



ISSN (E): 2277-7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2022; 11(12): 3578-3580  
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[www.thepharmajournal.com](http://www.thepharmajournal.com)  
Received: 19-10-2022  
Accepted: 22-11-2022

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## Graft compatibility between watermelon grafted on rootstock pumpkin, bottle gourd and sponge gourd

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### Abstract

This study was conducted at All India Co-ordinated Research Project on vegetable crops, Department of Horticulture, Mahatma Phule Krushi Vidyapeeth, Rahuri during the *Kharif* season 2020. This work aimed to study the graft compatibility between hybrids of watermelon and rootstocks. The three hybrids of watermelon Sagar King, Royal King and Black Badshah are used as scion. Varieties of pumpkin (Arka Chandan and Arka Suryamukhi); bottle gourd (Arka Bahar and Samrat) and Sponge gourd (Phule Prajakta and Phule Komal) were used as rootstocks. In scion, Black Badshah recorded minimum number of days to germination and days to reach grafting stage. In rootstock, Pumpkin recorded the minimum number of days to germination and days to reach the grafting stage. The minimum number of days to graft healing (5.33) and days to transplanting (19.00) was recorded in Phule Komal grafted with scion Royal King. Graft Success was recorded highest (94.67%) in rootstock Phule Prajakta when grafted on Black Badshah.

**Keywords:** Watermelon, scion, rootstock, compatibility

### Introduction

Watermelon (*Citrullus lanatus* (Thunb.) Matsum and Nakai) is a warm-season annual crop belonging to the family Cucurbitaceae having chromosome number  $2x = 22$ . It is grown in tropical and Mediterranean regions of the world and is believed to have originated from the Kalhari Desert of Africa (Simmonds, 1979) <sup>[1]</sup>. Globally it is grown in an area of 3 million hectares with a production of 100 million tons (FAOSTAT 2019) <sup>[2]</sup>. After China and Turkey India is the third-largest grower of watermelon. India contributes 123 thousand ha area with production of 3461 thousand MT (NHB 2021-2022). In India, Maharashtra is sixth in number with an area of 6.12 thousand hectares with 176.31 thousand MT of production (NHB 2016-2017).

Grafting of watermelon was first introduced in the 1920s and by 1998, in Korea, Japan and Taiwan, 95% of watermelon and melon plants were grafted onto resistant rootstocks, resulting in up to 200% higher yields in comparison with self-rooted plants (Lee and Oda, 2003) <sup>[9]</sup>. Rootstocks that are commonly used for grafting watermelon are *Cucurbita moschata*, *Cucurbita maxima*, *Cucurbita pepo*, *Benincasa hispida*, *Lagenaria siceraria*, *Citrullus lanatus*, *Cucumis metuliferus*, *Luffa spp.* as well as hybrids of squash species *C. moschata* × *C. maxima* (Lee, 1994) <sup>[8]</sup>.

Grafting vegetables helps in the management of biotic and abiotic stresses, increases yield, extends the harvest period, manipulates sex expression and improves fruit quality. Vegetable grafting reduces the agrochemical dependence on vegetable production (Rivard *et al.*, 2008). Compatibility is higher in intraspecific rootstock/ scion grafting than with interspecific grafting (Black *et al.*, 2003) <sup>[4]</sup>. Thus, owing to the beneficial effects incurred by grafting on different rootstocks, the present experiment was planned to check the graft compatibility of watermelon with different rootstocks.

### Material and Methods

The present investigation was conducted at the farm of All India Co-ordinated Research Project on vegetable crops, Department of Horticulture, Mahatma Phule Krushi Vidyapeeth, Rahuri. The experiment was conducted in the *Kharif* of 2021. Watermelon (scion) varieties i.e. Sagar King, Royal King and Black Badshah seeds were sown 15 days earlier than the rootstocks seeds i.e. Pumpkin (varieties- Arka Chandan, Arka Suryamukhi), Bottle gourd (var.- Arka Bahar, Samrat) and Sponge gourd (var.- Phule Prajakta, Phule Komal).

A single cotyledon method of grafting was used. Rootstock was given cut at 60° angles with razor blade in such a way that one cotyledon remains and one is removed. Seedling of scion was given cut at 60° angles below the cotyledons. This two cut surfaces were hold together with the help of grafting clip to ensure proper vascular binding. After grafting seedlings were placed in grafting chamber for healing. Relative humidity of 85-95% and temperature 28-32 °C was maintained to allow the graft union to heal. The observations were recorded as given below.

#### A) Rootstock and scion parameters

- 1. Days taken for germination:** The observation was recorded at every day by visual observation and average days taken for germination were expressed.
- 2. Days taken to reach grafting stage:** The observation was recorded based on seedling height, number of leaves and days required to reach correct stage of grafting.
- 3. Girth of scion and rootstock at time of grafting:** The replication wise stem diameter of rootstock was measured by using of digital Vernier Caliper Scale at the time of grafting.

#### B) Observation of grafted plant

##### Days taken for graft healing

The observation was recorded after 5 days of grafting by removing the grafting clips and the average days it took to heal the graft union was noted.

##### Graft Success (%)

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

##### Days to attain transplanting stage

The observation was recorded by counting the days required for transplanting from grafting and the mean days required for days taken to attain transplanting was worked out.

#### Results and Discussion

##### Rootstock and scion parameters

The mean data pertaining to days taken to germination, days taken to reach grafting stage and diameter of scion and rootstock depicted in Table 1. In scion, Black Badshah recorded minimum number of days to germination (9.74), days to reach grafting stage (23.86). Whereas, Sagar King recorded maximum number of days to germination (10.31), days to reach grafting stage (25.71). In rootstock, Arka Chandan showed minimum numbers of days to germination (6.50) were Phule Prajakta taken maximum number of days to germination (8.75). Minimum number of days to reach grafting stage (9.25) was recorded in Arka Suryamukhi and maximum number of days were recorded in Phule Prajakta (12.25). Watermelon is a warm-season crop. The optimum temperature for germination and growth is 20-25 °C. The seed shows poor germination if the temperature falls below 18 °C (Deepak Dhami, 2021).

Diameter of rootstock and scion at collar region is an important parameter which decides graft union combination. The scion showed non-significant difference for diameter. Whereas, rootstock recorded maximum diameter 2.52 mm Arka Suryamukhi. Minimum diameter was recorded in Phule Komal (2.10 mm).

#### Observation of grafted plant

The mean data pertaining to days taken to graft healing, days taken to transplanting and graft success (%) of grafted plant is depicted in Table 2. The rootstock Phule Komal recorded minimum days to graft healing (6.00) and Arka Chandan taken maximum number of days (10.00). In scion, Sagar King recorded minimum number of days (7.56) and Black Badshah taken maximum number of days (8.11) for graft healing. The interaction effect of rootstock and scion showed a significant difference for days taken for graft healing. Interaction R<sub>6</sub>S<sub>2</sub> recorded minimum days (5.33) for graft healing. While, maximum number of days (11.33) were noted with the interaction of R<sub>1</sub>S<sub>2</sub>. Days required for graft healing depends on stage of rootstock and scion as well as prevailing atmospheric conditions.

The rootstock Phule Komal taken minimum number of days (20.11) to attain transplanting stage. While, maximum days were recorded in Arka Chandan (23.89). In scion, Sagar King was noted lowest (21.28) days to attain transplanting. While, highest days to attain transplanting (22.22) was recorded in Royal King. In interaction R<sub>6</sub>S<sub>2</sub> was noted minimum (19.00) days for transplanting. While, R<sub>1</sub>S<sub>2</sub> was noted maximum (25.67) days for transplanting.

The rootstock Phule Komal recorded highest (93.67%) graft success. While, lowest was recorded in Arka Chandan (81.56%). In scion Black Badshah was noted highest (90.06%) graft success. While, lowest graft success (87.33%) was recorded in Sagar King. In interaction, R<sub>5</sub>S<sub>3</sub> was noted highest (94.67%) graft success. While, lowest graft success (77.33%) was noted in interaction R<sub>1</sub>S<sub>1</sub>. Similar results were obtained by Yetisir and Sari (2003) [13], El-Sayed *et al.* (2015) [6].

Grafting success depends on several factors that include graft union and graft compatibility, combination of scion and rootstock (Kawaguchi *et al.*, 2008) [7], Seedling age, post grafting management, size of scion and rootstock, culture condition, grafting method, tissue and structure differences, physiological and biochemical characteristics, growing stage of rootstock and scion, phytohormone and the environment which play a major role (Davis *et al.*, 2008) [5]. The success of grafting is also dependent upon the weather conditions and it varies from region to region within a season. The seasonal influence could be ascribed to the influence of prevailing temperature and humidity (Tamilselvi, 2015) [12].

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

Crop Name	Scion	Days to germination	Days to grafting	Diameter (mm)
Watermelon	Sagar King	10.31	25.71	2.14
	Royal King	9.97	25.43	2.20
	Black Badshah	9.74	23.86	2.07
	S.Em (±)	0.14	0.37	0.7
	CD (5%)	0.43	1.11	NS
<b>Rootstock</b>				
Pumpkin	Arka Chandan	6.50	10.75	2.40
	Arka Suryamukhi	7.00	9.25	2.52
Bottle Gourd	Arka Bahar	7.25	11.00	2.26
	Samrat	7.75	10.25	2.33
Sponge Gourd	Phule Prajakta	8.75	12.25	2.10
	Phule Komal	8.25	12.00	2.17
	S.Em (±)	0.38	0.37	0.07
	CD (5%)	1.13	1.11	0.20

**Table 2:** Number of days required to graft healing, days to transplanting from grafting and graft success (%)

Treatments	Days to graft healing	Days to transplanting	Graft Success (%)
<b>Rootstock</b>			
R <sub>1</sub> (AC)	10.00	23.89	81.56
R <sub>2</sub> (AS)	9.78	23.67	83.78
R <sub>3</sub> (AB)	7.78	21.56	90.00
R <sub>4</sub> (S)	7.67	21.33	89.67
R <sub>5</sub> (PP)	6.67	20.67	93.44
R <sub>6</sub> (PK)	6.00	20.11	93.67
S.Em. (±)	0.27	0.30	0.64
CD 5%	0.79	0.89	1.92
<b>Scion</b>			
S <sub>1</sub> (SK)	7.56	21.28	87.33
S <sub>2</sub> (RK)	8.28	22.22	88.67
S <sub>3</sub> (BB)	8.11	22.10	90.06
S.Em. (±)	0.19	0.21	0.45
CD 5%	0.57	0.61	1.33
<b>Interaction (R*S)</b>			
R <sub>1</sub> S <sub>1</sub> (AC+SK)	9.00	22.00	77.33
R <sub>1</sub> S <sub>2</sub> (AC+RK)	11.33	25.67	82.00
R <sub>1</sub> S <sub>3</sub> (AC+BB)	9.67	24.00	85.33
R <sub>2</sub> S <sub>1</sub> (AS+SK)	8.67	22.67	82.67
R <sub>2</sub> S <sub>2</sub> (AS+RK)	10.00	24.00	83.00
R <sub>2</sub> S <sub>3</sub> (AS+BB)	10.67	24.33	85.67
R <sub>3</sub> S <sub>1</sub> (AB+SK)	8.00	21.67	88.33
R <sub>3</sub> S <sub>2</sub> (AB+RK)	7.33	21.33	91.00
R <sub>3</sub> S <sub>3</sub> (AB+BB)	8.00	21.67	90.67
R <sub>4</sub> S <sub>1</sub> (S+SK)	7.00	21.00	89.00
R <sub>4</sub> S <sub>2</sub> (S+RK)	8.33	22.33	88.67
R <sub>4</sub> S <sub>3</sub> (S+BB)	7.67	20.67	91.33
R <sub>5</sub> S <sub>1</sub> (PP+SK)	6.67	20.33	92.67
R <sub>5</sub> S <sub>2</sub> (PP+RK)	7.00	21.00	93.00
R <sub>5</sub> S <sub>3</sub> (PP+BB)	6.33	20.67	94.67
R <sub>6</sub> S <sub>1</sub> (PK+SK)	6.00	20.00	94.00
R <sub>6</sub> S <sub>2</sub> (PK+RK)	5.33	19.00	94.33
R <sub>6</sub> S <sub>3</sub> (PK+BB)	6.33	21.33	92.67
S.Em. (±)	0.48	0.52	1.11
CD 5%	1.44	1.56	3.33

## Conclusion

From this investigation, it is concluded that Phule Prajakta is more compatible compared to other rootstocks with scion Black Badshah. Whereas, Phule Komal recorded minimum number of days to graft healing, graft success (%) and days to reach transplanting stage when grafted with scion Royal King.

## References

- Anonymous. Area and production of horticulture crops for 2019-20. National Horticulture Board, Ministry of Agriculture & Farmers' Welfare, Government of India, Gurgaon, Haryana; c2017-18.
- Anonymous. Food and Agriculture Organization Corporate Statistical Database. (FAOSTAT); c2019-20.
- Anonymous. Area and production of horticulture crops for 2019-20. National Horticulture Board, Ministry of Agriculture & Farmers' Welfare, Government of India, Gurgaon, Haryana; c2021-22.
- Black LL, Wu DL, Wang JF, Kalb T, Abbass D, Chen JH. Grafting tomatoes for production in the hot-wet season. AVRDC Publication. 2003;6:03-551.
- Davis AR, Perkins-Veazie P, Hassell R, Levi A, King SR, Zhang X. Grafting effects on vegetable quality. Hort Science. 2008;43(6):1670-1672.

- El-Sayed SF, Haassan HA, Gaara MA. Effect of different rootstocks on plant growth, yield and quality of watermelon. Annals of Agric. Sci. 2015;53(1):165-175.
- Kawaguchi M, Taji A, Backhouse D, Oda M. Anatomy and physiology of graft incompatibility in solanaceous plants. J Hort. Sci. Biotechnol. 2008;83:581-588.
- Lee JM. Cultivation of grafted vegetables. Current status, grafting methods and benefits. Hort. Science. 1994;29:235-239.
- Lee JM, Oda M. Grafting of herbaceous vegetable and ornamental crops. Hort. Rev. 2003;28:61-124.
- Rivard C, Louws FJ. Grafting to manage soilborn diseases in Heirloom Tomato production. Hortscience. 2008;43(7):2104-2111.
- Simmonds NW. Principles of Crop Improvement. Longman Group Ltd.; c1979. p. 277.
- Tamilselvi NA, Pugalendhi L. Agronomic evaluation of grafted Bitter Gourd (*Momordica charantia* L.) cultivars for growth and yield. The Bioscan. 2015;10(3):1331-1334
- Yetisir H, Sari N. Effect of different rootstock on plant growth, yield and quality of watermelon. Australian J of Experi. Agril. 2003;43(10):1269-1274.
- Kumar D, Dhama B, Pathak A, Kumar S. Assessment of Wasteland Resources of Uttarakhand. Soil and Water Conservation, 2021, 5000.