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Efficacy of naphthalene acetic acid on root promotion on vegetative propagation of *Tecoma stans* under mist chamber of semi-arid tropic region

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Abstract
The experiment was conducted at Institute of Agriculture, Tamil Nadu Agricultural University, Kumulur, Tiruchirappalli district of Tamilnadu, India. The experiment was laid out in Completely Randomized Block Design (FCRD) with 2 replications, including seven treatments of various concentration of NAA solutions *viz*., 500 ppm, 1000 ppm, 1500 ppm, 2000 ppm, 2500 ppm, 3000 ppm and control (without any treatment). Semi-hardwood cuttings of *Tecoma stans* were treated in quick dip method for 30 seconds and planted under mist chamber for rooting. Minimum days of sprouting (9.90 days), higher rooting percentage (80.90 %) and maximum root length (16.75 cm) were recorded in 3000 ppm concentration of NAA. We conclude from this experiment that quick dipping for 30 seconds with 3000 ppm of NAA will promote earlier rooting, maximum rooting percentage and improved root growth in propagation through rooting of *Tecoma stans* semi hardwood cuttings under mist chamber conditions of semi-arid tropical region.

Keywords: *Tecoma stans,* NAA, rooting hormone, quick dip method, semi-hardwood

Introduction
The yellow trumpet bush (*Tecoma stans*) is a small tree or large shrub belongs to Bignoniaceae family, has funnel-shaped, bright yellow, fragrant flowers with glossy green, pinnate leaves. It is native to the tropical and subtropical regions of Central and South America (Bailey and Bailey, 1976) [1]. This species have its ornamental value due to its golden yellow flowers in a raceme arrangement. It is very good ornamental perennial to make use for landscape gardening. In order to commercialize this species for landscaping, large scale multiplication is required but there are fewer studies taken up so far on the propagation aspects. The difficulty existed in sexual reproduction of *T. stans* is due to heterozygosity of seedlings, left the vegetative propagation as the only way for its true-to-type multiplication. Among the vegetative propagation methods, stem cutting is the easiest and cost effective method of multiplication mainly for ornamental shrubs. The rooting ability and success percentage of cuttings depends on many factors such as variety, season, location, age of the mother plant, part of the plants used, nutrient status of the cutting, climatic conditions, aftercare etc. As well, plant growth regulators also play an important role in formation of roots and shoot growth in cuttings. Root commencement with the exogenous application of plant growth regulators occupies a significant role in the field of plant propagation (Mukherjee *et al.*, 1976) [6].
Cuttings treated with plant growth regulators at optimum concentration will induce more rooting compared to untreated one, sometimes in the species which will not root easily under normal conditions. Action of growth regulator is based on the concentration of hormone applied which differs with type of species and cuttings etc. Auxin is well known to improve rooting of different types of cuttings. The development of root primordium cells depends on the endogenous Auxins in the cutting and synergic composite such as a diphenol. These substances lead to the synthesis of ribonucleic acid (RNA), which act upon root primordium initiation (Hartmann *et al.,* 2002) [4]. Exogenous Auxins are commonly used to improve rooting efficiency and quality of stem-cuttings. Treatment of cuttings with rooting hormones has been reported to improve rooting in many woody and semi woody species. Hence, the present study has been taken up to understand the method of propagation through stem cutting of *Tecoma stans* along with the treatment of plant growth regulator at semi-arid tropical zone of Tamilnadu.

Materials and methods
The experiment was conducted at Institute of Agriculture, Tamil Nadu Agricultural University, Kumulur, Tiruchirappalli district of Tamilnadu, India.

The experiment was laid out in Completely Randomized Block Design (FCRD) with 2 replications, including seven treatments of various concentration of Naphthalene Acetic Acid (NAA) solutions viz., 500 ppm, 1000 ppm, 1500 ppm, 2000 ppm, 2500 ppm, 3000 ppm and control (without any treatment). Semi-hardwood stem cuttings of pencil thickness were collected from healthy mother plants available in the institute. Semi-hardwood cuttings of 20 cm length with minimum 3-4 nodes without leaves were taken. A slant cut was given at the basal end and a transverse cut at the top of each cutting. The basal end (2.5- 3.0 cm) of the cuttings was dipped for 30 seconds with NAA solutions. Then, the treated cuttings were planted vertically in sterilized inert sand media under mist chamber condition to promote rooting. All cuttings were maintained under mist chamber and watered regularly. Relative humidity in the mist chamber was maintained at ≥ 85 % and temperature at 30 ± 2^0C. Further observations were recorded at 45 days after planting (DAP) on various shoot and root parameters such as days taken for sprouting, rooting percentage (%), number of buds sprouted, root length (cm), shoot length (cm) and number of leaves formed on cuttings. The inference was drawn after comparing the calculated F values with the tabulated F values at 5 % (P= 0.05) level of significance. The estimates of mean, variance and standard error were done as per Panse and Sukhatme (1967) [7].

Result and Discussion

In this study, the result shows (table 1) significance on the parameters such as days for sprouting, rooting percentage and root length. But it not showed any significant effect on number of buds per cutting, shoot length, number of leaves per cutting, though it shows variations. Cuttings of *T. stans* had minimum days of sprouting (9.90 days) at the NAA concentration of 3000 ppm. All the treatment are significant from control (without NAA) in days for sprouting but on par with each other. Rooting percentage of the cuttings also shows higher in 3000 ppm concentration (80.90 %). But it is on par with other concentrations such as 2500 ppm (78.60 %), 2000 ppm (71.60%), 1500 (68.50%) and 1000 (65.30%). This observation clearly denotes that, NAA treatment encourages quick sprouting and maximum rooting percentage of cuttings irrespective of concentrations. Also it is clear that effect of root promotion through quick dipping of rooting hormone is directly proportionate to the concentration of rooting hormone treated. Our findings are in line with experimental reports of Hussain and Urbi (2016) [5] on adventitious rooting in shoot cuttings of *Andrographis paniculata.* They stated that higher concentration of NAA resulted in an increased number of adventitious rooting per cutting. Similar reports were given by Raji and Osman (2012) [9] and Dash *et al*., (2011) [2] as that the higher dosages of auxins induced increased number of roots within a short time.

Maximum root length (16.75 cm) was recorded in 3000 ppm concentration, followed by 2500 ppm (15.90 cm) and 2000 ppm (13.57 cm) which are on par with each other. Shenoy, 1992[11] in *Rosa damascena* reported that the increase in root length over control may be due to the enhanced hydrolysis of carbohydrates, metabolites accumulation and cell division induced by Auxin. These results were in line with the findings of Patil *et al*., 1998 [8] in *Jasminum sambac* (Jasmine), Singh *et al.,* 2010 [13] in *Bougainvillea glabra* (bougainvillea), Grewal *et al*., 2005 [3] in *Dendranthema grandiflora* cv. Snowball, Singh *et al.,* 2013 [12] in *Cestrum nocturnum* (night jasmine) and Sharma, 2014 [10] in *Tagetes erecta* (marigold).

On observing number of buds sprouted per cutting, shoot length, number of leaves per cutting there is no significant difference was observed. By this experiment, pertaining to the effect of NAA on rooting of T*ecoma stans* semi-hardwood stem cuttings, we can observe that the rooting hormone NAA have the capacity to promote more rooting which results in quick sprouting and maximum rooting percentage; also stimulate the growth of root which is observed under inert media condition (sand). The effect of rooting hormone on shoot promotion and leaf growth has no significant differences among the various concentrations and control. Since we are using sand, an inert rooting media, have no interaction effect on the function of NAA on cuttings and the rooting process of cutting except that the more spaces between the sand particles allows the root to grow in fast.

Conclusion

We conclude from this experiment that quick dipping for 30 seconds with 3000 ppm of NAA will promote earlier rooting, maximum rooting percentage and improved root growth in propagation through rooting of *Tecoma stans* semi hardwood cuttings under mist chamber conditions of semi-arid tropical region. Further studies may be promoted by increasing the concentration of rooting hormone to standardise the maximum dosage of NAA promotes maximum rooting.

Table 1: Effect of different concentrations of NAA on rooting of *Tecoma stans*

Concentrations	Days for sprouting	Rooting percentage (%)	Number of buds per cutting	Root length (cm)	Shoot length (cm)	No. of leaves per cutting
500 ppm	12.40	60.70	2.30	10.10	8.97	6.90
1000 ppm	12.30	65.30	2.40	11.70	9.50	7.20
1500 ppm	11.57	68.50	2.60	12.67	10.10	7.80
2000 ppm	11.55	71.60	2.90	13.57	10.05	7.80
2500 ppm	10.10	78.60	3.10	15.90	10.25	8.49
3000 ppm	9.90	80.90	3.45	16.75	10.71	8.70
Control	15.50	35.60	2.10	6.60	7.50	6.30
Mean	11.90	65.89	2.69	12.47	9.58	7.60
SE.d	1.70	9.53	0.39	1.82	1.36	1.08
CD	3.65	20.43	0.83 (NS)	3.91	2.92 (NS)	2.32 (NS)

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