MANGO TOPWORKING

Mango Topworking is a quick, economical, low input technique of converting non-commercial, unaccepted or disease/pest prevalent mango trees into trees bearing high quality, healthy, desirable fruits through grafting or budding. Topworked trees can bear fruit within 1-2 years of starting and can be in full production after 4 years. The technique is of regional and international importance, allowing small farmers a relatively simple way of augmenting their income and their skills through production of a non-traditional export crop with an increasing market potential.

Mango topworking is dependent on:

a) a willing, enthusiastic ‘farmer’/householder ready to cooperate and learn new techniques of crop management and plant protection
b) a supply of healthy mango trees to serve as ‘root stock’ trees
c) a supply of healthy budding or grafting material from the selected varieties to act as ‘scion’ material
d) suitable tools

MANGO VARIETIES WITH REGIONAL POTENTIAL

The mango variety chosen to be grafted must have both suitable agronomic characteristics of disease/pest resistance, a dependable fruiting pattern, and be of export potential. It is best to use a variety of known suitability locally – rather than a variety which has been untested. The general characteristics of suitable regional varieties are:

St. Julian (Julie) A somewhat irregular bearer. Smallish fruits that do not show much colour. Good flavour and texture. Resistant to anthracnose.

Hayden Generally an irregular bearer. Large, attractively coloured, rounded fruits. Susceptible to anthracnose.

Graham Tends to alternate bearing. Medium-sized fruits of good flavour. Resistant to anthracnose.

Tommy Atkins Large attractive fruit, of good texture and flavour. Fairly regular in bearing. Moderately susceptible to anthracnose.

East Indian Stringy, but very sweet, smallish fruits. Moderately susceptible to anthracnose.

Keitt Good regular bearing. Large fruits, with some strings. Not as attractive as Tommy Atkins. Moderately susceptible to anthracnose.

Kent Large stringless, sweet and juicy fruits. Similar in appearance to Keitt. Moderately regular in bearing. Moderately susceptible to anthracnose.

Ceylon Similar to a St. Julian in texture and flavour. Fruiting pattern relatively regular but susceptible to anthracnose.

Imperial Another variety, very similar to the Ceylon but bearing very large fruits in the order of 2 lb (900 g).

AGRONOMIC CHARACTERISTICS OF IMPORTANCE IN CHOOSING VARIETIES

a) Resistance to Disease or Pests

Anthracnose

One of the major diseases affecting mangoes. It causes blossom drop and also fruit staining and rotting. Most varieties suggested show some resistance to anthracnose. However, moderately susceptible varieties may be relatively free of anthracnose most years in ‘low anthracnose’ areas.

Scab

Another disease affecting mangoes.

Fruit flies

A major insect pest attacking mangoes.

Thrips, Aphids

Other insects which attack mangoes.

b) Regularity of bearing

This is an important factor and needs to be considered since it affects the market potential of the mango by allowing planning in terms of providing a consistent supply, and also possibly choosing varieties which will supply fruit when the market is not glutted.

The bearing pattern of varieties is highly dependent on the location.
How to Topwork?

a) Preparation of the root stock
b) Preparation of the budding material – scion
c) Grafting the scion on to the Stock or topworking
d) After care and maintenance – including removal of gormandizers and early flowers.

**SUGGESTED TIMETABLE FOR TOPWORKING**

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N.B. This is a schedule for non-irrigated trees with a bi-annual rainy pattern.

**Preparation of Root Stock**

Root stock should be prepared in March or April so that grafting can be done in August to October. The selected trees must be cut back to leave 4 to 6 branch stumps, the number depending on the age and size of the tree. These stumps will bear the new shoots, on which the scions will be grafted. The bigger the tree, the more stumps that can be left for eventual grafting. The aim must be to get a ‘balanced’ top to the tree, so that the selected branches must be evenly distributed around the trunk.

All dead branches must be removed, and unwanted branches must be cut off close to the trunk.

Similarly, secondary branches must be cut off close to the branch. But surfaces must be painted with ‘coating off’ paint, or other recommended fungicidal product.

It is advisable to leave one or two side branches to maintain transportation flow. These are removed later, as soon as the grafts have taken.

**Preparation of the Scions**

The preparation of the scions needs to be done about 10 days before they are to be grafted. All the leaves on the selected shoots should be removed at the base of the petiole. This activates the dormant terminal and axillary buds on the shoot.

Preferably, on the same day as they are to be grafted, the prepared shoots are cut, with secteaux, to between 6 and 9 in (15 - 22.5 cm) in length. They are then dipped in fungicides, such as Captan® or Benlate®, and then put in a plastic bag for transport to site.

Ideally, grafting should be done as soon as possible after cutting but they may be kept in moist coir dust in sealed plastic bag, or in some other sealed container, and stored in a cool place.

**The Grafting or Topworking**

This is done as soon as the cut back trees have thrown out a number of strong, healthy new shoots, about an inch in diameter. The time from cutting back until the shoots are ready for grafting, may take from 4 - 6 months.

Between 4 - 6 of these shoots should be selected for grafting – so as to give a uniform shape to the tree. The actual number will depend on the size of the stock.

Unwanted shoots must be removed at their bases.

**Types of Grafting Method**

1. **Veneer Grafting:** a small scion, between 2 - 3 in (5 - 7.5 cm) long is grafted onto the side of the stock shoot, and about 9 in (22.5 cm) from the base. A notch is cut in the stock shoot, and a piece of scion cut to fit into the notch.

   As with all grafting procedures, care must be taken not to damage the buds on the scion.

   The scion is then tightly bound onto the stock with budding tape.

   **Veneer Graft - dressing scion to fit root stock**

   ![Fig. 1 Prepared Scion](image1)

   ![Fig. 2 Points at which cuts will be made on scion](image2)

   ![Fig. 3 Dressed Scion](image3)

   ![Fig. 4 Fitting scion to root stock](image4)
2. **Wedge Grafting:** the stock shoot is cut about 6 in (15 cm) up from the base and a wedge shaped notch is cut into the shoot. The scion is then cut to fit into the notch. The scion must be of similar diameter to the stock and may be up to 9 in (22.5 cm) long. Again budding tape is used to support the union.

**Wedge Graft - dressing scion to fit root stock**

![Diagram of Wedge Graft](image)

Fig. 5 Points at which cuts are made on scion  
Fig. 6 Points at which cuts are to be made on root stock

**Fig. 7 Fitting Scion**

Note: Saddle Graft is opposite to Wedge Graft. The root stock forms the wedge.

3. **Saddle Grafting:** this is the reverse of Wedge Grafting. A broad wedge shaped notch is cut into the base of the scion. The stock shoot is cut off about 6 in (15 cm) from the base and the end is cut to a wedge to fit into the notch in the scion. The union is tightly bound with budding tape.

**Saddle Graft**

![Diagram of Saddle Graft](image)

Fig. 8 Showing cuts to fit into wedge shaped notch cut in scion  
Fig. 9 Wedge shaped notch cut in scion.

Following topworking the trees need care and attention – this includes correct plant protection and crop maintenance. The proper aftercare will help ensure a high "take" of the grafts allowing the initial investment to bring quicker returns. The final result should be a tree with a well balanced canopy allowing even access to air, light, nutrients and producing eventual even fruiting.

**Necessary After Care and Maintenance Practices**

1. If **Veneer Grafting** has been used, the stem of the stock should be ringed just above the union, with a sharp knife, 3 - 4 weeks after the grafting. This is necessary to cut off the food supply to the shoot above the graft. Simultaneously the budding tape should be untied exposing the terminal bud and retired below the bud.

**Diagram showing ringing of stock above Veneer Graft**

![Diagram of Veneer Graft](image)

2. **Remove** gormandizers – these are the shoots that spring from below the grafts and compete with the grafted shoots for food and light. These must be cut off at their bases.

![Image of gormandizers](image)

3. **Stake** the younger trees to prevent whipping during strong winds. New grafts should be supported by splints during high winds to prevent damage.
4. Remove young fruits from grafted shoots to allow the new shoots to become fully established. Some varieties will flower within a year but heavy fruits may break the union. The second year the union will be strong enough to support a higher yield.

5. Fertilize the topworked trees a few weeks after top-working. The rates would be between ½ - 1 lb (227 - 454 g) per tree depending on size and productivity. A circle around where the drip line would be if the tree had not been top worked. The second application at the start of the next wet season should be twice as much. The larger and more productive the tree the greater the quantity.

6. Control pests and diseases by checking the trees regularly for insects, signs of insect feeding or for disease symptoms. Use a good broad based insecticide and a general purpose fungicide. Any problem which persists should be seen by your local plant protection specialist officer.

7. Control weeds by cutlassing or by chemical control.
   a) Viny weeds which can climb and compete with the young grafts need to be removed quickly.
   b) Persistent weeds need to be given spot treatments.
   c) Low ground cover of weeds is useful since this can help prevent soil erosion, especially on slopes.

8. Water the top worked trees, especially small trees during very dry weather if possible.

9. Remove the budding tape after about 3 months and after the graft has taken. If the graft has not taken after 3 months the scion must be dead and the shoot must be cut off at the base to prevent it becoming a gormandizer.

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**GLOSSARY**

**STOCK**
- this is a healthy mango tree which bears commercially or domestically uninteresting fruit, which may serve as a proxy parent for a wanted variety.
- it should be between 3 - 15 years old
- it should have a diameter between 3 in - 2 ft (7.3 - 60 cm)
- it should have a good rooting system
- it should not be old, gnarled or hollow trunked

**SCION**
- this is the budding or grafting material from the desired variety. They are shoot tips about 1 in (2.5 cm) in diameter and 6 - 9 in (15 - 22.5 cm) long taken from a healthy tree.
- use only shoot tips from mature flushes
- use only healthy material from highly producing, true bearing trees.

**GORMANDIZERS**
- these are the shoots which appear below the union and must be removed to allow the best conditions for a successful union.

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**MATURE FLUSHES**
- these are new growths which are sufficiently mature and slightly hardened. These can be identified by a change in colour from the new lime-yellow colour of shoots to a deeper green colour.

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**RECOMMENDED TREATMENT**

**FOR PLANT CARE**

a) Treatment of Root Stock
   - Fungicidal Paint - to be painted on cut surfaces
   - Bordeaux Paste
   - Oil Paint
   - Water proof protective coating

b) Treatment of Scion – a fungicidal solution to dip the scion in before transport to grafting site.
   - CAPTAN®
   - BENLATE®

c) Treatment of the Grafted Union – a budding tape to support young union
   - Budding tape
   - Waterproof tape
   - Clean Plant Material

d) Treatment of topworked tree
   - Pest/Disease Control
     - MALATHION®
     - BELMARK®
     - DIAZINON®
   - COCIDE®
   - DITHANE®
   - good broad spectrum insecticides
   - good broad based fungicides

e) Weed Control
   - Cutlassing
   - GRAMOXONE® - for most weeds
   - ROUNP®
   - used as spot treatments for difficult weeds
   - FUSILADE®

f) Fertilizing
- trees need fertilizers with a high potassium level to promote fruiting. Specific requirements depend on the local condition of the soil. Consult with your extension officer.

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Disclaimer: Mention of specific pesticides by their proprietary names is for the purposes of example only. It constitutes neither endorsement nor recommendation.