

MANGO ORCHARD ESTABLISHMENT GUIDELINES

Background

The mango belongs to the family Anacardiaceae in the genus *Mangifera*. The family consists of 41 species of which the mango (*Mangifera indica*) is the most important. The mango tree is an evergreen medium to large (9 – 35 m) tree. The tree has a long tap-root up to 6 m in depth and dense mass of feeding roots just beneath the soil surface. Mango leaves are simple leaves that are entire, leathery, short, pointed and oblong to lanceolate. Crushed leaves of many cultivars emit a distinct turpentine odour. New leaves are formed in periodic flushes about two to three times a year. In mature trees the first flush during the dry season is usually transformed into a flower flush.

Climatic and Rainfall Conditions

The mango is tolerant to a wide range of climatic conditions. It is successfully cultivated, under conditions which vary from very hot, very humid to cool and dry, to very hot and arid. Climatic conditions in a specific area will, firstly determine whether mangoes can be cultivated commercially in the given area, and secondly, will influence the choice of cultivars. It is advised that the average temperature during winter, should preferably be above 5 °C. For optimum growth, and production, the average maximum temperature should be between 27 and 36 °C.

Mangoes will grow in areas with an average annual rainfall of less than 300 mm, provided other climatic conditions are favourable. However, unless such low rainfall is supplemented by irrigation, the trees will produce very few fruit. At the other extreme, mangoes will also grow very well in areas with an average annual rainfall of 2 500 mm, or more. With such a high rainfall, usually accompanied by hot and humid tropical conditions, the mango is inclined to produce very poorly as vigorous vegetative growth takes place at the expense of reproductive growth. The annual water requirement (with no rainfall) of mature mango trees is 11 000 m³/ha/year. Also, the seasonal water usage of trees not subject to water stress, varies from approximately 20 to 44 m³/ha/day from June to November respectively. Water usage of trees subjected to water stress during the flower bud development stage is 9 500 m³/ha/year.

Wind

Mangoes can be grown in areas subjected to wind, provided that there is some form of protection against the wind and the most tolerant to wind cultivars are grown. Even mild wind will cause scratch marks on fruit which create apertures for the entry of harmful fungi and bacteria, and make the fruit cosmetically unacceptable for marketing. Stronger winds will cause loss of fruit which, in turn, result in lower yields.

Elevation

In the tropical and subtropical regions, mangoes grow well at altitudes from sea-level to 1 200 m. However, production decreases at the higher altitudes. In South Africa it is generally accepted that mango production above altitudes of 600 m is not commercially viable.

Soil Requirements

Mangoes grow and produce well on a wide variety of soil types. Under irrigation, mangoes grow well in soils with an unimpeded depth of more than 1 m. However, if irrigation scheduling is well planned, there should be no problem on soil with a depth of 750 mm, provided that any soil or rocky layers that restrict root growth to 750 mm soil depth allow excess water to drain easily.

The ideal soil texture for mango cultivation under irrigation is a sandy loam or loam (i.e. with a clay content of 15 – 25 %), but soils with a clay content of up to 50 % are also suitable. In some areas moisture losses through transpiration and evaporation are so low (due to humidity, temperature and rainfall conditions), that the soil is moist enough throughout the year to prevent wilting of the trees. Under such conditions mangoes can be grown under dry land conditions provided that the soil moisture retention ability is such that it can supply moisture to the plants during drier periods. Such soils have a depth of at least 600 mm and a clay content of between 15 and 30 %.

Propagation

Only poly-embryonic seeds are used as rootstocks. Seedlings derived from such seed will be true to type and uniform in growth and production habits. Mono-embryonic seeds are not suitable as stem burst often results from such rootstocks. Currently mainly Peach and Sabre seeds are used for rootstocks. Once the seeds have germinated, the seedlings are carefully lifted and separated from one another. Weak plants with twisted tap roots or stems are not used. Only the healthy plants are planted in plastic containers no smaller than 175 x 150 x 400 mm. Well-drained, sandy soil should be used for filling the plastic bags. This transplanting must be done at the right stage– 15 – 30 days after the seed has been planted in the bed, when they are in the fourth to fifth red-leaf stage. If the seedlings are planted out after the young, red leaves have started turning green, a high mortality rate can be expected. The rootstock is ready for grafting when it is about 450 mm tall and 10 mm thick at a height of approximately 250 mm. Rootstocks which are not ready to be grafted after one year should be discarded. A reliable source of graft wood must be established, with a known history regarding production and quality, as well as diseases such as malformation and bacterial blackspot. The graft wood must be the youngest, ripe, round wood that is no longer grooved. Ripe, terminal growth, with a well-developed terminal bud showing the first signs of growth, is the best graft wood. If this terminal bud is not yet ripe, wood of the previous growth flush, with a few lateral buds, may be used. Older wood should be avoided wherever possible.

Cultivars

Mango cultivars can be divided into three main groups, namely unimproved cultivars, improved tropical cultivars and improved subtropical cultivars. The unimproved group includes South African cultivars such as Peach, Sabre, Kidney (Sugar), Long Green and the so-called Bombay types of India. Typical of this group is high fibre content, undesirable external colour, susceptibility to disease, poor shelf life and a turpentine flavour. Most improved tropical cultivars produce fibreless fruit with outstanding eating qualities and no turpentine flavour. The improved subtropical cultivars were imported from the Sao Paulo province of Brazil and from Florida in the USA. The South African mango industry currently relies mainly on cultivars imported from Florida and on some fibrous cultivars. The most important commercially grown cultivars in South Africa are Tommy Atkins, Kent and Keitt. The South African season starts in late November and ends during middle April.

Mango Diseases

The most important mango diseases are caused by fungi and bacteria. The control of mango diseases cannot be seen as a series of isolated one disease or one chemical application, but rather as a continuous program, taking into account the type of disease and its requirements, the growth stages of the mango, the climate and the weather.

Anthracnose (Colletotrichum gloeosporoides)

Anthracnose affects all our mango cultivars to varying degrees, Tommy Atkins being less susceptible than for example Haden, Sensation and Zill. Locality will also affect the amount of anthracnose, as it is a rain – linked disease requiring free water for infection.

Powdery Mildew (Oidium mangiferae)

Powdery mildew is found in all mango growing areas and on all cultivars. Zill and Kent are very susceptible, Haden and Keitt moderately so, and Sensation and Tommy Atkins slightly susceptible, but control is still required in all cases. The disease is usually less of a problem in areas with warm winters. The damage caused is often underestimated as disease outbreaks occur early in the flowering stage.

Blossom Blight (Nattrassia mangiferae)

Blight is a very loosely used term and really means ‘the blackening and death’ of a plant part, usually from a central focus. This term has been applied on mangoes to severe powdery mildew attacks, severe anthracnose attacks and infection by *Nattrassia*. Powdery mildew can be ignored as the disease is distinctly different.

Bacterial Black Spot (*Xanthomonas campestris* pv. *Mangiferaeindicae*).

Bacterial black spot is a rain related disease. There are differences in susceptibility among cultivars, Sensation being resistant, Tommy Atkins moderately so, and Haden, Kent and Zill very susceptible, especially where they hang late. No cultivars however, are immune.

Malformation (*Fusarium subglutinans*)

Blossom malformation is easy to control, but if left unchecked can devastate an orchard. Vegetative malformation is usually seen on nursery trees, rarely in the field, and can be caused either by the malformation fungus or by eriophyid mites.

Mango Pests

Fruit flies (*Ceratitis* spp. & *Bactrocera dorsalis*)

Three types of indigenous fruit flies are known to attack ripening mangoes, namely the Natal fruit fly, *Ceratitis rosa*, the Mediterranean fruit fly, *Ceratitis capitata*, and the Marula fruit fly, *Ceratitis cosyra*. The invasive fruit fly, *Bactrocera dorsalis* furthermore threaten the industry. Mangoes can be severely damaged by the females laying eggs in the fruit and by the larvae which then develop in the flesh of the fruit.

Mango weevil (*Sternochetus mangiferae*)

The mango weevil is present in almost all the mango producing regions of South Africa. The distribution of this pest is mainly due to the transportation of infested fruit. Since the weevil develops within the mango seed, it can be transported unaware from one place to another. No alternative host plants are known to occur.

Coconut Bug (*Pseudotheraptus wayi*)

The coconut bug is confined to Africa and has been noticed in the coastal areas of Kenya and Tanzania, as well as on the islands Zanzibar, Pemba and Mafia along the East Coast of Africa. It occurs in South Africa on mangoes, guavas, macadamia nuts, pecan nuts, avocados and loquats. The damage caused to the various crops is more or less the same: young or mature fruits are attacked, causing fruit drop or lesions in mangoes, partial fruit drop in macadamia nuts or blemishes on the nut kernels of the remaining nuts, fruit drop or pock – like lesions on guavas, blemished fruit on loquats and various lesions on avocado fruit.

Armoured and Soft Scale Insects

This group of insects either affect the fruit or leaves of the mango tree. They cause leaf drop, which influence the crop size and cause cosmetic damages on the fruit, which have an influence on export of mangoes.

Mango Gall Fly

New leaves are the most susceptible to gall fly infestation. The adult females lay their eggs on the ventral surfaces of young soft leaves. On hatching the larva burrows into the leave tissue and feeds within it, resulting in the formation of small raised wart like galls on the leaves. The cultivars Tommy Atkins and Heidi appear to be very susceptible, whereas Sensation appears to be resistant.

Mealybugs

Three species of mealybugs occur on mangoes in South Africa. Mealybugs suck sap from leaves, wood and fruit. Their presence and the commonly associated honeydew and black sooty mould, make the fruit unsightly and unmarketable as fresh fruit. An infestation of mealybugs indicates a disruption of the natural balance existing between the pest and its enemies. Excessive sprays or the use of wide spectrum insecticides can eliminate the natural enemies to such an extent, that an outbreak of mealybugs can occur.