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Developing Propagation Techniques of *Indopiptadenia Audhensis* Brandis (Brenan): A Critically Endangered Species

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ABSTRACT

Indopiptadenia audhensis is an endemic and critically endangered species which locally known as Hathi Pula or Gainti. Study of propagation techniques was carried out by seed sowing and vegetative method. Seed were sown in different medium (sand, sand + soil, vermiculite) & different places (Mist chamber, shade house, open beds). Seeds were treated with 12 h normal water soaking, 12 h Hot water soaking and control. The result showed that seed pre soaked in hot water for 12 h had maximum 99.33% germination with vermiculite in Mist chamber and normal water soaking for 12 h showed 98.67% germination with sand + soil (1:1) in Mist chamber. The minimum germination observed in shade house with normal water soaking for 12 h as 66.67 %. The vegetative propagation conducted by branch cuttings which were treated with 1000 ppm IBA, 3000 ppm IBA, 5000 ppm IBA and control. The cuttings were planted in Mist chamber. The result of cutting propagation indicated that cutting treated with IBA 1000ppm performed maximum 35% rooting in sand followed by 20% and 16.67 % rooting with IBA 1000 ppm in vermiculite and IBA 5000 ppm in sand respectively. The control treatment reduced rooting percentage as 10 % in sand.

KEYWORDS Seed sowing, Vegetative propagation, IBA, Endangered, Endemic

Intoduction:

Indopiptadenia audhensis of Misosaceae family is a small or medium size tree species locally known as Hathi Pula or Gainti reported in sub- tropical regions of India (Uttar Pradesh); foothills of Himalayas in close vicinity to the territory of Nepal, hills above Brahmdeo in Eastern Kumaun and Tanakpur, Terai belt of Nepal Banks of Gandak and along the Indo-Nepal border (Kanjilal, 1966, Prakash et al. 2009). It occurs on the outermost hill ranges between 300 meter to 600 meter (A.E.Osmaston 1926). The greenish yellow flower appears in April to May and seed ripens in June. It is used as fodder for domestic animals; wood is yellowish or reddish, close grained and hard; economically wood is considered to be durable. *Indopiptadenia* is a monotypic genus represented by a single species i.e *Indopiptadenia oudhensis* an endemic and threatened taxon. The habitat loss due to modernization, overgrazing, animal husbandry has resulted in the loss of diversity. Endangered species have particularly suffered from lack of effective pollinators, viable seed formation, natural regeneration and disease etc. resulting in the depletion and erosion of the genetic diversity in them (A. Prakash et al, 2009). Bajpai et al 2014 has stated that the no. of plants has substantially decreased due to exploitation by local people, habitat destruction, and low regeneration ability of the species in natural habitats and that as a result species has become rare and threatened.

Uttar Paradesh Biodiversity, Board has recommended "*Indopiptadenia oudhensis* Brenan" to be declared as threatened species to the National biodiversity authority in 2009. (NBA annual report 2008-09). The Central Government of India, in Consultation with the Government of Uttar Pradesh, has recognized the species as 'on the verge of extinction and prohibited its collection. (Goyal 2009).

The IUCN category Near Threatened (NT) is assigned to the taxon. Recent survey of the species investigation shows that species occurs only in the Balrampur district of Uttar Pradesh and Eastern Kumaun (Tanakpur, Champawat district) of Uttarakhand. (Bajpai et al 2014).

Excessive lopping affects seed production and regeneration (Threatened species of Uttarakhand). It can be extinct from the nature in the absence of sufficient natural regeneration, lack of standardized propagation techniques and plantation. So there is an immediate need to conserve this species through development and standardization of propagation techniques for its mass propagation, nursery stock preparation and future plantation.

Material and methodology:

Description of experimental area:

The experiment was conducted in the forest nursery of Research wing of forest department at Nainital, Uttarakhand from 2014 to 2015. The area is situated at N 29^0 22′ latitude and E 79^0 25′ longitude at an altitude of 1200 m. The climate of the area is temperate. Frost occurs from December to February in winter.

Experimental material and design:

The branch cuttings of *Indopiptadenia audhensis* were collected from Purnagiri compart-3, Sukhidang, Champawat in the month of February. Different medium (vermiculite, sand + soil and sand) and IBA concentration (1000 ppm 3000 ppm, 5000 ppm, control) were used in this experiment. 10-15 cm long cuttings with 3 nodes were prepared and immediately treated with IBA ppm both treated and untreated cutting were tagged and planted in Mist-chamber, shade house and open beds at 5 cm spacing. The humidity was maintained above 60 %, temperature 25^0c to 35^0c and fogging at 30 minutes interval in Mist chamber. The experiment consists of 12 treatments and each treatment replicated thrice with 20 cutting per treatment. The best results of cutting propagation are shown in Table 1. Seeds were collected from Purnagiri compart-3, Sukhidang, Champawat of Uttarakhand in the second week of June, immediately seeds were dried and cleaned. 31 seeds were found in 1gm. Seed sowing was done in third week of June. Cleaned and viable seeds were sown in germination tray in different mediums (vermiculite, sand + soil (1:1), sand) and places (mist chamber, shade house, open bed). Pre sowing water treatments viz, normal water soaking for 12 h, hot water soaking for 12 h and control were applied to study the seed germination percentage. Seed experiment consists of 27

treatments and each treatment replicated thrice with 50 seed per treatments. The best results of seed sowing are shown in table 2.

Table 1. Effect of IBA concentration on sprouting (%) and rooting (%) in *Indopiptadenia audhensis***.**

S.No	Treatments	Sprouting %	Rooting %
1.	M1T1P1	70.00	20.00
2.	M1T2P1	46.67	10.00
3.	M1T3P1	30.00	3.33
4.	M1CP1	26.67	3.33
5.	M2T1P1	66.67	15.00
6.	M2T2P1	63.33	15.00
7.	M2T3P1	50.00	3.33
8.	M2CP1	43.33	1.67
9.	M3T1P1	86.67	35.00
10.	M3T2P1	61.67	11.67
11.	M3T3P1	41.67	16.67
12.	M3CP1	46.67	10.00

Acronym used: M1= vermiculite M2= sand + soil, M3= sand T1= 1000ppm, T2= IBA 3000 PPM, T3= IBA 5000ppm, C= Control, P1= Mist chamber.

Table 2. Germination (%) of *Indopiptadenia audhensis* **in different treatment, medium and places.**

S. No	Treatments	Germination percent (%)
1.	M1T1P1	97.33
2.	M1T2P1	99.33
3.	M1CP1	94.67
4.	M2T1P1	98.67
5.	M2T2P1	96.00
6.	M2CP1	98.00
7.	M3T1P1	98.00
8.	M3T2P1	98.67
9.	M3CP1	98.00
10.	M1T1P2	66.67
11.	M1T2P2	73.33
12.	M1CP2	86.67
13.	M2T1P2	75.33
14.	M2T2P2	84.00
15.	M2CP2	88.00
16.	M3T1P2	79.33
17.	M3T2P2	86.67
18.	M3CP2	86.00
19.	M1T1P3	85.33
20.	M1T2P3	82.67
21.	M1CP3	84.00
22.	M2T1P3	94.67
23.	M2T2P3	89.33
24.	M2CP3	94.00
25.	M3T1P3	98.67
26.	M3T2P3	96.00
27.	M3CP3	97.33

Acronym used: M1= vermiculite, M2= Sand + soil, M3= sand, T1 = Normal water soaking for 12 h, T2= Hot water soaking for 12 h, C= Control. P1= Mist chamber, P2= Shade house, P3= open beds.

Result and discussion:

The IBA concentrations and mediums were studied in the Mist chamber to analyze their effect in promoting sprouting and rooting in the month of July. The results in Table 1 indicate that highest 35% rooting observed in IBA 1000 ppm with sand in Mist chamber (M3T1P1) followed by 20 % rooting in IBA 1000 ppm with sand in Mist chamber (M1T1P1). The IBA 5000 ppm, IBA 3000 ppm, and control reduced rooting percentage as 16.67 % (M3T3P1), 15 % (M2T2P1) and 10 % (M3CP1) respectively (Figure 1). On the other hand maximum 86.67% sprouting observed in IBA 1000 ppm with sand (M3T1P1) followed by 70% sprouting in IBA 1000 ppm with vermiculite (M1T1P1), 66.67 % sprouting in IBA 1000 ppm with sand + soil (M2T1P1) and 63.33 % sprouting in IBA 3000 ppm with sand+ soil (M2T2P1). The control, IBA 3000 ppm and IBA 5000 ppm reduced sprouting percentage as 43.33 %, 63.33% and 50 % respectively (M2CP1, M2T2P1, M3T3P1, Figure 1). The overall result of cutting propagation clearly shows that IBA 1000 ppm produced highest 86.67% sprouting and 35% rooting with sand (M3T1P1) followed by 70% sprouting & 20 % rooting with IBA 1000 ppm in vermiculite under Mist chamber (M1T1P1). The control treatment produced minimum sprouting and rooting percentage as 43.33% and 1.67 % respectively (M2CP1; Figure. 1).

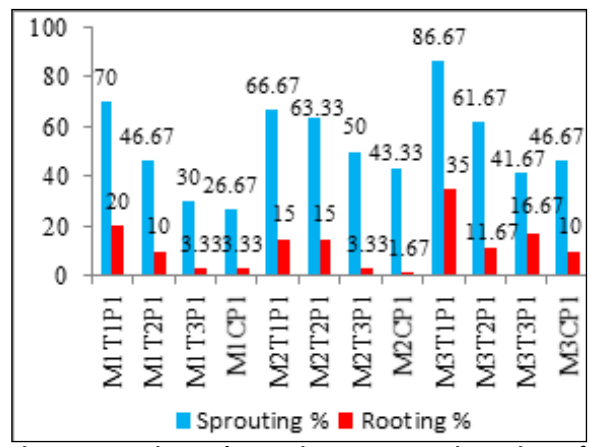

Figure. 1: Rooting and sprouting percentage in cuttings of *Indopiptadenia audhensis* **with different treatments in Mist chamber.**

The different pre-sowing treatments, mediums and places were studied to analyze the seed germination. The results in **Table 2** indicate that hot water soaking for 12 h showed highest 99.33 % (M1T2P1) seed germination followed by normal water soaking for 12 h as 98.67 % (M2T1P1, M3T2P1). On the other hand control treatment showed 98 % germination (M2CP1, M3CP1, Figure 2).

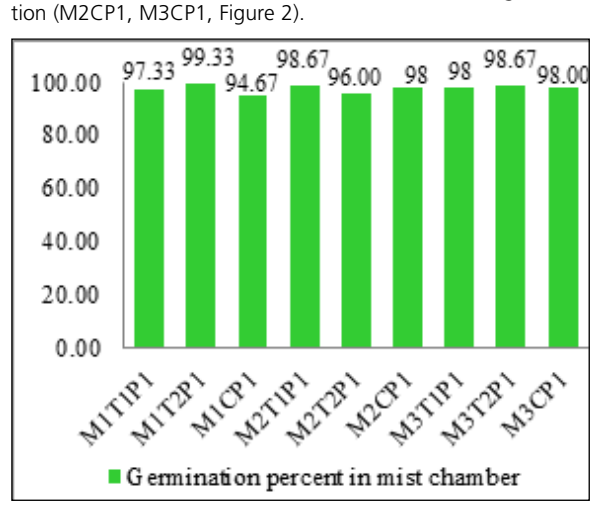

Figure 2: Germination percentage in Mist chamber with different treatments,

The Mist chamber was observed maximum 99.33 % germination with hot water soaking for 12 h in vermiculite (M1T2P1) followed by 98.67 % with normal water soaking for 12 h in sand + soil (M2T1P1) and 98.67 % germination with hot water soaking for 12 h in sand (M3T2P1). Minimum 94.67 % germination observed with control treatment in vermiculite (M1CP1; Figure.2).

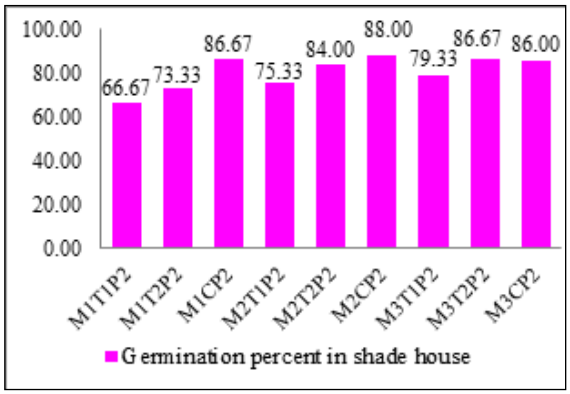

Figure 3: Germination percentage with different treatments in shade house.

The shade house was observed maximum 88 % germination in control treatment with sand + soil (M2CP2) followed by 86.67 % germination with control in vermiculite (M1CP2) and 86.67 % germination with hot water soaking for 12 h in sand (M3T2P2). The minimum 66.67 % germination was observed with normal water soaking for 12h in vermiculite (M1T1P2, Figure.3).

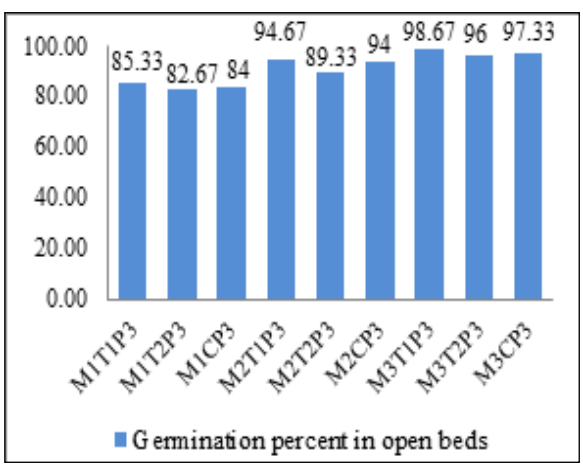

Figure 4: Germination percentage with different treatments in Open bed.

The open bed was observed maximum 98.67 % germination with normal water soaking for 12h in sand (M3T1P3) followed by 97.33 % with control treatment in sand medium (M3CP3) and 96 % germination with hot water soaking for 12h in sand (M3T2P3, Figure. 4). The minimum 82.67 % germination observed in hot water soaking for 12h with vermiculite (M1T2P3, Figure. 4). The overall result of seed sowing shows that the highest 99.33 % (M1T2P1) seed germination was found in Mist chamber followed by open beds and shade house as 98.67 % (M3T1P3) and 88 % (M2CP2) respectively. The lowest 66.67 % germination was found in shade house (M1T1P2, Figure.3). Seed germination was started in 4 to 6 days after seed sowing and completed within 8-15 days.

On the basis of this study, seed sowing is the best and easy method for producing quality planting material of *Indopiptadenia audhensis* in a shorter time compare to vegetative propagation. There is an immediate need to conserve this valuable species from extinction. Though here is huge scope to study and standardize the propagation techniques for species, even than this study will primarily help in reproduction, future plantation, biodiversity conservation and spreading awareness amongst the people.

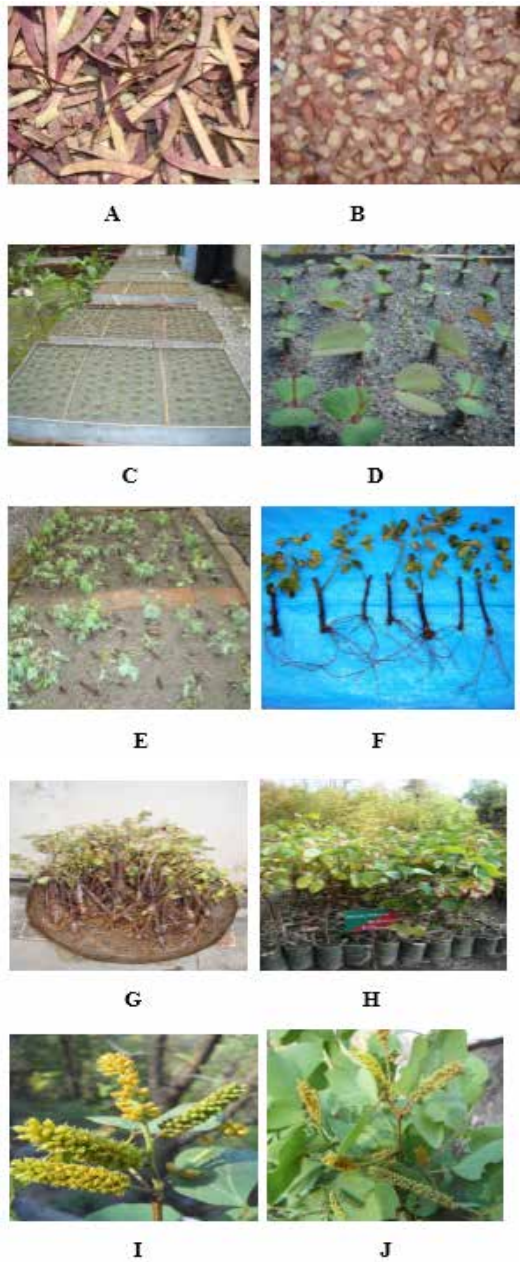

Figure 5: (A-B) Mature pods and cleaned seed (C-D) seed germination, (E-G) Vegetative propagation, (H) Transplanting in polythene bags (I –J) Flowering

References:

1. A. Prakash, K.K. Rawat, P.C. Verma; *Indopiptadenia oudhensis* (Brandis) Brenan: monotypic, endemic and highly endangered taxa needs conservation in Uttar Pradesh Biodiv News. A Quarterly e News letter of U.P state Biodiversity Board, Vol. 1 issue 1, Oct- Dec 2009.
2. A.E. Osmaston, A Forest Flora for Kumaon, International book distributors 318-A, Onkar road, Dehradun (India), 1926, pp.72.
3. Goyal, A.K. (2009) Collection of *Indopiptadenia oudhensis* prohibited. Biodiversity News 1(1): 7. Biodiv News. A Quarterly e News letter of U.P state Biodiversity Board, Vol. 1 issue 1, Oct- Dec 2009.
4. National Biodiversity Board (NBA) annual report, pp. - 50, 2008-09.
5. O. Bajpai, A.K.Shrivastava, A.K. Kushwaha, L.B. Chaudhary; Taxonomy of a monotypic genus *Indopiptadenia* (Leguminosae-Mimosoideae); Phytotaxa 164 (2): 061–078, 2014.
6. P.C Kanjilal, Forest Flora of Plain of Uttar Pradesh Ranunculaceae to Alangiaceae, India : Zucknow, 1966
7. Threatened species of Uttarakhand. Uttarakhand Biodiversity Board. http://sbb.uk.gov.in/files/books/Threatened_Species_Book-CTP.pdf.