Biological Forum – An International Journal **15(10): 1217-1223(2023)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Compatibility of Bell Pepper Hybrid with Different Chilli Rootstocks

Sanmathi Naik A.T.S.[1*], C.N. Hanchinamani[1], Shivanand Hongal[2], Naresh Ponnam[3], G. Manjunath[4], Mohan Kumar S.[5], Shankar Meti[6] and Pradeep Kumar[7]

[1]Department of Vegetable Science, College of Horticulture, Bengaluru (Karnataka), India.
[2]KVK, Kolar (Karnataka), India.
[3]Division of Vegetable Crops, ICAR-IIHR, Bengaluru (Karnataka), India.
[4]Department of Plant Pathology, College of Horticulture, Mysore (Karnataka), India.
[5]Department of Crop Physiology, College of Horticulture, Bengaluru (Karnataka), India.
[6]Department of Agronomy, College of Horticulture, Sirsi (Karnataka), India.
[7]ICAR-Central Arid Zone Research Institute, Jodhpur (Rajasthan), India.

(Corresponding author: Sanmathi Naik A.T.S.)*
(Received: 26 August 2023; Revised: 29 September 2023; Accepted: 06 October 2023; Published: 15 October 2023)
(Published by Research Trend)

ABSTRACT: This study explores the dynamics of vegetable grafting, focusing on bell pepper hybrid MS and various *Capsicum* spp. rootstocks. The experiment delves into seed germination, seedling growth parameters and grafting outcomes. MS hybrid demonstrates swift germination and robust seedling growth, attributed to hybrid vigor. Rootstocks CRS-22 and CRS-24 exhibit delayed germination and slower growth. MS grafted on CRS-1, CRS-2, CRS-11, and CRS-15 rootstocks showcases superior graft success, while CRS-22 and CRS-24 combinations exhibit lower success rates. Graft combinations with CRS-14 and CRS-21 demonstrate lower graft failure rates, emphasizing compatibility. Stem girth, leaf count, and plant height variations highlight the influence of rootstock selection. The study's insights contribute to optimizing grafting practices for enhanced bell pepper cultivation, emphasizing the crucial role of seed germination and seedling growth parameters in achieving successful graft unions. The chilli rootstocks such as CRS-1, CRS-2, CRS-11, CRS-14, CRS-15 and CRS-21 has shown more than 70 per cent of graft success indicating a higher compatibility with the bell pepper hybrid MS.

Keywords: Vegetable grafting, Compatibility, Graft success.

INTRODUCTION

Vegetable grafting is a horticultural technique that involves the fusion of two distinct plant parts, namely the scion and the rootstock. The scion represents the desired upper portion of the plant, selected for specific characteristics such as desirable fruit traits. On the other hand, the rootstock is chosen for its inherent resistance to soil-borne diseases, ability to withstand environmental stress and efficient nutrient absorption. This process results in the creation of a single, genetically combined plant, often referred to as a "physical hybrid" (Kubota *et al*., 2016).

The grafting procedure encompasses several crucial steps to ensure a successful union between the scion and rootstock. Initially, careful selection of both plant parts is paramount to the desired outcome. The scion and rootstock undergo meticulous preparation, involving precise cuts to facilitate a snug fit during the grafting process. Various grafting techniques, such as cleft grafting, whip-and-tongue grafting, or side-veneer grafting, are employed to physically join the scion and rootstock.

Following grafting, the healing process is initiated through the formation of a callus at the interface between the scion and rootstock. This callus serves as a bridge, aiding in the gradual union of the two plant parts. Vascular bundle differentiation is a subsequent stage, allowing the establishment of a connection for the transport of water, nutrients, and other essential substances between the scion and rootstock. Adequate healing time is essential for the success of the graft, during which the plant parts knit together, ensuring a robust and functional union.

The benefits of vegetable grafting are manifold. Grafted vegetables often exhibit increased yield, enhanced resistance to diseases (Gupta *et al*., 2023), improved tolerance to environmental stress, better nutrient absorption, and extended growing seasons. However, the success of grafted vegetables hinges on the compatibility between the scion and rootstock, emphasizing the importance of a strong connection for optimal horticultural performance.

The critical stage in the grafting process for bell peppers is days taken for seed germination (Bewley and Black 1985; Bernau *et al*., 2020) and days taken to reach grafting (Maria and Bosland 2010; Jang *et al*., 2011; Soltan *et al*., 2017; Rathod, 2017; Pilli *et al*., 2018; Sharma *et al*., 2019; Phukon *et al*., 2020; Andrade *et al*., 2020; Naik *et al*., 2021; Dharmik *et al*., 2022). The vigour and uniformity of germinated seeds directly impact the success of grafting. High-quality

seed germination ensures a consistent starting point for both scion and rootstock, contributing to the overall health and development of the grafted plant. Uniform germination is essential for standardization, allowing growers to work with plants at similar stages of development during grafting. Additionally, healthy germinated seeds provide a robust foundation for the subsequent growth phases, increasing the likelihood of successful graft unions and promoting optimal horticultural performance in the final grafted bell pepper plants.

Seedling growth parameters play a pivotal role in the success of grafting bell peppers. Robust seedlings with well-developed root systems and sturdy stems provide a strong foundation for the grafting process. Adequate seedling growth ensures that both scion and rootstock have the necessary resources and energy to support the union and subsequent growth after grafting. Vigorous seedlings also contribute to the establishment of a strong connection between the scion and rootstock, promoting successful callus formation, vascular bundle differentiation, and overall graft integration. Proper seedling growth parameters, including size, leaf development, and overall health, are key indicators of the plant's ability to withstand the grafting procedure and thrive as a grafted bell pepper plant. Ensuring optimal seedling growth sets the stage for a successful and productive outcome in the cultivation of grafted bell peppers.

Successful grafting requires careful consideration of germination conditions, appropriate rootstock and scion selection and precise timing for grafting. Additionally, factors such as stem girth, number of leaves, and plant height at the grafting stage contribute to the overall success of the grafting process (Johkan *et al*., 2008; Hamdi *et al*., 2010; Rodriquez and Bosland 2010; Jang *et al*., 2012; Soltan *et al*., 2017; Alfaro *et al*., 2021; Phukon *et al*., 2020). Understanding and optimizing these parameters are crucial for achieving successful and robust grafting outcomes in Capsicum cultivation. With this brief background the research was planned with the objective of compatibility of bell pepper with different capsicum species rootstocks.

MATERIAL AND METHODS

The experiment was conducted at research block of department of vegetable science, College of Horticulture, Sirsi, Uttara Kannada, Karnataka, during the month of January to March, 2023.

A. Rootstocks and scion used in the experiment

The present experimental study consisted of 11 resistant and popular chilli and capsicum varieties/hybrids along with locally collected *Capsicum frutescence* species as rootstocks. The seeds were local collections from Hosanagara, College of Horticulture, Sirsi, VNR, Nursery, Pvt. Ltd. and Rijk Zwaan Seeds. The scion is a popular capsicum hybrid, highly preferred to grown under the protected cultivation system.

B. Nursery raising

Raising of rootstock and scion: Individual rootstock and scion seeds were sown in the cavity of 50-celled portrays filled with cocopeat and *Trichoderma* (2g per kg of cocopeat) mixture. To increase the germination rate of the seeds, protrays were covered with black polythene mulch for four to five days after sowing with mild irrigation. The portrays are kept open under the polyhouse for six to seven days, and water is sprayed once in a day. To prevent damping-off disease, a preventive spray of fungicide (SAAF @ 2g/l) was applied at intervals of seven days. Scion seeds were sown 10-15 days after the rootstock seeds.

C. Procedure of grafting

1. Hardening of seedlings before grafting: The seedlings required for grafting were grown in a polyhouse until they had two true leaves, further, they were moved to a shade house until they were ready for grafting. Three to four days prior to grafting, the irrigation was reduced to harden them.

2. Selection of rootstock and scion seedlings: The rootstock seedlings and the scion seedlings were used for grafting. The digital Vernier callipers, was used to measure the stem girth of the seedlings. Grafting was done in the shade, ideally in the evening, mainly during the cool hours of the day. The well-known bell pepper hybrid Massilia (MS) was grafted on different *capsicum* spp. rootstocks and also self-grafted by cleft method of grafting. The non-grafted and self-grafted Massilia were used control.

3. Preparation of rootstock: The choice of the desired rootstock and the scion is the first and most important step in vegetable grafting. For a higher rate of graft success, the chosen rootstock and scion should have comparable girth and be matured at the time of grafting. The rootstock was prepared by giving a vertical cut at five cm above the collar region. At the centre of cut surface of rootstock, horizontal cut of 1.5 to 2 cm was done. A vertical slit was given vertically on the rootstock by removing the plant part three to five cm above collar region.

4. Preparing of scion: The growing tip of the scion up to a length of six to eight cm was taken, by leaving three to four cm above collar region, all the leaves were trimmed off remaining one or two apical growing leaves. Slant cut of about 1.5 to 2cm was given at one side of the lower part of the scion and the same level cut was given on the opposite side of the lower portion of the scion, such that a 'V' shape or 'wedge' shape was formed at the bottom part of the scion. Thus, the prepared scion was inserted into the vertical slit given on the rootstock and the union was kept in position by using grafting clip.

5. Nursing of grafted seedlings: Using a hand sprayer, water was sprayed on the grafted plants immediately in order to lower the transpiration rate. Grafted seedlings were placed within the conventional humidity chamber, which was set up in a shaded area. To control the temperature and humidity inside the chamber, a single layer of polythene sheet and a single layer of green shade net cloth were placed on top of a single layer of mulch sheet to prevent weed growth. For five to ten

days, water was sprayed three to four times every day to maintain the temperature.

6. Maintenance of humidity and temperature inside the chamber: Temperature and humidity play a crucial role in the success rate of grafted plants. The optimum temperature should range from 18 °C to 25 °C with 70 to 80 per cent of relative humidity is required for reducing the transpiration rate and to promote the successful union between rootstock and the scion. The temperature and relative humidity were monitored using digital thermo hygrometer inside the humid chamber. When the temperature exceeds the optimum level water was sprayed to the walls of the humid chamber. Gradually the plants are allowed to harden by removing them from the healing chamber at 15 days after grafting and kept them under natural climatic condition.

7. Healing of grafts: The graft union occurs and new leaves begin to emerge on the grafted plants after 15 to 20 days of keeping them in a conventional humidity chamber. By removing the clips from the union position, the graft union could be seen, and callus growth was visible.

8. Hardening of grafted plants: Fifteen days after keeping under the healing chamber, the grafted seedlings were moved to the shade net. To ensure the best survival per centage of grafted transplants, plants were properly acclimated before being transplanted under polyhouse conditions.

Visual observations of seed germination were recorded when 70 per cent of the seeds had germinated. The number of days taken from the date of sowing to the time of germination was noted. Days from the germination of the seedlings to when they achieved a graftable stem girth and leaves were counted to observe the time required to reach the grafting stage. The stem girth of the rootstocks and scion seedlings was measured by using digital vernier callipers, holding them at a distance of three to five centimetres above the collar region of the seedlings. The number of leaves in the rootstock and scion seedlings was counted and expressed in numbers. Height of the rootstock and scion seedlings was measured with scale and the observations were expressed in numbers.

After grafting, the seedlings were kept under healings chamber, the plants which looks healthy without having the symptoms of wilting were noted at 5, 10 and 15 days after grafting. The plants producing new leaves were considered as successful grafts. Plants that remained healthy at 5, 10, and 15 days after grafting and total number of grafts were recorded. It was calculated by the following formula.

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

The girth of the rootstock and scion was recorded at one cm above and below the graft union region by holding the digital vernier callipers. The number were recorded. The graft union girth of the graft union region was recorded by holding the digital vernier callipers at 15 days after grafting. The number observed in the callipers were recorded.

RESULTS AND DISCUSSION

Notably, among the various rootstock seeds, the bell pepper hybrid MS exhibited significantly quicker germination. The early germination in these hybrid seeds was mainly due to hybrid vigour. In contrast, the rootstock seedlings of CRS-22, CRS-12, CRS-21 and CRS-13 displayed a significantly prolonged germination period (Table. 1). These rootstocks belong to *Capsicum frutescence* species, as per the research findings of Dutta *et al*. (2015) the bird's eye chilli (*Capsicum frutescens* L.) seeds from the eastern Himalayan region of India had a mean germination time ranging from 13.53 days to 21.63 days. Over all the days taken for seed germination were found similar to the findings reported by Haque *et al*. (2016); Jang *et al*. (2011); Verdugo *et al*. (2001); Yamamoto and Nawata (2006); Naik *et al*. (2020).

The hybrid bell pepper seedlings took shortest period to reach the grafting stage. The early germination and rapid seedling growth, may be the reason for less number of days to reach the grafting stage, possibly due to hybrid vigour. However, more number of days were taken by CRS-21 and CRS-13 to reach the graftable stage. Comparatively delayed germination and slow growth rate may be the characteristic feature of these *Capsicum frutescence* seedlings. These are in line with the findings of Phukon *et al*. (2020).

The bell pepper scion MS utilized as rootstock seedlings showed the highest stem girth. In contrast, the seedlings of CRS-24 displayed a relatively less stem girth (Table 1). These findings are in line with the study conducted by Camposeco *et al*. (2018); Albornoz *et al*. (2020).

The highest leaf count was achieved by CRS-2 rootstock seedlings (Table 1). These seedlings may have faster growth rates, allowing them to produce more leaves by the time they reach the grafting stage. In contrast, the lowest leaf count was observed in bell pepper seedlings.

The highest plant height was achieved by CRS-8, CRS-15, CRS-2 and CRS-1 rootstock seedlings (Table. 1). In contrast, the lowest plant height was observed in CRS-22, CRS-12, bell pepper hybrid (MS). This variation can be attributed to several factors. Firstly, certain rootstock varieties may naturally exhibit faster growth rates during the seedling stage, allowing them to reach a taller height by the time of grafting.

Table 1: Seed germination and seedling growth parameters of selected *Capsicum* spp. used as rootstock and scion.

Treatments	Seed	Days taken to	Stem girth at the	Number of leaves	Plant height at the

	germination	reach grafting stage	stage of grafting (mm)	at the stage of grafting	stage of grafting (cm)
T_1: CRS-1	11.93 ^{b}	47.13 ^{b}	2.29 ^{bc}	8.57 ^{cde}	19.13 ^{e}
T_2: CRS-2	11.80 ^{b}	48.60 $^{b-e}$	2.40 $^{c-f}$	9.03 ^{e}	19.27 ^{e}
T_3: CRS-8	11.67 ^{b}	47.67 ^{bc}	2.34 ^{bc}	8.37 ^{cde}	19.93 ^{e}
T_4: CRS-11	11.67 ^{b}	47.33 ^{b}	2.36 ^{bcd}	8.10 ^{bcd}	17.87 ^{d}
T_5: CRS-12	14.47 ^{d}	48.87 $^{b-e}$	2.48 ^{ef}	8.77 ^{de}	12.47 ^{a}
T_6: CRS-13	14.87 ^{d}	50.80 ^{e}	2.73 ^{g}	8.23 ^{bcd}	14.15 ^{b}
T_7: CRS-14	12.93 ^{c}	50.33 ^{de}	2.51 ^{ef}	8.03 ^{bc}	17.80 ^{d}
T_8: CRS-15	11.80 ^{b}	49.73 ^{cde}	2.31 ^{bc}	8.77 ^{de}	19.80 ^{e}
T_9: CRS-21	14.47 ^{d}	50.60 ^{e}	2.40 $^{b-e}$	8.50 ^{cde}	15.17 ^{c}
T_{10}: CRS-22	14.33 ^{d}	50.13 ^{de}	2.28 ^{b}	7.57 ^{b}	13.07 ^{a}
T_{11}: CRS-24	11.93 ^{b}	48.13 ^{bcd}	2.11 ^{a}	8.23 ^{bcd}	17.37 ^{d}
T_{12}: MS (Rootstock)	8.60 ^{a}	41.47 ^{a}	2.52 ^{f}	6.50 ^{a}	12.40 ^{a}
T_{13}: MS (Scion)	8.60 ^{a}	41.47 ^{a}	2.47 ^{def}	6.50 ^{a}	12.53 ^{a}
SEm±	0.32	0.73	0.04	0.21	0.32
CD	0.92**	2.13**	0.11**	0.62**	0.93**
CV	4.46	2.65	2.42	4.54	3.42

**(p< 0.01), Different letters reveal significant differences according to Duncan's test p = 0.05. mm: millimetre, cm: centimetre, CRS: Chilli rootstock

The bell pepper scion MS grafted on CRS-1, CRS-2, CRS-11 and CRS-15 rootstocks, recorded highest graft success rate at 5, 10 and 15 days after grafting (Table. 2). Similar graft success per cent were noted by Hamdi *et al*. (2010); Jang *et al*. (2012); Soltan *et al*. (2017); Phukon *et al*. (2020). In contrast, the graft combinations involving CRS-22 and CRS-24 recorded comparatively lower per centages of graft success. The lower graft success rates may be due to slower callus formation (Lee, 2006), limited hydraulic conductance (Oda *et al*., 2005) and certain genetic attributes lading to incompatibility with the scion.

Table 2: Graft success per cent and graft failure per cent of bell pepper scion (MS) grafted on selected *Capsicum* spp. rootstocks at different intervals of graft healing.

Treatments	Per cent of graft success at 5 DAG	Per cent of graft success at 10 DAG	Per cent of graft success at 15 DAG	Per cent of graft failure at 15 DAG
T_1: MS on CRS-1	97.78 ^{ab}	86.67 ^{b}	80 ^{a}	20 ^{a}
T_2: MS on CRS-2	100 ^{a}	84.44 ^{bc}	80 ^{a}	20 ^{a}
T_3: MS on CRS-8	93.33 ^{abc}	84.44 ^{bc}	66.67 ^{cd}	33.33 ^{cd}
T_4: MS on CRS-11	100 ^{a}	80 ^{cd}	80 ^{a}	20 ^{a}
T_5: MS on CRS-12	86.68 ^{cde}	82.22 ^{bcd}	68.89 ^{c}	31.11 ^{c}
T_6: MS on CRS-13	80 ^{e}	77.78 ^{d}	66.67 ^{cd}	33.33 ^{cd}
T_7: MS on CRS-14	93.33 ^{abc}	80 ^{cd}	73.33 ^{b}	26.67 ^{b}
T_8: MS on CRS-15	97.78 ^{ab}	93.33 ^{a}	80 ^{a}	20 ^{a}
T_9: MS on CRS-21	91.11 ^{bcd}	84.44 ^{bc}	73.33 ^{b}	26.67 ^{b}
T_{10}: MS on CRS-22	88.89 ^{cd}	82.22 ^{bcd}	64.44 ^{d}	35.56 ^{d}
T_{11}: MS on CRS-24	84.44 ^{de}	80 ^{cd}	64.44 ^{d}	35.56 ^{d}
T_{12}: Self-grafted MS	80 ^{e}	80 ^{cd}	73.33 ^{b}	26.67 ^{b}
SEm±	2.40	1.57	1.11	1.11
CD	7.00**	4.59**	3.24**	3.24**
CV	4.56	3.28	2.65	7.02

**(p< 0.01), Different letters reveal significant differences according to Duncan's test p = 0.05. DAG: Days after grafting, CRS: Chilli rootstock

Graft combinations with CRS-14, CRS-21 and the self-grafted MS recorded lowest graft failure rates compared to CRS-22 and CRS-24 graft combinations. The less graft failure is due to higher compatibility of rootstock and scion. Even though CRS-22 and CRS-24 showed higher graft failure but had commonly acceptable per centage (Table 2).

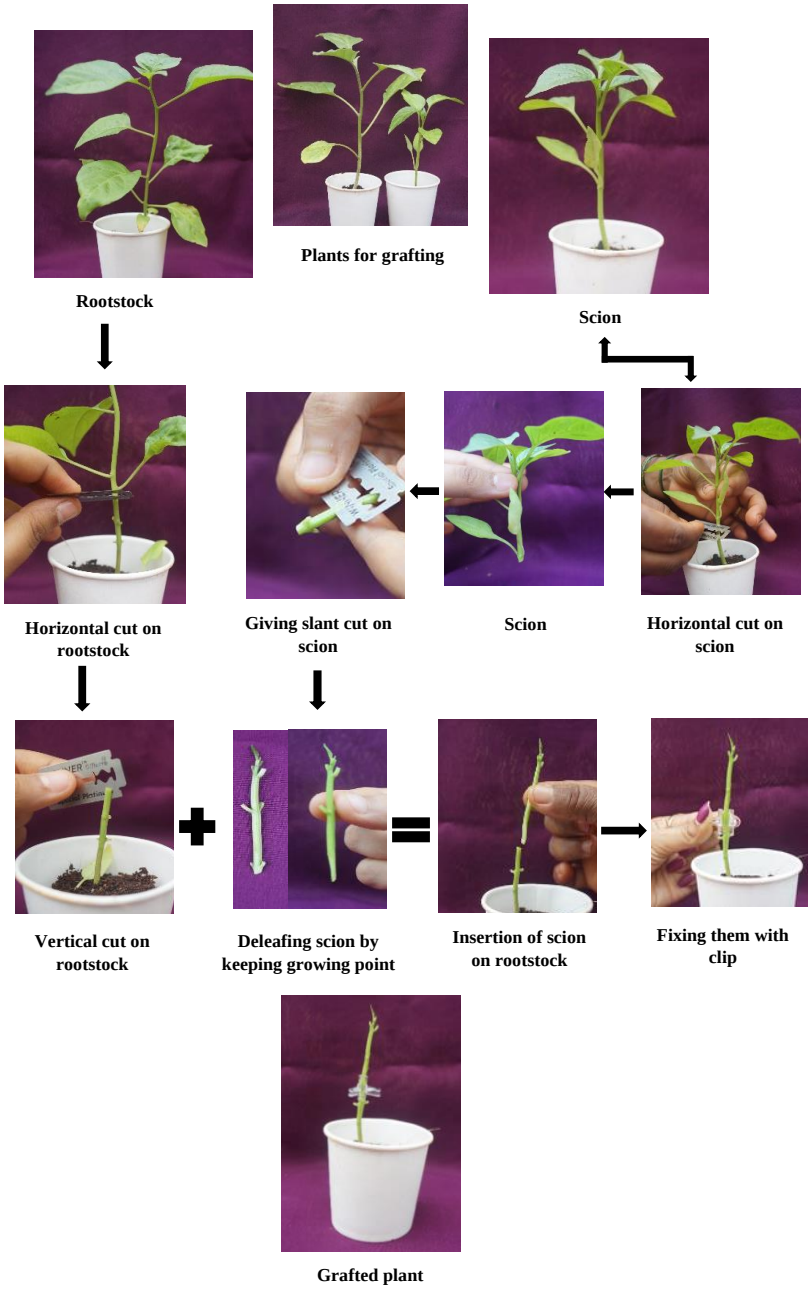
Significantly larger scion, rootstock and graft union girth was observed in the bell pepper scion MS grafted on CRS-13 (Table 3). In contrast, significantly lesser union girth measurements were recorded for MS grafted on CRS-24. These rootstocks and scions may inherently possess thinner stems, leading to the development of thinner plants and, subsequently, smaller graft plant girths.

Table 3: Girth of grafted seedlings at 15 days after grafting.

Treatments	Rootstock girth (mm)	Scion girth (mm)	Graft union girth (mm)
T_1: MS on CRS-1	2.83 ^{bc}	2.88 ^{bc}	3.27 ^{ab}

T_2: MS on CRS-2	2.95 ^{cde}	3.00 $^{c-f}$	3.40 ^{b}
T_3: MS on CRS-8	2.88 ^{bc}	2.93 ^{bc}	3.33 ^{ab}
T_4: MS on CRS-11	2.90 ^{bc}	2.95 ^{bcd}	3.35 ^{ab}
T_5: MS on CRS-12	3.02 ^{def}	3.08 ^{def}	3.49 ^{bc}
T_6: MS on CRS-13	3.27 ^{g}	3.33 ^{g}	3.78 ^{c}
T_7: MS on CRS-14	3.06 ^{ef}	3.11 ^{ef}	3.53 ^{bc}
T_8: MS on CRS-15	2.85 ^{bc}	2.91 ^{bc}	3.30 ^{ab}
T_9: MS on CRS-21	2.94 ^{cd}	2.99 $^{b-e}$	3.40 ^{b}
T_{10}: MS on CRS-22	2.82 ^{b}	2.87 ^{bc}	3.26 ^{ab}
T_{11}: MS on CRS-24	2.65 ^{a}	2.70 ^{a}	3.06 ^{a}
T_{12}: Self-grafted MS	3.07 ^{f}	3.12 ^{f}	3.54 ^{bc}
T_{13}: Non-grafted MS	2.82 ^{b}	2.87 ^{b}	3.22 ^{ab}
SEm±	0.04	0.04	0.10
CD	0.11**	0.11**	0.28**
CV	2.16	2.24	4.91

*(p< 0.05), **(p< 0.01). Different letters reveal significant differences according to Duncan's test p = 0.05, mm: millimetre, CRS: Chilli rootstock



CONCLUSIONS

In summary, the study underscores the distinct germination and early growth characteristics among various rootstock seeds in bell pepper cultivation. The bell pepper hybrid MS exhibited rapid germination and seedling growth attributed to hybrid vigor, while rootstock seedlings of *Capsicum frutescence* species, such as CRS-22, CRS-12, CRS-21, and CRS-13, displayed prolonged germination periods and slower growth rates. The choice of rootstock significantly influenced parameters such as stem girth, leaf count, and plant height. Grafting success rates varied among different rootstock combinations, with CRS-1, CRS-2, CRS-11, and CRS-15 demonstrating higher success rates, whereas CRS-22 and CRS-24 exhibited comparatively lower success rates possibly due to incompatibility. Additionally, graft combinations involving CRS-14 and CRS-21 showed lower graft failure rates, emphasizing the importance of rootstock-scion compatibility. The study provides valuable insights for optimizing rootstock selection and grafting practices in bell pepper cultivation to enhance overall plant development and yield.

FUTURE SCOPE

Explore molecular factors influencing compatibility between bell pepper scions and *Capsicum frutescence* rootstocks. Investigate adaptability of grafted bell peppers to diverse climates, enhancing crop resilience and geographic applicability.

Acknowledgement. I am grateful to Karnataka Science and Technology Promotion Society (KSTePS), Department of science and technology, Government of Karnataka, for providing financial assistance in the form of fellowship during my doctoral degree programme.
Conflict of Interest. None.

REFERENCES

Albornoz, F., Nario, A., Saavedra, M. and Videla, X. (2020). Rootstock × Environment Interactions on Nitrogen-Use Efficiency in Grafted Tomato Plants at Different Phenological Stages. *Agronomy*, *10*(3), 1-15.

Alfaro, V. A., Bethke, P. C. and Nienhuis, J. (2021). Effects of Interspecific Grafting Between Capsicum Species on Scion Fruit Quality Characteristics. *HortScience*, *56*(11), 1347-1353.

Andrade, F. L. D. N., Monteiro, S. M. F., Muniz, C. C. S., Gomes, R. F. and Santos, L. D. S. (2020). Compatibility and yield of 'Santa Cruz 47'okra onto rootstocks of the Malvaceae family. *Pesqui. Agropecu. Trop.*, *50*, 1-2.

Camposeco, M. N., Robledo-Torres, V., Ramirez-Godina, F., Mendoza-Villarreal, R., Perez-Rodriguez, M. A. and Cabrera-de la Fuente, M. (2018). Response of bell pepper to rootstock and greenhouse cultivation in coconut fiber or soil. *Agronomy*, *8*(7), 111.

Dutta, S. K., Singh, A. R., Boopathi, T., Singh, S. B. and Singh, M. C. (2015). Effects of priming on germination and seedling vigour of bird's eye chilli (*Capsicum frutescens* L.) seeds collected from eastern Himalayan region of India. *Bio Scan.*, *10*, 279-284.

Dharmik, Y. B., Ekta, D., Bagde, H. B., Goramnagar, P. N. and Dawaneand and Patinge, S. P. (2022). Standardization of time of grafting and age of rootstock in custard apple (*Annona squamosa* L.). *Biological Forum- An International Journal*, *14*(2a), 325-328.

Gupta, S., Maurya, D. and Kashyap, S. (2023). Review of grafting as a potential method for reducing biotic and abiotic stresses in Cucurbits. *Biological Forum- An International Journal*, *15*(4), 225-233.

Hamdi, M., Boughalleb, N., Ouhaibi, N., Tarchoun, N., Souli, M. and Belbahri, L. (2010). Evaluation of grafting techniques and a new rootstock for resistance of pepper (*Capsicum annuum* L.) towards *Phytophthora nicotianae*. *J. Sci. Food Agric.*, *8*(1), 135.

Haque, S. M., Paul, S. and Ghosh, B. (2016). High-frequency in vitro flowering, hand-pollination and fruit setting in ten different cultivars of *Capsicum* spp. (*C. annuum*, *C. chinense*, and *C. frutescens*): an initial step towards in vitro hybrid production. *Plant Cell, Tissue and Organ Cult.*, *127*, 161-173.

Jang, Y., Eunyoung, Y., Myeongcheoul, C., Yeongcheol, U., Kwandal, K. and Changhoo, C. (2011). Effect of grafting on growth and incidence of blight and bacterial wilt of pepper (*Capsicum annuum* L.). *Hortic. Environ. Biotechnol.*, *53*(1), 9-19.

Jang, Y., Yang, E., Cho, M., Um, Y., Ko, K. and Chun, C. (2012) Effect of grafting on growth and incidence of Phytophthora blight and bacterial wilt of pepper (*Capsicum annuum* L.). *Hortic. Environ. Biotechnol.*, *53*(1), 9-19.

Johkan, M., Oda, M. and Mori, G. (2008). Ascorbic acid promotes graft-take in sweet pepper plants (*Capsicum annuum* L.). *Sci. Hortic.*, *116*(4), 343-347.

Kubota, C., Miles, C. and Zhao, X. (2016). Grafting Manual: How to produce grafted vegetable plants.

Lee, S. G. (2006). Production of high-quality vegetable seedling grafts. *Acta Hortic.*, *759*, 169-174.

Maria, M. R. and Bosland, P. W. (2010). Grafting capsicum to tomato rootstocks. *J. Young Investig.*, *20*(2), 118-127.

Naik, S. A. T. S., Hongal, S., Anjanappa, M., Aravinda, J. S. K., Ashok., Chandan, K. and Harshavardhan, M. (2020). Studies on rootstock and scion parameters for grafting in cherry tomatoes (*Solanum lycopersicum* var. *cerasiforme*). *Int. J. Curr. Microbiol. App. Sci*., *9*(12), 24-28.

Naik, S. A., Hongal, S., Harshavardhan, M., Chandan, K., Kumar, A. J., Ashok, Kyriacou, M. C., Rouphael, Y. and Kumar, P. (2021). Productive characteristics and fruit quality traits of cherry tomato hybrids as modulated by grafting on different *Solanum spp*. rootstocks under *Ralstonia solanacearum* infested greenhouse soil. *Agronomy*, *11*(7), 1311-1332.

Oda, M., Maruyama, M. and Mori, G. (2005). Water transfer at graft union of tomato plants grafted onto Solanum rootstocks. *J. Jpn. Soc. Hortic. Sci.*, *74*(6), 458-463.

Ogata T., Kabashima Y., Shiozaki S. and Horiuchi, S. (2005). Regeneration of the vascular bundles at the grai interface in auto- and heterograis with juvenile nucellar seedlings of satsuma mandarin, yuzu and trifoliate orange. *J. Jpn. Soc. Hortic. Sci.*, *74*, 214-220.

Phukon, R. M., Saikia, S., Borah, P., Das S., Bhagowati, S. and Bezbaruah, R. (2020). Vegetable Grafting for Enhancing Yield and Combating Biotic Stress in Bhut Jolokia (*Capsicum chinense*) under Protected Condition. *Int. J. Curr. Microbiol. App. Sci.*, *9*(9), 3051-3055.

Pilli, K., Samant, P. K., Naresh, P. and Acharya, G. C. (2018). Influence of INM on chemical properties of soil in grafted (tomato and brinjal), non-grafted and self-grafted tomato. *Int. J. Chem. Stud.*, *6*(4), 2739-2742.

Rathod, T. (2017). Evaluation of rootstocks and scion in Brinjal, monitoring the changes induced by different

rootstock-scion combinations in terms of plant growth and fruit quality. *M.Sc. (Hort.) Thesis*, Dr. Y. S. R. Horticultural university, College of horticulture, Venkataramannagudem, West Godavari (India).

Rodriquez, M. M. and Bosland, P. W. (2010). Grafting Capsicum to tomato rootstocks. *Journal of Young Investigators*, *20*(2), 1-6.

Sharma, V., Kumar, P., Sharma, P., Negi, N. D., Singh, A., Sharma, P. K., Dhillon, N. and Vats, B. (2019). Rootstock and scion compatibility studies in tomato under protected condition. *Int. J. Curr. Microbiol. Appl. Sci.*, *8*(5), 1188-1197.

Soltan, M., Elaidy, F., Scheerens, J. and Kleinhenz, M. (2017). Grafting, scion and rootstock effects on survival rate, vegetative growth and fruit yield of high tunnel-grown grafted pepper (*Capsicum annuum* L.) plants. *Crop. Sci. Tech.*, *5*(5), 1-12.

Verdugo, H. S., Oyama, K. and Vazquez-Yanes, C. (2001). Differentiation in seed germination among populations of *Capsicum annuum* along a latitudinal gradient in Mexico. *Plant Ecol.*, *155*, 245-257.

Yamamoto, S. and Nawata, E. (2006). Germination characteristics of *Capsicum frutescens* L. on the Ryukyu islands and domestication stages of *C. frutescens* L. in Southeast Asia. *J. Trop. Agric.*, *50*(3), 142-153.

How to cite this article: Sanmathi Naik A.T.S., C.N. Hanchinamani, Shivanand Hongal, Naresh Ponnam, G. Manjunath, Mohan Kumar S., Shankar Meti and Pradeep Kumar (2023). Compatibility of Bell Pepper Hybrid with Different Chilli Rootstocks. *Biological Forum – An International Journal*, *15*(10): 1217-1223.