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GERMINATION BEHAVIOR OF FIBER SPECIES OF HIMALAYAN NETTLE (*GIRARDINIA DIVERSIFOLIA*) IN DIFFERENT ALTITUDE

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ABSTRACT

Laboratory as well as field study was conducted on the one year old seed of *Girardinia diversifolia* during May 2010. Seeds were first moistened for 48 hrs and thereafter subjected to warm and cold treatment for 1 to 4 week duration. Seed thereafter were put to germination test in Petridis plates on germination paper at 25^{0}C in seed germinator. Germination was recorded after 15 days and continued up to 30 days. In field condition in green house result indicated that at low altitude site has intermediate philological dormancy and seed germination per cent was 25.8% can be overcome at natural site of *Girardinia diversifolia* were average germination per cent in different soil media were 52.6% after 4 week.

Key words: Fiber, Himalayan nettle, Nursery technology, Management practices.

Introduction

The Himalayan Giant Nettle, *Girardinia diversifolia* (Friis, 1981), which belongs to the family Urticaceae, is locally known as "*Kandali"* in hilly area of Uttrakhand, India *Allo* in Nepali in the eastern and central regions, and *Puwa* in the western part of Nepal. There are several vernaculars to name it: Bhangre Sisnu, Lekhko Sisnu, Thulo Sisnu, Potale, Nagai etc (Gurung, 1988). Endemic to Himalayan region, it is one of the historically important Non Timber Forest Products (NTFPs) for Nepal. It grows in the hill districts from east to west between the altitudes of 1200 to 3000 meter and can be found in the tropical areas of Asia and Africa (Friis, 1981, Shrestha and Hoshion, 1998). This plant is a perennial herb, 1.5 to 3.0 m. ($9^3/_4$ foot) high, with perennial rootstock. Chen Jiarui *et al*. (2003) reported *Girardinia diversifolia* sub sp. Diversifolia sute. Straight, branched or not, 5-angled, 25.20 cm tall; stems and petioles spreading pubescent and armed with stinging and stigose hairs. Stipules oblong-ovate, 1.3 cm, sparsely strigose abaxially; petiole 2.15 cm; leaf blade light green, elliptic, ovate or oblate in outline, sometimes 3- lobed, 5.25 × 4.23 cm, herbaceous, 3-veined, lateral veins 3.5 each side, anastomosing before margin, abaxially sparsely pubescent and with armed stinging and setulose hairs, adaxially sparsely appressed strigose and armed with short stinging hairs, base cordate or subtruncate, margin usually 3, 5, or 7-lobed or, rarely, regularly serrate or sometimes doubly serrate at leaf base, apex short acuminate or acute; cystoliths minutely punctiform. Glomerules densely armed with stinging hairs. Male inflorescences in proximal axils, spicate, cymose-racemose or subpaniculate, 5.11 cm; female ones in distal axils of stem or in same axils as male, sometimes solitary, racemelike or paniculate, rarely long spicate, 1.28 cm, strigose and spreading hirsute. Male flowers subsessile or pedicellate, in bud 1 mm; perianth lobes 4, ovate, concave, setulose abaxially, apex acute, stamens 4; rudimentary ovary cupular. Female flowers ca. 0.5 mm; perianth lobes unequal, the larger connate lobe cymbiform 0.4 mm, enlarged to 1 mm at fruit, sparsely strigillose on outside, apex 3-toothed, the smaller lobe linear (Chen *et al.,* 2003). Fl. Sep. Oct, fr. Oct. Nov. Forest margins, shady moist places, along streams, disturbed from 2800 m to 3000m Himalayan region of India, Nepal, China, Indonesia, Korea, Malaysia, Sikkim, Sri Lanka, Africa (including Madagascar)]. Leaf blade usually not lobed, rarely 3-lobed with lobes ca. 1/3 of overall length, margin coarsely dentate or double-dentate, teeth gradually larger toward leaf apex; stipules 6.10 mm; male inflorescence unbranched, 1.2 cm; female inflorescence often in same axils as male, 2.6 cm leaf blade 3.7-lobed, rarely lowermost leaves not lobed and then margin regularly serrate or double-serrate, teeth gradually smaller toward leaf apex; stipules 12.30 mm; inflorescences not as above, often more than 6 cm. Friis *et al.* (1981) observed that it grows wild under the forest from east to west canopy between the altitudes ranging from 1200 to 3000 m. in Moist and can be found in the tropical areas of Asia and Africa. It grows in fertile well-drained soil. Neeraj *et al.* (2011), plant biodiversity assessment in relation to disturbances in mid-elevational forest of Central Himalaya, *G. diversifolia* density at hill top Western aspect recorded 80 individual per hectare.

Seed germination of *Girardinia diversifolia* in the laboratory treatment was started after 15 days and continued upto 30 days while at natural site it was 52.6% after four weeks.

Singh and Shrestha (1987) reported that the species is shade loving, cultivation could be combined as an under-storey crop. Its stem contains bast fibers of unique qualities-strength, smoothness, and when it is processed appropriately a silk-like luster appears which 580 mm in length. The aerial part is armed with numerous stinging hairs. The leaves are simple length ranges from 10 to 35 cm and alternately arranged in early stage and leaves become 3-7 lobes in later stages of development. Sethman Annette and Dreyling Gisela (2001) investigated the morphology of the stinging hair and the anatomy of the stem of the nettle fibre. The itch is produced from the formic acid contained in the oil glands under the stinging hairs. According to Sinha (1989) declining trend of Himalayan nettle in the nearby areas for collection suggests need of planting to meet the increasing demand. Traditionally, the fiber obtained from the bark of Himalayan nettle has been used for a variety of woven product, namely clothes ('Bhangra' 'east-coat'), bags, sacks, tablecloths, porter strap, blanket, etc. and are marketed in Kathmandu and are also exported to foreign countries like USA and Japan. As a result, natural stands have been declining despite the rules and regulation of the forest user groups, as they are open for harvesting only from September to December (Shrestha, 2000). In the eastern hills of Sankhuwasabha district in Nepal is well known for nettle product and recently been "discovered" by the international market and local women have formed more than 100 highly successful cooperatives to produce Himalayan nettle cloth for the tourist market (Joshi *et al.,* 1989). Tanka *et al.* (2000) reported the commercial utilization of Allo (*Girardinia diversifolia*) by the rais of Sankhuwasabha for income generation. Shrestha (1994) reported that 95 per cent out of 1029 families in four VDCs were using yarn spun from Allo. It is a source of livestock feed, bedding material, fuel-wood (Gibbon *et al.,* 1988) and live fence. Dunsmore and Dunsmore (2000) reported that the seed of nettle containing 10-12% oil could be used for soap and other oil based industries. Manandhar (1989) reported that decoction from leaf is used to treat headache, swollen joints, constipation and fever. A decoction of the roots, mixed with *Centella asiatica* is used to treat gastric troubles. The ashes of the plant are applied externally for the treatment of ringworm and eczema. It can be used for making blue dye and paper. This species is also reported to be used for preparation of a snack in addition to being used as vegetable (Shalini *et al.,* 2008). Rajeev Deokota and Chhetri (2009) have found an ingenious use for the allo plant (*Girardiana diversifolia*). O. Richter and F. Pick. Get. Pat (1915) repotted the Process for separating the bost fibres from *G. diversifolia.* Himalayan nettle (*Girardinia diversifolia)*, is found to be occurring abundantly in the Garhwal region of Uttarakhand. It was lying unexplored until 7-8 years back, when on realizing its potential in the field of textiles, many organizations in the region initiated Research and Development activity on the possibilities of handloom based product development in nettle. Research and Development in this field, is mostly aimed at generating livelihood opportunities for the rural people of Garhwal. While the Himalayan communities in Uttarakhand, traditionally associated with extracting fibres from nettle and hemp for rope-making, are no longer practicing the craft, Bhotia weaver community, at Mangroli village, Chamoli (UBFDB cluster) has learnt and mastered the technique of nettle fibre processing. Uttrakhand Bamboo and Fiber Development Board a Subsidiary of Uttrakhand Forest Department has been undertaking first exploratory works in the field in natural fiber and its processing (Lepcha *et al.,* 2009; Negi, 2009). The species is grown through seeds which are sown early spring in a greenhouse. When they are large enough to handle, they are pricked out into individual pots and are planted out in May. According to Sinha (1989) declining trend of Himalayan nettle in the nearby areas for collection suggests need of planting to meet the increasing demand.

The present paper describes the method used for seed germination at different altitudinal places.

Material **and** Method

Study area

The experiments were conducted at two sites (I) Forest Research Institute Dehradun at latitude: 30° 20'N and longitude: 78° 03'E 2300 Ft. above sea level (II) NWFP Nursery Chakrata at 30° 41' N and 77° 50' E longitude, at an altitude of 5954 Ft. above sea level. The both area are at different altitudes. The soil was also different.

Seed germination experiments were carried out in four types of containers:

1. Plastic trays
2. Poly bags
3. Hiko (Root trainers) trays each having 25 cavities
4. Mother beds.

Potting mixture

Garden soil, river sand, farm yard manure and Vermicompost. Seed of *Girardinia diversifolia* were procured from Chamoli district of Uttrakhand during the year 2009.

After manually dehusking, seed were tested by adopting floating method. The seed were soaked in

Table 1 : Average rate of germination per cent in different containers

Substrate media	Container								Mean
	C1-Poly bags		C2- Hiko trays		C3-Plastic trays		C4-Mother beds		
	Site I	Site-II	Site I	Site-II	Site I	Site-II	Site I	Site-II	
T1 (2 : 2 : 1)	21	51	49	48	49	46	38	48	43.75
T2 (2 : 2 : 1)	26	54	48	49	51	44	35	46	44.13
T3 (2 : 1)	20	25	48	62	50	60	24	62	44.63
T4 (2 : 1)	18	24	48	60	52	53	20	62	42.88
T0 Control	17	31	32	34	32	30	12	45	27.88
Mean	20.4	37	45	50.6	46.8	46.6	25.8	52.6	

T1 (Sand : Garden soil : FYM); T2 (Sand: Garden soil: Vermi); T3 (Sand: Vermi.); T4 (Sand : FYM); T0 Control (Sand : Garden soil)
No. of Seed sown per containers 100 in Poly house, No. of seeds sown per bed (1x1)m 500 Seeds, in 5mm depth in beds.

water for 24 hrs and those floating on the surface were rejected. Remaining seeds were treated with normal water and hot water treatment at different time.

Germination of such seeds were tested in the plastic tray, ploy bags, Hiko trays as well as direct sowing in nursery beds under shade (under plants) condition.

Preparation of potting mixture

Potting mixture for all containers including mother beds were comprised of five treatments of soil mixture sand, garden soil, FYM and vermicompost. After preparation of potting mixture, the containers were filled up and 50 seeds were sown in each pot. Data of germination percentage were recorded after 10-25 days in room temperature.

Preparation of beds

After completing the work pertaining to soil preparation the seed beds (1mt x 1mt) were made just prior to seed sowing. The beds were made in a systematic order i.e. the length of the bed faced East-West direction so as to provide shading wherever required. The beds were raised 10-25 cm above the ground level. 100 seeds per bed as per treatment were sown during the month of April in spacing 5 cm x 5 cm, the average temperature 18-25°C and 37 to 42°C respectively.

Germination in labs

Germination of such seed was tested in the laboratory also. Seeds need heat in order to come out of dormancy and germinate. So we provide seeds heat or temperature 25ºC in seed germinator. The germination of seeds started after 15 days. The germination rate was 16 per cent.

Treatments

T-Soil media, C- containers

Site I - NWFP Nursery FRI Dehradun,

Site-II - NWFP Nursery Chakrata

Results and Discussion

Maximum seed germination percentage was seen in Site-II (Chakrata NWFP nursery) in mother bed in T4C4, T3C4, and Site-I (FRI NWFP Nursery) in plastic trays maximum seed germination was seen in treatment T4C3, T3C3 in (Table 1). There was little variation in seed germination percent of combination of sand, garden soil, FYM and vermicompost. Seed germination containers i.e. poly bags, Hiko-trays and plastic trays in green house and mother beds at both experiment sites. Result indicated at I site (low altitude) has intermediate philological dormancy and seed germination per cent 25.8% the same can be overcome at natural site of *Girardinia diversifolia* average germination per cent was 52.6% after 4 weeks.

It is important therefore, to maintain adequate humidity in the containers during the germination phase. The rates of germination were related to seed in natural habitat and different seed containers of Himalayan Nettle. It is concluded that the results of a germination behavior can differ depending on the natural habitats, soil media in the containers and mother beds. Beds were prepared for seed germination in shady and east to west at high hills of Uttrakhand.

However, in containerized production system, the stock quality is seriously constrains by the poor quality of seed material, type of containers, potting mixture and other management practices and therefore require greater attention and care.

Conclusion and Recommendation

The maximum seed germination percentage and behavior was observed in shaded mother bed experiment site-I at Chakrata NWFP nursery. But maximum germination percentage was observed in potting media T4C3 in plastic tray lab condition of nursery beds and also potting media play major role in increasing germination percentage and growth behavior of Girardinia diversifolia High altitude with cold condition also play role in increasing seed germination and growth behavior of Himalayan nettle seedlings.

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विभिन्न तुंगताओं में हिमालयी नेट्टी (*जिरार्डिना डायबर्जीफोलिया*) की फाइबर प्रजातियों का अंकुरण व्यवहार

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सारां'ा

मई 2010 के दौरान *जिराडीनिया डायबर्जीफोलिया* के एक वर्ष पुराने बीजों पर प्रयोगशाला तथा कार्यक्षेत्रीय अध्ययन किये गये। बीजों को 48 घंटों तक भिगा कर रखा गया और उसके बाद 1 से 4 हफ्ते तक उन्हें गर्मी तथा ठन्ड में उपचारित किया गया। तत्पश्चात बीजों को 25 डि0से0 में अंकुरण पत्रक में बीज अंकुरक पर प्रेटीडिस प्लेट्स में अंकुरण हेतु रखा गया। 15 दिन बाद अंकुरण रिकार्ड किया गया जिसे 30 दिनों तक जारी रखा गया। ग्रीन हाउस स्थितियों में पता चला कि कम तुंगता वाले स्थलों में मध्यम और स्पष्ट सुप्तावस्था होती है जिसमें अंकुरण प्रति"ात 25.8 प्रतिशत रहा। *जिराडियाना डायबर्जीफोलिया* का अंकुरण प्रतिशत विभिन्न मृदा स्थितियों में चार सप्ताह बाद औसतन 52.6 प्रतिशत पाया गया।

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