Cutting Propagation of Rare Tree Species for Forest Restoration in Northern Thailand

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BACKGROUND

Forest restoration programs require production of high quality planting stock of a wide range of indigenous forest tree species. Because many of these species have proved difficult to propagate from seed it is important to develop methods to produce planting stock by other means. The method examined in this study was vegetative propagation of cuttings. The objectives of the research were i) to develop and test cutting propagation techniques for tree species which are rare or threatened with extirpation from northern Thailand and which have been difficult to grown from seed and ii) to test the effects of different rooting hormone treatments on cutting performance, in terms of survival, vigour and rooting. Four rare tree species, *Haldina cordifolia* (Roxb.) Rids., *Ilex umbellulata* (Wall.) Loesn., *Rothmania sootepensis* (Craib) Brem., and *Shoutenia glomerata* King ssp. *peregrine* (Craib) Roekm. & Hart. were investigated for their suitability for vegetative propagation. All cuttings were treated with various rooting hormones and placed in the same rooting media and propagator with approximately 30% sunlight. Only 9% of *Shoutenia glomerata* produced roots. This species rooted most efficiently without any hormone treatment and produced the highest relative performance scores. Application of auxin did not enhance rooting in the other three tested species. Rooting in these species was difficult to achieve and, therefore, it is not possible to mass-produce quality planting stock in simple non-mist propagators. Further work is required to achieve good rooting rapidly by testing other propagation methods or other hormone treatments for species conservation and for forest restoration in northern Thailand.

RESEARCH OBJECTIVE

The aim of this study was to determine whether or not vegetative propagation from cuttings is a feasible and efficient way to produce planting stock of rare tree species which cannot be grown from seed for forest restoration projects.

STUDY SITE

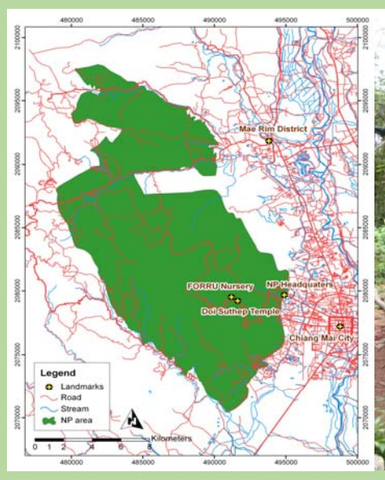

Figure 1. Sampling site in Doi Suthep-Pui National Park, Chiang Mai (Source: ICRAF-Chiang Mai)

Figure 2. Nursery experiment at the Forest Restoration Research Unit (FORRU-CMU) Nursery, Chiang Mai

Figure 3. Leafy stem cuttings

Figure 4. Cuttings in rooting media

METHODOLOGY

Leafy stem cuttings were tested with five rooting hormone treatments: Control (no auxin treatment), Seradix (powder containing IBA 3 000 ppm), IBA 3 000 ppm, IBA 8 000 ppm, and IBA:NAA 5 000:2 500 ppm.

Figure 5. Bounded bag to prevent moisture loss

Species selection
↓
Preparing of cuttings
↓
Soaking in fungicidal solution
↓
Dipping in rooting hormone
↓
Putting in rooting media (sand:rice husk charcoal, 1:1)
↓
Storing in big plastic bag
↓
Collecting data when rooting appear visible
↓
Potting of cuttings
↓
Collecting growth rate data

RESULTS AND DISCUSSION

Haldina cordifolia (Roxb.) Rids. (Family: Rubiaceae)

No cuttings of this species rooted within 93 days of treatment. Only three cuttings, with no chemical treatments, survived with shoots after 30 days. However, these cuttings died later without root development.

Ilex umbellulata (Wall.) Loesn. (Family: Aquifoliaceae)

All cuttings died, without producing any roots or shoots after 77 days, due to fungal infection. Three types of fungi could be distinguished: a white mycelium, orange spot and white spot.

Rothmania sootepensis (Craib) Brem. (Family: Rubiaceae)

Only four cuttings survived and produced new shoots after 45 days; three with the Seradix treatment and one with IBA 8 000 ppm. However, all cuttings died after 110 days without producing any roots.

Shoutenia glomerata King ssp. *peregrine* (Craib) Roekm. & Hart. (Family: Aquifoliaceae)

This species required 40 weeks from collection of leafy stem cuttings to the transfer of rooted cuttings into pots. Chemical treatments had no significant effects on the success of cutting propagation of this species. With no chemical treatments, a mean of 8.3% of cuttings survived with both roots and shoots. Moreover, the control produced the highest number of shoots per cutting. With regard to vigour, chemicals produced no significant affects for all of the four variables. Calculation of the relative performance score ranked the control as the most effective treatment.

Figure 6. Shoutenia glomerata with new shoots and roots

Table 1. Relative performance score of Shoutenia glomerata

Treatment	Cuttings surviving with roots and shoots		Vigour					Total [8]
	%[1]	Survival score[2]	No roots[3]	No shoots[4]	Root length[5]	Shoot length[6]	Vigour score[7]	
Control	8.3	50.0	1.0	1.4	5.2	0.9	38.9	88.9
Seradix	5.0	30.0	1.0	0.6	8.4	1.1	39.0	69.0
IBA 3,000 ppm	5.0	30.0	1.4	0.6	4.5	0.6	31.6	61.6
IBA 8,000 ppm	0.0	0.0	0.6	0.0	7.8	0.0	16.6	16.6
IBA:NAA 5,000:2,500 ppm	5.0	30.0	1.4	0.6	8.6	1.0	41.9	71.9

[1] % of cuttings surviving with roots and shoots
[2] calculated of survival score
[3] mean number of roots per cutting
[4] mean number of shoots per cutting
[5] mean length of root per cutting (cm)
[6] mean length of shoot per cutting (cm)
[7] calculated of vigour score
[8] total performance score

CONCLUSIONS

Shoutenia glomerata rooted most efficiently without any hormone treatment, with the control producing the highest performance scores. However, for this species rooting occurred very slowly and a low number of cuttings survived with both roots and shoots. Other treatments should be tried to accelerate rooting and increase survival of cuttings with both roots and shoots. *Haldina cordifolia, Ilex umbellulata* and *Rothmania sootepensis* could not be propagated from cuttings with the methods used in this study. The cuttings developed brown leaves, which rapidly wilted, followed by stem collapse. Cuttings must retain leaves for successful root initiation and development, for supply of auxins and nutritional factors. Moreover, maintenance of appropriate environmental conditions and the selection of juvenile material are both critical factors for the success of cuttings propagation. Cool air and high humidity at the leaf surface minimizes water loss from the material, while a moist, warm rooting medium encourages fast root development. Therefore, further experiments should be carried out to identify optimum environmental conditions and test other propagation methods or other hormone treatments to achieve rooting.

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