



## Effect of IBA and Rooting Media on Air Layering in Kinnow (*Citrus spp.*)

(\*Shubham Kumar, Annjoe V Joseph and Vijay Bahadur)

Department of Horticulture, SHUATS, Naini, Prayagraj, Uttar Pradesh

\*Corresponding Author's email: [sbhmk555@gmail.com](mailto:sbhmk555@gmail.com)

Citrus is an important sub-tropical fruit tree belongs to family Rutaceae and believed to have originated in China. Citrus has played a great role in the food and nutritional security and it can bring economic prosperity in the areas where it is grown. It is the one of the most important fruit crops since antique and known as a good source of vitamin-C with high antioxidant potential. It is a most valuable crop which is adaptable to wide range of soils, province, planting and cultural arrangements and over more than 100 nations recorded citrus production in 1980 (Reitz, 1984). India is the third largest citrus producing country in the world with an area of 1.02 m ha and annual production of 11.15 m tonnes (FAOSTAT 2015). Kinnow is a high yielding Mandarin hybrid, cultivated extensively in the Punjab region of India. It is a hybrid of two Citrus cultivar King (*Citrus nobilis*) x 'Willow Leaf' (*Citrus delicosa*) which developed by H. B. Frost. It contains 2% Vitamin A, 110% Vitamin C, 2% Iron and 4% Calcium. The cultivation of Kinnow in India for a long time and extends too many states of the country. In plants, where vegetative propagation is not easy. Bioinoculants can help in callus formation, root initiation, root development and survival percentage of air layers (Bankapur, 1957). Kinnow / Mandarin fruits comprise a high amount of juice content, making them ideal for extracting juice and pulp. Mandarin fruit the amount of juice may vary from 45 to 60%. The fruits could be used for a variety of purposes ranging from fresh juice to candy, jellies and wine. Kinnow / Mandarin peel and pulp are the major by-products of the Kinnow / Mandarin juice processing industry, which accounts for 55-60% of the fresh fruit weight, whereas around 30% of the produce of citrus fruits is processed to make juice. The remaining waste of Kinnow / Mandarin fruit after juice extraction could also be useful as animal feed. Kinnow fruit seeds are planted between August and October. Harvesting starts when the fruit's external colour becomes orange, from December to February. The best harvesting time is mid-January to mid-February, when the fruit attains a TSS/acid ratio of 12:1 to 14:1. The fruit quality declines in later pickings. Fruits are harvested by clipping the stem with the help of sharp clippers (secateurs). The stem is cut as short as possible to avoid mechanical injury to the fruit in packing and transits. As it is a comparatively loose rind fruit, harvesting by pulling fruits with one's hands is avoided. Coating kinnow fruits with commercial waxes can increase the shelf life up to 60 days. The fruit can be stored in cold storage at a temperature of 4-5 °C and a relative humidity of 85-90%. Most of the target export markets of kinnow from India are those of developing countries.

### Botany

Kinnow is a hot climate plant with very high productivity. Tree exhibits vigorous growth and can reach height of 35 feet. Kinnow plant has broad shallow roots reaching up to depth of 7 to 12 feet depending upon soil condition. Shoot system has columnar trunk bearing numerous

long, slender, ascending, and virtually thorn less branches. Branchlets bear dense foliage consisting of medium to large and broadly lanceolate leaves . Leaves are alternate, petiolate, simple, with entire margin, and unicostate reticulate venation. Leaves have smooth essential oils glands in the lamina giving aromatic smell. Kinnow bears off-white hermaphrodite solitaire pentaerous flower. The anthers are yellow color. Fruit is hesperidium containing 0 to 9 seeds. Kinnow fruit is globular to oblate in shape. Base of fruit is flattened. Fruit peel also known as rind has smooth surface and are easily peeled. Fleshy interior of fruits contains 9 to 12 sections called Carpels. Each carpels have greenish to yellow color seed. Unripe fruits are green in color with off white inner flesh. Ripened fruits are orange in color with orange color flesh and juicy. Each mature plant can produces up to 1000 or more fruits in a season.

### Origin and Distribution

The original home of *Zizyphus jujaba* Lamk, or *Zizyphus mauritiana* Lamk, is India while China is the home of *Zizyphus vulgaris* Lamk. These are the most commonly grown species found in India and China, respectively since ancient times. According to Decandole (1886) the centre of origin of ber is central Asia. This includes north west India. Afghanistan, areas of Todijaskistan. Uzbekistan and China. It is found growing wild, semi-wild and in cultivated forms in almost all parts of India. Various cultivares of (*Zizyphus mauritiana*) are found growing commercially in the north-west plains of India. Species like *Zizyphus nummularia* is also found growing wildly. In the eastern parts of India. Seedlings of *Zizyphus rotundifolia* are found growing abundantly with a few plantations of grafted cultivars of ber.

### Role of IBA and Rooting Media

The Kinnow Mandarin , is a non-climacteric tropical fruit from Rutaceae family and widely cultivated in wider Punjab region of India . The limited availability of good quality seedlings of citrus is the main problem to development of flourish it's market share in the current fruit industry. Therefore, in order to produce good quality planting materials, a study aimed at optimizing propagation and adventitious rooting technique and survivability of citrus air layer was conducted. In this study, four different levels of Indole-3-Butyric Acid (IBA) concentration (1000 and 1500 mg L<sup>-1</sup>) and three rooting media (cocopeat, vermicompost and garden soil) were applied after removal of bark (phloem) on the shoot to determine the effect on rooting and survivability of the wax apple air layer under field conditions. The results showed that the citrus shoots treated with 1500 mg L<sup>-1</sup> IBA produced the significantly higher number of roots, increased length of root, diameter of branch, length of branch, number of leaf and leaf area of air layers. In addition, the highest chlorophyll content and stomatal aperture were recorded in 1500mg L<sup>-1</sup> IBA treatment compared to other treatments including control. Vermicompost medium was better than garden soil and cocopeat in respect of rooting and survivability of air layers. The results showed that the combination of 1500 mg L<sup>-1</sup> IBA and vermicompost as rooting media give the best combination to root initiation, root number, root length and survival rate (100%) of wax apple air layers. From this study, it can be concluded that 1500 mg L<sup>-1</sup> IBA and vermicompost treatment enhance the root initiation, early establishment and survivability of citrus on air layered under field condition.

### Photos



## References

1. Glaustas Horticulture by P. Muthukumar and Kushal Publication
2. Nandhanambi, D., Arivazhagan, E. and Kandasamy, R. 2016. Influence of plant growth regulators and azospirillum on rooting of air layering in guava. *The Asian Journal of Horticulture*, 11(2): 261-268.
3. Anonymous. 2019. Horticultural statistics at a glance. Government of India, Ministry of Agriculture and Farmer Welfare, Department of Agriculture Cooperation and Farmers Welfare Horticulture Statistics Division.
4. Wan, A.A., Hussain, I., Rehman, N., Jane, A. and Ali, N. 2000. Effect of different media and timing factor on rooting of litchi (*Litchi chinensis*) plant through air layering. *Pakistan Journal of Biological Sciences*.
5. Baghel, M., Raut, A.U. and Ramteke, V. 2016. Effect of IBA concentrations and time of air layering in guava cv. L-49. *Research Journal of Agricultural Sciences*, 7(1):117-120.
6. Bora, N., Lal, R.L. and Syamal, M.M. 2012. Effect of etiolation and plant growth substances in rooting and survival of air layers of guava (*Psidium guajava* L.). *Indian Journal of Horticulture*, 62(3): 290-292.
7. Bose T.K., Mitra S.K. & Sadhu M.K. 1986. Guava In: Propagation of tropical and sub-tropical horticultural crops. NayaProkash, Calcutta, pp. 291–301