



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(11): 1056-1060
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www.thepharmajournal.com
Received: 14-09-2023
Accepted: 30-10-2023

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Varietal response of indigenous air layering in mango (*Mangifera indica* L.)

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Abstract

A field study was carried out at Krishi Vigyan Kendra, Bastar (C.G.) during the Kharif season of year 2021 and 2022 to perusal the “Varietal response of indigenous air layering in mango (*Mangifera indica* L.)”. The soil of the study plot was ‘*Inceptisols*’ having low nitrogen, medium phosphorus, and potassium content. The study was performed in seven mango varieties, viz., Dussehri, Mallika, Alfanjo, Amrapali, Neelam, Nandiraj and Barahmasi (10-year-old varieties of each). The results revealed that propagation of mango on these seven varieties takes an average of 47.71 days with about 59% average success rate after successful air layering (with soil + vermicompost + *Aloe vera* gel) in branches of mango. However, “Mallika” variety showed a better response in terms of success (62%) and Nandiraj showed the best response in terms of root initiation (41 days). And after one month of hardening the plant was ready for transfer to the field for commercial purposes.

Keywords: Air layering, vermicompost, mango, *Aloe vera* gel, *Mangifera indica* L.

Introduction

Mango (*Mangifera indica* L.) member of the cashew family (Anacardiaceae) is one of the most important and widely cultivated fruits of the tropical world. It is a common fruit of Bastar, where it is consumed by a large tribal population comprising large indigenous germplasm with high quality, flavour, insect, and disease resistance. So, there has been a serious urge for the exploitation of clones in the cultivation of mango, by which various mango varieties can be standardized, and also promote the multiplication of desired fruit plants (Chhonkar and Singh, 1972) [3]. The importance of propagating mango with less time with grafting can be economically viable and helpful for the rural population, for conserving and preserving indigenous germplasm, through propagating new uniform clones (Patel *et al.*, 1989) [7].

Air-layering is the technique of propagating new trees and shrubs from the stems still attached to the parent plant. by inducing roots to form on plant stem without cutting off the stem from the parent plant. It is a best way to replicate existing plants without disturbing the mother plant bearing flower or fruiting. Readily mature, much faster plants can be propagated through air-layering than growing them from seed or cuttings. By this method a new plant is propagated which is identical to the parent plant in all respects, like fruit, odour, colour, and size (Singh *et al.*, 2023) [11]. The new plant is formed from the parent plant in all respects upon which it depends for water and nutrients until roots develop. Comparatively bigger plants can be developed by this type of propagation in a low time period. Around 20 centuries ago the idea of air-layering was revealed in the China and as a method of reproducing ornamental and fruit plants it was long been known to horticulture experts (Mergen, 1953) [5]. Many woody plants have been propagated through this technique by gardeners for reproducing identical plants (Hossain, 2007) [4]. Locally raised mango plants through the vegetative propagation method enable the growth of the important mango varieties on their roots. A less impact of precocity exhibits by such trees than grafted tree varieties and presently used as rootstocks, low strength, stability, and precocity being the important characteristics for the advanced orchardist. Indole butyric acid (IBA) in a concentration of 25000 ppm comprises with hydrous lanolin to a 400 mm wide girdle has made little distance from the growing point method was developed by CSFRI. Mixture of sphagnum moss and compost (1:1) was moistened to the point and sample was firmly squeezed manually. This medium was applied to the girdle and securely wrapped in PVC (polyvinyl chloride) plastic everywhere in the medium. At the both end of girdle and over the PVC plastic string ties were knotted tightly.

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2. Materials and Methods

A study was carried out at Krishi Vigyan Kendra, Bastar (C.G.) during the Kharif season of year 2021 and 2022. The experimental field's soil was neutral with pH 7.60, organic carbon 0.64%, and lower nitrogen (228 kg/ha), medium phosphorus (19.5 kg/ha), and higher potassium (320 kg/ha). The experiment was conducted at the mango orchard's tree. In which 50 branches of seven varieties *viz.*, Dussehri, Mallika, Alfanjo, Amrapali, Neelam, Nandiraj, and Barahmasi (10-year-old varieties), *etc.* were studied by using locally available rooting agents (soil + vermicompost + *Aloe vera* gel) with clear polyethylene plastic.

Shoots were selected at waist height on the west side of some adjacent trees (north-south row orientation). Budding knife is used to make girdles, 40 mm wide, just above the base of the subterminal branch, care was taken in to consideration to eliminate all traces of tissue near by the secondary xylem and fresh *Aloe vera* gel was applied over the exposed xylem to induce early rooting.

In 300 mm long, and 110 mm wide polyethylene sleeves, the girdles were enclosed by implanting the shoots through the sleeves. Over the plastic and beneath the base of the girdle a tight string – tie was made to secure the sleeve to shoot. Moistened (soil + vermicompost) was applied until the girdle was entirely covered and compacted within the sleeve (Singh and Bhuj, 2000) ^[10].

The appearance of the completed air- layers was taken into consideration. After completion of rooting, pruning of branch with secateur was done and rooting was observed. The study was then completed.

3. Results and Discussion

The results revealed that time of air layering, rooting media, and variety exhibited a significant effect on rooting patterns (Fig. 1 to 4). In this experiment, (62%) of air layers were found successful, in the Mallika variety in comparison to Barahmasi whose success rate is (60%) as depicted in Table 1. However, in comparison with all the treatments Neelam showed (42%) success rate which is the lowest among all treatments. Variety Nandiraj is significantly superior in terms of root initiation (41 days), followed by Alfanjo (45 days) and Maximum days consumed in Mallika (52 days) for root initiation. Here, average days for root initiation were recorded as (47.71) and the percentage for successful air layering was (59%). The hormonal effects are one of the reasons for development of primary and secondary roots leading to the accumulation of internal substances and their downward movement. And cell division can be one of the reasons for number of secondary roots. However, the concentration of media also promotes faster and better root growth (Bhagat *et al.*, 2005) ^[2]. Results indicated that the combined effect of *Aloe vera* gel and (soil + vermicompost) has a differential response on seven mango varieties as depicted in Fig. 5 and 6. Here freshly harvested *Aloe vera* gel can be suggested as a substitute of root-inducing substance. *Aloe vera* leaves possess more anti-inflammatory and rooting hormone after detachment from plant (Ramchandra and Rao, 2008) ^[8]. Thus, PGR can be replaced by *Aloe vera* gel (Baghel BS, 1999; Satpal *et al.*, 2014) ^[1, 9]. Rooting in air-layering was significantly influenced by season, treatment, and medium. (Tyagi and Patel, 2004) ^[12].



Fig 1: Air layering in the branches of mango with (soil + vermicompost + *Aloe vera* gel)



Fig 2: Detachment of air layered branches after complete rooting



Fig 3: Air layered branches detached from mother plant showing complete rooting



Fig 4: Transfer of branches to the polybag for hardening

Constant moisture and temperature are one of the most important prerequisites for rooting so, Kharif season was more favorable for air-layers to survive. Various researches revealed that due to higher temperature, higher humidity and moisture root initiation was more in July, compared to other months (Nautiyal, 2002) ^[6]. However, comparatively

Propagation time is less in air-layered plants, easily clone we can through this technique, transfer alive and viable germplasm and planting material, Indigenous competent cultivars can be safeguarded and Early flowering has been introduced on all mango varieties.

Table 1: Effects of air layering propagation method on mango varieties (2 years of pooled data)

Treatment	Plant	Variety	Days for root initiation	No. of branches	Successful air layering	Percentage of success
T1	Mango	Dussehri	48	50	28	56%
T2	Mango	Mallika	52	50	31	62%
T3	Mango	Alfanjo	45	50	27	54%
T4	Mango	Amrapali	47	50	26	52%
T5	Mango	Neelam	50	50	21	42%
T6	Mango	Nandiraj	41	50	29	58%
T7	Mango	Barahmasi	51	50	30	60%
Average			47.71	50	29.5	59%

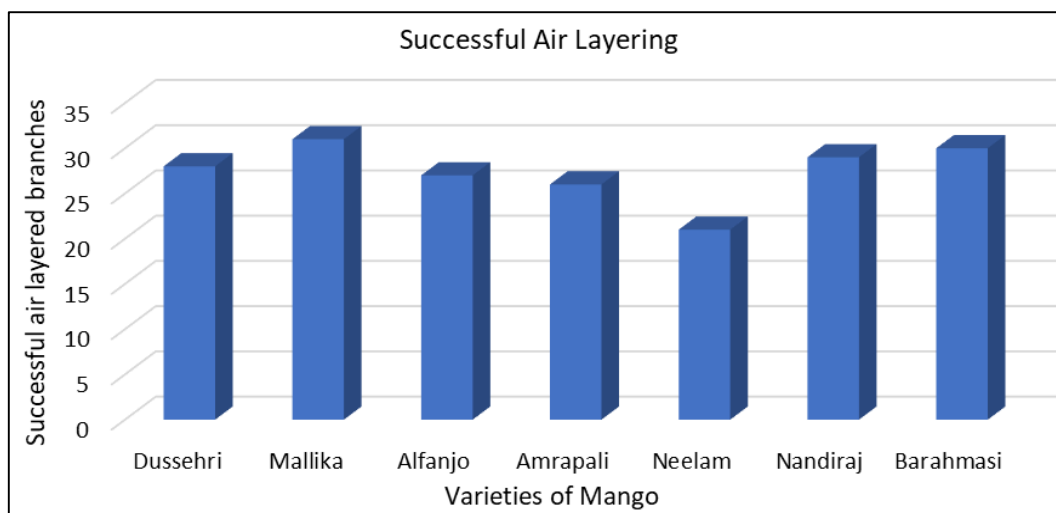


Fig 5: Varietal influence on successful air layering in mango

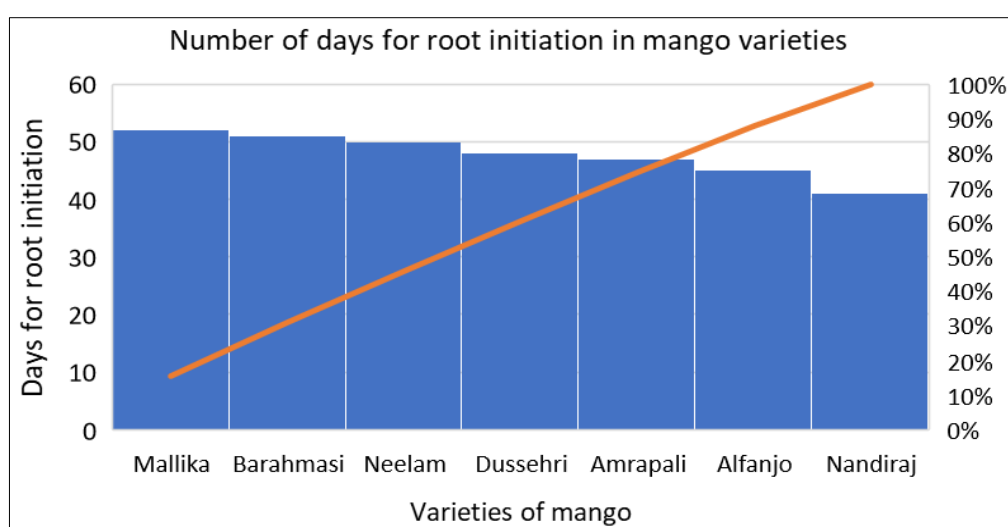


Fig 6: Varietal influence on root initiation in mango

Conclusion

According to the results achieved in this experiment, *Aloe vera* gel can be endorsed as another root-enhancing substance to enhance rooting in different mango varieties. In the present investigation, to collect gel substances *Aloe vera* leaves were used. However, greatest findings could be achieved by use of *Aloe vera* leaves harvested one week before being used as root-inducing substantial because it increases its rooting capability. However, in terms of the success percentage of mango varieties in this region variety “Mallika” is superior and Neelam showed significantly lowest response among all varieties, Finally Nandiraj variety is showing best response in terms of root initiation followed by Alfanzo and Amrapali.

Acknowledgement

The authors would like to express their gratitude to Dr. Santosh Kumar Nag, Senior Scientist and Head, Krishi Vigyan Kendra, Bastar and colleagues of horticulture discipline for providing needful information and observation of orchard for this work.

Conflict of Interest

The authors declare that there is no influence of any personal relationships or any competing financial interests appeared to be reported in this research paper.

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