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EFFECT OF PRE-SOWING TREATMENTS ON SEED GERMINATION OF *HOLOPTELEA INTEGRIFOLIA* (ROXB.) PLANCH.

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ABSTRACT

Holoptelea integrifolia (Roxb) Planch. is a multipurpose medicinal plant from the Ulmaceae family, commonly known as Indian elm. In this experiment seeds were treated with ten different levels (100ppm – 1000ppm) of GA_3 concentration. The treatment GA_3 500ppm has remarkable effect on germination of seeds. The 95.56 percent seeds were germinated in GA_3 500 ppm treatment. Other GA_3 treatments like 700ppm, 600ppm, 300ppm and 200ppm are responsible for more than 90 % germination of seeds.The results revealed that there is negative correlation by increasing of GA_3 concentration. We suggest that GA_3 -500ppm treatment for mass production of *Holoptelea integrifolia* (Roxb) Planch. seedlings in nurseries for avenue plantation and trees outside forest purposes.

Key words : GA_3 treatments, Germination percentage and *Holoptelea integrifolia*.

Introduction

Holoptelea integrifolia (Roxb) Planch. is a multipurpose medicinal plant from the Ulmaceae family, commonly known as Indian elm. The plant, a huge deciduous tree, can reach a height of 25 metres. White to whitish-grey bark and 6 to 8 mm thick, smooth bark with pubescent branchlets. Simple, alternating, stipulate, ovate or elliptic-ovate and acuminate are the characteristics of the leaves. When the bark is peeled or the leaves are crushed, an unpleasant smell is released. Small, greenish-purple, polygamous flowers are found in axillary fascicles or short racemes. Eight stamens are seen in male flowers, while five stamens are found in bisexual blooms. Superior, unilocular, compressedand stalked describe the ovary. A bifid stigma is seen on a fairly short (2.5–4mm long) style. Fruits are single-seeded samaras that are light brown, winged and stalked, obliquely elliptic orbicular, 2.5-3.5 cm long and 1.5–2.5 cm wide. February through March are when you can see flowers and fruit. Small, pale and kidney-shaped are the seeds.

The Pacific Islands were the origin of the plant species (Singh, 2012). It is found throughout the northern hemisphere's tropical and temperate regions. Asia's tropical regions, including India, Nepal, Sri Lanka, Indo-China, Cambodia, Laos, Myanmar, Vietnam, Burma and China are home to the plant (Bambhole and Jiddewar, 1985). It can be found in India in the outer Himalayan region from Jammu eastward to a height of 2000 feet, spreading through Assam and Burma, and in the southerly direction from Bengal to Central, Western and South India to the arid region of Ceylon.

Holoptelea integrifolia (Roxb) Planch is traditionally used for the treatment of gastritis, dyspepsia, colic, intestinal worms, vomiting, leprosy, hemorrhoids, dysmenorrhoea and rheumatism (Warrier *et al.*, 1995). Bark and leaves are bitter, astringent, thermogenic, digestive, carminative, laxative, depurative, repulsive and urinary astringent (Prajapati *et al.*, 2003). Ethnomedicinally, the leaves and stem bark of *H. integrifolia* are used by tribal people for the treatment of various ailments. The mucilaginous bark is boiled and the juice squeezed out and applied to rheumatic swellings (Nandkani, 1976). Paste of the stem bark is externally applied to treat the inflammation of lymph glands, ringworm and scabies. Decoction of the leaves is used

to regulate fat metabolism, treat ringworm, eczema and cutaneous diseases (Benjamin and Christopher, 2009). Stem bark acts as an anti- inflammatory agent specifically for eyes. Stem bark paste is externally applied on forehead of the patient suffering from common fever (Singh and Ali, 1994).

The species have the multiple medicinal uses. Besides, the species also suitable for the avenue plantations, parks and wastelands because it helps in the mitigating the global warming by sequestrating the greenhouse gases like CO_2 from atmosphere. For the supply of seedlings to avenue plantations or any other suitable areas, mass production of seedlings are required. To raise seedlings in nurseries, there should be a proper methodology for treating the seedlings for better production. Hence, this study was carried out to check the best pre sowing treatment that enhance the germination of *Holoptelea integrifolia* (Roxb) Planch seeds.

Materials and Methods

Experimental site

The study was conducted at Tropical Forest Research institute, Jabalpur, India (lies between N 23.09 E 79.98 and N 23.10, E 79.98) during the year 2022-2023. The experiment was conducted in Completely Randomized Design at laboratory conditions.

Details of experiment

The root trainers have been used for the germination of seeds. The medium used for the study was coco-peat only. No nutrients were added to the medium. After filling the root trainers with coco-peat, in each root trainer pot, one seed was sown at 1cm depth. The watering of the root trainers was done after the sowing of seeds. In this study, seeds were treated with four treatments with three replications.

The experiment was conducted in two consecutive years (2022 and 2023) with different treatments.

Treatment details

Germination parameters were recorded for the experiment-Ieach day up to 30 days.

Days to initiation of germination

The polybags were observed daily, for seedling emergence. The days on which the first seedling emerged was expressed as days to initial germination (Sadat *et al*., 2014).

Days to 50 percent germination

A number of days taken for 50 percent of the seeds to germinate in entire lot was considered as 50 percent germination (Coolbear *et al*., 1980).

Days to final germination

The number of days taken for the last seedling emergence was recorded and expressed as days to final germination (Mauromicale and Cavallaro, 1995).

Germination percentage

The number of normal seedlings produced in each treatment was counted and average was expressed in percent (ISTA, 2003)

$$\text{Germination percentage} = \frac{\text{Total number of germinated seeds}}{\text{Total number of seeds sown}} \times 100$$

For the experiment-II (during 2023), only the total germination percentage has been recorded.

Statistical analysis of data

The experiment was carried out in a Completely Randomised Design. Data were analysed by analysis of variance (ANOVA) to detect significant differences between the means (Sheoran *et al*., 1998). Significantly differing means were tested based on the F test value at the 0.05 probability level.

Results and Discussion

Experiment-I

Germination of seeds

The first germination was observed in GA_3 (T_2) 200 ppm within 5 days. Readings were taken up to 30days from the date sown. The days to take first germination

Experiment-I	Experiment-II
T_0 - Untreated seeds (Control) T_1 - Cold water (24 hours) T_2 - GA3 200 ppm 0020 (24 hours) T_3 - *Cow dung + Cow urine slurry (24 hours) *20grams of cow dung and 20ml cow urine mixed in 200ml of water to make slurry.	T_1 - $GA_3$100 ppm (24 hours) T_2 - $GA_3$200 ppm (24 hours) T_3 - $GA_3$300 ppm (24 hours) T_4 - $GA_3$400 ppm (24 hours) T_5 - $GA_3$500 ppm (24 hours) T_6 - $GA_3$600 ppm (24 hours) T_7 - $GA_3$700 ppm (24 hours) T_8 - $GA_3$800 ppm (24 hours) T_9 - $GA_3$900 ppm (24 hours) T_{10} - $GA_3$1000 ppm (24 hours)

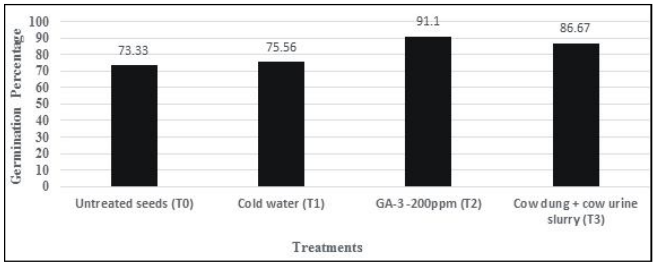

Fig. 1 : Graph between treatments and final germination percentage.

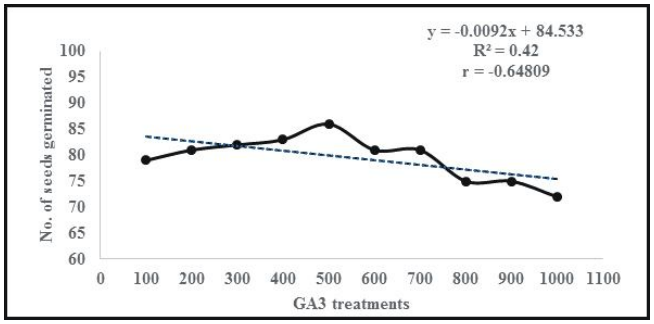

Fig. 2 : Relationship between GA_3 treatments and no. of seeds germinated.

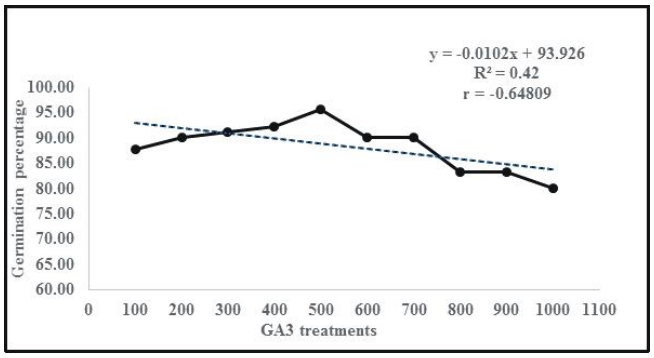

Fig. 3 : Relationship between GA_3 treatments and germination percentage.

and at par with each other at 5% level of significance.-

The emergence of seedlings was recorded up to 30 days from its date of sowing. After 30 days, the data were analysed by analysis of variance (ANOVA) to detect significant differences between mean (Sheoran *et al.*, 1998). There is a significance difference between treatments, the treatment GA_3 -200ppm (T_2) and treatment cow dung + cow urine slurry (T_3) is significantly differed from treatment cold water (T_1), untreated seeds (control T_0) and they are at par with each other at α-5% significance level.

Germination percentage

The maximum average germination percentage was recorded in the treatment of GA_3-200ppm (T_2) compared to other treatments and minimum average germination was recorded in the treatment of untreated seeds (control T_1). The same results were reported by Tzortzakis (2009) that GA_3 treatment may improve rapid and uniform seedling emergence and plant development in nurseries and/or in greenhouses, which is easily applicable by nursery workers with economic profits.

Experiment-II

The experiment-I results revealed that the treatment GA_3 200ppm has the remarkable effect on germination of *H. integrifolia* seeds. Because of the great effect on seed germination, we conducted another experiment to check at what ppm of GA_3 treatment is more effective on seed germination. As mentioned above, used ten different levels of GA_3 (100ppm-1000ppm)

Germination percentage

Table 1 : Days to first germination, days to 50% germination and average germination of *Holoptelea integrifolia* (Roxb.) Planch.

Treatments	Days to first germination	Days to 50% germination	Average germinated seeds
Untreated seeds (T_1)	7.66	14.00	22.00
Cold water (T_1)	6.66	12.66	22.66
GA_3-200ppm (T_2)	5.67	11.33	27.33
Cow dung + cow urine slurry (T_3)	6.33	12.00	26.00
C.D.	N/A	1.561	3.265

order is $T_2 > T_3 > T_1 > T_0$ (5.6 > 6.3 > 6.6 > 7.6). There is no significance between the treatments on the days to take first germination. The 50% germination of seeds was recorded in GA_3 (T_2) 200ppm treatment first, average days taken to attain 50% is 11.3 days. The maximum days taken to attained 50% germination was recorded in untreated (T_0 - treatment) seeds. The treatments GA_3 -200ppm (T_2), cow dung + urine slurry (T_3), clod water (T_1) is significantly differed from untreated seeds (T_o)

In this experiment, seeds were sown in three replications of complete randomized design. Each replication block consists 30 seeds. The germination of seeds was recorded up to 30 days from date of sowing. The maximum germination percentage was observed in GA_3 500 ppm treatment followed by $GA_3$400 ppm & GA_3 300 ppm. The least germination percentage was observed in GA_3 1000 ppm and GA_3 800 ppm. The 95.56 percent seeds were germinated in GA_3 500 ppm treatment. The

Table 2 : Average germination percentage of treatments.

Treatments	Average germination percentage (%)
Untreated seeds (T_0)	73.33
Cold water (T_1)	75.56
GA_3-200ppm (T_2)	91.10
Cow dung + cow urine slurry (T_3)	86.67
C.D.	10.88

Table 3 : No. of seeds germinated and germination percentage of treatments.

S. no.	Treatments	No. of seeds germinated	Germination percentage
1.	T_1 - GA_3 100 ppm (24 hours)	79	87.78
2.	T_2 - GA_3 200 ppm (24 hours)	81	90.00
3.	T_3 - GA_3 300 ppm (24 hours)	82	91.11
4.	T_4 - GA_3 400 ppm (24 hours)	83	92.22
5.	T_5 - GA_3 500 ppm (24 hours)	86	95.56
6.	T_6 - GA_3 600 ppm (24 hours)	81	90.00
7.	T_7 - GA_3 700 ppm (24 hours)	81	90.00
8.	T_8 - GA_3 800 ppm (24 hours)	75	83.33
9.	T_9 - GA_3 900 ppm (24 hours)	75	83.33
10.	T_{10}-GA_3 1000 ppm (24 hours)	72	80.00
C.D.		1.956	3.302
SE(m)		0.658	1.111
SE(d)		0.931	1.572
C.V.		1.434	2.179

data were analysed by analysis of variance (ANOVA) to detect significant differences between mean (Sheoran *et al.*, 1998). There is significance difference between treatments and number of seeds germination and germination percentage. The treatment GA_3 500ppm is significantly differs from other treatments at 5% level of significance.

The relationship between the treatments and no of seeds germinated in experiment is decreasing in nature. Increasing levels of GA_3 up to 500 ppm enhanced the germination of seeds, but more than 500 ppm of GA_3 treatment decreased the germination of seeds. Patel *et al.* (2018) recorded same results that the GA-$_3$-500 ppm treatment was great impact on the red sanders seeds to enhance the germination with less period of time. The result shows that increasing of GA_3 concentration is not responsible for germination of *Holoptelea integrifolia* seeds.

Conclusion

This study helps us to understand the pre germination treatments on germination of the *Holoptelea integrifolia* (Roxb) Planch. seeds. From results found that the treatment GA_3- 500ppm is enhancing the germination of seeds in short period of time means within 30 days 95.56% of seeds were germinated. Other GA_3 treatments like 700ppm, 600ppm, 300ppm and 200ppm are responsible for more than 90 % germination of seeds. The results revealed that there is negative correlation by increasing of GA_3 concentration. We suggest that GA_3 -500ppm treatment for mass production of *Holoptelea integrifolia* (Roxb) Planch. seedlings in nurseries for avenue plantation and trees outside forest purposes.

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