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Air Layering under Protected Condition: A New Technique for Year-Round Propagation

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Abstract

Air layering is a promising method for propagation of species which are difficult-to-root through stem cuttings. However, the operation of layering is season bound and is generally practiced in rainy season. In the present article, a new technique for year round propagation of woody perennials has been discussed with watery rose apple as a model crop. The technique involved carrying out air layering on mother plants which are grown in big sized pots in a polyhouse provided with misting facility. Through this method, off season propagation of watery rose apple with 92.2% success was obtained during dryer part of the year. Further, use of coir pith compost could reduce the time taken for rooting. This novel technique could be utilized for mass multiplication during off-season.

Key words: *Coir pith compost; marcottage; substrate; Syzygium aqueum; woody perennials*

Introduction

Andaman and Nicobar Islands in the Bay of Bengal are known to harbor wide variety of underutilized fruits (Singh et al., 2012). Watery rose apple (*Syzygium aqueum* (Burm.f.) Alston, a tropical underutilized fruit species native to Malaysia and Indonesia, is popularly grown as backyard crop by island farmers (Bohra et al. 2019). Generally, these fruits are less sweet and have crisp watery texture and hence, the name watery rose apple. Fruits are relished especially during summer months. It is one of those species that produce fruits minimum two times a year under island condition and fruits are often sold in local markets. There is demand for good quality planting material of superior types from island farmers.

During field surveys, a superior germplasm with profuse fruiting and sweetish fruits (18 °B) was identified in a farmer's field in Middle Andaman Island (Fig. 1). In order to carry out further studies, it was multiplied through air layering in field condition and successfully rooted plants were brought to the authors' Institute for further hardening. However, to multiply any plant in large number, mother plants need to be established in field condition, and suitable vegetative multiplication technique needs to be adopted after the plant attains sufficient maturity.

Vegetative propagation has been regarded as an efficient method for mass multiplication of true-to-type plants. A number of techniques of vegetative propagation such as cutting (stem/ leaf/ root), layering, grafting, budding and micropropagation have been employed for multiplication of plant species depending upon the growth habit of plant, its maturity, growing season, facilities available, manpower *etc.* (Acquaah, 2004; Waman et al., 2019). Of these, air layering has been considered as an efficient method for multiplication in difficult-to-root horticultural species including guava (*Psidium guajava*), *Syzygium* species, cinnamon (*Cinnamom umverum*), tejpat (*Cinnamom umtamala*) *etc.* (Vyas *et al.* 2017; Waman and Bohra, 2018). However, in most of the cases, this practice is season-bound and rainy season is generally preferred for taking up propagation activity. Literature on air layering in horticultural crops clearly demonstrated the role of time of layering in rooting success (Tomar, 2016; Vyas *et al.*, 2017; Waman and Bohra 2018).

High atmospheric relative humidity prevailing during rainy season favours the rooting process and this condition could be simulated in a protected structure/ polyhouse with misting facility. With this hypothesis, we attempted air layering in watery rose apple using potted mother plants which were maintained under polyhouse

condition. Further, we conducted studies to know the effect of substrates on rooting success.

Materials and methods

The present study was carried out in Horticultural Plants Propagation Unit, Division of Horticulture and Forestry of ICAR- Central Island Agricultural Research Institute, Port Blair during 2019-2020. Mother plants (hardened air layers from farmer's field) were planted in 22 L pots filled with soil: FYM (3:1, v/v) and allowed to establish for one year.

To explore the possibility of propagation during off season, air layering was performed during December 2019, which is considered as the dry period in the islands. Selected branches of pencil size thickness from each plant were layered, in which 2,000 mg/L of indole-3 butyric acid (HiMedia, Mumbai, India) was used for inducing roots and soil: vermicompost (1:1, v/v) was used as substrate. Plants were maintained in naturally ventilated polyhouse provided with misting. Layers were harvested when root mass was seen from the poly cover. During subsequent experiment, effect of two substrates *i.e.* soil: vermicompost (1:1, v/v) and coir pith compost was studied on induction of rooting in air layers. Layering was carried out in potted watery rose apple plants following the similar procedure as detailed above, except for substrate. In both the trials, observations on rooting percentage, number of roots per layer, root length (cm) and root thickness (mm) were recorded using standard practices (Waman and Bohra 2018). Mean and standard error of mean of the data was computed using MS Excel software.

Results and discussion

In the first trial, air layers became harvestable after 99 days of layering. Results revealed that rooting was induced in 92.2% of the layers during the dry period which is generally not congenial for air layering. The mean number of roots was found to be 6.2 ± 0.57 roots per layered shoot. Mean length of root was found to be 8.1 ± 0.44 cm, while the root thickness was 2.2 ± 0.12 mm. Though the experiment was conducted during dry period, misting facility in the polyhouse provided necessary high humidity for induction of rooting in the air layers during the present study. Thus, this technique is of great practical utility for off season air layering in this plant.

Fig. 1: Fruiting branch of elite watery rose apple type (left) and successfully rooted layer with coir pith compost as substrate (right)

Coir pith compost has been regarded as a valuable input for nursery applications (Waman et al., 2019). In order to study its effect on air layering, second trial was conducted in which two substrates were compared. Interestingly, during this trial harvestable rooted layers were observed after mere 28 days of layering, as against 99 days in the first trial with soil: FYM as substrate. Layers of both treatments were harvested at this stage, which revealed 100% rooting in coirpith compost substrate as against mere 25% in case of soil: FYM substrate. It means that use of light medium with good water holding capacity could not only improve the rooting percentage but reduced the time required for layering drastically. This finding is in line with report by Patel *et al.* (2012),

who obtained quicker root induction with sphagnum moss substrate.

Various growth related parameters of air layers from two substrates have been presented in Fig. 2. Results suggested that, apart from quick induction of rooting, higher mean number of roots per layer (5.8 ± 0.92) and mean root length (8.9 ± 0.63 cm) were noticed in layers obtained from coir pith compost as substrate (Fig. 1). Root thickness in both the treatments remained comparable. This clearly demonstrated superiority of coir pith compost as substrate over soil: FYM. Use of decomposed coir pith has been reported to improve adventitious root induction and root length in *Vanilla planifolia* (Siddagangaiah et al., 1996). Role of coir based products has been well documented in vegetative propagation of horticultural crops (Khedkar *et al*., 2017).

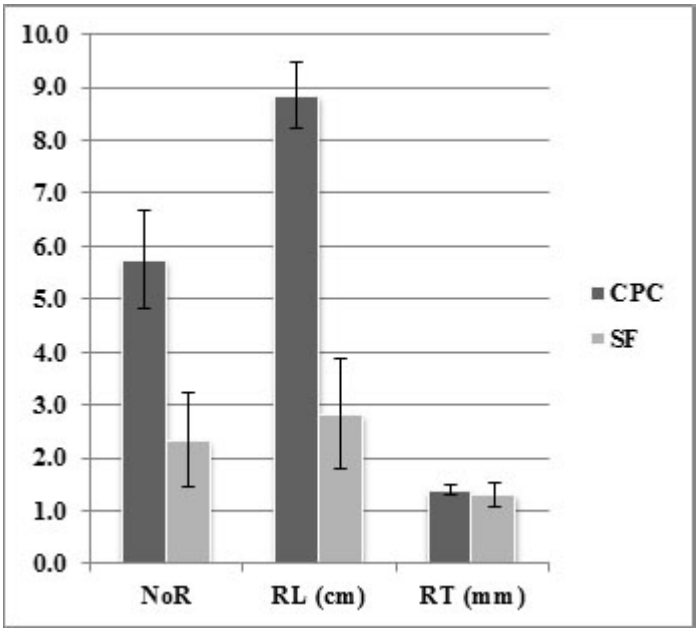

Fig. 2: Effect of different substrates on performance of air layers after 28 days of layering (NoR: number of roots/ layer; RL: mean root length; RT: mean root thickness; CPC: coir pith compost and SF: Soil: FYM - 1:1, v/v)

Conclusion

Air layering in potted plants under polyhouse condition was found to be an efficient method for off season production of plants of watery rose apple. Further, use of coir pith compost supported the rooting process. This technique could be of great practical utility for multiplication of superior germplasm and rare species in which only a few plants are available. Further, in commercial crops, apart from their layering in open field condition during rainy season, the discussed method could supplement production of planting material during off season as well. Considering the short layering cycle and gap period between the cycles, layering could be done 3-4 times in a year on the same mother plant.

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