



Short Communication

Impact of GA₃ Seed Pre-Treatment on Seedling growth in *Delonix Regia*

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Abstract

An experiment was conducted during the year 2015-16 at the nursery of Biotechnology- cum-Tissue Culture Centre, OUAT, Bhubaneswar, Odisha, India, to study the impact of physical treatments of seeds with GA₃ (i.e. Control, 700, 710, 720, 730, 740, 750, 760, 770,780,790 and 800 ppm concentration) on seedling growth in *Delonix regia*. Seeds physically treated with of GA₃ at 790 ppm significantly enhanced the plant height (41.66cm), number of bipinnate leaves (8.33), maximum root length (28.66 cm), seedling fresh biomass (6.59 g) and dry biomass (2.55g) at 45 Days after sowing (DAS). Hence, it may be concluded that seeds pre- treated with GA₃ at 790 ppm play an important role for obtaining better quality seedlings of *Delonix regia*.

Keywords: *Delonix regia*, GA₃, seedling.

Introduction

The seed of leguminous tree have the germination problem, while success of the tree can be rated from the establishment and stand depends much on seed germination. Seed of many tree species of Fabaceae family has hard seed coat¹ and hard endosperm². Germination of very few tropical tree species information is available on breaking the seed dormancy³. Pretreatments in a wide sense are the treatment that seeds have to undergo in preparation of sowing⁴. Physiological dormancy generally related to Absciscic acid and Gibberellins as well as other hormones metabolisms inside. Gulhmohar (*Delonix regia*) is a species of flowering trees in the family fabaceae. It was known for its form like leaves and flamboyant display of flower. *Delonox regia* is a native of Madagascar.

The tree was been widely planted for the last 150 years or more as a landscape tree in the garden. *D.regia* is a tall tree reaching a height of more than 15 m and girth of 2 m under favorable condition^{5,6}. The tree is almost evergreen, with broad spreading, open umbrella shaped crown⁷.

The leaves are bipinnet and feathery, up to 60 cm long, petiole stout⁸. Besides this it has many uses as medicine, food resources due to high protein content⁹.The leaf and bark is used by local people in form of paste to reduce pain¹⁰ and flowers have been used as for gynecological disorder¹¹.The high exploitation is generally not counter balanced by propagation efforts, hence that decreased the *Delonix regia* population. Hence the present study was under taken to find out the proper concentration of GA₃ for the seed pre treatment and its effects on seedling growth of *D.regia*.

Methodology

The field experiment was conducted at the nursery of Biotechnology-cum-Tissue Culture Centre, OUAT, Bhubaneswar, Odisha, India during the year 2015-16 in CRD design with three replications. Seeds were collected from candidate plus trees identified in Bhubaneswar during the month of July 2015. The nursery area is located at 20°15' North latitude 85°52' East longitudes and at altitude of 25.9 meters above mean sea level. It experiences typical tropical weather conditions, and succumbs to the heat and cold waves that sweep in from north India. The summer months from March to May are hot and humid, and temperatures often shoot past 45° C in May. The south west monsoon lashes Odisha and in June, July and August receive, the maximum rainfall, which may average over 220 mm a month. Pleasant weather conditions prevail during November in Bhubaneswar, but December and January face the chilly winds from the North and North-east at average speeds of 7 miles/hour. Temperatures drop to approximately 15° C during these months.

The seeds were subjected to pre- sowing treatment with GA₃ of different concentration separately each for 24 hours, Viz: 700, 710, 730, 740, 750, 760, 770,780,790, 800 ppm and a control. The pre treated seeds were sown in nursery in poly pots containing planting mixture of soil, sand and FYM of ratio 2:1:1; seed were sown at the rate of 10 seeds per replication. Seeds were monitored for 45 days of sowing to record plant height (30 DAS/45 DAS), number of bipinnate leaves (30 DAS/45 DAS), root length, fresh biomass, dry biomass and survival percentage were calculated on observations basing on the number of seedling survived. Randomly five seedlings from each replication were marked for observation.

The data generated were analyzed using SAS 7.0. The data were subject to ANOVA and the treatment means were compared¹².

Results and Discussion

The results on the *in vivo* seedling growth obtained during the experiment, was carried out to visualize a significant influence of different concentration of GA₃ on seedling growth of *Delonix regia*. The increase in the concentration of GA₃ increased the growth of the seedling and then there was a steady decline. Analysis of variance revealed significant difference in seedling height, number of bipinnate leaves, root length, fresh biomass, dry biomass and survival percentage over time (P=0.05). The growth attributes and biomass were influenced by the different concentration of GA₃. At 30 DAS highest plant height (37.33cm), Number of bipinnate leaves (7.66) were recorded in T₁₁ (790 ppm). The lowest plant height (13.66cm) and number of bipinnate leaves (4.33) were recorded at T₁ (Control). In case of 45 DAS highest plant height (41.66cm) and number of bipinnate leaves (8.33) were recorded in the similar treatment as in 30 DAS in T₁₁. Lowest plant height (15.00 cm) and number of bipinnate leaves (5.00) were recorded in control. The superiority in growth parameters may be due to the GA₃, the possible reason for the increase in growth parameters was due to the

physiological effect of gibberellins on growth parameters of plant cells e.g., Cell elongation and cell division¹³. All GA₃ treatments were effective for increasing in growth of seedling when compared with the control. This may be due to activated amylase which digested the available carbohydrate into simpler sugar, so that energy and nutrition were easily available to faster growing seedling. Increase in plant growth due to GA₃ treatment¹⁴. Survival percentage of seedling was significantly highest (76.67) in T₁₁ and lowest (20.00) in T₁. This result corroborated with the findings of Ashraf *et. al.*¹⁵. Highest root length (28.66cm) were recorded in T₁₁ and lowest (9.33cm) were recorded in T₁. Here increase in length of root was recorded in the similar treatment to which has boosted the growth of the seedling above ground level, it might have given the same effect for the below ground i.e. in the root. With regards to fresh biomass significantly highest (6.59 g) was recorded in T₁₁ and lowest (1.61g) in control. In case of dry biomass highest (2.55g) were recorded in T₁₁ and lowest (0.44g) in control. Plant growth regulators in overcoming the harmful effect on growth may be due to the change in endogenous growth regulators¹⁶. It has been confirmed that seed pre treatment with GA₃ promotes the growth¹⁷.

Table-1
Effect of GA₃ Seed pre-treatment on seedling growth of *Delonix regia*

Treatments	Parameters							
	Plant Height @ 30 DAS (cm)	Number of Bipinnate leaves @ 30 DAS	Plant Height @ 45 DAS (cm)	Number of Bipinnate leaves @ 45 DAS	Survival percentage @ 45 DAS	Root Length @ 45 DAS (cm)	Fresh Biomass (g)	Dry Biomass (g)
T ₁ (Control)	13.66	4.33	15.00	5.00	20.00	9.33	1.61	0.44
T ₂ (700 ppm)	17.00	5.33	19.66	6.33	33.33	15.66	2.66	0.78
T ₃ (710 ppm)	21.00	6.33	24.33	6.66	40.00	17.33	3.04	0.95
T ₄ (720 ppm)	28.33	6.33	32.00	6.66	46.67	19.00	3.15	1.02
T ₅ (730 ppm)	32.00	6.66	36.00	7.66	50.00	20.66	3.16	1.09
T ₆ (740 ppm)	32.66	6.66	36.66	7.66	53.33	22.66	3.64	1.47
T ₇ (750 ppm)	34.66	6.66	36.66	7.66	53.33	23.33	3.72	1.28
T ₈ (760 ppm)	35.33	6.66	37.66	7.66	53.33	23.66	3.78	1.25
T ₉ (770 ppm)	35.33	6.66	38.33	7.66	53.33	24.33	3.96	1.25
T ₁₀ (780 ppm)	35.33	7.33	39.33	8.00	60.00	25.00	5.86	1.65
T ₁₁ (790 ppm)	37.33	7.66	41.66	8.33	76.67	28.66	6.59	2.55
T ₁₂ (800 ppm)	26.66	4.66	30.66	6.33	46.67	15.00	2.45	0.78
C. D. at 5%	4.59	0.64	4.81	1.13	8.02	1.82	0.62	0.50

Conclusion

In conclusion, the results indicated the significant effect of GA₃ on the seedling growth of *Delonix regia*. Therefore 790 ppm GA₃ seed pre-treatment is recommended to obtain better growth and survival rate of this threatened tree species.

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