Propagation of New Zealand Native Flora By Seed

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INTRODUCTION

At Taupo Native Plant Nursery, our primary objective is to produce, hardy ecologically sourced New Zealand native plants. Our production this year is expected to be between 1 and 1.2 million plants. Thus for both practical and economic reasons 90% to 95% of our plants are produced from seed.

For the purpose of this paper I will highlight certain areas that a high level of proficiency is required for native seedling production.

TREE IDENTIFICATION AND TYPE SELECTION

Initial correct plant identification is essential in any collection of plant material. The identification of whether the plant is endemic to that site also needs to be attained i.e. the correct genotype identified, if plants are to be used for eco-sourcing.

Eco-sourcing refers to the sourcing of indigenous New Zealand plant propagation material from natural stands of vegetation that are derived from naturally occurring parents and the planting of the subsequent plants back in the same ecological district or locality from which they originated.

The reasons for this practice are:

- Maintain beneficial genetic purity, both morphological and physiological differences can vary in the same species from different ecological districts, e.g. manuka (*Leptospermum scoparium*).
- Increase plant survival. Plants of one particular species sourced from different ecological regions or localities can have distinctly different environmental tolerances such as frost or salt winds.

The Practical Aspect of Eco-sourcing. The plants sourced from different ecological regions or localities can have distinctly different environmental tolerances. These tolerance limits are largely set by the genetic makeup of the plant, so hybridisation or plants from a different ecological source may produce offspring intolerant of local environmental conditions. Thus botanical provinces have been produced (Fig. 1). New Zealand has been divided up into 85 ecological regions and 268 ecological districts. These have been based on landform, geology, climate and biological content.

Even in "clean" areas interspecific and intergeneric hybrids may occur but are fairly rare. Second generation progeny may occur naturally but normally the next generation is sterile, e.g. *Celmisia*.

SEED SET AND MATURITY

The early indications of flowering and seed set is necessary data that should be noted. Certain native plants are well documented for irregular flowering.

The flowering and seed production in beech trees varies considerably from year to year. In years of high seed set, known as "mast years" there can be a 50-fold increase in seed productivity. The trigger mechanism is not fully understood, but indicators

are that hot dry conditions in the late summer and autumn will be followed by a mast year in the following spring and summer.

Some ecological districts may have different flowering patterns. Thus one low seed set in one area may be offset by a heavy set somewhere else. I have also noticed bi-annual bearing occurring on some trees which is another factor to consider when mapping out a site.

Resulting from indifferent weather or other environmental stimulus, flowering may occur outside normal seed set timings. This normally produces very low or nil seed set, e.g. cabbage tree (*Cordyline* spp.).

HARVESTING.

Harvesting procedures depend on:

How Much Seed is to be Collected. In rare and endangered plants only very small amounts are normally collected to allow as much natural seed dispersal as possible. When collecting seed from species which produce seed in copious quantities, e.g., raupo (*Typha orientalis,* syn. *T. muelleri*), only one seed head needs to be collected to produce thousands of plants. Seed produced in minute amounts may require a huge effort to collect the same amount of seed.

Timing of seed collection is crucial; there are great seasonal and geographical variations. One of the biggest problems in untrained seed collection is the harvesting of immature seed. Often immature seed will not ripen once picked and or will not store well.

Local fauna populations also have an effect on the amount of seed that can be gathered. In off-shore islands with very high bird populations there is often very little seed left to be collected. Thus harvesting of immature seeds may be the only way to collect seed material, e.g., *Knightia excelsa*.

In some cases seed may still be present even into the next flower season, e.g., *Pittosporum* spp.

Seed types:

Capsules and pods	Kowhai (*Sophora* spp.)
Fruity berries	*Coprosma* spp.
Daisy-type seed heads	*Olearia* spp.
Raceme-like seed heads	kamahi (*Weinmannia racemosa*)
Nut and large berries	karaka (*Corynocarpus laevigata*)
Grass-type seed heads	*Carex* spp.
Small seeds	*Hoheria* spp.
Receptacle-grain type	totara (*Podocarpus totara*)
Coned seeds	kauri (*Agathis australis*)
Pip fruit seed	kawakawa (*Macropiper excelsum*)
Fine capsule-borne seed	pohutukawa (*Metrosideros excelsus*)

Much of our seed is hand picked. Podocarps may be either hand picked, e.g., bog pine (*Dacrydium bidwillii*), or areas matted out to collect the falling seed, e.g., rimu (*Dacrydium cupressinum*).

SEED PROCESSING AND STORAGE

Processing procedures will depend on the type of seed material and the condition of seed material. At our nursery all berry/drupe-type seed are fermented and rubbed

to remove as much fleshy material as possible. Failure to do so in some cases can leave germination inhibitors contained in the pulp still attached to the seed. This not only causes uneven germination but may cause rot to occur in the stratification process that may follow. Certain seed types may require drying to crack the capsules open, e.g., immature manuka (*Leptospermum scoparium*).

At any of the seed processing procedures, prolonged exposure to environmental conditions that encourage desiccation will decrease seed viability or perhaps introduce or reintroduce seed dormancy.

The main mechanisms that cause seed dormancy are:

1) Environmental factors.
   - Light requirement for germination positive or negative
   - High temperatures
   - The absence of water
2) Internal factors.
   - Seed coat prevention of gas exchange
   - Seed coat mechanical effects
   - Embryo immaturity, rudimentary embryos
   - Low ethylene concentration
   - Presence of inhibitors
   - Absence of growth promoters
3) Timing mechanisms.
   - After ripening
   - Disappearance of inhibitors
   - Synthesis of growth promoters

Dormancy is broken following the subjection of the seed to various environmental conditions which may include: frost, prolonged period of cold, prolonged exposure to cool moist conditions in the presence of oxygen i.e. stratification, intense heat, physical abrasion, fungal attack, passage through the intestine of birds, etc.

In my experience the optimum temperature of native seed storage is at a rigid 4 to 5C. If seed is stored too wet or too dry seed longevity and viability is reduced. Regular inspection of seed is required to check for rotting or remove any inhibitory gases or alkaloids which may have built up.

SOWING AND GERMINATION

If all the correct procedures have been followed, sowing is only a process of timing. These have already been recorded in books and journals.

Seed covering is a matter of choice. I try to emulate the natural seed conditions for germination which may vary from surface sowing to the use of heavy grit.

The observations of seedling growth and performance characteristics are tools for checking for genetic pollution or outstanding characteristics, e.g., tolerance to environmental conditions or leaf colour, which then can be used for type selection.

All the activities from seed collection to plant despatch are documented to produce a comprehensive data base. This ensures Taupo Native Plant Nursery is at the forefront of native plant supply throughout New Zealand.

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