CHAPTER 6 - SEEDLING PRODUCTION, ESTABLISHMENT and NUTRITION

Open grown blackwood aged 1 year
(see also p.73)

Seed

Blackwood seed requires treatment to ensure rapid and even germination. Several methods are used:

- Clipped or nicked seed produces maximum germination within 14 days. This is ideal for germination tests, or small valuable research seedlots.
- The hot water method is standard practice (i.e. pouring boiling water over the seed and leaving the seed to steep and swell overnight), but variation in germination percentage, and time to germinate between seed sources has been noted.
- Bulk scarification is considered in Tasmania to be the most practical method for pre-treating seedlots over 20 gm. This gives similar germination times to clipped seed, but higher germination percentage. The recommended scarification is 10 minutes in their machine, with 10 gm lots, using 40 grit sand paper. Seed is then immersed in 90°C hot water for one minute prior to sowing. New Zealand nurserymen are simplifying operations by importing scarified seed, with excellent results.

Bare rooted seedling production

For the production of bare-rooted seedlings at Forest Research, seed is sown using the vacuum drum seed sower at 12.5 cm between lines and 7 cm between seeds. Soil covers the seed to a depth of 3-6 mm. Wind lift and soil splash are countered by 50% shade cloth tunnels over the beds until emergence is complete, if considered necessary.

Standard undercutting and wrenching operations are also carried out.

Planting stock

For 1/0 bare rooted stock in New Zealand, it is recommended that plants should be 60 cm tall with a minimum 7 mm root collar diameter. Topping in New Zealand nurseries is standard procedure.

Characteristics of bare rooted seedlings:

- These are the most robust, cost less, and are easy to transport.
- Planting must be done in winter.
- Planting should be done as soon as possible after receiving the stock.

Planting stock

A New Zealand establishment trial tested the following on two sites: bare rooted one year; one and a half year seedlings; plus the same treatments stumped 15 cm above the root collar before planting; one-year-old seedlings with mostly juvenile foliage; one-year-old seedlings with mostly mature foliage; two container types and direct sowing (on one of the two trial sites) After three years the type of seedling (Fig 16) was not critical to successful establishment. All treatments except direct sowing showed similar diameter and height growth. Direct sowing was not considered a viable establishment option.

Figure 16: Seedling types used in trial

Container

Blackwood can be grown in a wide range of container types: paper pot, jiffy pot, root trainers etc. Provided seedlings are grown correctly and pricked out on time, and not left in the container too long, container type is of little importance to blackwood establishment.

Characteristics of container seedlings:

- The size of container stock is dependent on the size of container used. Seedlings are usually smaller than bare rooted, more expensive, and difficult to carry.
- They allow planting outside the winter months.
- Planting can be delayed.
- To get optimal growth in the first year, the plants should be well established before spring.

In Tasmania it is recommended that container stock should not be used on sites that are prone to:

- Frost.
- Browsing.
- Weeds that are difficult to control.

Establishment

If the first principle in growing blackwood successfully is careful site selection, the second is to give the young trees a kick start in the establishment phase.

The Kick Start

There is a clear advantage in encouraging rapid early growth in blackwood. This can be achieved by providing conditions where growth is rapid and sustained, and malformation less prominent. On difficult sites with slower growth, a branchier habit develops and it is harder to produce an adequate butt log.

Factors which favour a kick start are:

- Site selection (shelter and moisture).
- Robust planting stock.
- Site preparation.
- Good genetic stock (see Chapter 5).

Site Preparation

Weed control

Blackwood seedlings will struggle through long grass and scrub, but grow much faster when competing weeds are controlled.

A useful regime is:

- Pre-plant spray with Roundup (1 metre diameter) - optional.
- Post-plant release with Gardoprim, soon after planting.
- Tree protectors allow sheep to graze the site and also permit sprays to be used safely, if necessary.
- Good spot cultivation at planting.

Fertiliser

A number of studies have shown conflicting responses to fertiliser application in New Zealand.

In summary:

- There is no benefit in applying nitrogen (blackwood is a legume, and therefore fixes nitrogen).

  On most sites there is no need for additional phosphorous. However, if soils are deficient in phosphorous it is advisable to apply it in the form of superphosphate. The recommended dose is 150 gm per tree, soon after planting.
- A New Zealand glasshouse study concluded that superphosphate, with its balanced phosphorus (P) and sulphur (S) content, would be a very suitable low cost fertiliser to use when establishing blackwood in soils low in either P, or P and S. Similar responses are reported from South Africa.

Cultivation

No full cultivation trials have been established in New Zealand, but one trial at Whangamata suggested that fertiliser was more important than weed control or a light cultivation while another trial in the Hunua Ranges indicated that good spade cultivation was beneficial to growth.

Protection

Livestock must be kept away from the young trees by either a boundary fence or tree protectors.

Both rabbits and hares are troublesome in New Zealand. In Australia, wallabies and pademelons are highly destructive.

Rabbits chew young foliage, but cause most damage by digging around the roots.

Hares are more destructive.

- They attack newly planted trees at night.
- They slice through the stem near its base, causing a typical 45° cut.
- They do not eat the foliage.
- They return on successive nights, causing an enlarging zone of destruction.
- They appear territorial, often selecting elevated sites (the tree damage may be a method of defining territory).
- They can be controlled by either:
  - A good rifle (effective and satisfying).
  - Tree protectors (60 cm K.B.C.)
  - Chemical deterrent.

Fertiliser Trials

Early New Zealand research indicated that an important factor in obtaining vigorous early plantation growth was the post planting application of superphosphate. However, just how much fertiliser to apply was not clear. This trial, with stock from the same seedlot, replicated at five North Island locations, was designed to give a definite pointer to the optimum per tree application rate per location. However, although there was considerable variation in growth between locations, statistical analysis of the growth data to age four showed no significant differences between any of the treatments (0, 150, 300 and 450 g/tree) at any of the locations.

These studies concluded that weed control should be applied in conjunction with fertiliser application, in order to gain maximum tree growth.

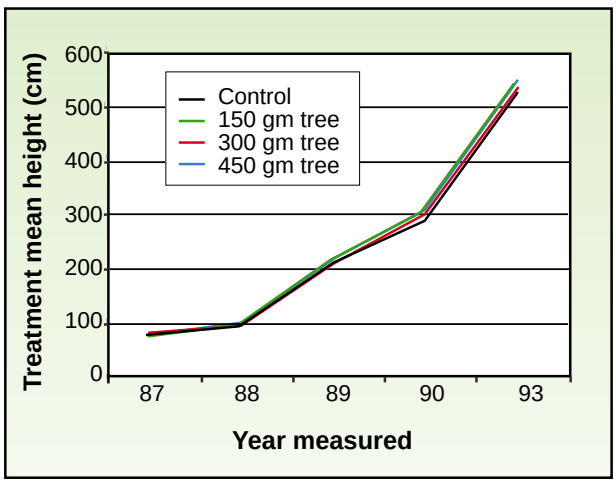

Figure 17: Results of varying fertiliser rates at five sites.

Tree Protectors

These protect the tree from damage by hares and sheep. The greenhouse conditions within the shelters also result in increased growth rate. Tree stability is not a problem with blackwood, although it can be with conifers.

By using shelters, blackwood can be planted in pasture with continued grazing by sheep. Trees should be located in selected areas that are moist and sheltered.

The trees can be planted in groups of three or four, at 7 or 8 metres between each group and silviculturally treated as described in Chapter 10.

Protection against sheep can be achieved using 1.2 metre K.B.C. shelters, and 0.6 metre shelters give protection against hares. Because of stock rubbing, two stakes per shelter are advised, and they need occasional checking. Weeds growing inside the shelters can be withdrawn from beneath the shelter, and sprayed with Roundup. The shelters can be used again after 2-3 years.

Nutrition

Monthly foliage nutrient trends over three years.

Forest Research collected foliage samples over a three year period, in the regime trial at Rotorua. These were taken from the top third of the crown, from 24 dominant trees, every four weeks (tree age 5-8 years). This data showed that the most logical month for foliage sampling blackwood would appear to be April. However, collections in this period may not be sampling for minimum concentrations of K or Ca, which are both lowest in March.

The analysis of approximately 600 nutrient samples is held in the national database at Forest Research. No information is available on the optimum nutrient status for blackwood growth. The database shows the following mean and range of nutrients for New Zealand grown blackwood (Table 6).

Table 6: Mean and range for nutrient samples analysed at Forest Research

Nutrient	Unit	Mean	Range
N	mg/g	3.05	0.22-4.73
P	mg/g	0.17	0.03-0.55
K	mg/g	1.14	0.31-2.24
Ca	mg/g	0.61	0.14-2.03
Mg	mg/g	0.16	0.07-0.41
S	mg/g	0.18	0.09-0.44
Na	mg/g	0.06	0.02-0.22
Mn	µg/g	321.19	26.00-1960.18
Zn	µg/g	21.33	6.20-120.00
Cu	µg/g	5.58	0.38-22.70
Fe	µg/g	63.70	27.66-301.00
B	µg/g	18.13	3.00-39.00

Key Points

- Siting is very important.
- Robust planting stock + good spade cultivation + good weed control = good plantation establishment.
- Seed requires treatment to ensure even germination.
- Seedling type is not critical to success.
- Fertiliser is not always necessary, however P and S should be applied on P deficient soils.
- If fertiliser is applied it should be in conjunction with weed control.
- Seedlings need protection from stock/wildlife during establishment.
- Nutrient deficiency and/or optimum levels are unknown.
- Foliage collection is recommended in the month of April.

Suggested reading:

de Zwann 1982.

Fairweather and McNeil 1997.

Knight 1986.

Hunter, Knight, and Messina 1989.

Messina, and Barton 1985.

Nicholas and Gifford 1989.

Nicholas 1981.

Neilsen (ed) 1990.

Van Dorsser 1981.

Wilkinson and Jennings 1994.