

JOB ROLE – GARDENER

Sector – Agriculture

(Qualification Pack Code: AGR/Q0801)

PPT's for Class XI



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UNIT 3: PLANT PROPAGATION

Session 3: Plant Propagation by Grafting

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Session Objectives

The student will be able to :

- Demonstrate plant propagation by grafting

Introduction

The method of joining parts of two plants in a manner that they form a unit and function as one plant is known as 'grafting'.

Grafting is used for a different purposes i.e. to repair injured trees, to produce dwarf trees and shrubs, to retain varietal characteristics, to adapt varieties to adverse soil or climatic conditions *etc.*

Grafting

Advantages of grafting

- Plants propagated by grafting are true-to-type, and bear flowers and fruits early.
- Local variety of older plants can be improved to superior variety by top working.
- Wounded or damaged tree trunks can be repaired by special grafting methods.
- Rootstock has an influence on resistance, vigour and quality of grafted plants.

Grafting

Disadvantages of grafting

- It is an expensive method of propagation.
- New varieties cannot be developed by grafting.
- Plants produced through grafting are short lived as compared to plants propagated by seeds.
- When contaminated tools or propagation material are used in grafting, newly propagated plants may also get infected.

Rootstock

The part of the graft that provides root system to the grafted plant is known as 'rootstock'. It is, normally, raised by seeds in the seedbed, and then, transplanted in the nursery bed for budding and grafting. Rootstocks are also raised in pots and polythene bags.

Grafting

Characteristics of rootstock

- Adaptable to local climatic conditions
- Resistant to adverse climatic and soil conditions
- Resistant or tolerant to pests and diseases
- Propagates easily
- Compatible with scion
- Promotes early healing and formation of cambium layer

Scion

The upper portion of graft combination taken from the desired plant to be multiplied is known as 'scion'.

Grafting

Characteristics of scion

- Scion wood must be of the previous season but not from more than one-year old plant.
- Flowering shoots or shoots from where the harvesting is recently done must be avoided.
- Healthy and well-developed vegetative buds must be selected.
- The scion or bud sticks must be selected from known performing orchard trees.

Selection of scion

- The mother plant must be vigorous, high yielding, true-to-type and free from undesirable bud mutation and viral diseases.
- It is advisable to collect scion from grown-up trees.
- It must be preconditioned by defoliating the branch before it is used for budding or grafting and it promotes the buds to swell.

Methods of Grafting

1. Scion attached method

In this method, the scion shoot is not detached from the mother plant until the union takes place. After the successful union of scion and rootstock, the scion is separated in gradual cut from the mother plant. For making the grafting handy, the rootstock is grown in a container or polythene bag. These are the methods followed in plants in which successful graft unions are difficult to obtain. Such as approach grafting and tongue grafting.

Methods of Grafting

2. Scion detached method

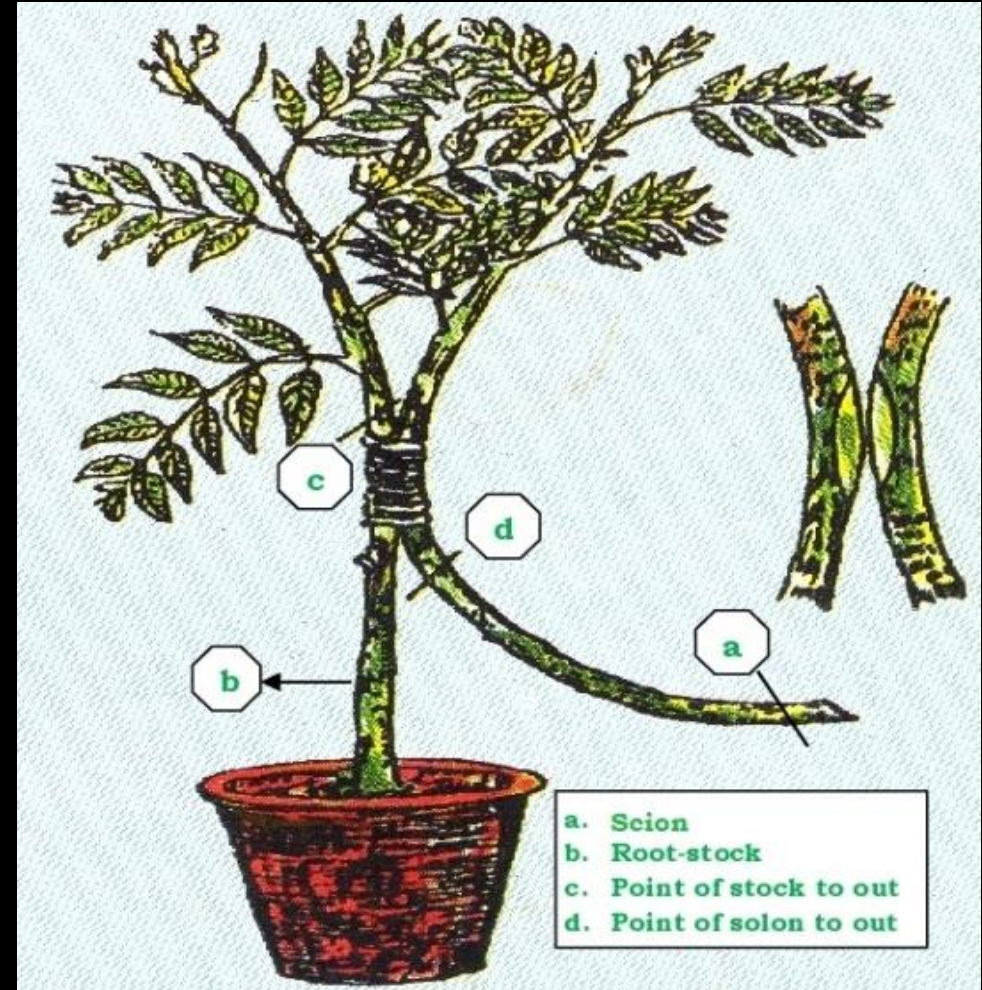
This method is a more popular method of grafting and comparatively easier to perform and the rate of success is more. In this method, the scion is first detached from the mother plant, and then, inserted or tied on the rootstock eg. veneer grafting, side grafting, wedge or cleft grafting, stone or epicotyl grafting, whip or splice grafting and bark grafting.

Methods of Grafting

Scion attached method

Approach grafting

It is also known as 'inarching'. The main feature of approach grafting is that two independent self-sustaining plants are grafted together. After successful union of the graft, the scion plant is detached below the graft union from the mother plant and the top of the rootstock plant is removed above the graft. e.g. mango, guava, sapota *etc.*



Methods of Grafting

Sliced approach grafting

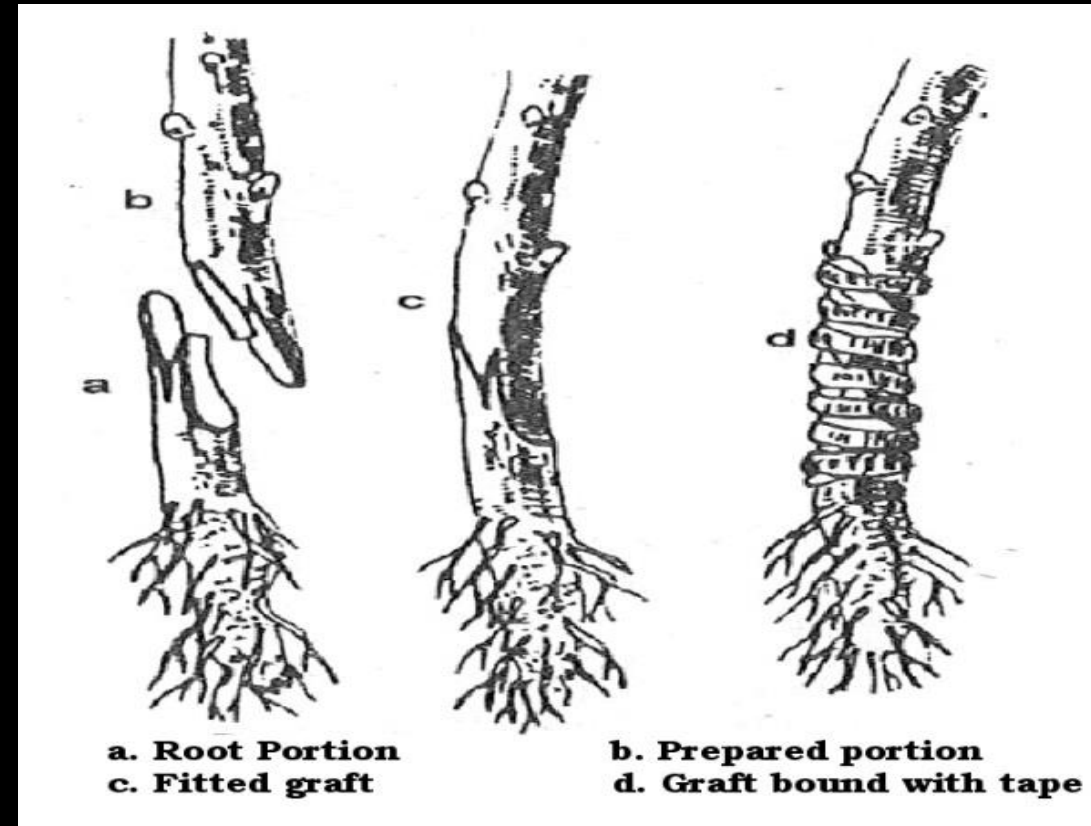
Procedure

- Bring the selected rootstock and scion close together.
- Find out the most comfortable point of contact.
- At the point of contact, a thin slice of wood along with a bark of 2.5 to 5-cm long from the rootstock and the scion is removed.
- The operated size must be uniform on both the stems of the rootstock and the scion.
- The cut surfaces are then brought together so that they cover each other completely by overlapping. Press them firmly together and tie with a waxed string or polythene tape, so that water does not enter it.
- After the successful union, head back the rootstock above the union and cut the scion below the union.

Methods of Grafting

Tongue grafting

This method differs from the former in the way that two cuts are given on both the scion and rootstock.



Methods of Grafting

Tongue grafting

Procedure

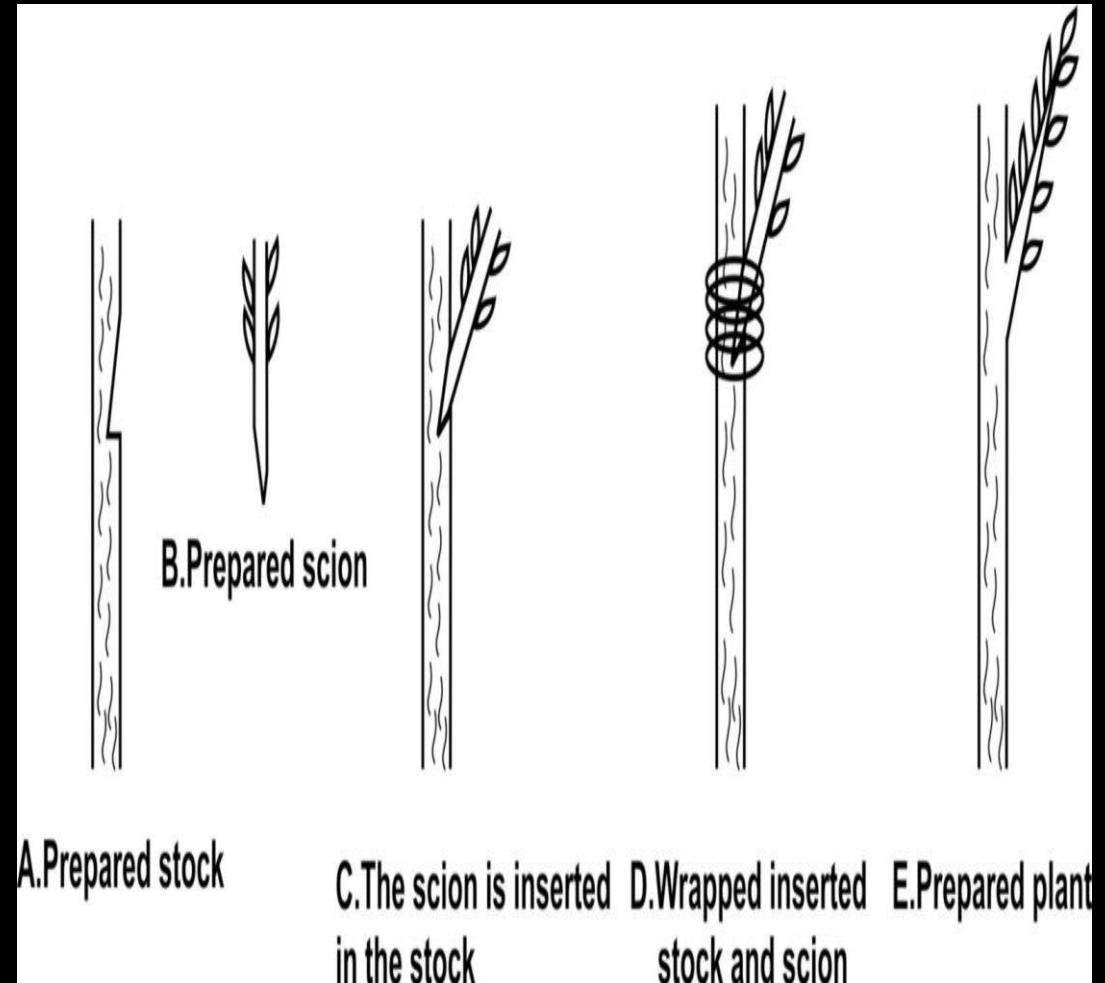
- Bring the selected rootstock and scion close together.
- Remove the slice of wood along with the bark of 2.5 to 5-cm-long from the rootstock and scion.
- A second slanting partial cut downward on the stock and upward on the scion is made, producing a thin tongue of same size on the stem of stock and the scion.
- Insert the scion in the stock so that these tongue cuts interlock.
- All operated portions must be in contact with each other.
- Tie the operated portions.

Methods of Grafting

Scion detached method

Veneer grafting

It is a simple and more economical method of grafting. It is the most ideal for establishing in situ orchards and top working of old unproductive orchards. The best time in north India is in March – April and July – August. Mango, cashew and peach are commercially propagated by this technique e.g. conifers, deciduous trees and shrubs.



Methods of Grafting

Veneer grafting

Procedure

- A shallow 3 to 5 cm long downward cut is made on the rootstock.
- At the base of the first cut, a second short inward and downward cut is made, which intersects the first cut.
- In between both the cuts, remove the piece of wood along with the bark .
- The scion is operated with a matching long cut on one side and a short cut on the opposite side is given at the base.
- Insert the scion and fix it in the rootstock.
- Wrap and tie firmly. Cut back the rootstock above the union after successful union.

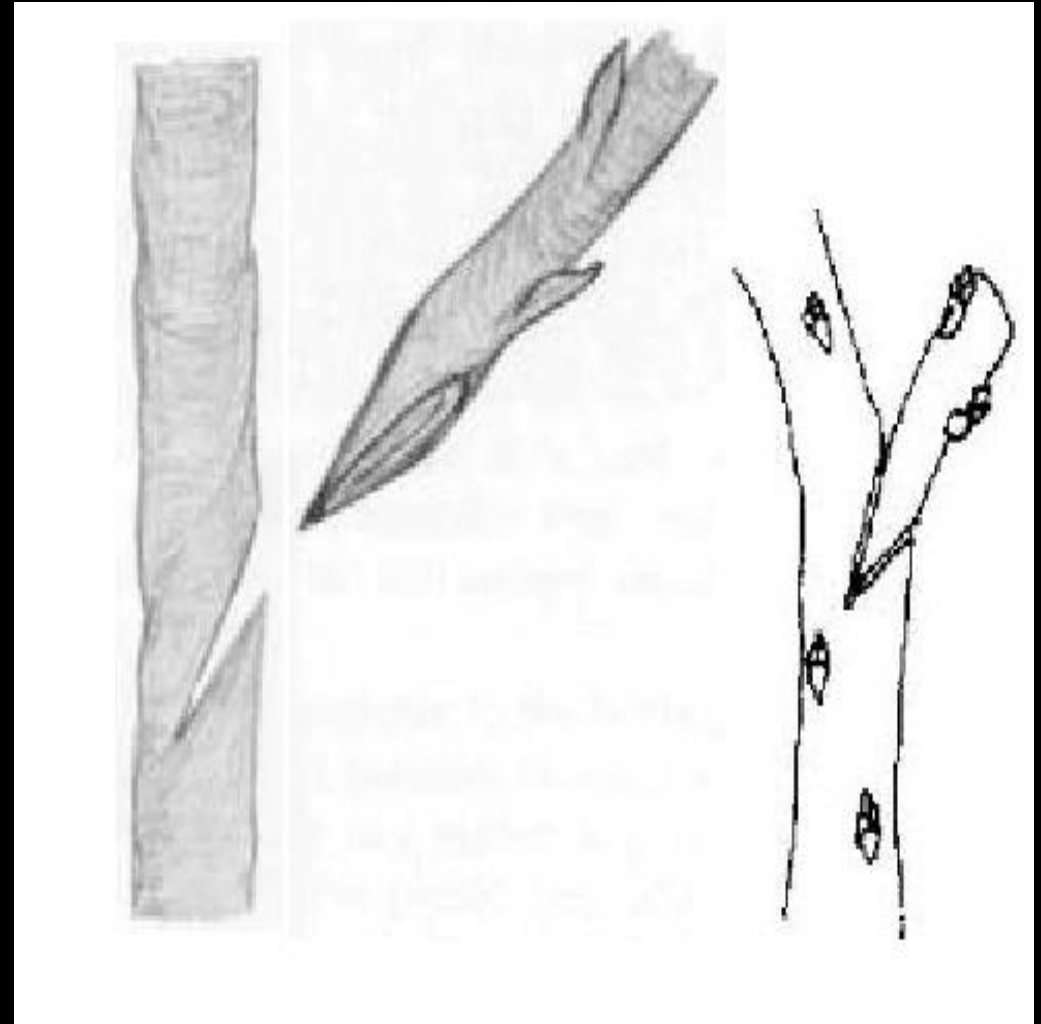
Methods of Grafting

Side grafting

In this method, the operated scion is inserted into the side of the established rootstock, which has more girth than scion, e.g., hibiscus.

Selection of material

- A rootstock of 2.5-cm diameter is selected.
- The scion needs to have 3-5 buds and about 7.5 cm long.
- The scion must be comparatively thinner than the rootstock.
- Use a sharp knife for cutting.



Methods of Grafting

Side grafting

Procedure

- On the stem of the rootstock, a slanting downward and inward cut of about 2.5-5 cm deep is made.
- A wedge of the same size (2.5-5 cm length) of the scion is prepared by two slanting cuts oppositely towards the base.
- The scion is then inserted into the operated rootstock.
- Pour wax and make the operated portion waterproof.
- Wrap and tie the grafted portion to keep it intact.
- After the graft is completed, cut the stock above the union.

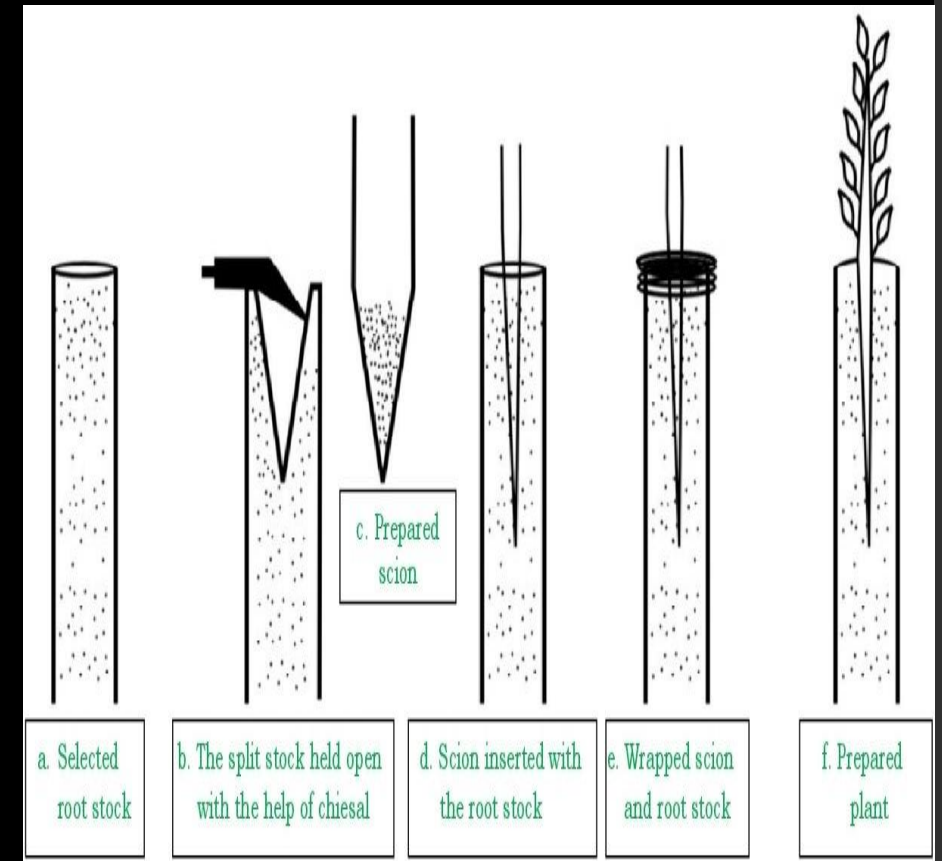
Methods of grafting

Cleft grafting

It is comparatively a simple and an easy method of grafting, which is widely used in fruit trees, e.g., mango, jackfruit, *bael*, *aonla*, etc.

Selection of material

- The scion must be a terminal shoot with 3-5 buds. It must be of the current season and in active growth.
- The scion shoot is defoliated about 2 weeks ahead of separation from the mother plant.
- This will help accumulate food in the shoots and the buds on the shoot become swollen.



Methods of Grafting

Cleft grafting

Procedure

- The seedling of the suitable rootstock, which is 4-5 months old is selected. Head back the rootstock.
- A sharp vertical straight downward cut of 3-5 cm in the centre of the stem is made.
- Two slanting cuts at opposite side towards the base of the same length (3-5 cm) as in root stock are given on the scion shoot.
- This will give a wedge-shaped appearance to the scion stick.
- The wedge-shaped scion is inserted in the split of the rootstock.
- Insert the scion in a way that matches the cambium layer at least one side with the stock.
- Tie the grafted portion firmly in position with a polythene tape.

Methods of Grafting

Stone or epicotyl grafting

In this method, stones are sown in polythene bags or moist sand bed and covered with 5-7 cm layer of leaf mould for germination. When the seedlings are about 15 days' old, they are taken out and grafted indoor.

Procedure

- The wedge of the scion is made at the base by giving two slanting cuts of 5 cm long.
- Head back the stock by giving a straight horizontal cut.
- From the centre of the stock, give a vertical cut of 5 cm long downward.
- Insert the wedge-shaped scion in the split portion of the stock and tie the graft firmly with a polythene strip.

Methods of Grafting

Whip or splice grafting

It is the oldest methods of grafting. This method is used in fruit trees like apples and pear.

Procedure

- Head back the rootstock terminally.
- Give a slanting cut downwards of 2.5-5 cm from the top.
- On the scion, a slanting cut is given from the base upward of the same size.
- The cut on both the stock and scion must be smooth.
- Put the operated portions on each other so that they form a single stem.
- Wrap the union with a polythene tape or a special nursery tape.

Methods of Grafting

Bark grafting

A plant graft made by slitting the bark of the stock and inserting the scion beneath called bark grafting. It is commonly used in top working.

Selection of material

- The bark of rootstock must be in sap-flowing condition.
- The scion must be in dormant condition.
- The scion must be 10-13 cm long and have 3-5 dormant buds



Methods of Grafting

Procedure

- A vertical cut of 3-5 cm is made in the bark of the stub of the rootstock.
- To prepare wedge shape of the scion, a cut of 3-5 cm in length is made at the end of the scion, followed by another cut on the opposite side of the first cut.
- Slightly lift the bark of the rootstock of the cut portion. Insert the wedge-shaped scion into the rootstock and cover it with the bark of the rootstock.
- After grafting, the exposed cut surfaces of the stub and scion are covered with wax.
- Several scions may be used for grafting on a single stock, according to the width of the stub.

Grafting for Special Purposes

Bridge grafting

This method is used for repairing wounds in trees made by implements, frost, rodents or diseases. In this grafting, the bark of a tree is damaged, resulting into girdling of the tree. Completely girdled tree will die. Bridge grafting repairs girdling.

Selection of the material

- The rootstock must be in sap-flowing condition.
- The scion comprises one-year-old dormant shoots of 6-12 mm in diameter.
- The number of scion sticks depends upon the size of wound to be repaired.
- The selected scion may be of the same or compatible plant

Grafting for Special Purposes

Bridge grafting

Procedure

- Trim the wounded area by removing the dead bark.
- The cuts are made in the bark at the top and bottom of the wound at 5 to 7.5 cm distance.
- Long slanting cuts are given on the scion at the top, as well as, at the bottom.
- Both the cuts must be on the same side.
- A sharp wedge of scion is made by an additional short, slanting cut opposite to the first.
- The operated portion of the scion is inserted in each slot of the bark on the rootstock in the way that the wedge remains under the flap of the bark at each end.
- The graft unions at top to bottom are waxed.

Grafting for Special Purposes

Top working

Top working is the method of grafting by which inferior or older plants are rejuvenated into superior or new ones. Top working is, generally, adopted in plants with long lives. It gives better result in plants like apple, avocado, citrus, mango and shrubs or vines. Top working can be done by top grafting or top budding. For top working, cleft, whip, wedge or side grafting methods can be used, according to the suitability of a plant. Top working is, usually, done in the spring.

Grafting for Special Purposes

Top Working

Precautions

- Observe the progress of the branches of a top worked tree every 3-5 days.
- Cracks developed in wax coating must be re-waxed.
- Whitewash the trunk to avoid sunburn.
- Scion should also be protected from bright sun by creating shade.
- New shoots developing from scions are tied to stakes to avoid breaking off due to winds.
- The top worked trees should be regularly irrigated and manure.

Summary

In this session you have learnt about the different methods of grafting and grafting for special purposes.

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