

# Propagation of Jojoba (*Simmondsia chinensis* Schneid.) by Tip Cuttings<sup>©</sup>

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## INTRODUCTION

Jojoba (*Simmondsia chinensis* Link. Schneid.) is an arid zone shrub that is native to the Sonoran Desert of Arizona, California, and northern Mexico (Gentry, 1958). The species is an extreme xerophyte and follows the flowering pattern of a number of desert species in that it is dioecious and wind pollinated.

The taxonomic position of the species is obscure. The species was originally placed in the family Buxaceae but has now been transferred to the monospecific family Simmondsaceae and there is some debate about the likely evolutionary history of the plant. The inappropriate specific name (*chinensis*) is a result of a mix up in the labeling of collection boxes from an expedition that visited both Western U.S.A. and China during the 19th century.

Jojoba produces annual crops of large brown seeds that may be crushed to yield a liquid wax (often referred to as jojoba oil) that is valued as a moisturiser in cosmetics and as a high pressure, high temperature lubricant.

The high commercial value of the liquid wax, the high yields obtained on minimal water and the ability of the species to extract water from water-table recharge areas that would otherwise increase salinity have led to the adaptation of jojoba as a crop in Australia.

Early growers attempted to establish commercial jojoba plantations from seed. This approach failed because half the plants were unproductive males and most of the females did not produce consistent high yields of seed.

Three high-yielding female clones were selected by NSW Agriculture and Jojoba Science Pty. Ltd. from about 4500 plants grown from a seed collection that included a range of provenances (Milthorpe and Dunstone, 1989). Two male clones that match the flowering time of the females and are reproductively compatible with them were also selected. A method of reproducing these clones in large numbers at a reasonable price was necessary before an Australian jojoba industry could be established.

The five clones were bulked up using tissue culture but the plantlets produced by this method grew slowly and took 15 months to reach a size that was suitable for field planting. As soon as sufficient parent material had been cultured a method of propagating the bulk of the plants by tip cuttings was developed.

## PROPAGATION BY TIP CUTTINGS

**Requirements.** The Australian jojoba industry has a requirement for large batches of jojoba plants that can be field ready within a single season. The plants must be tough enough to survive in the field, often under extreme temperatures with

a minimum of attention and the cost must be low enough to allow for large areas to be planted.

Jobjoba is susceptible to both leaf and root fungal pathogens under humid greenhouse conditions and diseases established in the nursery phase may carry over into the field after planting. It is essential that jobjoba plants offered to growers carry no risk of infection by these pathogens. The rooted cuttings must be protected from infection at all stages of production by ensuring that the cutting material is optimal, that nursery hygiene is first class, that the plants are effectively inoculated.

The use of chemical fungicide drenches to control pathogens can be counterproductive as these agents may suppress the fungi without completely eliminating them. A residual infection may then develop into a serious disease long after the plant has been established in the field. The jobjoba propagator must produce plants that are disease free by the application of sound nursery hygiene and early inoculation with biological control fungi.

**Collection of Cutting Material.** The cutting material is collected from selected healthy plants of certified varieties in existing commercial plantations. The optimum collection time is April through May, when the material has firmed up but is not excessively hard nor is it frost damaged. The cuttings are packed dry in unlined polystyrene boxes that are sealed and stored in a cool room at 4°C. The collection may take place over 2 or 3 days before the cuttings are despatched to the nursery.

Each box of cuttings contains over 1000 pieces and up to 30 boxes are prepared at a time. The consignment is sent by truck overnight from the plantation to the nursery, a distance of 550 km. The boxes are picked up and taken to the nursery early in the morning so that work can start without delay.

**Preparation of Cutting Trays.** The cutting trays are prepared 5 to 7 days before the cuttings arrive. A mix of peat, perlite, and pine sawdust (1:6:1, by volume) is prepared and inoculated with pelleted trichoderma (Trichopel-P<sup>®</sup>) and VAM (Vaminox<sup>®</sup>). The inoculants provide a level of protection against pathogens both in the nursery and later in the field (Sawant et al., 1995, Camprubi et al., 1995).

The trays are wetted thoroughly and placed in a warm place so that the inoculants are well established at the time of sticking.

**Sticking Procedures.** The cutting material is stored in a cool insulated room as it often takes 5 days to complete the processing of the whole batch. The boxes are removed from storage one at a time and the cutting material is dipped into a 3% bleach solution for 20 sec before being drained.

Cuttings are prepared from newly hardened green wood. Fresh cuts are made with sharp sterilised scissors without regard for the position of the node. The cut end is dipped in a commercial rooting liquid containing minerals, vitamins, and 3000 ppm IBA (Clonex purple<sup>®</sup>) and the cutting inserted into the prepared trays at the rate of 130 per tray.

**Rooting.** Once the cuttings are prepared the trays are watered and placed on heat beds. The heat beds are covered with a layer of coarse material that is well drained, this prevents water moving along the bench that is in contact with the trays. The heating beds are set at 27°C and misting is set at the lowest possible setting that will prevent the cuttings drying out.

The leaves of the cuttings are sprayed with suspendable trichoderma at the rate of 1 g.liter<sup>-1</sup> within 24 h of sticking to destroy fungi on the leaves. All plants become thoroughly inoculated with trichoderma and VAM as the roots develop and the inoculant carries over to the pots during the potting up process and ultimately to the field.

The cuttings are held under these conditions for about 6 weeks and a well developed root system forms. At this stage the mist is gradually reduced until the plant is well hardened and ready to be potted up.

**Potting Up.** The rooted cuttings are potted up into a pine bark based medium in 5 cm × 5 cm × 12 cm forestry tubes for growing on. Great care must be exercised at this stage as the roots are extremely brittle.

The potted plants are placed in trays that suspend them above the ground so that water cannot run between pots and root pruning takes place (Reko<sup>®</sup> 40 plant trays).

The trays are placed in a double-skinned greenhouse that retains heat well during winter and spring while the jojoba is growing out. The growth rate is low during the winter when the days are short but it rapidly increases in spring as the days get longer and the temperature rises towards the optimum of 33°C.

The jojoba plants are sorted and despatched to the plantation sites during the planting season that lasts from October through to March. One male plant for every 20 females is the usual planting ratio. After planting in the field the jojoba is watered every 2nd day for 3 weeks after which it must survive on soil water. Losses at this stage are in the order of 1.5% to 2.5%.

The xeromorphic nature of jojoba has meant that it is difficult to propagate vegetatively. However, using this method, large numbers can be propagated and the Australian jojoba industry is now moving ahead.

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