PRACTICAL GUIDELINE FOR THE HANDLING OF BARE ROOTED NURSERY TREES FROM LIFTING TO PLANTING

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Lifting of trees

- Growth cessation of nursery trees should take place in early autumn (naturally or induced by, for example, reducing water and nitrogen) to ensure a sufficient dormancy induction phase of approximately 6 to 7 weeks where:
    - Terminal and lateral buds develop;
    - Reserves build up;
    - Trees harden off in preparation for winter and the entrance into endodormancy.
- Bare rooted nursery trees should be lifted and handled without leaves to minimise stress.
- Ensure that neither the buds, leader nor root system is damaged during lifting and handling thereafter.
- Nurserymen should aim to delay the defoliation of trees as long as possible, preferably 6-7 weeks after terminal growth cessation, to ensure that adequate reserves build up for re-growth in spring. A shorter period between growth cessation and defoliation can result in significantly weaker growth after planting and greater sensitivity to cold- and chemical rest breaking damage. It can also result in re-growth in the nursery which would be very detrimental to tree quality.
- Nursery trees should preferably not be lifted at a fixed calendar date.

Transport and Reception

- Confirm in advance with the nursery when the trees will be delivered or need to be picked up.
- Trees should preferably not be transported on hot days, but if no alternative exists, it should be done early in the morning or late in the afternoon. Also, do not transport the trees under a tarp during a hot day as the upper part of the trees can be damaged by the heat if the vehicle is in the sun for a long time.
- Ensure that there is a suitable area to unload the trees.
- Trees should preferably be passed on from the delivery vehicles, rather than being dropped off on their root systems.

- Make sure that the correct trees are received.
- Since nursery trees are commonly bundled for transport, storage and other practical reasons, insects and pathogens can easily spread between the trees. Therefore, identify and remove all infested/diseased/physically damaged trees.
- Ensure that the rope/cable ties used to bind the bundles does not damage the bark and allow entry to pathogens.

  (Optional)

  - Bare rooted trees can temporarily be stored in bins before cold storage or planting to minimise handling and ensure that the root systems stay moist. Growers doing the latter should note the following:
    a) Bins should be stored in the shade.
    b) Make use of bin liners on the bottom and sides of the bins to prevent dehydration of the roots.
    c) Process:
       - Add a sawdust layer of approximately 20 cm thick in the bin.
       - Gently insert the bundles upright in the bin and tag the bundle that's inserted last – this bundle should be removed first to prevent potential damage to the root systems and bark.
       - Carefully remove the rope/cable ties that binds the bundles. Disinfectant sprays can be considered if damage on the bark is noted.
       - Fill the bins with sawdust up to the graft unions and ensure that good contact between the roots and sawdust is maintained.
       - Ensure that the sawdust is always moist, but that excess water is fully drained before cold storage.
  - If the trees are temporarily layered-in in trenches on the farm before planting, growers should note the following:
    a) Layered-in trees must be irrigated optimally.
    b) New white roots must preferably not develop in the trenches as these roots are very brittle and easily damaged during planting.
    c) Sprouting of trees in the trenches should be avoided at all costs and therefore the trees should not be left in the trenches for too long.
    d) Trenches must be positioned so that trees are not exposed to direct sun and also not flooded during heavy rains.

Storage in cold room (Optional)

- Ensure that the trees are clearly tagged.
- Store trees for approximately 6-8 weeks before planting.
- Ensure that the temperature and relative humidity of the cold room do not deviate from the best management practice.
    - Preferably store between 2 and 4 °C to ensure that enough positive cold units accumulate.
    - Under no circumstances should trees be stored together with fruit at -0.5 °C as no effective chilling will accumulate according to the Utah (Richardson) and Daily Positive (Infruitec) Chill Unit models.
    - Ensure that the optimum high humidity is maintained in the cold room – as close to 100% as possible.
- The main aim of cold storage is to accumulate chill. Although cold storage can also serve as temporary storage while the orchard is prepared for planting, trees should under no circumstances sprout while in the cold room and therefore the trees should not be stored for too long. White roots are very brittle and easily damaged during planting, while etiolated shoots that develop in cold rooms are extremely sun sensitive.
- Trees are typically kept with their roots in sawdust during cold storage. It goes without saying that it is not advisable to use sawdust (or other mediums) containing pathogens or contaminated with old root residues or harmful substances such as diesel.
- Ensure that the sawdust (or other mediums) fill as many gaps between the roots as possible.
- Ensure that the sawdust (or other mediums) stays moist around the roots.

Orchard Preparation

- If the orchard is replanted, apply the necessary soil treatments, and ensure that all the material of previous orchards/vineyards are removed.
- Consult your soil scientist about the need for soil amendments or mulches.
- If deficiencies and/or the pH must be rectified during soil preparation, ensure that the chemical elements are adequately mixed to prevent localised toxicity or salt precipitation.
- Ensure that the training- and irrigation systems are in place before planting. If necessary, consult your irrigation designer for the optimal design.

Planting

- Decide on an optimal planting time and plan accordingly. Note that pears should preferably be planted during early winter, especially if grafted on BP rootstocks.
- Trees must be planted while dormant following a 6-7 week dormancy induction period and after cold storage, if necessary. The trees should also be planted before any movement of white roots and buds.
- Make planting holes immediately before planting and avoid flattened walls (pot effect) as it will restrict root growth and cause water accumulation and the resultant drowning of the roots.
- Do not prune or bend the roots during planting.
- Insert a shovel full of soil into the planting hole and spread the roots on it.
- Add the remaining soil and water simultaneously into the planting hole to ensure that good contact between the roots and the soil is maintained. A 20 L container as well as a water cart must always be on hand.
- Plant the trees with their graft unions approximately 10 cm above the soil/mulch. An exception may be with example M.9 or other dwarfing interstems where the grower might want or do not care if the interstems root.

Establishment

- Ensure that all trees, especially tall trees, are supported/ fastened after planting as fastened trees will grow faster and invest less (of the initially very limited) energy in supportive wood formation. Fastening of trees also prevent potential girdling that can take place in rocky soils due to movement in the wind.
- Consult your technical advisor on the appropriate rest breaking treatments for the young trees.
- Ensure that the drippers/micro-sprinklers are placed optimally (over the root zone) so that the root systems are always kept moist.
- Consult your technical advisor/soil scientist on the optimal irrigation level and scheduling for the orchard.
- Fertilisation:
    - Ensure that the fertiliser/manure is not applied directly against the bark as it can result in toxicity, trunk burn and even girdling.
    - Consult your fertiliser expert regarding an optimal fertilisation program.
- Weed management and pest- and disease control:

- Consult your crop protection specialist to perform the best management practice.
- Ensure that the tree trunks are protected against herbicides.

This guideline was compiled from previous articles published in the Fresh Quarterly[1] and South African Fruit Journal[2] and a guideline drafted by Angelique Pretorius (Technical Manager, Kromco) with input from F Ungerer and N Kapp.

[1] Bestbier, G. 2020. Get a handle on new trees. Fresh Quarterly, December, pp. 10-11.
Mouton, A. 2020. To pot or not. Fresh Quarterly, December, pp. 12-13.
[2] Steyn, W. and Theron, K. 2015. What are the physical characteristics of a good nursery tree? SAFJ, October/November, pp. 63-65.
Theron, K. and Steyn, W. 2015. What are the physiological characteristics of a good nursery tree? SAFJ, December/January, pp. 64-67.
Steyn, W., Theron, K. and Ungerer, F. 2016. Nursery trees: When is it not the nurseryman's fault? SAFJ, June/July, pp. 66-69.

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