

Microbudding in bael as influenced by foliar spray of NAA and BA on rootstock and scion

Yashwanti¹, MK Sharma¹, Dhurendra Singh², Kamlesh Kumar²✉ and DK Sarolia²

¹Department of Horticulture, SKRAU, Bikaner-334006

²ICAR-Central Institute for Arid Horticulture, Bikaner

✉ Corresponding author: Kamlesh Kumar, Email: kamlesh9520@gmail.com

Copyright ©2016 Yashwanti et al., This is an open access article published under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Preferred citation for this article: Yashwanti, Sharma MK, Singh D, Kamlesh Kumar K & Sarolia DK. 2016. Microbudding in bael as influenced by foliar spray of NAA and BA on rootstock and scion. *Journal of Agriculture and Ecology*, 2: 32-36; <http://doi.org/10.53911/JAE.2016.2205>.

Abstract

Conducted an experiment in nursery with five levels of plant growth regulators i.e., control (T₁), NAA 25 % (T₂), NAA 50 % (T₃), BA 25 % (T₄) and BA 50 % (T₅) replicated thrice and selected five plants per replication under complete randomized block design. Total 75 saplings under experimentation, under this experiment, three to four months old rootstocks and 30-40 cm long scion sticks were selected for spraying different concentrations of NAA and BA at 7 days before the budding operation. The treated bud sticks were used for excision of buds for budding on treated rootstocks. Results revealed that budding operation was performed on rootstocks treated with BA 50 ppm, it was possible to produce saleable size budded saplings in relatively shorter period as compared to control i.e. within 60 days after budding.

Key words: Micro-budding, NAA, BA, foliar spray of PGRs, Bael (*Aegle marmelos* Correa.)

Introduction

Bael (*Aegle marmelos* Correa.) is also called Bengal quince, golden apple, holy fruit, stone apple, *bel*, *bela*, *shriphal* or *belpatra* in India. It is quite hardy, prolific bearer and highly remunerative even without much care under hot arid climatic conditions. It is a tall, slow growing, sub-tropical deciduous fruit tree which is suitable for various soil-climatic conditions ranging from swampy to dry soils and can tolerate alkaline soils and is not injured by temperature as low as -7 °C (Singh & Roy 1984). It can be grown in soils having pH range 5 to 10, where many other fruit trees fail to grow (Jauhari & Singh 1971). It is considered as

religious fruit of India because of one of the beloved fruits of Lord Shiva. The *bael* fruits are nutritious and rich in therapeutically active substance marmelosin that is known as panacea of the stomach ailments. Not only fruits its seeds contain 62 per cent protein, 32 per cent oil, 3 per cent carbohydrate and 3 per cent ash (Banerjee & Maiti 1980; Samadia 2016).

Although *bael* cultivation has increased over the years in other parts of the country but even there are some stumbling blocks for its rapid increase in cultivation. One of the problems faced by farmers in increasing the cultivation of *bael* rapidly is lack of availability of suitable true to type budded plants. Number of experiments were conducted on this crop with varied success rate in different agro climatic conditions of the country (Singh 1954; Singh et al 1976; Moti et al 1976; Chadha 2001). These studies were mostly conducted in more favourable agro-ecological conditions which are more congenial for the vegetative propagation. However, yet few attempts seems to be made for standardization of vegetative propagation technique under arid ecosystem of Rajasthan. Therefore, under extreme adverse climatic conditions of arid region, several times formation of bud or graft union becomes difficult and leads to poor bud uptake. Furthermore, scion grows slowly due to climatic stresses. Therefore, there is an urgent need to improve vegetative propagation efficiency using plant growth regulators (such as NAA, IBA and BA) under arid climatic conditions. Recently, micro budding technique has been standardized in some fruit crops such as citrus (Vijaykumari & Singh 2003), wood apple (Kadam et al 2008), tamarind (Kadam et al 2008). Keeping in view an experiment was conducted to see the efficiency of microbudding propagation by use of plant growth regulators foliar spray on root stock and scion of *bael* in arid region.

Materials and methods

The experiment was conducted at Hi-Tech nursery complex, Central Institute for Arid Horticulture, Beechwal, Bikaner. The treatments was comprised of five levels of plant growth regulators i.e., control (T_1), NAA 25 % (T_2), NAA 50 % (T_3), BA 25 % (T_4) and BA 50 % (T_5) replicated thrice and selected five plants per replication under complete randomized block design. Total 75 saplings under experimentation, under this experiment, three to four months old rootstocks and 30-40 cm long scion sticks were selected for spraying different concentrations of NAA (25 and 50 ppm) and BA (25 and 50 ppm) 7 days before the budding operation. The treated bud sticks were used for excision of buds for budding on treated rootstocks. The solution of different concentrations of NAA and BA were sprayed by hand sprayer on the experimental seedling rootstocks and scion stick of mother plants.

The periodical data recorded on days taken for sprouting, bud success and number of leaves as well as on sprouted scion length and diameter were observed visually during the

experimentation as per standard methodology and analysis as well as interpretation of the data was carried out in accordance to Panse & Sukhatme (1985).

Result and discussion

The minimum number of days (23.50) for bud sprouting were observed in budded plants at T₅ (BA 50 ppm) as compared to mean maximum days (26.33) at T₁ treatment. Number of days taken for bud sprouting in budded plants was significantly influenced by 50 ppm of NAA and or BA. Both the treatments were found to induce early bud sprouting with 9.67 to 11 days, whereas, late (17.67 days) bud sprouting was observed under control conditions. Remarkably early bud breaking is observed in the plants in which root stock and scion were treated with BA-50 ppm seven days prior to budding might be due to promotive effect of BA on cell division which influenced lateral cell expansion. The present study supported by the findings of Miller (1961); Fox (1968) & Wilkins (1969).

The significant difference on per cent of bud sprouting was recorded among the treatments compared to control. The maximum percentage (80%) of plants with scion growth was recorded with BA 25 ppm closely followed by BA 50 ppm (62%) 30 days after budding. After 120 days of budding, the BA 50 ppm resulted 87.5 per cent of scion growth and BA 25 ppm resulted 100 per cent, whereas, minimum percentage (50%) of plants with scion growth was recorded in control. BA treatment also recorded maximum bud sprouting due to their synergistic effect with endogenous levels of hormone of the rootstock and scion. The grated buds are deficient in cytokinin which might be stimulated by exogenous source of cytokinin for their growth (Phillips 1965).

Bud survival percentage after sprouting showed cent per cent in all the treatments at 30, 45 and 60 days after budding. Similarly, length of sprouted scion showed non significant with respect to treatment, while maximum in T₅ followed by T₃ and T₁. The maximum length (22 cm) and diameter (2.53 mm) of sprouted scion was obtained in BA 50 ppm treatment after 30 days of budding and the minimum length (7 cm) and diameter (1.66 mm) was recorded in control. BA 50 ppm was found to have increasing influence on the length of scion up to 120 days and gave 30.2 cm length of scion.

Table 1. Effect of foliar spray of NAA and BA on root stock and scion of *bael* on number of days taken in bud sprout and bud sprouting

Treatment	Detail	Number of days taken in bud sprouting	Bud sprouting (%)
T ₁	Control	26.33	40 (39.15)
T ₂	NAA 25 ppm	24.00	60 (50.85)

T ₃	NAA 50 ppm	24.53	70 (57.00)
T ₄	BA 25 ppm	24.48	80 (63.93)
T ₅	BA 50 ppm	23.50	80 (63.93)
	SEm $\pm$	0.13	3.82
	CD (5%)	0.41	12.05
	CD (1%)	0.58	17.13

Number of leaves showed significant differences with regards to treatment application of PGRs, the mean maximum number of leaves (5.17) was recorded at T₅ (BA 50ppm) and minimum in NAA 25 (T₂) treatment after 30 days after budding (DAB). After 60 and 90 DAB maximum leaf number was in T₅ (5.42 & 6.14) treatment and minimum in T₁ treatment (3.17 & 3.25). After 120 days the mean maximum of leaves (6.57) was recorded in T₅ level (BA 50 ppm) and mean minimum number of leaves (3.50) was recorded at T₁ treatment. The mean maximum number of leaves progressively increased with the advancement of growth and development period up to 120 days after budding operation. The treatment BA 50 ppm helped in early growth of scion and ultimately more number of leaves with this treatment. Results obtained by Vijayakumari & Singh (2003) are also in accordance with the present findings.

Table 2. Effect of foliar spray of NAA and BA on root stock and scion of *bael* on number of leaves days after budding

Treatment	Detail	Number of leaves days after budding (DAB)			
		30	60	90	120
T ₁	Control	2.66	3.17	3.25	3.50
T ₂	NAA 25 ppm	3.00	3.25	3.66	4.00
T ₃	NAA 50 ppm	3.26	3.50	4.05	4.50
T ₄	BA 25 ppm	3.13	3.25	3.50	3.63
T ₅	BA 50 ppm	5.17	5.42	6.14	6.57
	SEm $\pm$	0.05	0.06	0.06	0.09
	CD (5%)	0.16	0.18	0.19	0.27
	CD (1%)	0.22	0.26	0.28	0.38

Thus, it is recommended that for vegetative propagation of *bael* nurserymen can use foliar spray of rootstock with BA 50 ppm seven days prior to budding operation for inducing early growth in the budded plants and to obtain the plants of saleable size within 60 days of budding.

Reference

- Banerjee N & Maiti M. 1980. *Journal of the Indian Chemical Society*, 57: 945-946.
- Chadha KL. 2001. Bael. In: A Handbook of Horticulture, ICAR, New Delhi.
- Fox JE. 1968. Molecular control of plant growth. Dickenson Publishers, California.
- Jauhari OS & Singh RD. 1971. *Indian Horticulture*, 16 (1): 9-10.
- Kadam JH, Karale AR, Warade SD & Patil RS. 2008. Adopt micro bud grafting for quicker multiplication in tamarind. National Seminar on Opportunities and Challenges of Arid Horticulture for Nutrition and Livelihood. March, 8-9, 2008. Pp.69.
- Miller CO. 1961. Kinetin and related compounds in plant growth. *Annual Review of Plant Physiology*, 14: 395-408.
- Moti, Dhar L & Chaturvedi OP. 1976. Propagation of some tropical and sub tropical fruits by budding. *Punjab Horticulture Journal*, 16 (1-2): 33-38.
- Panse VG, Sukhatme PV. 1985. In: Statistical methods for Agriculture workers. ICAR, New Delhi, pp: 145-155.
- Phillips IDJ. 1965. *Annual Review of Plant Physiology*, 16: 291-332.
- Samadia DK. 2016. Horticulture based crop production site management approach (HBCPSMA) – an innovative concept for doubling farm income under dry-lands. *Journal of Agriculture and Ecology*, 1: 1-9
- Singh LB. 1954. Propagating bael vegetatively. *Science and Culture*, 19: 485 - 486.
- Singh RN & Roy SK. 1984. The Bael. ICAR, New Delhi, India.
- Singh UR, Pandey IC, Upadhaya MP & Prasad RS. 1976. Propagation of bael by budding. *The Punjab Horticultural Journal*, 16: 57- 59.
- Wilkins MB. 1969. The physiology of plant growth and development. Mc-Graw-Hill Book Co., New York.