
Olive Propagation

SUMMARY:

A very important component of the olive sector is the multiplication and certification of planting materials. The traditional methods used for olive multiplication since ancient times are the purely asexual method of propagation (using suckers or cuttings) and later on the method of grafting seedlings. The main techniques which are now used commercially for olive propagation are rooting of cuttings and grafting of seedlings.

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CATEGORY:

[Crop production](#) [7]

COUNTRIES:

Cyprus

Egypt

Iran

Jordan

Libya

Morocco

Palestinian Territory

Saudi Arabia

Tunisia

Yemen

DESCRIPTION:

Rooting of Cuttings

The advantage of this technique is the fast multiplication capacity of the easy rooting varieties. The type of cuttings used is hardwood, 15 cm long and 1 cm diameter which are taken from mature shoots (maximum one year old) of the mother tree.

Handling of cuttings and factors affecting their rooting for rooting (Post-removal)

Labelling and recording: This is an important action to avoid mixing of varieties. Handling: In order to minimize water loss from stems, they should be transferred to the propagation facility as soon as possible. The stem tissues should not be bruised as the damaged area is a source of disease. Nursery staff need to be trained in grading and sorting the cuttings and in the use of tools in order to guarantee the quality of work, speed and for human and plant safety. Cutting characteristics and guidelines for successful rooting:

1. The cuttings should be selected from vigorous wood of the current year's growth that contains a high level of food reserves. One of the most important factors for rooting is the sufficient carbohydrate reserves in

the shoots. Well matured cuttings from the current season's growth with short internodes are preferred. Cuttings that are too succulent, pithy and low in stored carbohydrates should be discarded;

2. The mother plants should be pruned back hard every winter to maintain vigor and quality of cuttings;
3. The cuttings should be long enough to provide economical use of the shoots, easy handling, and possess sufficient food reserves to support rooting, establishment and production of a plant of the desired shape and quality. The length and the diameter of the cutting should be determined largely by the species/cultivar rooted and the propagation facilities. Cuttings usually have 0.8 to 1cm diameter and 15-20 cm length;
4. Remove sufficient leaves so that the lower leaves are not in contact with the rooting media and to also prevent drying. Only two pairs of leaves should be left in each cutting;
5. Cuts must always be clean, without any fringing and tearing. The slant must always allow the rainwater to run off it;
6. Polarity: the cuttings have to be the correct way up, that is the proximal end (nearest the crown or junction of roots and shoots) to base, and the distal end (nearest the shoot tip) upwards
7. Application of rooting hormones, particularly when applied in solution, can significantly improve results;
8. The cuttings can be placed in the rooting media either at 60° angle or in a vertical position and one third of their length should remain under the rooting media in order to test the rooting ability of the cuttings in the two positions; and
9. Using a mist propagation unit under protected facilities is recommended.

Rooting Hormones

Rooting hormones should be applied to the base of cuttings to increase overall rooting percentages, hasten root initiation, increase the number and quality of roots and encourage uniformity of rooting

The most widely used hormone is Indole Butyric Acid (IBA) and the most common method used for application is to quickly dip the base of cuttings for 3-5 seconds in a 3000 ppm IBA solution.

Rooting Media

One of the most important criteria for the successful rooting of cuttings is a reliable rooting medium. Criteria to consider when selecting a rooting medium are:

- a) Cost;
- b) Quality (particle size, freedom from silt, salt, weed, seeds, diseases, pH 5.5-6.5);
- c) Physical Structure: (a) ability to support the cutting (b) easy sticking of the cuttings
- (c) adequate aeration;
- d) Mixing - the ability to be easily mixed; and
- e) Standardization - every attempt should be made to standardize the mix. Major Constituents (Components) for Rooting Media:
 - a) Peat - peat is the material most commonly used;

- b) Bark - there has been increasing interest in recent years in the use of shredded or pulverized bark;
- c) Sawdust - this is another byproduct formed during the processing of forestry products;
- d) Fine and coarse sands;
- e) Perlite - it may be used alone, but is best to mix with other rooting media;
- f) Loam - mainly used for rooting open-ground hardwood cuttings; and
- g) Other local plant by-products.

Rooting facilities

Propagation facilities such as greenhouses and mist propagation units offer controlled environments, can enhance the rooting capacity and provide satisfactory growth and development for olive plants.

Cuttings need to remain in the mist propagation units for about three months in order to develop roots. These are then transplanted in pots and placed in a shade house for a period of one to two months for hardening. The plants should then remain in the nursery for another six months in order to obtain the appropriate training and size.

Olive plants should be trained in nurseries with a single trunk with no low shoots in order to facilitate training in the orchard. Single-trunk olive trees should be grown in nurseries with 2 or 3 branches about 1m above the ground to facilitate full mechanization. These scaffold branches and secondary branches should form a free vase shape requiring just light pruning during the first few years.

Plastic-covered greenhouses are the most widely used type of facility in which mist systems are installed, either over a bench or floor area. The same greenhouses can be used for both rooting of cuttings and for raising seedlings and grafted / budded plants. Glass greenhouses can also be used as mist propagation units but these are more expensive structures.

Besides cost, three particularly important aspects should be considered for selecting the misting equipment. These are: the efficiency of the mist nozzles in providing a fine and even distribution pattern with no excessive overlap; the efficiency of the automatic control system that controls the amount and frequency of misting over the cuttings; and proper water filtering to reduce the possibility of blockages. Other factors to be considered are:

1. Temperature. The optimum rooting medium temperature should run at 18- 21°C. The optimum ambient temperature should range from 21 to 26°C. Air temperatures in excess of 30°C should be avoided.
2. Humidity. It is important to keep the cuttings turgid during the period from collection until they are well rooted in the propagation facility. Recommended humidity is close to saturation (>80%)
3. Light. Light acts by its intensity, length and its quality on the photosynthetic activity of the leaves of the cutting and the synthesis of rooting promoters. The recommended lighting of 5000 to 10000 lux will activate rooting of the olive tree cuttings.

Hardening, soil mixtures, containers and other cultural practices

Weaning or hardening is a crucial procedure for plant propagation. For this treatment shade houses are used to provide outdoor shade and protect container-grown plants from high temperatures and strong light intensities. Shade-nets can effectively cut solar radiation to different degrees depending upon the mesh of the nets. Woven green plastic materials are widely used. Different densities of materials are available that allow shading from 40% up to 70%.

Soil mixtures / potting composts: This is one of the most important elements for the successful germination, growth of seedlings, development of grafted / budded plants and rooted cuttings. The main criteria to consider when selecting a rooting medium are: cost, particle size, freedom from silt, salt, weed/seeds, diseases, pH 5.5-6.5, and adequate aeration.

Recommended potting soil medium is: 1 part of organic matter (manure or peatmoss), 1 part loam and 1 part sand.

Containers: For fruit trees it is recommended to use black plastic bags 35cm high and 20cm wide with holes for drainage, instead of transparent, small plastic bags.

Other cultural practices such as staking, proper irrigation and fertilization, and effective weed, pest and disease control are essential for obtaining high quality planting material.

For media sterilization, solar energy can be used by covering the soil mixture with transparent plastic polyethylene sheet for at least 10 to 12 days. Before covering the media adequate moisture must be ensured.

Recommended types of fertilizers are the Slow Release (Osmocote-type) fertilizers (6, 9, 12, 18 months) with N, P, K, Ca, Mg, Zn, enriched with fritted trace elements.

Grafting/budding of seedlings

This technique is used in olive varieties with a low rooting percentage in cuttings. However it requires more space and longer time periods for plant production. The main rootstock sources are seedlings of wild or cultivated olive varieties. The operator must be skilled in grafting, therefore training and subsequent practice is very important. Correct and efficient equipment and materials are required, appropriate to the type of grafting to be carried out (knife, tying materials etc). The rootstock and scion should be true-to-name and compatible. The correct time of the year is important (when the cambium of the rootstock must be active).

Scion/rootstock characteristics and guidelines for successful grafting/budding:

1. The rootstock should be in its active growth stage i.e. time of budding and grafting is important. Best periods are April-May and August-September. The rootstock should be 9 to 18 months old.
2. The appropriate time to collect the scion-wood is at the active growth stage of the mother plant.
3. The rootstock (seedling) must be healthy (free from diseases and insects), vigorous, with straight trunk, have smooth texture and clean bark, thickness of 0.6-1cm diameter with a well developed root system.
4. Unsprouted or dormant healthy buds should be collected for budding. Buds that are too young or too old should not be used. The best buds are usually those in the middle and basal portions of the shoot.
5. To avoid drying, the collected graft sticks should be wrapped in a wet clean cloth and put in a polyethylene bag.
6. The buds should not be removed from the bud stick prior to budding operation..
7. The cut should be done first on the rootstock and then the bud from the stick. They should then be

immediately placed inside the bark of the rootstock for better results.

8. The final cut of the scion should be done according to the shape and size of the cut made in the rootstock.

9. The point of budding/grafting must be at least 15cm above the ground.

10. The rootstock-scion union should be wrapped with grafting and budding tape in such a way that no air and water can enter into the wound part.

11. Unwrapping of the wound should be done after the rootstock-scion union is completed, usually after three weeks.

12. The upright growth of the scion is enhanced by removing lateral branches or the buds developed below the rootstock-scion union.

The after-care of grafts is also a significant factor of success and must include attention to the following:

1. Correct environmental factors (temperature, humidity, shading, ventilation);

2. Prevention of drying out of the cut surfaces (tying materials, tie-in properly);

3. Prevention of pest and disease infection;

4. The tying-in material must be removed in 3 to 4 weeks after grafting/budding, otherwise it will bite into the plant tissue if retained too long and cause constriction as the stem girth increases;

5. Irrigation-Fertilization (Fertigation);

6. Weed Control - use black polyethylene on the ground to avoid weeds;

7. Caning and tying-in to give further support to the graft union and the scion growth in order to avoid bent stems;

8. Shading for hardening-off (weaning-off); and

9. Proper training of the grafted/budded plants in the nursery facilities with a single trunk and 2 or 3 branches about 1 m above the ground.

Source of scion wood and cuttings

The stock plants from where the scion wood and cuttings are taken can be divided into two categories:

Pre-basic plantations. The stock plants are grown in the ground or in specific containers

(50 litres) under protection in screen houses in order to avoid any infection from pests, diseases and viruses. These plants provide healthy materials to the mother tree orchards and to the nurseries.

Mother Tree Orchard (MTO) Permanent stock plants are grown in the open ground without protection. The MTO is an essential part of each and every plant nursery because it is the source of high quality, healthy and true-to-type propagating materials (scion wood and cuttings). In the MTO proper cultural practices such as pruning, irrigation, fertilization, weed control and pest and disease control must be applied. Labelling is also very important.

Heavy pruning and more N relative to P and K should be applied because it encourages vigour, thus

increases the number and improves the rooting of cuttings. It regulates the growth (flushes) and encourages the scion-wood to be at the correct stage and shapes the trees so that it is easy to collect scion wood and cuttings.

In MTOs the following should be taken into consideration:

a) The mother plant must be genetically stable and true-to-type (genetically identical).

It may be selected from existing stock or collected from well-known and recognized sources;

b) The trees must be maintained in a good condition by applying the proper cultural practices such as irrigation, fertilization, mulching and weed, pest and disease control;

c) The age of the mother tree should not be too old or too young, and be established with closer spacing for shoot and bud collection;

d) Heavy pruning and more N relative to P and K should be applied to stimulate shoot growth, as the new vegetative growth is the main part of the tree used for propagation of planting material; and

e) Pruning must be done with tools sterilized in a dilute household bleach solution (diluted 1 part to 4 parts water so as to contain 1% sodium hypochlorite (NaClO)) to avoid mechanical transmission of virus disease. Tools should be washed in clean water before using them.

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