi Aman	31.00	72.53	2.72	350.52
Tomato cv. SPS 2 + Tomato cv. Kashi Aman	28.87	70.45	2.41	325.18
SE ±	1.02	2.33	0.17	20.22
CD @ 5%	3.15	7.19	0.53	62.32
CV	5.83	5.49	11.10	9.73
Significance[#]	**	**	**	**

[#]** and ** represent P<0.05 and 0.01, respectively.
SE ± = Standard error, CD = Critical difference and CV = Coefficient of variation

An increase in the number of primary branches may result from the brinjal rootstock's impact on the mineral makeup of the plant's aerial structures, which could be linked to the root system's morphological traits, such as its vertical and lateral expansion. These characteristics would have enhanced water and nutrient absorption, which in turn encouraged more branches in grafted plants. These results were consistent with those published by Latifah et al. (2021) and Ganiyu et al. (2018). The early flowering and picking seen in grafted plants with brinjal as the rootstock might be explained by the vigorous rootstock, which improves nutrition, water uptake and increases chlorophyll content,

Table 3: Correlation analysis among graft success percentage, morpho-phenological and yield attributes of tomato in response to different rootstocks

Parameters	*Graft Success Percentage*	*Number of primary branches*	*Days taken for 50% flowering*	*Number of inflorescence per plant*	*Number of flowers per inflorescence*	*Days taken for first picking*	*Number of fruits per plant*	*Fruit set percentage*	*Fruit weight (kg/plant)*	*Fruit yield (q/ha)*
Graft Success Percentage	1.00									
Number of primary branches	0.38	1.00								
Days taken for 50% flowering	-0.48*	-0.53*	1.00							
Number of inflorescence per plant	-0.07	0.58*	-0.51*	1.00						
Number of flowers per inflorescence	-0.41	-0.54*	0.38	-0.16	1.00					
Days taken for first picking	-0.4	-0.31	0.75**	-0.41	0.1	1.00				
Number of fruits per plant	0.17	0.31	-0.56*	0.68**	-0.16	-0.58*	1.00			
Fruit set percentage	0.65**	0.83**	-0.62**	0.3	-0.43	-0.39	0.28	1.00		
Fruit weight (kg/plant)	0.29	0.38	-0.6**	0.64**	-0.07	-0.58*	0.75**	0.4	1.00	
Fruit yield (q/ha)	0.5*	0.74**	-0.55*	0.48*	-0.34	-0.52*	0.53*	0.67**	0.69**	1.00

Significance level: **highly significant ($P < 0.01$), *significant ($P > 0.01$ or $P < 0.05$).

as well as the translocation of endogenous flowering-promoting substances from the rootstock to the scion through the graft union. Tsaballa et al. (2021) came to the conclusion that genetic exchange takes place across graft junctions between the scion and rootstock, which might have an impact on the outcomes seen in grafted plants. Grafted scions showed notable changes in DNA methylation patterns, indicating that epigenetic processes had a role in the grafting effects (Tsaballa et al., 2021). An increase in the number of inflorescences per plant and flowers per inflorescence might have resulted from grafted plants having more branches. This may also be caused by a number of interrelated factors, such as increased stress resistance because of higher RWC and lower WSD, favorable hormonal balance, and improved photosynthetic efficiency that makes enough moisture available to the flowers, which lowers flower abortion. Findings from earlier research by Khah et al. (2006) and Hossain et al. (2019) were consistent with the results presented.

Effect of grafting on yield attributes

Significant differences were observed in yield attributes mediated by grafting, as evident from Table 2. Greater fruit retention strength was shown by treatment with brinjal rootstock cv. Jawahar Baigan 20-14 grafted with Tomato cv. Kashi Aman, which produced the maximum number of fruits per plant (35.20) and the highest fruit set percentage (78.85%) as compared to ungrafted treatments. Brinjal rootstock cv. Jawahar Baigan 20-14 grafted with Tomato cv. Kashi Aman also exhibited the highest fruit weight per plant (3.48 kg/plant) and fruit yield per hectare (430.78 q/ha), followed by Brinjal rootstocks cv. IC311300 + Tomato cv. Kashi Aman and Brinjal rootstock cv. Kashi Sandesh + tomato cv. Kashi Aman, which were at par and showed superior rootstocks than other tomato rootstocks and un-grafted Kashi Aman (Table 2).

The grafted plant's improved photosynthetic efficiency would permit it to support a higher number of developing fruits, which in turn results in a greater fruit set percentage. Moreover, the well-developed root system of the brinjal rootstock optimizes the nutrients and water absorption, hence enhancing the plant's vitality and stress tolerance. This enhanced water retention of the plant reduces fruit drop and adds up to an increased fruit set percentage (Khah, 2012; Latifah et al., 2023). The highest fruit weight per plant and yield per hectare was recorded in the treatment with brinjal cv. Jawahar Baigan 20-14 as rootstock. This could be due to the fact that brinjal cv. Jawahar Baigan 20-14 had influenced to retain the maximum number of flowers with less flower drop and maximum fruits per plant, along with the highest percentage of fruit set, which led to maximum yield. The improvement in the absorption capacity of brinjal rootstock could be attributed to a stronger and vigorous root system that is often more effective than that of self-

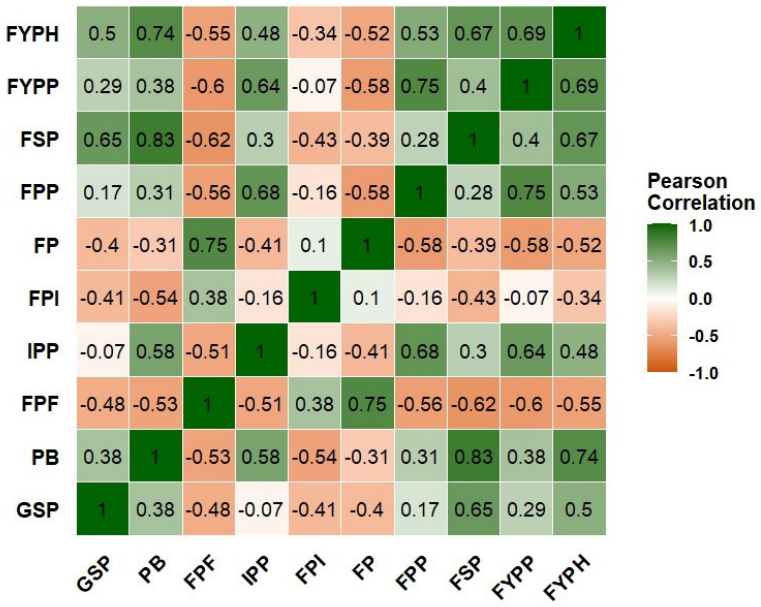

Figure 2: Correlation heatmap of graft success percentage, morpho-phenological parameters and yield attributes in grafted tomatoes. [Graft Success Percentage (GSP), number of primary branches (PB), Days taken for 50% flowering (FPF), Number of inflorescence per plant (IPP), Number of flowers per inflorescence (FPI), Days taken for first picking (FP), Number of fruits per plant (FPP), fruit set percentage (FSP), Fruit weight (kg/plant) (FYPP) and Fruit yield (q/ha) (FYPH)]

rooted scion plants. The results were in accordance with the findings reported by Latifah et al. (2023) and Chandanshive et al. (2023).

Correlation analysis among graft success percentage, morpho-phenological and yield attributes

Correlation analysis (Table 3) showed significant interrelationships among key traits. Graft Success Percentage (GSP) was positively correlated with Fruit Set Percentage (FSP) (r = 0.65, $p < 0.01$), Fruit Yield (q/ha) (FYPH) (r = 0.50, $p < 0.01$), and Fruit Weight (kg/plant) (FYPP) (r = 0.29, $p < 0.05$), while negatively correlated with Days taken for 50% Flowering (FPF) (r = -0.48, $p < 0.05$), Number of Flowers per Inflorescence (FPI) (r = -0.41, $p < 0.05$), and Days taken for First Picking (FP) (r = -0.40, $p < 0.05$). These results indicate that higher graft success improves fruit set, early development, and yield. The heatmap (Figure 2) visually displays these correlations, with green and orange shades representing positive and negative values, and shade intensity indicating correlation strength.

FYPH was positively correlated with FYPP (r = 0.69, $p < 0.01$), FSP (r = 0.67, $p < 0.01$), Number of Primary Branches (PB) (r = 0.74, $p < 0.01$), and GSP (r = 0.50, $p < 0.01$), but negatively with FPI (r = -0.34, $p < 0.05$), FPF (r = -0.55, $p < 0.01$), and FP (r = -0.52, $p < 0.01$). This implies that better vegetative growth and reproductive traits contribute to higher yield, while delayed maturity and excessive flowering reduce efficiency. FYPP showed strong positive correlations with Number of Fruits per Plant (FPP) (r = 0.75, $p < 0.01$), Number of Inflorescences per Plant (IPP) (r = 0.58, $p < 0.01$), and PB (r = 0.83, $P < 0.01$), emphasizing the role of vegetative vigour and reproductive output in yield. FPF showed strong negative correlations with FYPH (r = -0.55, $p < 0.01$) and FYPP (r = -0.53, $p < 0.01$), suggesting that delayed flowering reduces yield potential. FPI also showed negative correlations with IPP (r = -0.41, $p < 0.05$) and FSP (r = -0.43, $p < 0.05$), indicating that fewer flowers per inflorescence may benefit reproductive success. Overall, grafting tomato onto brinjal, especially using Jawahar Baigan 20-14 as rootstock, significantly improved growth, morpho-phenological, physiological, and yield-related traits.

Conclusion

This experiment accentuated the benefits of grafting in tomato plants, especially when using robust, locally-adapted brinjal rootstocks. The results showed improved plant growth morpho-phenologically, as well as enhanced yield and yield-related traits, especially with Brinjal rootstock cv. Jawhar Baigan 20-14 + Tomato cv. Kashi Aman, Brinjal rootstock cv. IC311300 + Tomato cv. Kashi Aman and Brinjal rootstock cv. Kashi Sandesh + tomato cv. Kashi Aman, stating that these could be utilized as potential rootstock for stress alleviation and yield improvement. Rootstocks native to specific regions demonstrated better adaptation to their local agroclimatic conditions, potentially improving the scion's ability to withstand stress. Information regarding locally-adapted rootstocks could be valuable for selecting compatible rootstock-scion combinations and optimizing cultivation practices that enhance tomato yield. Given these findings, it is suggested to investigate a variety of scion-

rootstock combinations in various agroclimatic zones for their effects on compatibility of the graft and determining the associated growth, yield and quality parameters.

Acknowledgments

We are thankful to the Department of Horticulture, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya for research supports.

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सारांश

यह शोध अध्ययन सब्जी अनुसंधान केंद्र, महाराजपुर, उद्यानिकी विभाग, जवाहरलाल नेहरू कृषि विश्वविद्यालय, जबलपुर (म.प्र.) में रबी मौसम 2023–2024 के दौरान किया गया, जिसमें बैंगन और टमाटर की छह विभिन्न रूटस्टॉक्स का प्रयोग सामान्य सायन टमाटर किस्म 'काशी अमन' के साथ ग्राफ्टिंग हेतु किया गया। इस प्रकार, उपचारों में एक अनग्राफ्टेड तथा छह ग्राफ्टेड संयोजन शामिल थे, जिन्हें ग्राफ्ट अनुकूलता, मॉर्फो-फेनोलॉजिकल एवं उपज संबंधी गुणों तथा इनके मध्य सहसंबंध के लिए मूल्यांकित किया गया। परिणामों से ग्राफ्ट सफलता दर में महत्वपूर्ण भिन्नताएँ पाई गईं, जिसमें टमाटर किस्म 'काशी अमन' (सायन) को बैंगन किस्म 'जवाहर बैंगन 20-14' (रूटस्टॉक) पर ग्राफ्ट करने पर सर्वाधिक ग्राफ्ट सफलता प्रतिशत (87.50%) प्राप्त हुआ। बैंगन किस्म 'जवाहर बैंगन 20-14' एवं टमाटर किस्म 'काशी अमन' के बीच रूटस्टॉक–सायन अंतःक्रिया ने मॉर्फो-फेनोलॉजिकल विशेषताओं को महत्वपूर्ण रूप से प्रभावित किया, जिससे सर्वाधिक प्राथमिक शाखाएँ (15.67), प्रति पौधा अधिकतम पुष्पगुच्छ संख्या (35.87) तथा सबसे शीघ्र फल तुड़ाई (70.67 दिन प्रतिरोपण के बाद) प्राप्त हुई। टमाटर किस्म 'काशी अमन' को टमाटर किस्म 'एएसपीएस-1' पर ग्राफ्ट करने पर प्रति पुष्पगुच्छ अधिकतम फूलों की संख्या (5.79) प्राप्त हुई। उपज से संबंधित गुणों में ग्राफ्टिंग के माध्यम से महत्वपूर्ण सुधार देखा गया, जिसमें टमाटर किस्म 'काशी अमन' को बैंगन किस्म 'जवाहर बैंगन 20-14' पर ग्राफ्ट करने पर प्रति पौधा अधिकतम फलों की संख्या (35.20), फल स्थापन प्रतिशत (78.85%), प्रति पौधा उपज (3.48 किग्रा) एवं प्रति हेक्टेयर उपज (430.78 क्विंटल) प्राप्त हुई। ग्राफ्ट सफलता का सकारात्मक सहसंबंध पौधों की शाखीय वृद्धि एवं उच्च फल उपज से पाया गया, जबकि इसका नकारात्मक सहसंबंध शीघ्र पुष्पन एवं तुड़ाई से देखा गया। फल उपज का मजबूत संबंध ग्राफ्ट सफलता, प्राथमिक शाखाओं की संख्या तथा शीघ्र पुष्पन एवं फलन लक्षणों से पाया गया, जिससे यह स्पष्ट होता है कि बैंगन रूटस्टॉक का उपयोग वृद्धि एवं उपज संबंधी गुणों में सुधार हेतु लाभकारी है। अतः 'जवाहर बैंगन 20-14' को टमाटर की वृद्धि एवं उपज गुणों में सुधार हेतु रूटस्टॉक के रूप में प्रभावी ढंग से उपयोग किया जा सकता है।