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EFFECT OF CERTAIN PHYTOHORMONES ON SEED GERMINATION AND SEEDLING GROWTH OF *TECOMA STANS* (L.) H.B.K.

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ABSTRACT

Tecoma stans, popularly known as yellow elder, yellowbells is the member of the family Bignoniaceae. The plant is a shrub or a small tree upto six meter tall. Seeds of *T. stans* are flat oblong with transparent wings on each end. Fresh seeds germinate readily in sandy soil in the spring. In the present investigation, various plant growth regulators *viz.*, IAA, IBA, NAA and GA_3 have been used to study their effect on seed germination and seedling growth. Various concentrations (10, 50, 100, 500 and 1000 ppm) of PGRs have been taken along with control. Maximum seed germination was recorded at 10 and 50 ppm of IAA whereas least germination was recorded at 100 ppm of IBA. Radicle length was observed maximum at 10 ppm of IAA. Hypocotyle length was observed maximum at 100 ppm of GA_3 (4.72 cm) and minimum at 50 ppm of NAA (1.56 cm). Overall, the result was observed nil at 500 and 1000-ppm concentrations of all PGRs for all the 3 parameters.

Key words: *Tecoma stans*, *growth regulators, seed dormancy and seed germination.*

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INTRODUCTION

Tecoma stans popularly known as yellow elder, yellowbells is a member of the family bignoniaceae. The plant is a shrub or a small tree upto six meter tall. It is a native of Southern Florida to West Indies and South America. It is usually cultivated in warmer regions all over the globe but is also found as an escape in the wild condition. Medically, decoction of *T. stans* is used against scorpion sting.

The seeds are produced in large number but only very few germinate. There are many factors which are responsible for the poor seed germination *viz.* high temperature, lack of water in habitat and low viability of seeds, etc. The present investigation was undertaken in view of its poor seed germination and to enhance it. For the same purpose plant growth regulators were tried to enhance seed germination.

MATERIALS AND METHODS

Seeds of *T. stans* were collected from different sites located in Jaipur and adjoining area. Seeds are flat oblong (0.6 cm) with transparent wings. After preliminary selection for uniformity (the criteria being the size and colour of seeds) they were surface-sterilized with 0.1% $HgCl_2$ for two minutes and thereafter repeatedly washed with distilled water (Mishra, 1998). The seeds were soaked for 24 h in PGRs (IAA, IBA, GA_3 and NAA) solutions of various concentrations (10, 50, 100, 500 and 1000ppm). The seeds soaked in distilled water for 24 h were taken as control. Treated seeds were washed thoroughly with distilled water and kept in Petri plates over wet filter paper for germination. Three replicates of 10 seeds

each were used for each concentration of plant growth regulator. The experiment was conducted under laboratory conditions. The seeds were irrigated frequently with distilled water. Final observations were made on 12th day of experiment. The parameters selected for observation include the number of seeds germinated and seedling growth *viz*. radicle and hypocotyle length. The average values of three replicates were taken for each parameter. The data was subjected to relevant statistical analysis (Bishop, 1996).

RESULTS AND DISUSSION

All data on seed germination percentage, radicle and hypocotyle length of seedlings are recorded in Tables 1-3 and Figures 1-3.

Effect on seed germination: Among various growth regulators, maximum germination (86.66%) was recorded at 10 and 50 ppm of IAA, followed by 80% in IBA at 10ppm. Least germination percentage was recorded at 100 ppm of IBA. At 500 and 1000 ppm of all the growth regulators that is no seed germination was recorded. Statistically, the results were highly significant among concentrations but were not significant for control versus treatment, among chemicals and among replicates (Table 1 and Figure 1).

Effect on radicle length: IAA showed positive results for radicle length at 10ppm, which was 2.19 cm more than the control (3.94). In IBA, however with the increase in concentrations the length of radicle decreased. Minimum length was recorded at 100 ppm of IBA (2.61cm). Statistically, highly significant results were observed for control versus treatments, among concentrations, among chemicals. However it was not significant for replicates (Table 2 and Figure 2).

Effect on hypocotyle length: Hypocotyle length was recorded maximum at 100ppm of GA_3 (4.72 cm). Treatment with NAA showed least growth among all the growth regulators used and this further decreased as the concentration increased at 50 ppm, where the least length was recorded (1.56 cm). Statistical analysis for hypocotyle length showed that the results were not significant for control versus treatment and among replicates but were highly significant among concentration and among chemicals (Table 3 and Figure 3).

A number of growth regulators have been reported for breaking dormancy of seeds, enhancing permeability and hastening germination. It is revealed that these PGRs have significant effect on seed

Table 1. Effect of plant growth regulators on seed germination percentage of *Tecoma stans* (Value represent mean of three replicates)

Chemical/Conc.	Control	10 ppm	50 ppm	100 ppm	500 ppm	1000 ppm
IAA	36.66	86.66	86.66	76.66	-	-
IBA	36.66	80	73.33	40	-	-
GA3	36.66	70	60	66.60	-	-
NAA	36.66	66.66	63.33	73.33	-	-

Source of Variation	D.F.	S.S.	M.S.S.	Variance ratio 'F'
Replication	2	0.75	0.375	0.197NS
Control VS Traetment	1	3.021	3.021	1.589NS
Among Concentrations	5	722.486	144.491	76.007***
Among Chemicals	3	10.486	3.495	1.838NS
Interaction	2	34.929	17.464	9.186**
Error	58	110.274	1.901	-

D.F.=Degree of freedom, S.S.= Sum of Squares, M.S.S=Mean sum of squares, *= Signifcant, **= Highly significant, ***= Very highly significant, NS= Not significant

Table 2. Effect of plant growth regulators on radicle length (cm) of *Tecoma stans* (Value represent mean of three replicates)

Chemical/Conc.	Control	10 ppm	50 ppm	100 ppm	500 ppm	1000 ppm
IAA	2.41	6.13	4.67	5.18	-	-
IBA	2.41	4.57	2.97	2.61	-	-
GA3	2.41	4.84	4.50	5.48	-	-
NAA	2.41	3.20	0.88	0.94	-	-

Source of Variation	D.F.	S.S.	M.S.S.	Variance ratio 'F'
Replication	2	0.6805	0.3402	0.133NS
Control VS Traetment	1	94.426	94.426	37.17***
Among Concentrations	5	134.556	26.911	10.594***
Among Chemicals	3	-52.172	-17.391	6.982**
Interaction	2	88.447	44.223	17.410***
Error	58	2.540	2.540	-

D.F.=Degree of freedom, S.S.= Sum of Squares, M.S.S=Mean sum of squares, *= Signifcant, **= Highly significant, ***= Very highly significant, NS= Not significant

Table 3. Effect of plant growth regulators on hypocotyl length (cm) of *Tecoma stans* (Value represent mean of three replicates)

Chemical/Conc.	Control	10 ppm	50 ppm	100 ppm	500 ppm	1000 ppm
IAA	2.24	4.25	3.75	4.33	-	-
IBA	2.24	3.64	3.4	3.38	-	-
GA3	2.24	3.96	3.88	4.72	-	-
NAA	2.24	3.65	1.56	1.89	-	-

Source of Variation	D.F.	S.S.	M.S.S.	Variance ratio 'F'
Replication	2	0.306	0.153	1.085NS
Control VS Traetment	1	0.150	0.150	0.95NS
Among Concentrations	5	183.595	36.71	260.35***
Among Chemicals	3	8.874	2.958	20.978***
Interaction	2	21.979	10.989	77.936***
Error	58	8.178	0.141	-

D.F.=Degree of freedom, S.S.= Sum of Squares, M.S.S=Mean sum of squares, *= Signifcant, **= Highly significant, ***= Very highly significant, NS= Not significant.

physiology and enhance seed germination. There are conflicting reports about the diverse effect of various growth regulators on seed germination. It has been reported that, the higher concentration of IAA and GA_3 had significant effect on seed germination of *Asparagus sprengeri* Regelin in dark condition (Dhoran and Gudadhe, 2013). The higher concentration of IAA showed very least elongation of plumule, whereas GA_3 showed highest germination percentage as well as highest radicle and plumule length in black gram and horse gram reported (Chauhan and Tomar, 2009). IBA showed maximum length of shoot and root of

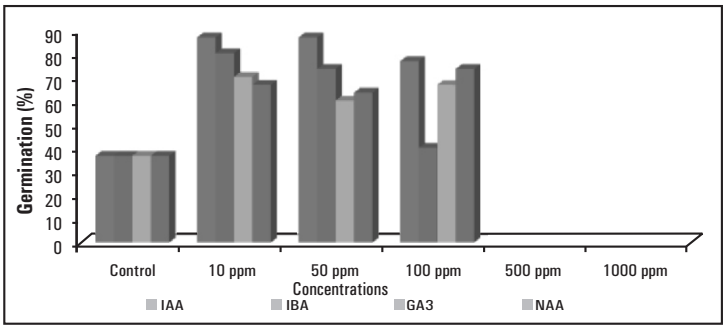

Figure 1. Effect of plant growth regulators on seed germination percentage of *Tecoma stans*

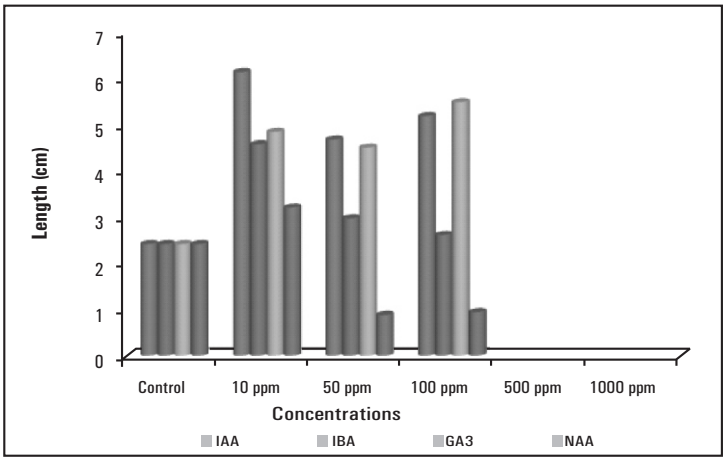

Figure 2. Effect of plant growth regulators on radicle length (cm) of *Tecoma stans*

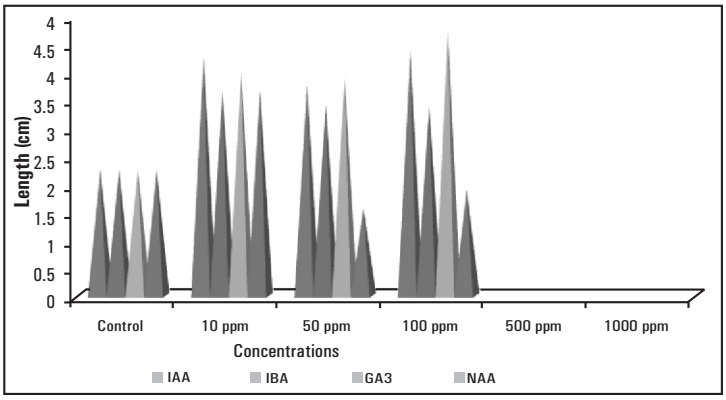

Figure 3. Effect of plant growth regulators on hypocotyl length (cm) of *Tecoma stans*

Asparagus racemosus (Vijay and Kumar, 2004). Jindal & Bhansali (1997) experimented on BAP, IAA, kinetin, GA_3 and systemic fungicide Bavistin and extracts of abnormal plant growth on *Zizyphus* and *Prosopis.* Rami and Patel (2014) carried out the experiment to study the influence of different growth regulators on seed germination, shoot length, root length, fresh and dry weight and vigour index of *Oroxylum indicum and found that GA_3 at 50 ppm had a significant effect on germination*. Jain *et al*. (2006) observed that in *Tecomella undulata* GA_3 increased seed germination upto 93.3% at 10 ppm. Patil and Gaikwad (2011) also observed that GA_3, SA and 6-BA were effective in breaking dormancy at 100 ppm in *Simarouba glauca*. Gathe and Sathe (1998) carried out studies on germplasm of seven species by treating seeds with 100 ppm of GA_3 and found that it is significant only for one species namely, *Sterospermum chelonoides.* Christian (2013) studied the effect of gibberellic acid (GA_3) and kinetin (KIN) on the germination and dormancy on the stored seeds of medicinal plant, *Withania somnifera* (Var. WS 20) and found that gibberellic acid with 10^{-5} M and kinetin 10^{-7} M were better for seed germination. The effect of physico-chemical treatments, storage, temperature, photoperiod and growth regulators (GA_3, IAA, IBA, 2,4-D and BA) on seed germination in *Withania sominifera* was observed by Punit *et al*., (2013). The most effective treatment was GA_3 at 150 µg/ml. Saritha and Sreeramulu (2013) concluded that the lower concentrations of GA_3 were more effective on seed germination of *Celosia argentea* L. Kumar *et al*., (2013) while working on seeds of *Calligonum polygonoides* L. observed that higher concentrations of growth regulators *viz.* BAP, GA_3 and kinetin showed promoted effect on seed germination.

Sankhla and Sankhla (1972) while studying seed germination in lettuce seeds found that NAA and IAA retard germination in concentrations higher than 10ppm. In the present investigation also, higher concentrations of NAA and IAA reduced seed germination and seedling growth.

Mozumder and Hossain (2013) observed enhanced seed germination with growth regulators (GA_3 500ppm + kinetin 50ppm). The most drastic effect of NAA and 2,4-D in *Tecomella undulata* was observed by Jain *et al*., (2006). They observed that higher concentrations (100ppm to 1000ppm) of both NAA and 2,4-D showed extremely poor results for germination, growth of radicle and hypocotyle.

CONCLUSION

In the present study the best results were obtained at lower concentrations of generally all plant growth regulators. It is interesting to note that the response of *Tecoma stans* at 500 and 1000 ppm concentrations of all the growth regulators was too inhibitory that not a single seed showed germination.

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