

Commercial Marcotting of Fruit Trees

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INTRODUCTION

Marcotting is the internationally recognised horticultural term for aerial layering, originating from the French word "marcotte"; that is "to aerial layer". This method of vegetative propagation is widely used throughout the world to clonally propagate fruit trees which are difficult to reproduce by any other means, e.g., lychee and longan. It is also an easy way to propagate most types of plants without the need for specialised equipment, growing houses, or skills.

Marcotting uses large amounts of propagation material and is labour intensive. Both these factors limit the commercial use of this propagation technique when compared to the more cost-effective methods used in the highly competitive nursery industry. It can also produce a weak-rooted plant that is prone to lodging if the root system is not properly trained when the marcot is removed from the parent tree and grown on.

PRINCIPLES OF MARCOTTING

The basic principle is to cincture the branch by completely removing a section of bark around the branch to a width of 1-4 cm, depending on branch diameter. A suitable rooting medium is placed over the cinctured area and enclosed in an impervious material that will retain the desired moisture level in the rooting medium and keep excess moisture out. Usually sterile peatmoss is used as the rooting medium and clear plastic is used as the impervious material. The plastic is held firmly in place by binding with strong twine or by using plastic covered wire, such as twist-ties.

The marcot root ball needs to be held firmly in place during the rooting period as any twisting of the rooting medium around the branch will damage roots.

BOTANY

Cincturing the branch removes the bark and hence the phloem or food conducting tissue down to the active cambium layer. Care must be taken not to excessively damage the water-conducting tissue or xylem inside the cortex (the hard woody section of the branch). The stronger the cortex, the easier it is to cincture a branch without damaging the xylem. This is important as the branch, stem, and leaves above the cincture rely on this water supply for survival.

Sugars manufactured by the leaves above the cincture can no longer transfer down the branch to the lower stem and roots, and therefore accumulate in the cinctured branch. This accumulation of sugars is as important as root development, for this supports the marcotted branch once removed from the tree until an independent root system develops.

It is important that no active cambium cells or any bark remnants remain within the cinctured area. Re-callusing of the cincture will result in the sugars going to the main parent plant, and even if adequate roots develop in the marcot root ball, the marcot can die soon after removal from parent tree due to lack of food reserves.

Starches and carbohydrates begin to accumulate at the top of the cincture. This encourages the development of a ring of callous at that point and, provided moisture conditions and rooting medium are correct, roots develop from this callous into the rooting medium.

The first roots that appear are generally thick, corky, adventitious roots that are few in number and very fragile. In time, fibrous secondary roots develop from the primary roots. It is important that marcots are allowed to remain on the parent tree until secondary roots are well developed. This time will vary depending on plant genus, species, variety, and temperature. Usually a minimum of 10 weeks to a maximum 20 weeks is required for proper root development and sufficient food reserve accumulation.

MARCOTTING PROCEDURE

Cincturing. The width of the cincture is generally 3 to 4 times wider than the branch diameter. A pair of adjustable pliers or multi grips are ideal for bark removal.

Some species with very active cambium that tends to re-callous during the rooting period need to be left for 1 to 2 weeks prior to wrapping with rooting medium. Alternatively the cambium can be removed by scraping or by using abrasive emery paper.

Angular stems can be a problem as bark with associated cambium may remain in grooves. Remove bark using a pointed instrument.

Cincturing is best done when there is good sap flow as bark is easier to remove.

Rooting Media Type/Placement. Many different media may be used such as peatmoss, vermiculite, perlite, bagasse, leaf mould, clay, straw, well drained soil, coconut dust, rice hulls, and raw sphagnum moss. Any medium that is well aerated but holds moisture is suitable.

Generally, peatmoss or raw sphagnum moss mixed with varying amounts of vermiculite or peatmoss are used to obtain the correct physical properties for each particular plant species. Sterile, disease-free materials give best results. A rooting medium that holds together is easier to use, as less is lost during the plastic wrapping procedure.

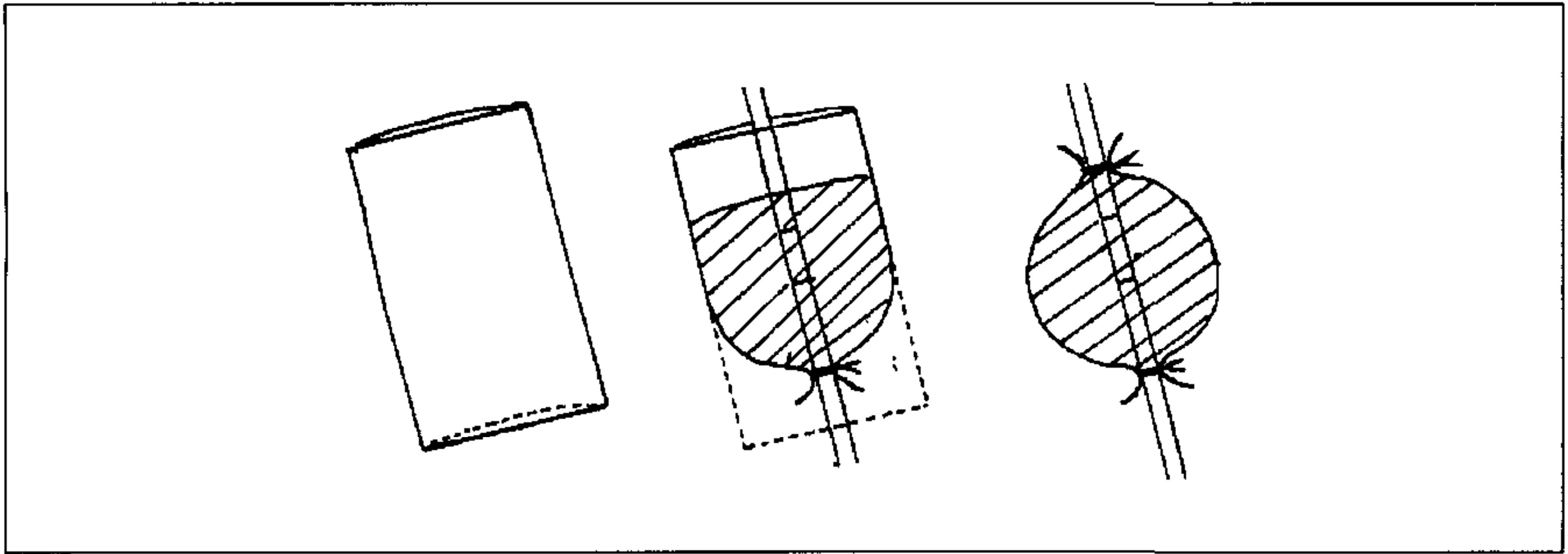
Root ball size should be as small as possible relative to branch size to achieve success, e.g., a completed root ball of 12 cm by 8 cm is ideal when marcotting lychee and longan branches, 1-2 cm in diameter with a total marcot branch length of 50-60 cm. Too large a root ball will hold excess moisture that will inhibit root development and increase the weight on the parent tree which can cause limb breakage.

The placement of the rooting medium is important. Aim to have the top of the cinctured area in the top one-third of the rooting medium. This allows for some flexibility when wrapping rooting medium onto the branch. Too low and the roots will not develop as the top tie will prevent root development. Too high and the roots will not have sufficient room to grow.

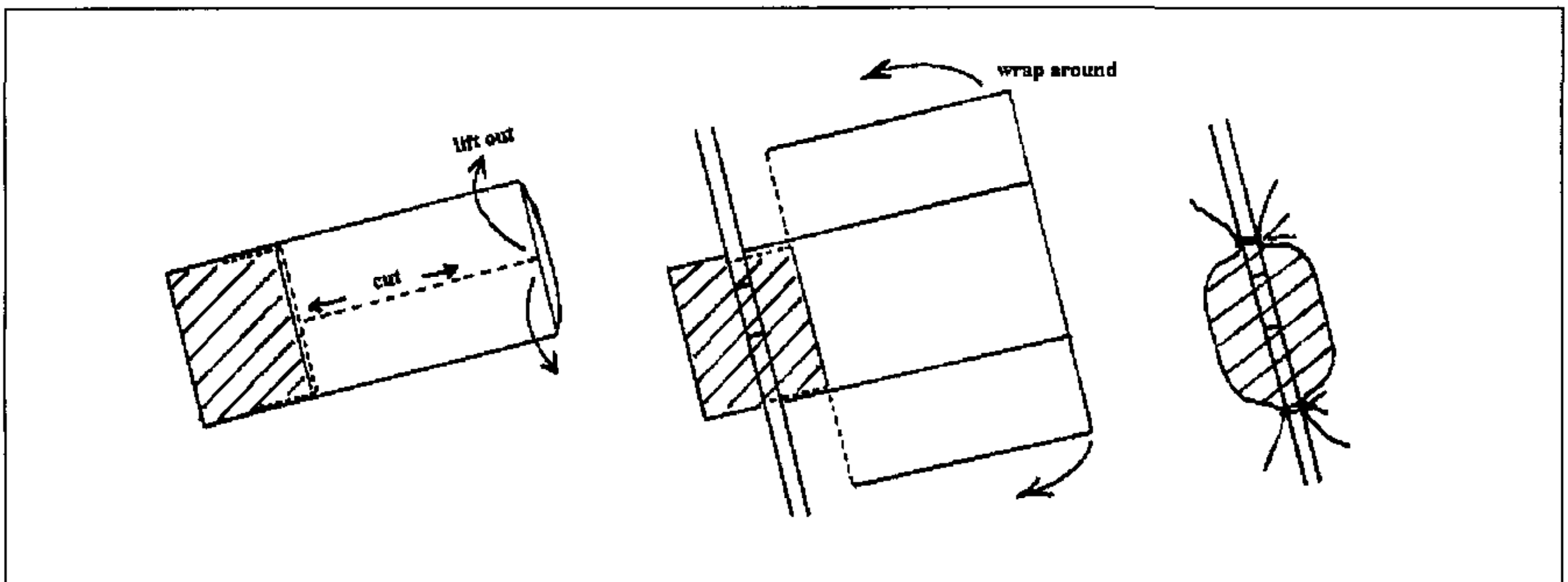
Wrapping Methods. The methods of applying the rooting medium, plastic wrapping, and securing vary greatly depending on personal preference and speed of operation required.

1) Plastic sleeve suitable for small numbers as this method is slow (approximately 25 per hour). The required size plastic sleeve is pulled down over top of branch, tied

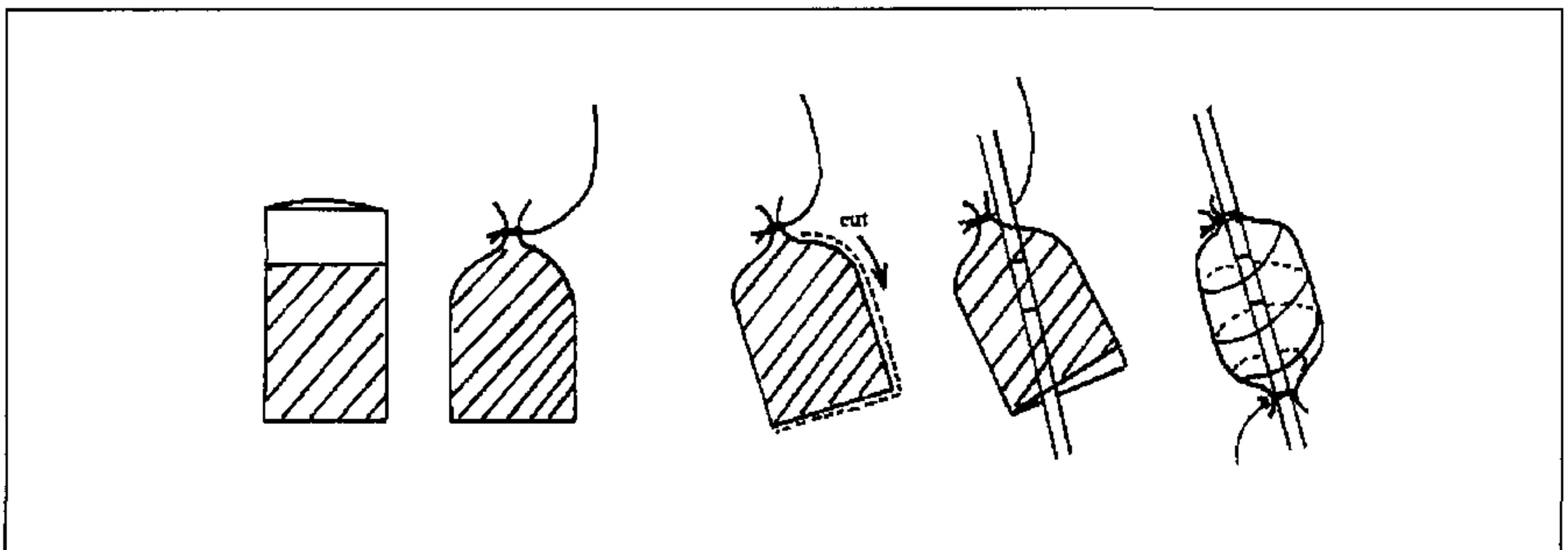
off below cincture, rooting medium is placed into sleeve, plastic sleeve is pulled up, medium is squeezed tight, and plastic sleeves are tied off above cincture.



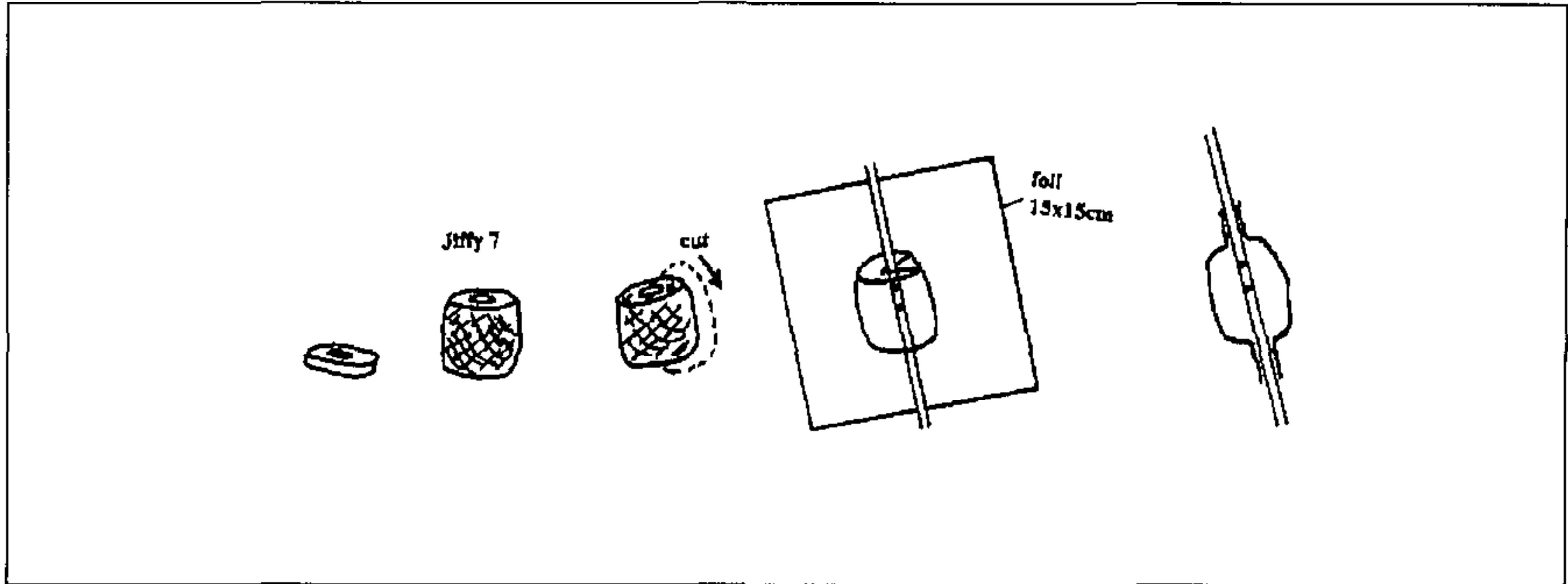
2) Split pre-filled plastic pouch and flap—lower pouch is filled with rooting medium, pouch is placed around cincture, and rooting medium is pushed up and around branch. Remaining plastic flap is wrapped around branch and the top and bottom are fixed using twist-ties. Approximately 45 per h can be completed.



3) Pre-filled plastic bags tied off with 30 to 60 cm twine—plastic bags 20 × 10 cm are pre-filled and the open end is tied off with 60 cm of strong twine. The plastic bag is cut from twine knot, along one side and down to the bottom. The rooting medium is pushed up around branch, plastic is pulled up either side of branch, over and around rooting medium. The plastic is then tied up using attached twine. Approximately 50/h can be completed.



4) Jiffy 7 peat pot/aluminum foil wrap for mini marcots—Jiffy 7 peat pots are expanded in water and allowed to free drain. The attached net is cut lengthways along one side of Jiffy 7. Peatmoss is pushed around branch and wrapped with pre-cut aluminum foil sheet—suitable for very small branches around 0.5 cm only. This has limited use, generally when propagation material is scarce.



TIMING

Marcotting can be carried out at any time of year so long as the bark is easily removed during the cincturing operation. Late spring to early summer is usually the best, provided mother plants are well grown and under irrigation if dry weather conditions are experienced at that time of year. Best root development occurs under the diurnal temperature range 15 to 28C depending on plant species.

Ideally if marcots can be removed and grown on during the warmer summer months, root establishment is easier and plants are stabilised before the onset of cool winter temperatures. If dry springs and early summers are likely, or if parent trees are not irrigated, it may be best to delay marcotting until mid summer or when rainfall is likely. Excessive rain with extended periods of cloudy weather and low temperatures generally gives a poor result. The physical properties of the rooting medium and thickness of plastic used may need to be varied according to weather conditions.

AFTER CARE

When removing mature marcots with very dry rooting medium, place in water within 5 to 10 min of removal to avoid stress and possible root damage. Trim leaves on marcot branch according to the extent of root system development. Trim any twisted roots and roots growing around and upwards before potting on. Keep the newly potted plant in a high humidity atmosphere of at least 75% to 80% RH.

Avoid excessive watering of newly planted marcot but do not let potting medium and/or marcot root ball dry out. Care must be taken with fertilisers and any applied nutrients during the initial establishment period. Weak nutrient solutions or small amounts of longer-term slow-release fertilisers are safest for 3 to 4 months. Roots take 3 to 6 months to establish depending on plant species and temperature.