

OBSERVATIONS ON CONTROLLING FLOWERING AND TREE SIZE IN LYCHEE BY STRATEGIC PRUNING

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ABSTRACT

There is strong interest in methods of tree size control in lychee orchards in Australia. Smaller trees are easier to harvest and insect, bat and bird control are more effective. This all adds up to increased net returns for the grower. This paper reports on the effects of pruning in summer or winter or both seasons on flowering and fruit production of cultivars Bengal, Kwai May Pink and Wai Chee over a single season in subtropical Queensland, Australia. A mechanical pruner was used to shave approximately 25-30 cm of new wood from the canopy. Flowering after pruning and fruit production were reduced by about 25 per cent, compared to non-pruned trees, with trees pruned in summer showing the best response. The long-term benefits of pruning requires further research.

SAMEVATTING

Daar is tans wye belangstelling in Australië oor metodes van hoe om boomgrootte te beheer in lietsjieboorde. Kleiner bome is makliker om te oes en insek, vlermuis en voëlbeheer is meer effektief en lewer groter netto inkomste vir die produsent. In hierdie artikel word gerapporteer oor die effek van somer- of wintersnoei in albei seisoene, op blomvorming en produksie van die Bengal-Kwai May Pink- en Wai Chee-kultivars in subtropiese gebiede van Queensland, Australië. 'n Meganiese snoeimasjien is gebruik om min of meer 25-30 cm nuwe groei af te snoei. Blomvorming en oes na snoei was 25 persent minder in vergelyking met ongesnoeide bome, met die beste snoeiresultaat by bome wat in die somer gesnoei is. Die langtermyn effek van snoei op die produksie van bome vereis egter nog verdere navorsing.

INTRODUCTION

Irregular flowering and rapid tree growth are major factors affecting the profitability of the Australian Lychee Industry. The general response of lychee trees to any form of pruning is to produce vigorous, less fruitful foliage as quickly as possible. Young (1977) in Florida showed that flowering and cropping were lost for 1-2 years after lychee trees were pruned heavily in late winter. However, the response to pruning seems to depend on the timing and amount of wood removed. Recent work from Israel (Goren, 1990) indicates that pruning at a specific time of the year can be used to restrict tree size, without inducing excessive vegetative growth. Flowering could also be induced in vegetative trees, by pruning unwanted flushes in winter. Vegetative growth can be readily controlled in Israel, because it is generally dry from after harvest in July until just before panicle formation in November and December. Temperatures are generally similar to Nambour, although the days and nights in summer are 3-4°C warmer in Israel. Conditions at Nambour are more likely to encourage leaf growth after pruning.

These Israeli studies suggest that pruning offers some scope for effective tree size control, as well as inducing flowering in vegetative trees. This would be of great benefit to all cultivars, with the advantages of reduced harvesting costs by way of ease in picking of fruit, and more economic control of birds, bats and moths with netting. This all adds up to increased net returns for the grower.

The authors are presently halfway through a three-year experiment, hoping to complete it in 1994. The aim of the pruning experiment is to provide guidelines for controlling tree size, while maintaining flowering in commercial orchards with the associated economic benefits.

MATERIALS AND METHODS

The sites, cultivars and ages of the trees are listed in Table 1.

Treatments entailed no pruning (control) or pruning in February (summer), or pruning in February (summer) and in May-June (winter), if trees are vegetatively flushing, or pruning in May-June (winter).

A mataba mechanical pruner was used to shave approximately 25-30 cm in length of wood from the canopy of the trees at different pruning times of the season. The diameter of the pruned wood was 1-1,5 cm.

MEASUREMENTS

A monthly record was kept of vegetative flushing and flowering, expressed as a percentage of the terminal branches on a tree.

Yield was estimated at harvest by counting the proportion of branches with fruit and total weight of fruit per branch sampled from 10 branches per tree. Five to six trees were used for each treatment.

RESULTS

Figures 1-3 show that pruning at any time during the tree's crop cycle reduced flowering and fruit yield. For flowering, reduction of up to 25 per cent is suffered across all cultivars for pruned trees compared to non-pruned trees. The proportion of terminal branches fruiting generally followed the pattern of flowering. The only exception was winter pruning for cultivar Kwa May Pink at Buderim, which had much lower fruiting than predicted by flowering. Average fruit fresh weight per panicle ranged from 150-350 g in cultivar Bengal at Sippy, to 40-50 g in the other orchards. Cluster weight was generally not affected by pruning. The only exception was cv Bengal after winter pruning, where cluster weight was half of control values. It is too early to predict which time of pruning reduces flowering and yield least, but summer and summer/winter pruning appear the best compromise for controlling tree size without severely reducing productivity. It is also too early to make recommendations about the different cultivars. However, Kwai May Pink seems to be less vigorous than Bengal, as expected. The level of flowering was generally low in control and pruned trees of cv Wai Chee.

DISCUSSION

In the long history of the horticultural exploitation of lychees, little has been developed about the relationship between flowering and potential yield and tip pruning or hedge-rowing at strategic times of the season. This is important for the control of tree size without reducing the yields of individual trees.

In normal lychee culture, general pruning and tree training starts in the nursery and continues during tree establishment and for the full life of the orchard. Although it has been practised extensively in Taiwan, minimal pruning is usually performed in

TABLE 1 Sites, cultivars and ages of trees

Location	Soil types	Tree age (years)	Cultivar	Potential yield (kg/tree)
Sippy	sandy loam on heavy clay	12	Bengal	140
Palmwoods	sandy loam on heavy clay	6	Kwai May Pink	50
Palmwoods	sandy loam on heavy clay	6	Wai Chee	40
Buderim	heavy clay	6	Kwai May Pink	40

From 3rd National Lychee Seminar, Bundaberg, Australia

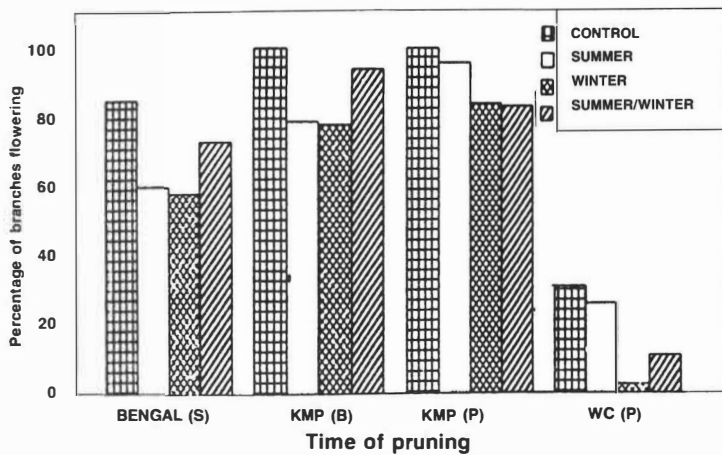


Fig 1 Effect of time of pruning on the percentage of terminal branches flowering in four lychee orchards in southern Queensland. Data are the means of 5-6 trees over one year.

Cultivars: KMP (Kwai May Pink), WC (Wai Chee);
Sites: S (Sippy), B (Buderim), P (Palmwoods).

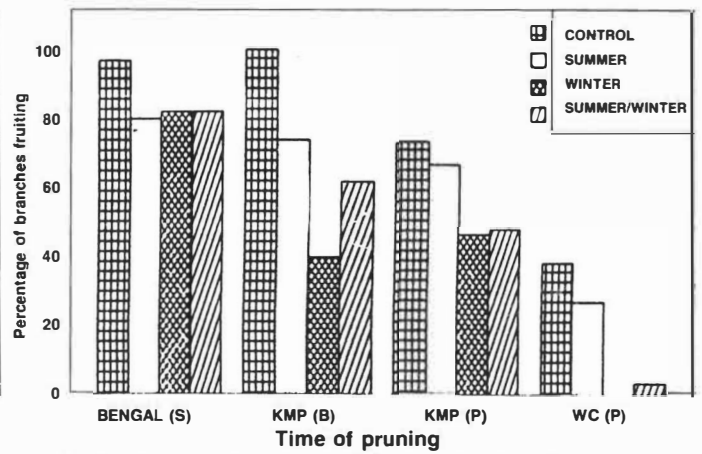


Fig 2 Effect of time of pruning on the percentage of terminal branches fruiting in four lychee orchards in southern Queensland. Data are the means of 5-6 trees over one year.

Cultivars: KMP (Kwai May Pink), WC (Wai Chee);
Sites: S (Sippy), B (Buderim), P (Palmwoods).

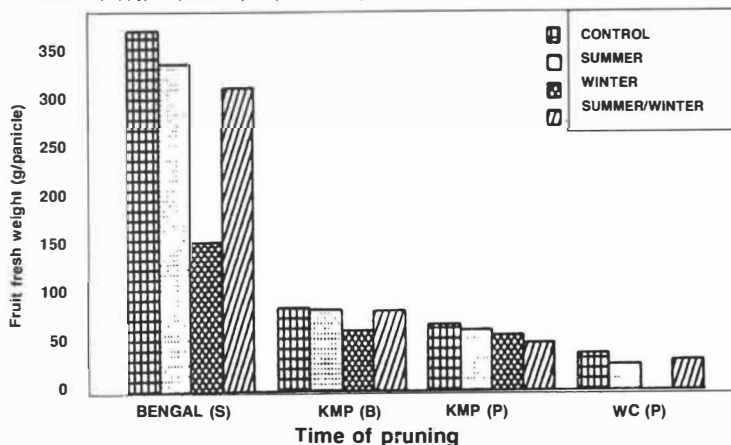


Fig 3 Effect of time of pruning in four lychee orchards in southern Queensland. Data are the means of 5-6 trees over one year. Branches without fruit are not included in analyses.

Cultivars: KMP (Kwai May Pink), WC (Wai Chee);
Sites: S (Sippy), B (Buderim), P (Palmwoods).



Fig 4 Tip-pruning young Kwai May Pink trees after harvest with an electric pruning saw.

Australia on bearing trees over the fruiting year, except when harvesting the fruit. At harvest approximately 5-10 cm of the wood below the fruit cluster is removed.

Hedge-rowing of mature bearing lychee trees may be a way of controlling tree size and could be incorporated with the general pruning duties carried out on the farm. Research has shown that mechanical pruning does decrease the flowering and yield capacity of the tree. However, if good size is achieved and the reduction in productivity of the tree is not too large, returns to the grower should be higher. This is because in the first instance picking and spraying costs will be reduced. Controlling trees to 3-4 m in diameter also offers the potential of high density plantings in lychee. Yields per hectare in high density plantings of 4 m x 4 m spacings (625 trees per hectare) would be much higher than in traditional plantings of 12 m x 6 m (140 trees per hectare), even if individual tree yields are reduced by 25-30 per cent after

pruning. The results, however, are only preliminary. The authors are not sure of the effects of yearly pruning on long-term productivity.

Mechanical pruning is the ideal way to maintain tree height, if it only slightly reduces flowering and individual tree yields. The authors feel that mechanical pruning or hedge-rowing of lychees and other subtropical, tropical terminal bearers, ie avocado and mango, could be a candidate when trees have reached 3-4 metres in height. Harvesting costs can be considerably reduced and pest control made easier.

CONCLUSION

This paper gives only preliminary data on the effects of pruning at strategic times (summer v summer/winter v winter) on flowering and yield. The data show that tip pruning or hedging at any time during the season leads to a small reduction in flower-

ing and yield in some cultivars. Flowering and yield need to be maintained close to those in unpruned situations, if pruning is to have a role in lychee orchard management.

Industry recommendations can only be given confidently when the long-term effects of pruning in commercial orchards are known. Pruning should be evaluated for at least another three years. In the meantime, pruning looks promising and could become an important management tool for lychee growers.

REFERENCES

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