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INFLUENCE OF IAA AND IBA ON ROOTING AND SHOOT FORMATION OF STEM CUTTINGS OF *RHINACANTHUS NASUTUS* (L). KURZ. - AN ENDANGERED MEDICINAL PLANT FROM INDIA.

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ABSTRACT

Stem cuttings of *Rhinacanthus nasutus* (L.) Kurz. are comfortable to root. Treatment with IAA (Indole-3-Acetic Acid and IBA (Indole-3-Butyric Acid) determined promotion of rooting and enlarged shoot development. The basal part of cuttings successful in rooting responded. Stem cuttings of *Rhinacanthus nasutus* were treated with various concentrations of IBA (100, 200, 300, 400 and 500 ppm). IBA treatments significantly improved rooting in stem cuttings. Among the cuttings IBA 300 ppm produced percentage of rooting (66.05), number of roots percutting (9.60) and length of roots (19.70 cm). Stem cuttings of *R. nasutus* were with different concentrations of IAA (100, 200, 300, 400 and 500 ppm). IAA treatments indicatively upgraded rooting in stem cuttings. Among the cuttings IAA 500 ppm caused percentage of rooting (60.10), number of roots percutting (10.12) and length of roots (10.15 cm). The most acceptable manner for vegetative propagation of *R. nasutus* would be cuttings soaked either in 300 ppm IBA solution or in 500 pm IAA solution.

KEYWORDS: Medicinal Plant, Stem cutting, *Rhinacanthus nasutus.* Indole -3-Acetic Acid, Indole-3-Butyric Acid.

INTRODUCTION

The genus *Rhinacanthus* comprises of about twenty five species confined to the tropics and subtropics. *Rhinacanthus nastus* (L.) Kurz. (Acanthaceae), known familiarly in English as Snake Jasmine, in Telugu Nagamalle, in Hindi Kabutar Kaphul and in Tamil as Nagamalli due to the appearance of its flowers and the traditional utilize of the root against snake venoms, is a medicinal plant found in India, China, Sri Lanka, Thailand, Taiwan, Madagascars and throughout South East Asia.[1] The origin of the plant is both from India and China.

Rhinacanthus nastus is an endangered medicinal plant. It is used as skin diseases, ringworm, aphorodisiac and snake bite.[2,3] This plant has been utilized in folk remedies to cure various diseases such as diabetes, hepatitis, eczema, pulmonary tuberculosis, hypertension and cancers.[1,4] The plant is extensively utilized in traditional medication to treat antitumour, liver diseases, hepatoprotective, peptic ulcer, scurvy, inflammation and obesity.[5] It is also used in treatment of some diseases like to treat liver disorders, cancer, helminthiasis obesity, inflammation and scurvy.[6] The natural multiplication through seed is demanding due to medicine men, herbalists and local people. Auxins, a class of plant growth substances are often called as phytohormones or plant hormones and performance and essential role in coordination of various growth are behavioral process in the plant life cycle.[7,8] Indole -3-Acetic Acid (IAA), Naphathalene Acetic Acid (NAA) and Indole-3-Butyric Acid (IBA) are typically the essential auxins which are usable commercially and can be applied with liquid (liquid formulation) or in talc (Powder formulation) for rooting and sprouting of stem cuttings.[9,10] Many auxins such as Indole Acetic Acid (IAA), Indole Butyric Acid (IBA), Naphthalene Acetic Acid (NAA) and 2,4-Dichlorophenoxy Acetic Acid (2, 4-D) have been reported to support rooting in cuttings of the most of the plant species. Each auxins concentration various from plant to plant and type of the cuttings used. IBA or NAA or combination of both is mostly recommended for rooting of cuttings. These are usable in liquid, talc, tablet and popularly sold as solvent based concentrates that may be diluted to the desired concentration for treating cuttings of particular plants.[11]

Larsen and Guse[12] and Kester *et al.*,[13] reported that the most trustworthy rooting hormone is Indole Butyric Acid (IBA) although other such as Naphathalene Acetic Acid (NAA) can also be utilized. However, short or no information was found on the response of *Rhinacanthus nastus* to applied growth hormones. This research therefore aims at evaluating

the result of application of growth hormones on sprouting and rooting behavior of *Rhinacanthus nastus*. The principal disadvantages of seed propagation is that it takes more time for germination whereas stem cuttings can be rooted early. The goal of vegetative propagation is to get the best planting stock with highest genetic quality material. The current investigation was therefore, undertaken to find out rooting potentialities of *Rhinacanthus nastus* (L.) Kurz. under partial shade with the help of IAA and IBA (rooting hormones).

MATERIAL AND METHODS

The study was carried out at Government Arts College (Autononous), Salem, Tamilnadu. The stem cuttings were collected from plants growing in Shevaroy Hills in the month of December 2016 when the plants were in vegetative growth phase. Each cuttings was 9-16cm long having 2-3 nodes.

The basal end (2cm) of cuttings was dipped in 100, 200, 300, 400 and 500 ppm of the IBA (Indole -3- Butyric Acid) solution and 100, 200, 300, 400 and 500 ppm of the IAA (Indole-3-Acetic Acid) solution for 3 hours. Ten cuttings were taken for each treatment was replicated 3 times. For control, the cuttings were dipped in distilled water only. The treated cuttings were planted in polythene bags containing river sand and red soil in 1:1 ratio under partial shade. After planting the cuttings were sprayed with water at 3 hours intervals during day time only till they rooted after which polythene bags were watered once daily. The observations were documented after two months of planting the cutting. The data on percentage of rooting, root number, root length and shoot length were recorded and tabulated.

RESULTS AND DISCUSSION

Results indicated a vast spectrum of efficacy of growth hormones on percent sprouted, percent of rooting, root number and root length of stem cuttings of *Rhinacanthus nasutus* (Tales 1-2). The determine of IBA and IAA on rooting of stem cuttings in *R. nasutus* growth hormones of different concentration of IBA 100, 200, 300, 400 and 500 and IAA 100, 200, 300, 400 and 500 ppm were used.

As propagation through seeds is rather complicated, cuttings have been showed for the application. The growth hormones IBA and IAA had deep root inducing capacity. The results on repond of plant growth hormones for rooting and root length were recorded 45 days after planting (Tales 1-2) (Fig. 1, 2). The cuttings of *R. nasutus* treated for IBA 300 ppm were proved significantly efficient for percent rooting while comparing with different growth

hormones concentrations. Highest number of leaves per cuttings was found for IBA 300 ppm in *R. nasutus* (Table.1). All the treatment of IBA and IAA showed the percentage of rooting in comparison to the control (Table 1). Among the IBA treatments highest rooting percentage was notable with 300 ppm (66.05) (Fig.5), which as followed by 400 ppm (58.07), 500 ppm (49.06), 200 ppm (41.61) and 100 ppm (34.72) (Fig.3).

The IAA treatments maximum rooting percentage was noted with 500 ppm (60.10) (Fig.6) which was followed by 400 ppm (54.15), 300 ppm (51.14), 200 ppm (40.11) and 100 ppm (30.06) (Fig.4). These treatments indicatively excellent effect than the control. The differential effects of many auxins on rooting of stem cuttings of various plant species have been ascribed to the chemical quality of auxin, the approach of treatment and the morpho-physiological condition of the cutting.[14-17]

All the treatment of IBA and IAA essentially increased the number of roots / cuttings as compared to sterile distilled water (Control). The highest number of roots per cutting was noted when cutting were treated with 500 ppm IBA (10.65) followed by 400 pm IAA (10.23). IBA treatment significantly enhanced the number of roots / cutting as compared to 100 ppm IAA (8.10), 200 ppm IAA (8.90), 300 ppm IAA (9.11) and 500 ppm IAA (10.12) respectively.

Root length established maximum (12.92 cm) with 500 ppm IBA followed by 400 ppm IBA (12.83cm), 300 ppm IBA (10.70cm), 200 ppm IBA (9.13 cm) and 100 ppm (8.92 cm) treatment respectively. Greatest survival (76.25%) was noticed when the cuttings were treated 400 ppm IBA against smallest survival (8.41%) in untreated cuttings. Highest survival (68.16%) was noted when the cutting were treated with 500 ppm IAA against least survival (8.41) in control cutting. The IBA and IAA treatments demonstrated significantly lengthy shoots than the control (3.5cm). The maximum shoot length in 500 ppm IBA and 400 ppm IAA treatment could be due to the upgrade causes of the treatments.

Use of vegetative stem cuttings for the propagation of plants have been found very effective mode in number of plants such as *Jatropha curcas, Jatropha gossypifolia, Embelia tsijeriam, Caesalpinia bonduc* and *Andrographis lineata*.[17-20] Yadav, et al.,[21] reported the vegetative propagation of *Adina cordifolia* through branch cuttings. Siva Subramanian and Narayanayyar[22] studied the rooting experiments on stem cuttings of *Evolvulus alsinoides*. Medicinal plants commonly develop in uncultivated in usual habitat, but scientific method

would be serviceable to extend their biomass provide as well as ryinacanthin contents. It is noteworthy that *R. nasutus* has got numerous uses. Due to over exploitation this plant its disappearing from original habitat hence its vegetative cultivation on commercial scale is recommended. The current research laid a influential establishment for the conservation of this extremely importance medicinal plant which are utilized world wide.

Table 1: Effects IBA and rooting of stem cuttings of *Rhinacanthus nasutus* (L.) Kurz.

Hormonal Treatment	Concentration of Auxins (ppm)	Survival (%)	Percent of Rooting	Root number	Root Length (cm)
Control	-	8.41	15.07 ±0.17	1.95 ± 0.15	2.75 ± 0.55
IBA	100 ppm	40.36	34.72 ± 0.14	7.50 ± 1.00	8.92 ± 0.26
IBA	200 ppm	48.24	41.61 ± 0.21	8.13 ± 0.13	91.13 ± 0.72
IBA	300 ppm	57.20	66.05 ± 0.27	9.60 ± 0.83	19.70 ± 0.20
IBA	400 ppm	76.27	58.07 ± 0.06	10.30 ± 0.67	12.83 ± 0.43
IBA	500 ppm	64.35	49.06 ± 44	10.65 ± 0.11	12.92 ± 0.64

ppm = Concentration in parts per millions, Data represents in mean ± standard error two independent, each with 10 cuttings per treatment.

Table 2: Effects IAA and rooting of stem cuttings of *Rhinacanthus nasutus* (L.) Kurz.

Hormonal Treatment	Concentration of Auxins (ppm)	Survival (%)	Percent of Rooting	Root number	Root Length (cm)
Control	-	8.41	15.07 ±0.17	1.95 ± 0.15	2.75 ± 0.55
IAA	100 ppm	36.17	30.06± 0.18	8.10 ± 0.13	7.31± 0.13
IAA	200 ppm	41.15	38.11 ± 0.06	8.90 ± 0.15	8.10 ± 0.38
IAA	300 ppm	58.20	57.14 ± 0.19	9.11 ± 0.02	8.61 ± 0.41
IAA	400 ppm	63.15	54.15± 0.20	10.23± 0.60	9.33± 0.16
IAA	500 ppm	68.16	60.10± 65	10.12± 0.71	10.15± 0.55

ppm = Concentration in parts per millions, Data represents in mean ± standard error two independent, each with 10 cuttings per treatment.

Fig 1: Mass multiplication of *Rhinacanthus nasutus* with IBA Treatments.

Fig 2: Mass multiplication of *Rhinacanthus nasutus* with IAA Treatments.

Fig 3: Rooting of *Rhinacanthus nasutus* with 300 ppm IBA Treatments.

Fig 4: Rooting of *Rhinacanthus nasutus* with 500 ppm IAA Treatments.

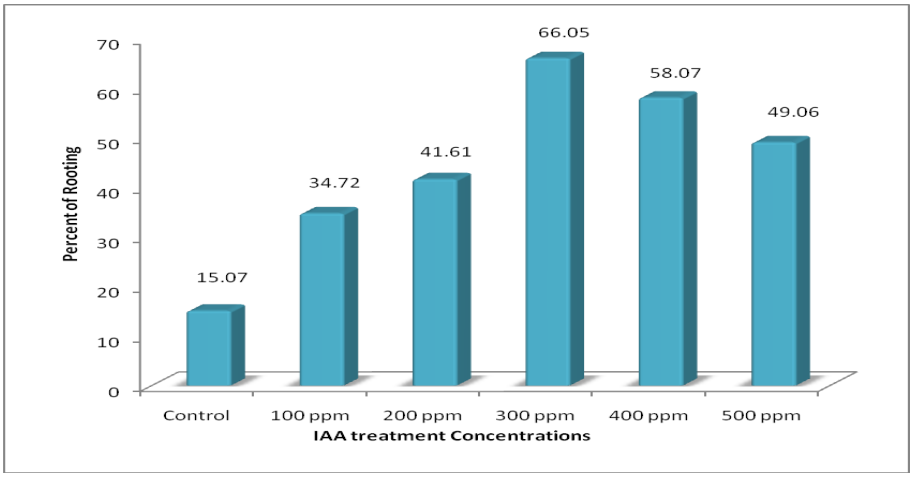

Fig – 5: Effects IBA and rooting of stem cuttings of *Rhinacanthus nasutus* (L.) Kurz.

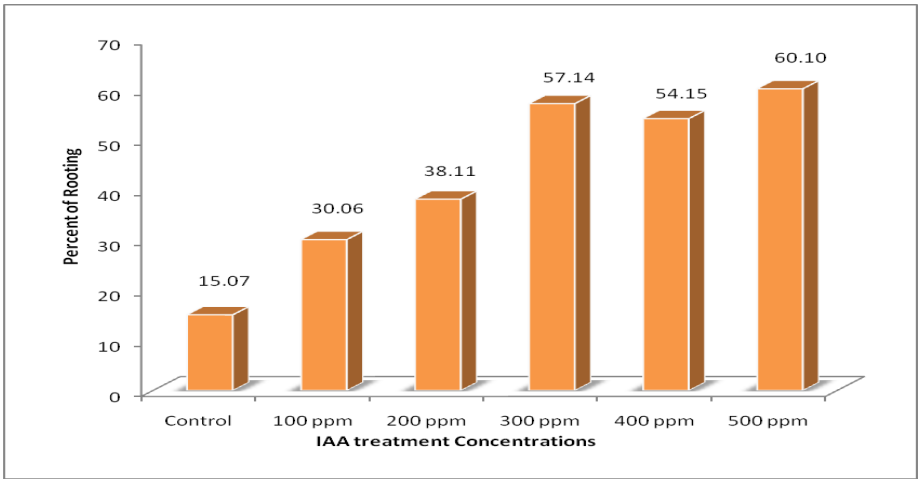

Fig 6: Effects IAA and rooting of stem cuttings of *Rhinacanthus nasutus* (L.) Kurz.

CONCLUSION

In the present study, the growing behaviour was evaluated for stem cuttings of medicinally important shrub species *Rhinacanthus nasutus*. (L.) Kurz. which is usually used for several

medicinal purposes. Due to over exploitation this species is disappearing from original habitat hence is propagation on commercial scale is recommended. *In vivo* experiment was conducted on the effect of stem cutting length (two and three nodes), cutting diameter (thickness - 0.71 cm and thinness 0.50 cm) and pre-treatment of exogenous hormones in powder formation Indole - 3- Acetic Acid and Indole - 3 Butyric Acid) on percent cutting sprouted, node sprouted and survival. Stem cutting of *Rhinacanthus nasutus* are convenient to root treatment with IBA and IAA improved rooting increased shoot growth shade under intermittent misting. IBA and IAA treated cuttings performed better in all growths parameters compared to control. The highest percentage of rooting was noticed in IBA 300 ppm (66.05%). The maximum root length was recorded in IBA 500 ppm (12.92 cm). The roots were rich and branched in quality. The percentage of rooting and root distance upgraded by using plant growth regulators, either individually or together. The present investigation concludes that vegetative cultivation of these an endangered medicinal plant is feasible through use of exogenous hormone stem cuttings.

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