



## INFLUENCE OF DIFFERENT GROWTH REGULATORS ON PROPAGATION OF LEMONIA (*RAVENIA SPECTABILIS* AND *RAVENIA SPECTABILIS VARIEGATA*) IN SUB-TROPICAL ZONE

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### ABSTRACT

The present investigation was carried out to study the effect of different growth regulators on propagation of *Ravenia Spp.* in subtropical zone under naturally ventilated polyhouse equipped with foggers at Mandouri farm of Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal. Significant differences among the treatments (IAA @1000ppm, IAA@2000ppm, IAA @3000ppm, IBA @1000ppm, IBA @2000ppm, IBA @3000ppm, NAA @1000ppm, NAA @2000ppm, NAA @3000ppm and Control) on root emergence and proliferation were noticed. After two consecutive years of studied, (*Ravenia spectabilis* and *Ravenia spectabilis Variegata*), can successfully propagated by tip cutting in the month of June with the treatment of NAA @ 3000 ppm for rapid multiplication of this plant in sub-tropical zone. The second best growth regulators may be considered like IAA @2000ppm and IBA@3000ppm for this purpose.

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## INTRODUCTION

*Ravenia* (*Ravenia spectabilis* and *Ravenia spectabilis Variegata*) belonging to family Rutaceae, is an important flowering shrub, native to Cuba and Brazil, grows well under wide range of climate all over the world. This plant having special characteristics like evergreen, woody shrubs, compact branching, trifoliolate attractive glossy green (*Ravenia spectabilis*) and variegated (*Ravenia spectabilis Variegata*) leaf. This plant is used for garden decoration in the shrubby border in different types of gardens, parks, along roadsides, streets, byways and highways as a graceful outdoor perpetual flowering plant, which bear pink colour flowers all most round the year. It is also great for landscaping as a single decorative specimen or amidst a crowd of low-growing plants in a border. According to Bose *et al* (2008) reported that this plant is suitable for sunny and semi shade locations. There is a tremendous demand of this plant due to rapid urbanization.

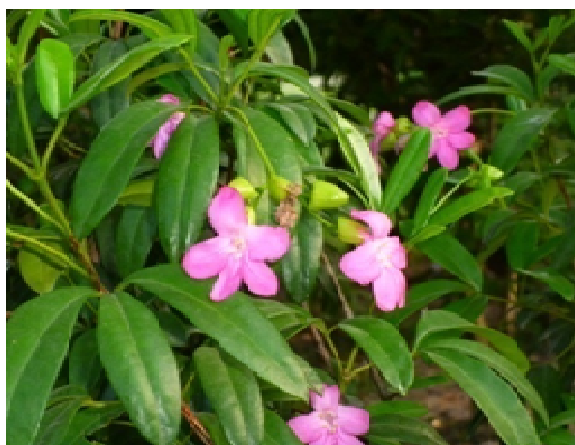
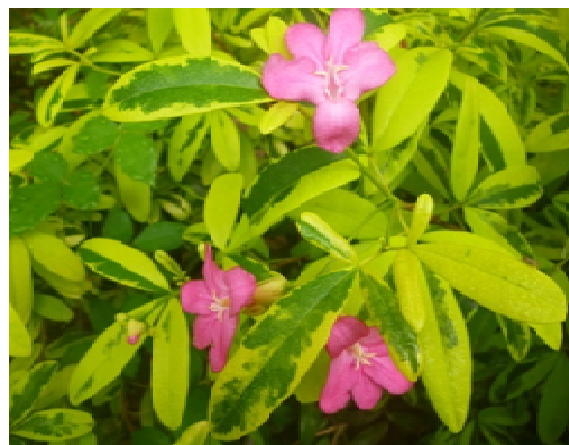
Besides these advantages, this plant is very hardy and easy to maintain in garden. However, rapid multiplication of this plant is a problem and wastage of propagating material very often takes place due to sparse rooting and unavailability of a suitable combination of variety and growth regulator in the sub-tropical environment. Randhawa and Mukhopadhaya (2000) said that best method of propagation of *Ravenia spectabilis* is air layering, whereas Bose *et al* (2008) reported this species can be propagated by air layering & cutting, and Chakraborty, and Mukhopadhaya (2008) also said layering and cutting is only methods of propagation of *Ravenia spectabilis*.

## MATERIALS AND METHODS

The experiment was carried out under naturally ventilated poly house at Mandouri farm of Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, during 2014-15 and 2015-16. The cuttings of two species were taken from the mother block of germplasm collection under instructional farm of BCKV in the month of 15<sup>th</sup> June. New growth of tip portion of the branches up to 4-5 inches (three to four leaves) was taken for cuttings.

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Fig.1. *Lemonia* (*Ravenia spectabilis*)Fig. 2. *Lemonia* (*Ravenia spectabilis Variegata*)Table 1. Effects of different growth regulators on rooting behaviour of *Ravenia* (*Ravenia spectabilis* and *Ravenia spectabilis Variegata*)

| Treatments                   | % of rooting of <i>Ravenia</i> cutting |                       | No. Of roots/cutting of <i>Ravenia</i> |                       | Root length(cm) of <i>Ravenia</i> cutting |                       |
|------------------------------|--|-----------------------|--|-----------------------|---|-----------------------|
|                              | Spectabilis                            | Spectabilis Variegata | Spectabilis                            | Spectabilis Variegata | Spectabilis                               | Spectabilis Variegata |
| T <sub>1</sub> :IAA @1000ppm | 62.00                                  | 60.00                 | 3.33                                   | 4.33                  | 6.50                                      | 2.33                  |
| T <sub>2</sub> :IAA @2000ppm | 80.67                                  | 70.00                 | 4.33                                   | 6.33                  | 9.50                                      | 4.00                  |
| T <sub>3</sub> :IAA @3000ppm | 74.00                                  | 40.00                 | 3.33                                   | 3.33                  | 12.00                                     | 2.00                  |
| T <sub>4</sub> :IBA @1000ppm | 79.33                                  | 40.00                 | 5.33                                   | 3.33                  | 6.50                                      | 2.90                  |
| T <sub>5</sub> :IBA @2000ppm | 82.33                                  | 50.00                 | 5.33                                   | 4.33                  | 6.60                                      | 3.50                  |
| T <sub>6</sub> :IBA @3000ppm | 90.00                                  | 89.67                 | 6.33                                   | 6.33                  | 9.20                                      | 9.67                  |
| T <sub>7</sub> :NAA @1000ppm | 59.67                                  | 70.00                 | 3.33                                   | 5.33                  | 8.00                                      | 4.70                  |
| T <sub>8</sub> :NAA @2000ppm | 71.33                                  | 70.67                 | 4.33                                   | 5.67                  | 10.00                                     | 3.20                  |
| T <sub>9</sub> :NAA @3000ppm | 94.00                                  | 92.33                 | 7.00                                   | 6.33                  | 12.00                                     | 9.13                  |
| T <sub>10</sub> :Control     | 20.00                                  | 21.33                 | 2.00                                   | 2.00                  | 1.50                                      | 1.13                  |
| SE(±)                        | 1.71                                   | 1.34                  | 0.34                                   | 0.33                  | 0.37                                      | 0.19                  |
| CD at 5%                     | 5.08                                   | 3.97                  | 1.00                                   | 0.97                  | 1.10                                      | 0.57                  |
| CV(%)                        | 4.15                                   | 3.83                  | 13                                     | 11.92                 | 7.86                                      | 7.87                  |

After cutting, the cut ends were treated with 0.2% Copper oxychloride for 15 minutes followed by treatment with different growth regulator solutions. A cutting bed was prepared with sterilized coarse sand containing up to a depth of 6 inches. Then cut end of cuttings were placed inside sand bed up to a depth of one inch. During investigation micro-environment of the cuttings bed had temperature range of around 25-32°C, light intensity 1500-1750 foot candle and humidity 85-90%. Every day misting with water was provided through foggers in the evening hours. Rooted cuttings were planted in the earthen pots (growing media content with soil and cowdung manure in the ratio of 3:1). The experiment was laid out in Randomized Block Design with ten treatments replicated thrice and the statistical analysis of the data was carried out following Fisher's Analysis of Variance Technique as described by Gomez and Gomez (1984). The treatments comprised under mentioned of different concentrations of IAA, IBA, NAA and without any treatment.

|                              |                              |                              |
|------------------------------|------------------------------|------------------------------|
| Treatments                   | Treatments                   | Treatments                   |
| T <sub>1</sub> :IAA @1000ppm | T <sub>4</sub> :IBA @1000ppm | T <sub>7</sub> :NAA @1000ppm |
| T <sub>2</sub> :IAA @2000ppm | T <sub>5</sub> :IBA @2000ppm | T <sub>8</sub> :NAA @2000ppm |
| T <sub>3</sub> :IAA @3000ppm | T <sub>6</sub> :IBA @3000ppm | T <sub>9</sub> :NAA @3000ppm |
|                              |                              | T <sub>10</sub> :Control     |

Observation was recorded up to three and half months (90 days for rooting and 15 days for plant survivability in pots) with the parameters of percentage of rooting, number of roots per cutting, root length, days required for root initiation and percentage of plant survivability in pots. The different concentrations of growth regulators (1000, 2000 and 3000ppm) like IAA, IBA and NAA were prepared in the laboratory of Bidhan Chandra Krishi Viswavidyalaya.

## RESULTS AND DISCUSSION

The effect of different growth regulators with various concentration were significantly differ among the treatments on percentage of rooting, number of roots per cutting, root length, days required for root initiation and plant survivability in pots of tip cutting of *Ravenia* (*Ravenia spectabilis* and *Ravenia spectabilis Variegata*) reflected in Table1 and 2. After three months of observation, the highest percentage (Fig. 3) of rooting in *Ravenia spectabilis* (94%) and *Ravenia spectabilis Variegata*(92.33%) in tip cutting were obtained in T<sub>9</sub>: NAA @3000ppm, whereas very poor performance was recorded in control(20.00 and 21.33 respectively) over others treatments. Production of roots in terms of number per plant is an important factor to plant survivability in pots, here it has been found that profuse rooting was found in *Ravenia spectabilis* (7.00), when treated with same treatment followed by T<sub>6</sub>:IBA @3000ppm(6.33),whereas cutting of *Ravenia spectabilis Variegata* brought excellent rooting(6.33/cutting) at par with 2000 ppm of IAA, 3000ppm of IBA and NAA, and very worst result was recorded in control(2.00/cutting in both types of cutting) incomparision to others treatments. The growth of the roots in term of length was markedly influenced of tip cutting of *Ravenia spectabilis* at par (12cm) with 3000ppm of IAA and NAA, whereas tip cutting of *Ravenia spectabilis Variegata* of new roots were extended maximum up to 9.67 cm, when cuttings were treated with IBA @ 3000ppm followed by NAA @ 3000ppm (9.13cm) and very stunted growth was noted in control (1.5 and 1.13cm respectively) over others treatments.

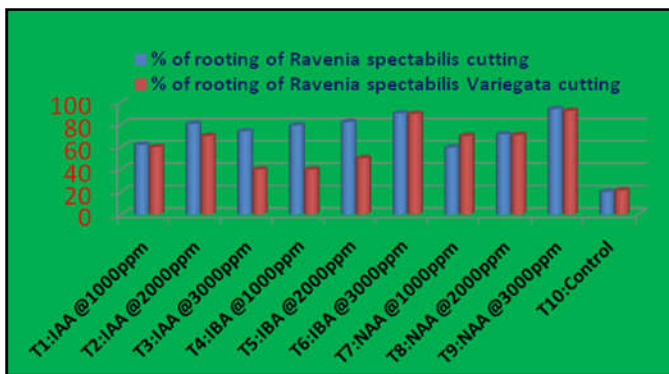


Fig. 3. Effects of different growth regulators on rooting behaviour of Ravenia( *Lemonia spectabilis* and *Lemonia spectabilis Variegata*)

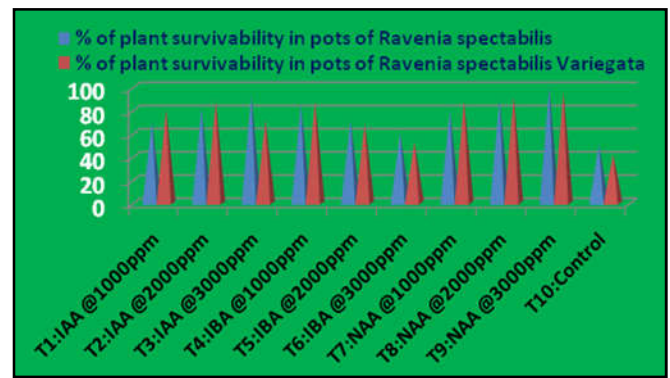


Fig.4 Effects of different growth regulators on plant survivability of Ravenia(*Lemonia spectabilis* and *Lemonia spectabilis Variegata*)

Table 2. Effects of different growth regulators on days required for rooting and plant survivability of Ravenia (*Ravenia spectabilis* and *Ravenia spectabilis Variegata*)

| Treatments                   | Days required for root initiation of Lemonia cuttings |                       | % of plant survivability in pots of Lemonia cutting |                       |
|------------------------------|---|-----------------------|---|-----------------------|
|                              | Spectabilis   | Spectabilis Variegata | Spectabilis   | Spectabilis Variegata |
| T <sub>1</sub> :IAA @1000ppm | 38.00   | 54.67                 | 76.00   | 72.00                 |
| T <sub>2</sub> :IAA @2000ppm | 34.00   | 42.00                 | 90.00   | 84.00                 |
| T <sub>3</sub> :IAA @3000ppm | 30.00   | 51.33                 | 84.00   | 68.00                 |
| T <sub>4</sub> :IBA @1000ppm | 46.00   | 50.00                 | 88.00   | 70.00                 |
| T <sub>5</sub> :IBA @2000ppm | 42.00   | 46.00                 | 90.00   | 80.00                 |
| T <sub>6</sub> :IBA @3000ppm | 35.33   | 38.00                 | 95.67   | 94.00                 |
| T <sub>7</sub> :NAA @1000ppm | 40.00   | 40.00                 | 80.00   | 84.00                 |
| T <sub>8</sub> :NAA @2000ppm | 32.00   | 35.00                 | 89.00   | 86.00                 |
| T <sub>9</sub> :NAA @3000ppm | 30.00   | 30.00                 | 98.00   | 98.00                 |
| T <sub>10</sub> :Control     | 65.00   | 64.33                 | 64.00   | 56.00                 |
| SE(±)                        | 1.61  | 1.78                  | 1.59  | 2.03                  |
| CD at 5%                     | 4.79  | 5.29                  | 4.71  | 6.02                  |
| CV(%)                        | 7.12  | 6.83                  | 3.23  | 4.43                  |

Photographs showing the Influence of different growth regulators on propagation of Lantana Ravenia (*Lemonia spectabilis* and *Lemonia spectabilis Variegata*)



Fig.5 Effect of different IAA concentrations on rooting of Ravenia (*Lemonia spectabilis*)



Fig.6 Effect of different IBA concentrations on rooting of Ravenia (*Lemonia spectabilis*)

Root initiation process was started earlier in *Ravenia spectabilis* (30 days) at par, when cutting was treated with 3000ppm of NAA and IAA followed by 2000ppm of both the growth regulators by 32 and 34 days respectively. But in *Ravenia spectabilis Variegata* only NAA at 3000ppm brought earliness of rooting by 30 days followed by 2000ppm of same growth regulators, whereas root development process was delayed in control in both the cases by 65 and 64.33 days respectively over others treatments. Regarding new plant survivability in pots, when rooted cuttings were potted in the

earthen pots (pot containing 3 parts soil + one part cowdung manure), highest plant survivability(98%) of *Ravenia spectabilis* and *Ravenia spectabilis Variegata* was recorded from cuttings were treated with NAA @3000 followed by IBA 3000ppm(95.67 and 94% respectively) over others treatments (Fig.4). From the above results for the propagation of *Ravenia spectabilis* and *Ravenia spectabilis Variegata*, with increase of IBA and NAA doses from 1000 to 3000 ppm simultaneously increased the percentage of rooting, number of roots/cutting and root length, but in case of IAA treatment, maximum output



Fig.7 Effect of different NAA concentrations on rooting of *Ravenia* (*Lemonia spectabilis*)

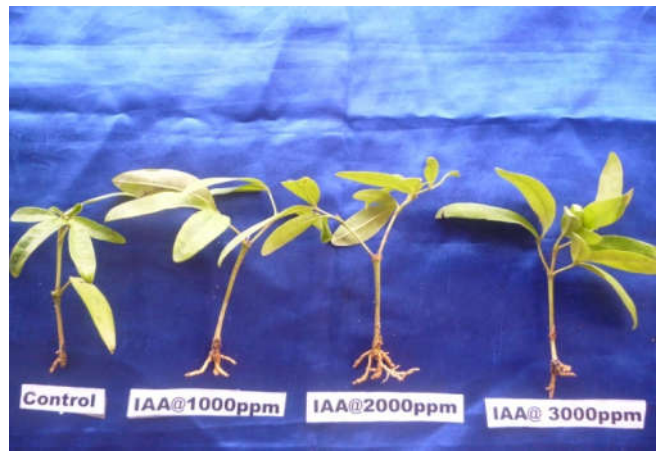


Fig.8 Effect of different IAA concentrations on rooting of *Ravenia* (*Lemonia spectabilis Variegata*)



Fig. 9 Effect of different IBA concentrations on rooting of *Ravenia* (*Lemonia spectabilis Variegata*)



Fig. 10 Effect of different NAA concentrations on rooting of *Ravenia* (*Lemonia spectabilis Variegata*)

was obtained in 2000ppm in all aspect (Fig.5,6,7,8,9 and 10). Regarding process of root development, all most all the growth regulators brought earlier emergence of rooting with higher concentration treatment. After observing of three months of cutting in cutting beds and rooted of new plants were potted in earthen pots, then plant survivability studied up to 15 days and found that both the plants of cutting increased survivability with proportionately increased of growth regulators level, but in case of IAA 2000 ppm is best in this regard and beyond that negative response was found.

### Conclusion

It may be concluded that all growth regulators have positive response on all parameters studied related to propagation of *Ravenia spectabilis* and *Ravenia spectabilis Variegata*. The most remarkable findings were noted that tip cutting in the month of June with NAA @ 3000ppm brought the cuttings maximum rooting and plant survivability in earthen pots, that is (rooting: 370 %, plant survivability: 53.12% in *Ravenia spectabilis* and rooting: 332.86 %, plant survivability : 56 % in *Ravenia spectabilis Variegata*) more than control and this growth regulator has beneficial effect for rapid multiplication of this plant in sub-tropical zone.

The second best growth regulators may be considered like IBA @3000ppm and IAA@2000ppm for this purpose.

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