

The introduction of *Paulownia* to Nepal

M.B. Rayachhetry* and M.B. Karki**

Summary

Trials were made on seed germination, nursery techniques and growing media for *Paulownia tomentosa* and *P. kawakamii*, as preliminaries to the possible introduction of the genus to Nepal. Incubation of the seeds for an hour at 40°C, or treatment with 1% sulphuric acid, did not improve germination. By May 1988, some 10 000 *P. tomentosa* and 110 *P. kawakamii* seedlings had been raised in the nursery of the Institute of Forestry at Pokhara; heavy losses were experienced from an (unidentified) defoliating caterpillar, and some from damping-off, although both were successfully controlled. Various potting mixtures were tried in a polythene greenhouse over winter; the best growth was in a 1:1 mixture of soil and compost.

Introduction

There has been much recent international interest in the use of *Paulownia* species as fast growing exotics. Most are native to China; *P. fortunei* also extends into Vietnam and Laos, while *P. tomentosa* occurs in Korea and Japan. There would be great interest in their introduction to Nepal, especially for agroforestry, if species could be found that were suited to the climate of different parts of the country. For a first trial, seeds of *P. kawakamii* were obtained in May 1987 from the Botanical Garden of the Forestry Research Institute, Taipei, Taiwan, and of *P. tomentosa* in June 1987 from Maryland, USA, and the trials reported here were begun.

A short selection of relevant literature that was consulted is listed under "References".

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Seed germination

Plants of *Paulownia* species can be raised from seed or from root cuttings. The seed is tiny (0.56 million/kg) and is reported to be difficult to handle, but trees raised from seed are said to be healthier (Anon., 1986).

Preliminary trials indicated a germination period of about four weeks, so it was decided to try two treatments designed to reduce this period. *P. kawakamii* was tested in June 1987 with three replications, and *P. tomentosa* in September with four replications; otherwise the same tests were made with each species. The seeds were divided in three lots and treated as follows, with 50 seeds in each treatment replication:

- Control: soaked in distilled water.
- Heat treatment: placed on moistened filter paper and incubated for one hour at 40°C.
- Acid treatment: soaked in a 1% solution of sulphuric acid for one hour at room temperature and then given three 5-minute washes in distilled water.

The seeds, in petri dishes, were placed randomly on a table, kept moist with distilled water, and monitored daily for four weeks.

The results are recorded in Table I.

Statistical analyses showed no significant differences, and there is no advantage in applying these treatments.

Nursery techniques

Raised seedbeds were prepared in August-September 1987. They were treated with Dithane M-45 at 1.235 g/m² and 10% BHC powder at 6 g/m². Seeds of *P. kawakamii* (15 g) and *P.*

* Department of Medicinal Plants. Deputed to the Institute of Forestry.

** Assistant Dean, Institute of Forestry, Pokhara

tomentosa (150 g) were soaked in distilled water and incubated at 35°C for 24 hours, partially dried, and sown broadcast at about 4.5 and 6.25 g/m² respectively. The seeds were covered with a thin layer of soil, and the beds watered. To prevent drying out, the beds were then covered, at a height of about 60 cm, with either polythene sheeting or thatch.

Under the polythene, germination of *P. kawakamii* started in seven days, and of *P. tomentosa* in five days; good, uniform germination was completed in fifteen days. Under the thatch, germination did not start until the third week. The difference is assumed to be due to the higher temperature and humidity under polythene.

An outbreak of an unidentified defoliating caterpillar in October caused about 40 % mortality. The seedlings were dusted with 10 % BHC powder, and watered immediately afterwards. The caterpillars were controlled, but some leaves were scorched by the powder.

Also in October, when the seedlings had two to six leaves, there were sporadic occurrences of damping-off in the polythene-covered beds. This was thought to be the result of the high temperature and humidity under the polythene, which encourages fungal growth and also the rapid growth of the seedlings, whose softer tissues then make them more susceptible. Prompt detection and spraying with Bengard at 10 p.p.m. limited losses to about 10 %. Spraying was repeated twice a week for two weeks.

Apart from caterpillars and damping-off, there has been slight damage from hail (leaving "shot holes" in the leaves).

Plant production from *P. tomentosa* was about 67 per gram of seed, but from *P. kawakamii* only about 7 plants/g. In May 1988 there were about 10 000 *P. tomentosa* plants in the nursery, and 110 *P. kawakamii*, ranging in height from 5 to 35 cm.

Table 1 - Cumulative germination
(Figures in parentheses are percentages)

	Week 1	Week 2	Week 3	Week 4
<i>Paulownia kawakamii</i> (3 x 50 = 150 seeds per treatment):				
<u>Control</u>	45(30)	68(45)	109(72)	115(76)
<u>Heat</u>	55(37)	85(57)	90(60)	91(61)
<u>Acid</u>	83(55)	110(73)	114(76)	114(76)
<i>Paulownia tomentosa</i> (4 x 50 = 200 seeds per treatment):				
<u>Control</u>	134(67)	173(86.5)	177(88.5)	177(88.5)
<u>Heat</u>	158(79)	163(81.5)	163(81.5)	164(82)
<u>Acid</u>	155(77.5)	179(89.5)	181(90.5)	181(90.5)

Growing media

A polythene greenhouse, 1.5 m high, was constructed, in which different potting mixtures were tested over winter.

Three constituents were used: nursery soil, sand, and "compost". The soil is a sandy loam, of pH about 6.7, nitrogen 0.13 %, and available phosphorus 6 p.p.m., according to its analysis by the FRIC soil laboratory; it was

passed through a 3-mm wire mesh. The compost was a well decomposed, semi-dried mixture of buffalo dung and straw. The sand was passed through a 5-mm mesh.

The four treatments used mixtures of these ingredients:

- N - nursery soil only (control)
- NC - 1:1 soil and compost
- NCS - 1:1:1 soil, compost, and sand
- NS - 1:1 soil and sand

Each treatment was replicated five times for each species. The experimental unit was 5 seedlings of *P. kawakamii* or 20 of *P. tomentosa*.

Very large polypots were used, 18 x 28 cm lay-flat size (i.e. 7 x 11 inch), in view of the deep roots developed by *Paulownia*.

Seedlings were potted at twelve weeks, on 20 December. *P. kawakamii* was 3-4 cm tall, and *P. tomentosa* 3.5-6.5. The pots were distributed at random in the greenhouse. They were watered immediately after pricking out and then at weekly intervals, and tended as necessary.

Mortality and height were assessed after 13 weeks. Height was measured on the tallest four plants in each *P. kawakamii* unit, and the tallest fifteen in *P. tomentosa*.

Mortality is recorded in Table 2.

Table 2 - Total mortality percent

	N	NC	NCS	NS
<i>P. kawakamii</i>	4	4	4	15
<i>P. tomentosa</i>	1	4	20	27

Analysis of variance showed no significant differences between treatments for *P. kawakamii*, but there were significant differences at the 95 % confidence level for *P. tomentosa*.

Height growth is recorded in Table 3.

Table 3 - Mean height in centimetres

	N	NC	NCS	NS
<i>P. kawakamii</i>	50.2	94.5	52.6	17.2
<i>P. tomentosa</i>	22.5	66.1	15.1	6.2

Analysis of variance showed that there were significant differences between

treatment means for both species in these experiments at the 99 % confidence level.

Much the best growth was on the NC mixture, which has the highest nutrient content. The much faster growth of *P. kawakamii* is probably because it is a tropical species, which would benefit from the greenhouse conditions more than *P. tomentosa*. It was also less crowded in these trials. The indications are that it is worth continuing to test *Paulownia* species. This study gives some preliminary ideas about how to germinate seed and raise seedlings.

References

Anon. (1986) *Paulownia* in China: cultivation and utilization. Prepared by the staff of the Chinese Academy of Forestry and the International Development Centre.

Beckjord, P.R. (1982) Containerized and nursery production of *Paulownia tomentosa*. *Tree Planters' Notes* 33 (1) 29-33.

Beckjord, P.R. (1984) Nursery production of *Paulownia* seedlings. Cooperative Extension Service, Horticulture Production Publication HE:132-184. University of Maryland, College Park.

Beckjord, P.R.; McIntosh, M.S. (1983) *Paulownia tomentosa*: effects of fertilization and coppicing in plantation establishment. *Southern Journal of Applied Forestry* 7 (2) 81-84.

Tang, R.C.; Carpenter, S.B.; Witter, R.F.; Graves, D.H. (1980) A crop tree for wood products and reclamation of surface-mined land. *Southern Journal of Applied Forestry* 4, 19-20.

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