Pruning of Mango Trees: An Update

S.A. Oosthuysie
Merensky Technological Services, P.O. Box 14, Duivelskloof 0835

ABSTRACT
The growth responses to the pruning practices being carried out by a number of mango growers have led to some interesting insights. Some principles relating to pruning, and the correct practices of pruning mango trees are disclosed and detailed here. Considered are management procedures after planting, shoot tipping to encourage branching in young trees, pruning to stimulate flushing in young-bearing trees, and size maintenance pruning in fully-grown trees.

INTRODUCTION
The growth responses to the pruning practices being carried out by a number of mango growers have led to some interesting insights. Some principles relating to pruning, and the correct practices of pruning mango trees are disclosed and detailed here. Considered are management procedures after planting, shoot tipping to encourage branching in young trees, pruning to stimulate flushing in young-bearing trees, and size maintenance pruning in fully-grown trees.

Pruning away only a small part of the top end of the shoot or branch (Fig. 1). Thus a portion of the shoot or branch will remain, and a portion will be removed. By tipping we mean the removal of only the apical bud (Fig. 3). In tipping or tip-pruning we are actually removing a portion of the shoot or branch (Fig. 1). Thus a cut is made flush with the adjoining branch.

Thinning or branch-thinning should only be performed when it is absolutely necessary. Pruning of mango trees mainly comprises heading cuts.

In young mango trees, where the problem of mutual shading does not exist, the removal of leaves represents a cost to the tree. In encouraging branching by tipping, one hopes to enable the tree to produce more new shoots (and thus leaves) during each flushing cycle than it normally would. Stated differently, one aims to increase the rate of the increase in leaf number associated with canopy development. Implicitly, the benefit, which relates to the extra number of new leaves produced, should exceed the cost, which relates to the number of leaves removed when pruning. To benefit maximally, the cost in terms of the number of leaves removed must be minimized. The effect of tipping on canopy development, and on tree structural strength and cropping ability has been previously quantified (Oosthuysie, 1995a).

Fig. 5 shows a mango terminal shoot. Most of the leaves are clustered at the apex due the internodes being very short in this region. By pruning away only a small part of the top end of the shoot (± 5 cm), one will in fact be removing a large...
Fig. 1 By heading we mean cutting of a shoot or branch to remove a portion of the shoot or branch.

Fig. 2 By tip-pruning we mean light heading.

Fig. 3 By tipping we mean removal of only the apical bud.

Fig. 4 By thinning we mean removal of an entire branch.

Fig. 5 A mango terminal shoot. Most of the leaves are clustered at the apex.

Fig. 6 Incorrect pruning (as shown here) limits thickening of the lower branches and of the shoot itself.

Fig. 7 Trees can flop over themselves if tipping is not performed correctly.

Fig. 8 Branching naturally occurs at the end of branches where the internodes are very short.
pruning is essential to ensure the tree's survival and optimal growth. In the case of mango trees, pruning is also crucial for enhancing fruit quality and yield. The pruning process can be divided into two main stages: pre-bearing and post-bearing.

During the pre-bearing stage, pruning is primarily focused on stimulating shoot growth. This is achieved by removing the shoot tips to encourage the development of new lateral shoots. This is particularly important in mango trees, as the removal of the shoot tip can lead to the development of more vigorous shoots. Additionally, removing the shoot tips can help in the development of inflorescences, which are essential for fruit production.

In the post-bearing stage, pruning is used to manage the tree's growth, reduce flowering variation, and maintain a balanced tree structure. This involves the removal of weak shoots, the thinning of mature shoots, and the removal of the shoot tips to encourage the development of new shoots. Proper pruning techniques can help in the development of a balanced tree structure, which is essential for optimal fruit yield and quality.

In conclusion, pruning is a critical aspect of tree management, especially for mango trees. It is important to follow the recommended pruning techniques to ensure the tree's healthy growth and optimal fruit production.
Fig. 9 The main scaffold branches of a mango tree often arise from a single point.

Fig. 10 In Heidi, the upper axillary and apical buds often develop naturally.

Fig. 11 Development of the central shoot when tipping is not performed in Heidi.

Fig. 12 Short shoots have leaves which contribute to growth and the replenishment of carbohydrate reserves.

Fig. 13 The fruit on mango trees are retained lower down on the canopy.

Fig. 14 Relationship between number of fruit and number of new shoots developing during the fruit growth and development period in Sensation (above) and Tommy Atkins (below).

Fig. 15 Heading branches just behind the point of inflorescence attachment to hasten postharvest flushing.
Fig. 16 Uniform postharvest flushing in Tommy Atkins effected by heading cuts made after harvest.

Fig. 17 Mango trees should be maintained as single stemmed whips until they have gained sufficient height.

Fig. 18 Pinch out laterals by hand when they are still soft.

Fig. 19 Head the single stemmed trees at least 80 cm above ground level.

Fig. 20 A trunk of sufficient height will ensure that fruit do not come to rest on the orchard floor due to branch bending.

Fig. 21 Development of axillary inflorescences due to heading at the wrong time.
are not showing signs of growth or are just starting to show signs of bud development.

**Gibberellin application to limit or prevent flowering (optional)**

A gibberellin spray (ProGibb®; 100 ppm a.i.) can be administered to in early to mid-June in Sensation, Kent, Keitt and Heidi, or in late July in Tommy Atkins and Zill (Oosthuysen, 1995b). On the date of spraying, all of the dormant terminal shoots must be tip-pruned (removal of ± 2 cm of the upper portion of the shoots), and any inflorescences that are present must be removed by tip pruning in the same way. Soft new shoots arising from pencil-thick or thicker terminal shoots must also be removed by tip-pruning. Soft new shoots arising from thinner shoots should be left to develop fully. Treatment of mango trees as stated here is generally effective in preventing further flowering. Flowering may still occur if the winter is exceptionally cool or is prolonged.

**Age to Allow Trees to Bear a First Crop**

The cropping potential of a mango tree is directly related to the size of its canopy (Oosthuysen, 1995a). The rate at which the canopy increases in size thus determines the rate at which tree yield increases over time. Moreover, the size of the canopy when the tree is first allowed to bear determines how large the first crop will be.

In bearing mango trees, the extent to which tree growth occurs prior to harvest depends on the crop load (Fig. 28). Hence, the year after planting during which the trees are first allowed to bear determines how large the first crop will be.

Postharvest flushing in trees having borne a heavy crop may be delayed and may occur unevenly. In Sensation, it is often observed that trees or branches have cropped heavily flush as late as the flowering period or shortly thereafter. When this happens, entire trees or branches fail to crop.

In the important late cultivars (Heidi, Sensation, Keitt and Kent), the time available for new shoot development after harvest and before cool temperatures set in is shorter (four to 12 weeks) than that for the early cultivars (Irwin, Tommy Atkins and Zill) (± 12 weeks). A reduction in the time available for growth after harvest may reduce a mango tree's capacity to increase in size.

In the cultivars which have a tendency to produce new shoots during the fruit growth and development period (Zill, Heidi), the year after planting during which the trees are first allowed to carry a crop may not be critical to future orchard performance. One might consider allowing such cultivars to bear after two (high density planting) to four years (wider tree spacings). In the cultivars which are late and have a tendency to set heavy crops (Keitt and Kent), the time of first bearing may have a great impact on future performance of the orchard. One might consider allowing such cultivars to only bear after three (high density planting) to five years (wider tree spacings).

In Sensation, which is late and tends to set heavy crops, substantial canopy development occurs during the off-years (Fig. 26). Hence, the year after planting during which the trees are allowed to start cropping would not appear to be critical to future orchard performance in this cultivar. One might thus consider allowing Sensation to bear after two (high density planting) to four years (wider tree spacings).

**Cash flow considerations** may force growers to permit precocious bearing. Ultimately, the year in which trees should first be allowed to bear a crop depends on the rate of canopy development and the tree spacing. In high density orchards where the spacing between trees in the row is two metres or less and between rows is 5 to 8 m, allowing trees to bear after two to three years from planting may be feasible, whereas in the case of trees spaced 3 m or more apart in the row and 5 m or more between rows, greater time spans may be more appropriate. Shorter time spans may also be generally suitable in areas which are warmer, and are therefore conducive to a greater flushing frequency.

**Pruning of Bearing Trees which have Not Attained their Final Size**

In such trees, it is only necessary to prune at or shortly after harvest. Ones aim here is more to encourage early and prolific flushing after the harvest than to ensure that the flush will be large (Fig. 28). It is noteworthy that only a limited number of new shoots will develop during the flowering and fruit growth period — providing that the trees crop adequately.

Head all of the branches bearing fruit (harvest pruning) or which bore fruit (postharvest pruning) a few centimeters (± 5 cm) behind the point of attachment of the fruit stalk (Fig. 27). Head the branches which produced an inflorescence, but failed to retain fruit and failed to produce new shoots in the same way (Fig. 28). The pencil-thick or thicker terminal shoots can be tipped.

**Pruning to Maintain Tree Size**

Size maintenance pruning should only be performed once the trees or tree-hedges have attained the dimensions which one wishes them to have. In theory, one should only maintain tree size once mutual shading between the trees or tree-hedges effects a reduction in orchard yield.

The ideal tree or tree-hedge dimensions can be determined empirically for a particular tree spacing and row orientation by recording orchard yield over time. Orchard yield will generally increase until such time that mutual shading results in a yield reduction. The tree dimensions can be considered ideal during the season just prior to that when a reduction in yield occurs due to shading, i.e., when orchard yield is at its maximum.

Size maintenance pruning is performed shortly after harvest. Ones aim is to remove the flush growth which occurred after the previous harvest by heading all of the branches back. In trees which crop adequately, this will generally entail heading each branch behind the first branching point encountered when moving inward from the branch periphery (Fig. 29). Pruning can be performed by hand or by mechanically hedging (Fig. 30). Size maintenance pruning may only be required every second or third year in cultivars or situations where yearly canopy expansion is not substantial.

Since size maintenance pruning results in the removal of most of the leaves, it may be beneficial to delay such pruning until signs of bud swell are apparent. This should allow for leaves to contribute to the replenishment of tree reserves prior to their removal. Further research is however required to establish what benefit a delay in size maintenance pruning may hold.

For cropping not to be detrimentally affected by size maintenance pruning, prolific flushing must occur after such pruning. It is therefore important that conditions after harvest be favourable for shoot growth. Water and nutrients should not
Fig. 22 Development of the first lateral shoots after heading for the first time.

Fig. 23 By tipping we expressly mean only the removal of the apical bud.

Fig. 24 Late flushing of Sensation mango trees during their off year.

Fig. 25 Substantial canopy development of a Sensation mango tree during an off year.

Fig. 26 Head fruit bearing branches to hasten postharvest flushing.

Fig. 27 Head all flowering branches failing to retain fruit to hasten postharvest flushing.
Size maintenance pruning will generally entail heading each branch behind the first branching point found.

Fig. 28

Mechanical hedger used to maintain the size of mango trees.

Fig. 30

Tree appearance after size maintenance pruning.

Fig. 29

be lacking, and temperatures should be conducive to flushing. By mid-April, the trees should show complete canopy recovery. The effect of size maintenance pruning on re-growth, shoot starch, flowering and cropping has been previously investigated (Oosthuyse, 1994).

Size maintenance pruning can greatly facilitate orchard sanitation (Kotze, pers. comm., University of Pretoria) By removing the prunings, much of the disease inoculum and insect pests that were present in an orchard will also be removed. Moreover, the canopy interior will be exposed and therefore accessible to sprays targeted at diseases or insect pests. Mango weevils were considered to hide in branch crevices and under loose bark (Joubert and Pasques, 1994).

It is recommended that the new shoots which develop after size maintenance pruning be sprayed with a fungicide (copper) as soon as the leaves are fully expanded. This will afford protection from disease re-infection, and thus allow one to capitalize on the sanitation benefit.

It has not been found necessary by the author to protect the inner-branches from solar injury (sunburn) after size maintenance pruning. The application of a white coating (e.g. diluted PVA paint) to the upper-side of the exposed inner-branches might be considered, particularly in hot, dry areas.

ACKNOWLEDGEMENTS

Henry Bosman (Zimbabwe) is acknowledged for encouraging me to write this article. Thanks are due to W. Saaiman for abstract translation, and to Merensky Holdings for allowing publication.

LITERATURE CITED


OOSTHUYSE, S.A. 1995b. Effect of aqueous application of GA3 on flowering of mango trees: Why in certain instances is flowering prevented, and in others flowering is only delayed? S.A. Mango Growers’ Assoc. Yearbook 15. (in press)