8.4 Durian Propagation and Nursery Practice

Nguyen Minh Chau,[1] Huynh Van Tan,[1] Yan Diczbalis[2] and David I. Guest[3]

Abstract

This paper details nursery best practice procedures to ensure the supply of adequate quantities of vigorous, disease-free seedlings to the durian industry. Procedures adopted in Vietnam and Australia are compared and contrasted.

Introduction

Best practice in durian nurseries is fundamental to the establishment of healthy durian orchards. In Vietnam, the durian industry is rapidly expanding, but there is a general shortage of selected durian cultivars. As has been seen in other rapidly expanding horticultural industries, high demand for planting material can lead to shortcuts being taken in nursery practice, resulting in poor-quality and variable planting material. This can be a serious problem when soil-borne pathogens such as *Phytophthora* species. are spread from infected nursery stock to newly established orchards. As a consequence, what may have been a disease-free orchard becomes infested. Once established, pathogens like *Phytophthora* are practically impossible to eradicate. In established durian-growing countries, such as Thailand, nursery operators have developed considerable expertise in propagating selected cultivars for distribution to orchards. However, even here, soil-borne disease can be a problem if nursery hygiene is not carefully implemented and monitored. The impacts of diseases like phytophthora on nurseries include the direct costs due to plant deaths, and the difficulties and extra costs associated with managing diseases, poor-plant quality and damage to the nursery's reputation among customers.

Propagation Techniques

Nurseries use a range of propagation techniques to service the rapidly expanding durian industries in Vietnam. The particular technique favoured depends on the availability of selected genotype stock and scion material, the quantity of planting material required, the price paid by purchasers, and labour costs and skills.

Cho Lach District in Ben Tre Province in the Mekong Delta of Vietnam is well known for its production of fruit tree saplings. The Cho Lach people learnt grafting techniques from the French around 100 years ago and now produce more than 20 million citrus, durian, mango, longan, mangosteen and rambutan saplings annually. A hard-working family in this area can produce 30,000 to 40,000 durian plants each year. In general, the quality of the nursery stock is good, as the nurserymen and women are skilled and experienced.

In Australia, durian planting material is provided by a small number of nurseries where the proprietors are usually also durian growers. The Australian durian industry is relatively small and still in its infancy, hence clonal production is based on a range of cultivars as part of longer-term, regional cultivar

[1] The Southern Fruit Research Institute, Box 203, Tien Giang, Vietnam.

[2] Centre for Wet Tropics Agriculture, Queensland Department of Primary Industries, South Johnstone, Queensland 4859, Australia.

[3] School of Botany, The University of Melbourne, Victoria 3010, Australia.
Current address: Faculty of Agriculture, Food and Natural Resources, The University of Sydney, New South Wales 2006, Australia.

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testing. In the past, seed supply was limited, and imported seed, mainly of Indonesian and Malaysian origin, was the main source of seedling stock. Australian-grown fruit not suitable for fresh fruit sales were also keenly sought as a source of seed. The genetic base of rootstock is extremely variable and may explain some of the differences in tree performance and survival seen in the field. Seeds were sown either in bulk or into individual pots (2–5 L plastic bags; Figure 8.4.1). Potting mix varies between nurseries, but generally consists of a mixture of sand, soil and composted organic matter (pine bark, peanut shells or similar). In some cases, vermiculite or perlite is used in place of organic compost. Some growers have found that a more open (aerated) mixture results in improved root growth and seedling vigour (Figure 8.4.2). One major producer of durian planting material has moved to a soil-less mix consisting of 80% composted pine bark and 20% sand (Zappala et al. 2002). Potting mix is rarely pasteurised at present, but is being considered against a background of improved understanding of how disease is transferred.

A major innovation has been the introduction of raised nursery benches, which allow pots to be placed above the ground, hence minimising contamination of new pots and plants by water movement on the nursery floor.

Propagation techniques are evolving as nurseries learn and develop new and more reliable techniques. Nurseries have used approach grafting, marcotting, budding and wedge-graft techniques. Bud grafting utilising the Fokert technique was initially the preferred method of propagation. In the Northern Territory, Lim (1997) reported that cleft-grafting techniques were as successful as Fokert budding, but the time of year was crucial to maximal success. Zappala et al. (2002) also presented data that confirm that propagation during the warm, wet season resulted in higher success (generally greater than 60%) than propagation carried out under cool, dry conditions.

Australian nurseries, like their Vietnamese counterparts, now predominately use a wedge-grafting technique rather than Fokert budding. Actively growing, 6–12-month-old seedling material is preferred as rootstock. Scion material with one to two active buds is selected from healthy trees (Figure 8.4.3). One-third to one-half a leaf is left on the bud stick and the lower part of the stick is trimmed to a wedge shape. The stock stem is cut cleanly and split, and the bud stick is inserted and held together with plastic clothes pegs. The newly prepared graft is covered with a semi-opaque plastic bag and the pot placed in a warm, plastic house. The pegs are removed after a callus has formed 3–4 weeks after grafting (Figure 8.4.3). Some durian growers who produce planting material for their own use prefer to use an approach-graft technique (Figure 8.4.4).

In Vietnam, the traditional wedge-graft or budding technique was largely replaced by the U-grafting (side-graft) technique about six years ago. U-grafting allows four to five times the number of saplings to be produced per budwood (Figure 8.4.5). The U-grafting technique is also much easier to carry out than is traditional budding.

Figure 8.4.1 Durian seed germination

Figure 8.4.2 Well-aerated potting mix (80% composted pine bark:20% sand) results in greater root vigour (plant on right) relative to a plant grown in a soil mix.

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Figure 8.4.3a (above) Scion material with one to two active buds is selected from healthy trees.

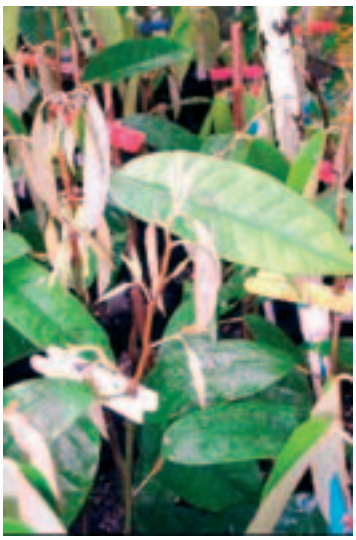

Figure 8.4.3c (right) New buds emerging from a wedge graft 3–4 weeks after grafting. Plastic clothes pegs are used to bind the grafts

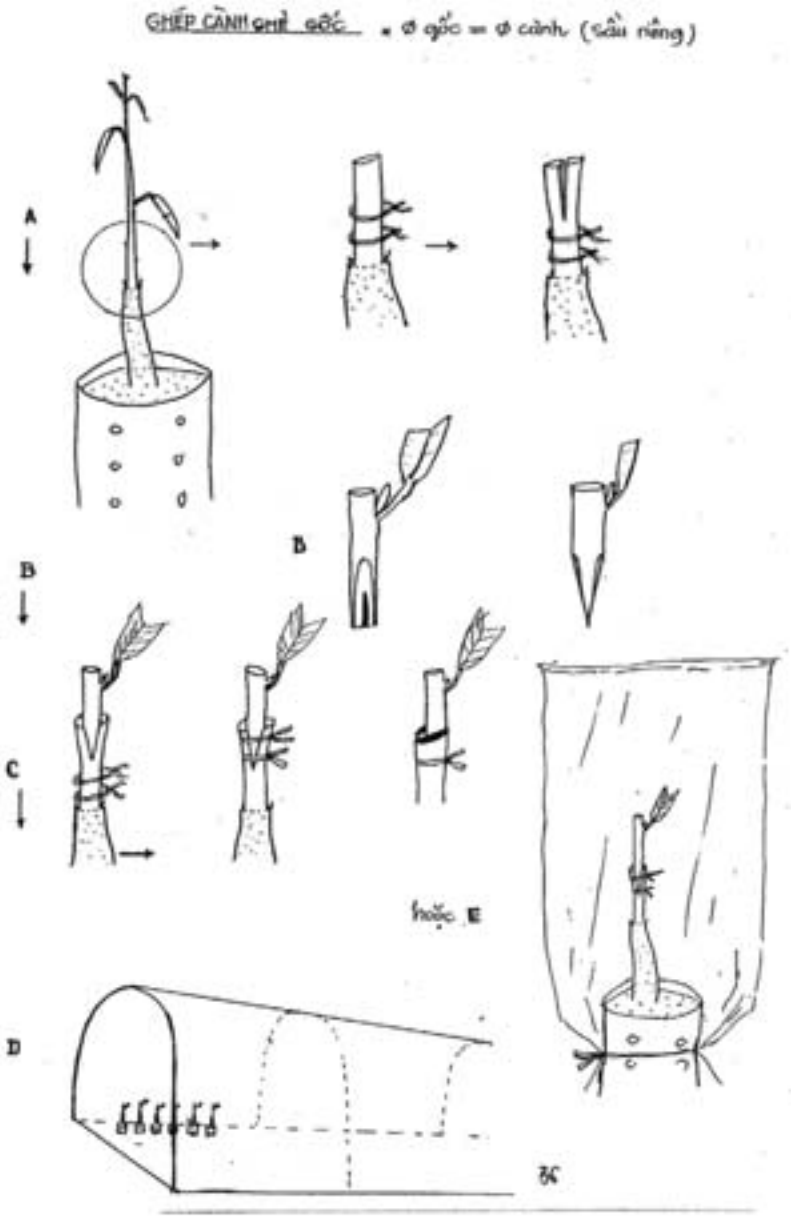

Figure 8.4.3b Wedge-grafting technique

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Durian nurseries produce two types of durian saplings — one rootstock or two rootstocks. Saplings with two rootstocks establish and grow faster than single rootstock saplings. The wedge graft is used for two rootstock saplings, while U-grafts are used for single rootstock saplings. The time needed from sowing the seed to selling the plants is approximately 12 months.

As in Vietnam, double versus single rootstocks have been tested in Australia (Figure 8.4.4). Australian nurseries prefer to produce single rootstock material. Shortage of seedling stock, lower labour requirements and better long-term field survival of single-stock plants are the main reasons for preferring single rootstock material. Australian experience suggests that field survival of trees is

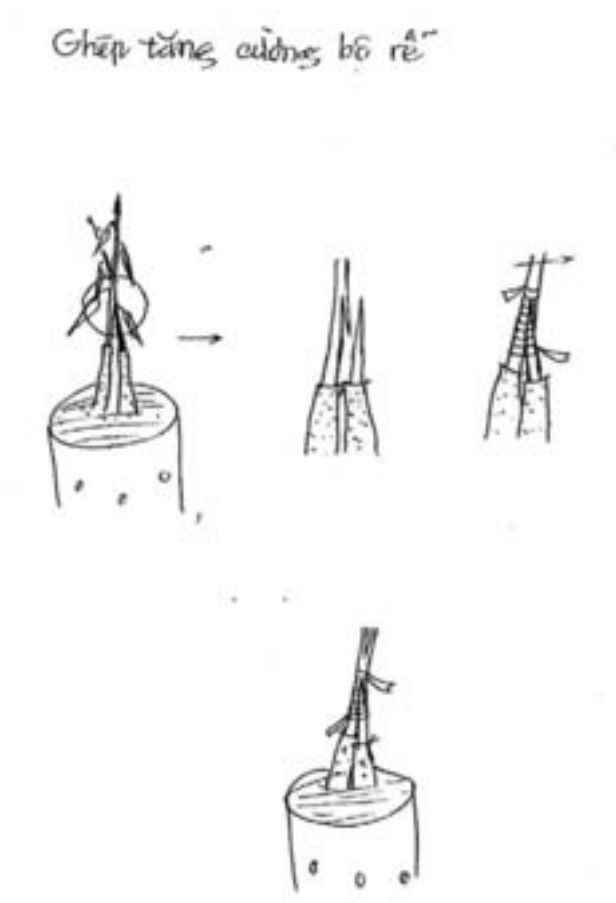

Figure 8.4.4b (above) Vietnamese durian approach-grafting technique.

Figure 8.4.4a (left) Approach graft used to create multiple rootstocks.

Figure 8.4.4c Approach grafting using plastic clothes pegs for graft clamping.

Figure 8.4.4d Advanced double rootstocks ready for planting (SOFRI, Vietnam).

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enhanced if grafted trees are kept in the nursery until they have a trunk diameter of more than 12 mm and are approximately 1 m in height (Zappala et al. 2002). Australian nurseries have made little use of the side-graft technique, known in Vietnam as the U-graft. This method uses 12–24-month-old rootstocks, which in Vietnam are direct seeded into nursery beds and then uprooted and potted a month before grafting.

A few durian growers avoid using grafted planting material, preferring to use seedlings. Anecdotal evidence suggests that stock/scion incompatibility may affect the vigour and productivity of grafted durian. There are very few hard data on the performance and disease susceptibility of durian stock/scion combinations, and this is an area in high need of further research.

Nursery Hygiene

It is important that more attention be paid to producing disease-free planting stock in the future, to prevent the spread of pests and pathogens. To achieve this, durian nursery operators need to follow best-practice methods, such as those established in the citrus and avocado industries and discussed in Chapter 7.2 (NGIA 2003). They also require access to reliable diagnostic services. Furthermore, it is advisable to accurately record and

Figure 8.4.5a Uprooted 18-month-old seedling being prepared for side or U-grafting (Vietnam)

Figure 8.4.5c Side-grafted durian seedling ready for planting

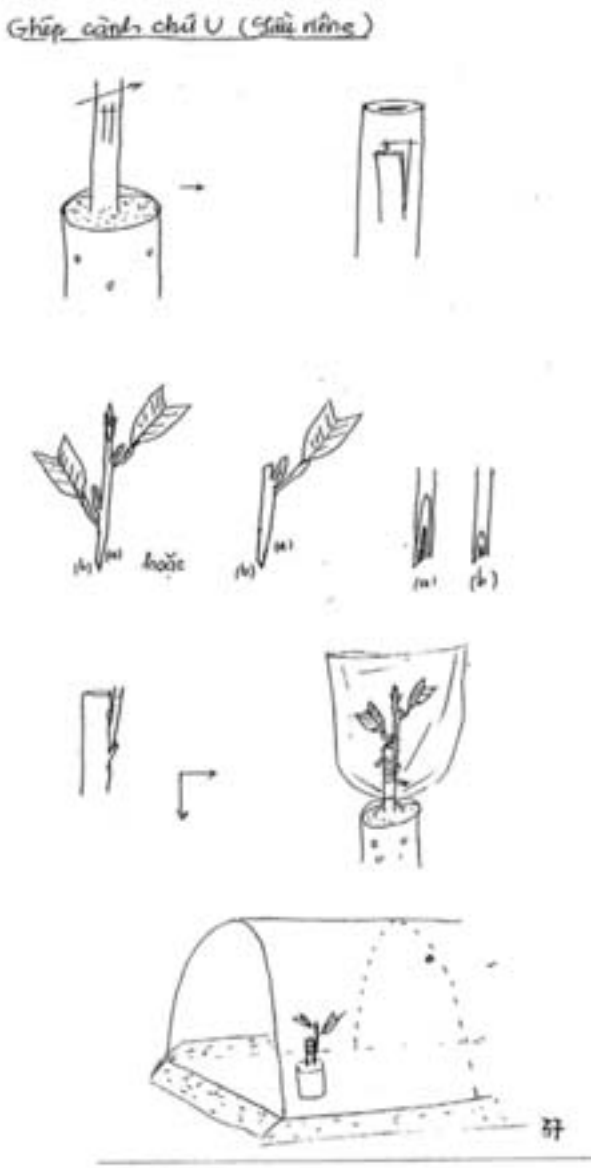

Figure 8.4.5b Side-grafting technique

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regularly audit nursery procedures to ensure that recommended practices are being followed, and to identify difficulties. Ultimately, these procedures form the basis of a nursery accreditation scheme, guaranteeing high-quality, certified, disease-free planting material for growers.

The following best practices are recommended for durian nurseries:

- Nurseries should be established away from mature orchards on sites that are properly drained to avoid water entry or run-off.
- Only seed from disease-free fruit that has not been lying on the ground should be used to establish rootstocks.
- Only budwood from disease-free trees, taken from branches above the soil-splash level, should be used as scion material.
- Plant material from other nurseries should be quarantined in a separate facility and monitored for pests and diseases for at least four weeks.
- Potting media should be porous and free-draining. Soil, river sand or coconut fibre, should be avoided, as these substrates frequently contain *Phytophthora*, *Pythium*, *Rhizoctonia* and nematodes. Composts should be anaerobically fermented and matured for at least 10 weeks before use.
- All potting media should be thoroughly mixed on surfaces that are drained to exclude both water run-off and entry, and are free from soil and other sources of contamination.
- Potting media should be pasteurised by steam–air treatment.
- Pasteurised potting media should be stored in closed, disinfected containers, and must be regularly baited for *Phytophthora* before use.
- Potting media can be recycled, but must be steam–air pasteurised and stored hygienically.
- Nursery floors and paths should be sealed with concrete, or covered with coarse gravel at least 75 mm deep, and kept free of plant material and weeds.
- All pots, utensils, tools, containers and trolleys must be cleaned of soil or potting mix after use. Used pots and containers should be sterilised in 1% hypochlorite solution, and tools regularly disinfected with quaternary ammonium detergents (2000 ppm is recommended) or 70% methylated spirit. Hands must be washed with soap and water or an approved hand-washing biocide.
- Only pathogen-free irrigation water, preferably from deep bores, should be used. Irrigation water must be regularly monitored for pathogens, especially *Phytophthora*.
- Pots should be placed on raised, slatted benches and spaced to allow free air movement. Larger pots may be placed on raised beds of coarse gravel at least 75 mm deep, with adequate drainage to ensure that water does not accumulate or pond. In these cases, the gravel should be tested regularly and be certified pathogen-free.
- Watering hoses should be kept off the ground.
- Nursery areas should be fenced and secured to restrict access and prevent the entry of animals.
- Wind and dust should be suppressed.
- Plants should be grown in appropriate levels of light. Durian seedlings tolerate direct sunlight and overshading can cause disease problems.
- Appropriate fertiliser applications, preferably composted chicken manure, should be timed to ensure optimal nutrition and growth.
- Anyone entering the nursery area should wash their hands before entry, walk through a footbath containing copper fungicide, and not smoke or eat.
- Plants should be regularly inspected for pests and diseases and culled as required.
- Plants should be sold or distributed for planting before the roots become bound.
- Discarded plants and potting mix should be stored in designated closed containers and removed frequently. Discarded material may be anaerobically fermented and composted, or buried away from the nursery and drainage lines. Diseased plants should be burnt.
- Weeds in the pots and around the nursery beds must be rigorously controlled.
- Insect pests such as mealy bugs, aphids, thrips, white-fly, scale, mites and borers, should be managed, preferably using integrated pest management.
- Use of fungicides in the nursery should be avoided (especially phosphonates) as these may mask disease symptoms without eradicating the pathogen.

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