ISAH INDIAN JOURNAL OF ARID HORTICULTURE
2019, Vol. 1 (1):60-62

Studies on stooling in bael (*Aegle marmelos* Correa) under semi-arid conditions

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(Received: 10.07.2019; Accepted: 7.08.2019)

Abstract

The study on stooling on bael was conducted to find out the the efficacy of 1000-7000ppm concentration of IBA on rooting behavior in stool layers at CHES (ICAR-CIAH), Vejalpur, Panchmahals (Godhra), Gujarat during the 2015-16.Among the different concentration tried, the highest number of primary root (15.34), secondary roots (69.80), root biomass (6.05g), survival per cent in nursery (24.24) and field condition (19.72) was recorded in the stool layers treated with IBA 5000 ppm, whereas the maximum length of primary roots (34.75cm), diameter of primary (1.50mm) and secondary roots (0.73 mm) was observed in the shoots (stool layers) treated with IBA 7000 ppm. However survival per cent in nursery and field condition ranged between 10.25-24.24 and 5.17-19.72 per cent, respectively. Stool layers which were not treated with IBA could not survive in nursery as well as under field condition. Different concentration of IBA significantly influenced the rooting in stool layers over control under rainfed semi-arid conditions.

Key words: Bael, primary root, root biomass, stooling

Introduction

Bael (*Aegle marmelos* Correa) is an important indigenous fruit of India and known since ancient times. It is grown in various parts of South East Asia including India, Sri Lanka, Pakistan, Myanmar, Bangladesh, Thailand and most of the South-East Asian countries. In India, bael is being grown throughout the country and is known by other vernacular names like *bael, bela, bili, bilva, belo, maredu, vilwam, sriphal*, golden apple, Indian quince and Bengal quince (John and Stevenson, 1979). It is found growing in sub-tropical, tropical, arid and semi-arid regions of the country. It is grown in temple premises of the Lord Shiva and fruits are used as important ingredients of holy pyre (*havan*). It is a nutritious and medicinal fruit plant, which is most suitable to grow in water scarce areas of the country. Its fruit is highly nutritive, and rich in riboflavin, vitamin A and carbohydrate. Various chemical constituents' *viz*., alkaloids, coumarins and steroids have been identified and isolated from different parts of bael plants. Ripe and mature fruits are used for making various value added products and all parts of tree is used in various *ayurvedic* formulation. The commercial method of bael multiplication is patch budding and soft wood grafting (Singh *et al.,* 2014 and 2018), but for production of uniform rootstocks, stooling is an alternative mothod for mass multiplication clonal rootstocks. Keeping these in view, an attempt was made to find out response of IBA on rooting and survival of stools under rainfed hot semi-arid conditions.

Materials and Methods

The experiment was carried out at Experimental Farm of Central Horticultural Experiment Station, Godhra, Gujarat during 2015-16. *Deshi* plants of Goma Yashi were sawed off just a height of 15-20 cm above the ground level in the month of April (2nd week) to encourage the emergence of new shoot growth from the stump. Normal cultural practices were followed during the period of experimentation. Owing to commencement of high temperature and availability of soil moisture, a large number of new shoots were induced. When the shoots attain a height of 45-50 cm, acquired uniform pencil thickness, a circular ring bark of 2.5 cm wide was removed in the first week of July. The exposed portion of ring was rubbed gently in order to remove cambium without causing injury to wood. The lanoline containing different concentration (100, 2000, 3000, 4000, 5000 and 7000 ppm) of IBA were smeared thoroughly on and around the upper portion of girdled shoots. A set of shoots without IBA treatment was taken as control. In all the cases, the ringed portion was covered with soil up to height of 10-15 cm above the ringed shoots to cover the basal portion of each shoot followed by mounded portion was moistened and covered with organic mulch to avoid moisture loss and flashing out of soil owing to rain. The soil was kept moist throughout the stooling period through irrigation whenever needed. In the second week of September, *i.e.* 65 days after stooling, the soil was carefully removed so as to expose the ringed portion. Each rooted shoot was detached from the mother plant carefully. While removing the stool layers from mother plant, the rooted shoots as much as possible soil was allowed to adhere to the roots. The shoots were headed back before separating from the stump in order to maintain the root shoot ratio. The experiment for survival and growth characters under nursery was analyzed in factorial RBD. Observations on rooting and root characters were

recorded before transplanting. In each treatment, rooted shoots were transplanted in the nursery and survived stools were shifted to field conditions.

Results and Discussion

Results of study divulged that the different concentration of IBA influenced the rooting behaviour and survival of stool layers (Fig. 1, 2, 3 and 4). In general, different levels of IBA increased the rooting in stools in bael over control. Results of study revealed that the application of IBA enhanced the number of primary and secondary roots in the shoots treated with IBA than control. The highest number of primary roots per stool layers was recorded in IBA 5000 ppm (15.34) followed by IBA 4000 ppm (13.20) and was recorded the least in control (4.40). Similarly, the number of secondary roots (69.80) was recorded the highest in same treatment (IBA 5000ppm) followed by IBA 4000ppm (60.65), IBA 6000ppm (57.78) and it was recorded the lowest in control (15.20), among the different concentration of IBA tried. This finding is in agreement with results reported by Rymbai and Sathynarayan (2010) in guava. IBA at 7000 ppm concentration also recorded the maximum primary root length (34.75 cm) and secondary root length was recorded the maximum in IBA 5000ppm (7.90cm) closely followed by IBA7000ppm (7.70cm) and minimum of the same was recorded in control (6.32 and 2.65cm). More or less similar results have been reported by Tyagi *et al.,* (2004) and Mishra *et al.,* (2007) in guava. Diameter of primary (1.50 mm) and secondary (0.73mm) roots was recorded in stool layers treated with IBA7000 ppm followed by IBA 6000 ppm (1.30 and 0.65mm) whereas these parameters were recorded the lowest in control (0.75 and 0.40 mm). The length of root was recorded the maximum in the shoots treated with IBA 7000 ppm, but the fresh root biomass (6.05g) was recorded highest in the shoots treated with 5000 ppm followed by IBA 6000 ppm and the same was recorded the least in control (3.02g) (Fig.5). Less survival under nursery and field conditions might be influenced by climatic conditions prevailing under hot semi-arid conditions. The survival per cent in nursery ranged between 10.25-24.24 being the maximum in the stool layers treated with IBA 5000 ppm and the lowest in IBA 1000 ppm whereas not a single stool layer could be survived in nursery which was not treated with IBA. Such effects may be due the longer roots and disturbed secondary and tertiary roots during separation from mother plants. These findings are in consonance with the results of earlier workers (Dutta and Mitra, 1991; Bhagat *et al.,* 1999; Mishra *et al.,* 2007). More or less similar results have been reported by Lal *et al.,* (2007), Saroj and Pathak (1994), Rymbai. and Sathynarayan (2010), Singh (1998), Ahmed *et al.,* (2007) under different agro-

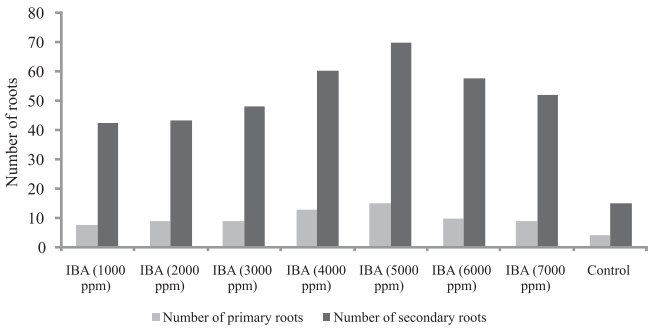

Fig.1: Rooting behavior under different concentration of IBA under hot semi-arid condition.

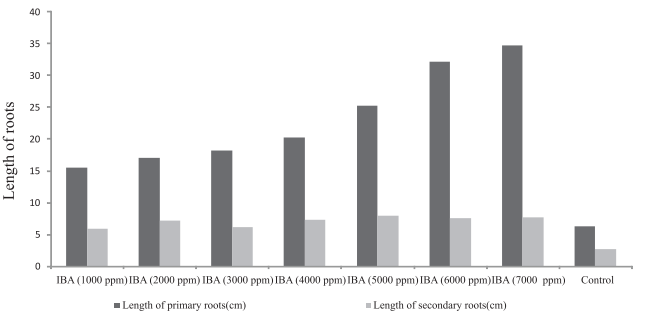

Fig.2: Length of roots under different concentration of IBA under hot semi-arid condition.

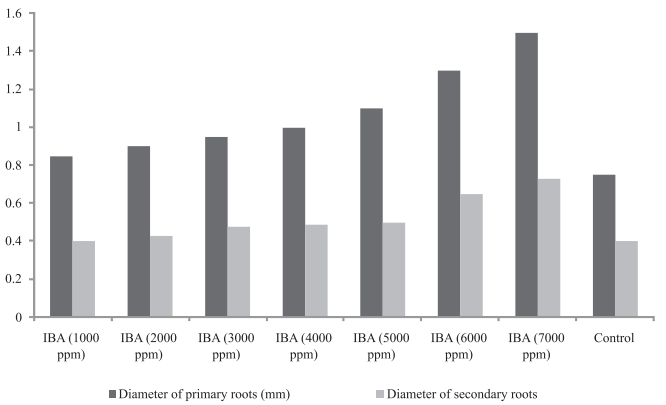

Fig.3: Diameter of roots under different concentration of IBA under hot semi-arid conditions.

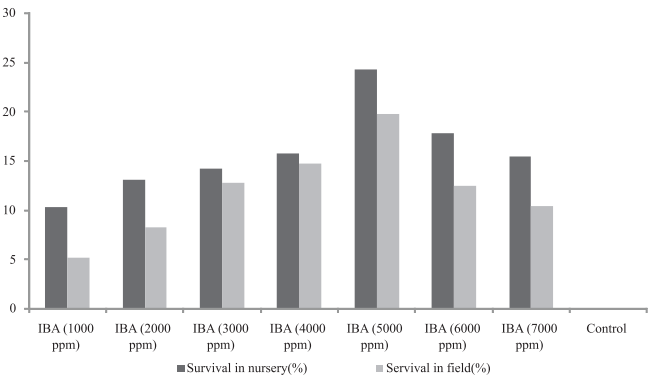

Fig.4: Survival per cent of stool layers under nursery and field condition

climatic conditions.

Based on the observation, it may be inferred from the study that the application of IBA is effective in inducing the rooting and promoting root characters in stool layers in bael. Among different concentration of IBA applied, application of IBA at 5000 ppm concentration proved to be most effective for rooting, root characters and survival in nursery and field conditions under hot semi-arid conditions of western India. However survival was very less under nursery and field conditions which reflect that the work on this aspect needs to be intensified for recommendation and commercial exploitation.

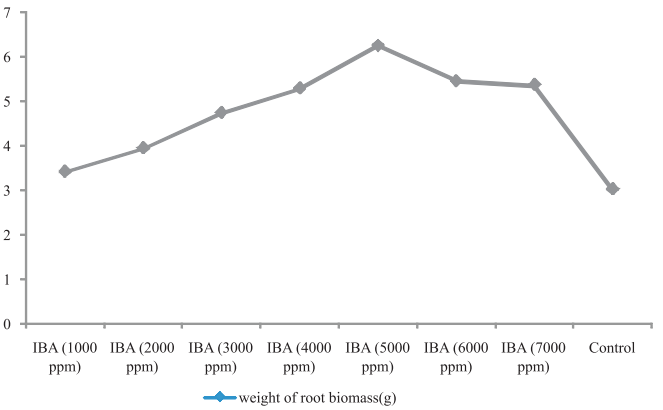

Fig. 5. Root biomass under different concentration of IBA in stool layers under hot semi arid conditions.

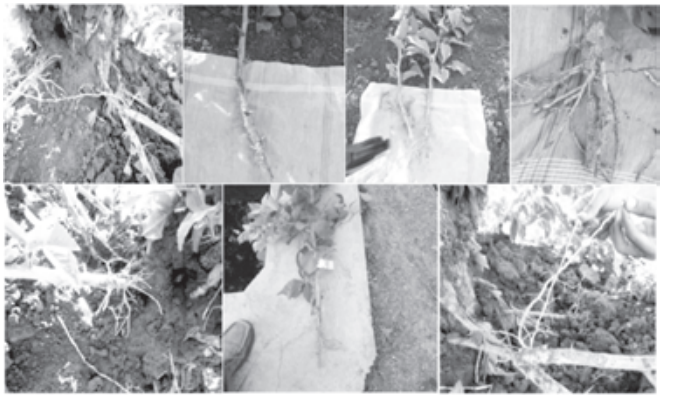

Fig. 6. Views of rooting behavior in different concentration of IBA in bael stool layers

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