

Effect of Time and Degree of Flower Thinning on Fruit set, Fruit Growth, Fruit Characters and Yield of Durian (*Durio zibethinus* Murr.) cv. Mon Thong

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ABSTRACT

The effects of time and degree of flower thinning on fruit set, fruit growth, fruit characters, and crop yield of durian cv. Mon Thong were investigated. Flower thinning at full bloom showed a significant increase in percent of fruit set. Flowers thinned to 10 percent remaining per tree showed a significant increase in the number of fruits harvested. Flower thinning increased fresh weight and yield of durian, but had no effect on fruit quality.

Key Words :- durian, *Durio zibethinus* Murr., flower thinning, fruit quality, fruit set.

INTRODUCTION

Durian (*Durio zibethinus* Murr.) is probably one of the most famous and controversial fruits in the world, it is also the most highly valued and most desired seasonal fruit in Southeast Asia (Coronel, 1983).

Durian is to some extent self-incompatible (Valmayor *et al.*, 1965), and hand pollination has been tried in Thailand to increase the chance of fertilization. Cross pollination was found to increase the percent of fruit set (Somsri, 1987). The yield of durian in most Southeast Asian countries appeared to be low and erratic, mainly as the result of poor flowering and inadequate fruit set (Subhadrabandhu *et al.*, 1991). In Thailand these constraints are much less serious, but still the mean yield per unit area and production in successive years are low and variable, ranging from 3.1 to 8.3 tons per hectare. Well managed orchards in Thailand can produce up to 10-18 tons per hectare, that is about 50 fruits of 1.5-4.0kg. per tree (Yaacob and Subhadrabandhu, 1995).

Flowering tends to be excessive in durian, and after setting a high percentage of young fruits

drop. With the cultivar Chanee up to 90% of young fruit abscised and fall within 0-2 weeks after fruit setting (Chandraparnik *et al.*, 1992). The degree of fruit drop is thought to depend on the competition for carbohydrates and hormones between young fruits (Ryugo, 1988). To maintain the ideal amount of fruits on a tree by flower and fruit thinning is a critical factor in obtaining high quality and yield of harvested fruits. However, at present there is no established data described appropriated flower thinning strategies for durian in Thailand. Therefore, the objective of this investigation was to examine the effects of time and degree of flower thinning on fruit setting, fruit growth, fruit quality and crop yield of durian cultivar Mon Thong grown in Trat Province.

MATERIALS AND METHODS

Thirty-six, 6 years old durian trees cv. Mon Thong were used in this study. The trees were planted in 1985 in a commercial private orchard in Trat Province, Thailand. Studies were conducted over the period from March 1990 to June 1991. The experiment was arranged factorially in a completely

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randomized design having two factors, (1) stage of thinning and (2) degree of thinning. There were 3 trees in each treatment combination, each tree representing one replicate, a total of 3 replicates for each treatment combination.

1. Stage of thinning.

The treatments consisted of hand thinning at three stages of flower development, that is at four weeks before full bloom, two weeks before full bloom and at full bloom.

2. Degree of thinning.

The branches close to the trunk were subjected to the following thinning treatments : (1) No thinning; (2) Flowers were thinned to allow 50% of flowers remaining in the tree, (3) Flowers were thinned to allow 25% of flowers remaining in the tree; (4) Flowers were thinned to allow 10% of flowers remaining in the tree.

Hand pollination of the individual flower in each tree was done at night, soon after anthesis, by using their own pollen. After thinning the flowering parameters were measured.

1) Percent of fruit set. Fruit set was recorded one week after full bloom.

% Fruit set

$$= \frac{\text{Total number of fruit}}{\text{Total number of flowers}} \times 100$$

2) Percent of fruit harvested
% Fruit harvested

$$= \frac{\text{Total number of fruit harvested}}{\text{Total number of fruit set}} \times 100$$

3) Fruit characters. Fruit quality characteristics were recorded as follows, fruit weight, flesh weight, seed weight, number of carpels, percent flesh recovery which is measured by calculating from the formula

% Flesh recovery

$$= \frac{\text{Weight of flesh}}{\text{Total fruit weight}} \times 100$$

peel thickness, flesh thickness, number of normal seeds per fruit, number of abnormal seeds per fruit, and flesh color.

RESULTS AND DISCUSSION

The study in flower thinning of durian showed a high percentage of fruit set in those remaining flowers after thinning at full bloom (Table 1). Degree of thinning did not show any significant effect on the percentage of fruit set. Whereas thinning to 10% of flowers remaining per tree gave high percentage of fruits retained on the tree at harvest as well as the highest total yield (Table 2 and 3). Time of thinning did not show any significant effect on the percentage of harvested fruits and total yield. In avocado, Cull (1986) found that gross flowering was reflected in a marked fall of nitrogen level in leaves, and a similar carbohydrate storage response was expected, hence heavy flowering may decrease yield. In Thailand the amount of durian flowers tend to be excessive. A high percentage of flowers thinning causes a decrease in sink (young leaves, flowers and developing fruits) capacity, and consequently ensure that source capacity is enough for the expansion and storage sink of developing fruits. Udomsriyothin (1992) finding supported the above statement, as he found that thinning to 66 percent at 20 days after flower emergence can increase carbohydrate content in the remaining flowers of durian cv. Chane.

There was no significant effect on mean fruit weight with flower thinning in this study (Table 4). However, flowers thinned to 10% and 25% remaining per tree tended to give the heaviest fruit weight compared to the other treatments. This showed that the total yield of durian in this study was under the influence of the number of harvested fruit but not fruit weight. Thus, the productivity of tropical fruit species like durian was likely to be improved most by increasing the number of potential sink for carbohydrate (Turner, 1986). Thinning of flowers and young fruitlets was reported in Fuyu persimmon grown in Queensland (Collins and George, 1997). Trees with the highest fruit loads produced higher yields of small fruit in the first season, followed by lower yields of large fruit in the next season. They also had lower carbohydrate reserves at the beginning of the second season. In contrast to trees with the lowest fruit loads which produced low yields of large fruit in the first season, followed by higher yields of smaller fruit in the

second season, they gave superior yields overall. They also had higher carbohydrate reserves at the beginning of the second season (Collins and George, 1997).

As for fruit quality, this study showed that there were no significant differences in the number of carpels per fruit at different degrees of thinning and for different thinning times. No significant

Table 1 Effects of time and degree of thinning on fruit setting percentage (Average from 18 branches).

Degree of thinning	Time of thinning			Average
	4 weeks before full bloom	2 weeks before full bloom	At full bloom	
Control (No thinning)	62.40	58.05	60.37	60.28
Thinning to 50% of flowers left on the tree	43.37	66.15	69.12	59.55
Thinning to 25% of flowers left on the tree	62.97	63.42	70.81	65.73
Thinning to 10% of flowers left on the tree	56.61	48.31	70.72	58.55
Average	56.34b ^{1/}	58.99 ab	67.76 a	

cv = 16.7%

^{1/} Means within the same column followed by common letter are not significantly different at the 5% level by Duncan Multiple Range Test.

Table 2 Effects of time and degree of thinning on the percentage of fruit at harvest (Average from 3 trees).

Degree of thinning	Time of thinning			Average
	4 weeks before full bloom	2 weeks before full bloom	At full bloom	
Control (No thinning)	0.83	0.87	0.83	0.84c ¹
Thinning to 50% of flowers left on the tree	0.87	2.68	1.86	1.80bc
Thinning to 25% of flowers left on the tree	2.37	2.06	2.24	2.22b
Thinning to 10% of flowers left on the tree	7.33	4.97	6.50	6.27a
Average	2.85	2.65	2.86	cv = 48.1%

^{1/} Means within the same column followed by common letter are not significantly different at the 5% level by Duncan Multiple Range Test.

effects of thinning on peel and flesh weight of the fruit were recorded. Also seed weight, number of normal and abnormal seeds of the fruits were not significantly different among the treatments. Percent thinning and thinning time did not show any

significant effect on flesh recovery, flesh thickness, peel thickness and flesh color of the fruits. Similar results were found in lychee (Chaitrakulsub *et al.*, 1992) and peach (Trichan and Subhadrabandhu, 1987) which showed that manipulation of vegetative

Table 3 Effects of time and degree of thinning on total yield (kg/tree). (Average from 3 trees).

Degree of thinning	Time of thinning			Average
	4 weeks before full bloom	2 weeks before full bloom	At full bloom	
Thinning to 25% of Control (No thinning)	79.6	75.4	72.8	75.9b ^{1/}
Thinning to 50% of flowers left on the tree	101.6	123.7	87.0	104.1ab
Thinning to 25% of flowers left on the tree	113.4	96.0	95.8	100.7ab
Thinning to 10% of flowers left on the tree	122.8	85.7	110.3	106.3a
Average	56.34b ¹	58.99 ab	67.76 a	

cv = 25.3%

^{1/} Means within the same column followed by common letter are not significantly different at the 5% level by Duncan Multiple Range Test.

Table 4 Effects of time and degree of thinning on mean fruit weight (kg.) (Average from 3 trees).

Degree of thinning	Time of thinning			Average
	4 weeks before full bloom	2 weeks before full bloom	At full bloom	
Control (No thinning)	2.7	2.6	2.8	2.7
Thinning to 50% of flowers left on the tree	2.6	2.9	3.0	2.8
Thinning to 25% of flowers left on the tree	2.9	3.2	2.9	3.0
Thinning to 10% of flowers left on the tree	2.7	3.1	3.3	3.0
Average	2.7	3.0	3.0	

cv = 13.1%

growth at the flowering and early fruit set stages had no influence on the flesh quality of fruits at harvest.

In this study, the growth rate of durian fruits was found to follow a simple sigmoid curve (Figure 1 and 2). The growth of durian fruits either expressed in length (Figure 1) or diameter (Figure 2) increased very rapidly until the ninth week after pollination. There were no significant differences in fruit growth

among the treatments.

Due to the increase in labour costs, chemical thinning is popular for many fruits e.g. grapes, peaches, apples, pears (Childers, 1983). In Thailand, labour costs are not yet serious, but they are expected to be of economical significance soon. In durian, flower thinning and flower position on the branch or on whole tree is very important for determining fruit quality at harvest (e.g. fruit shape, fruit size).

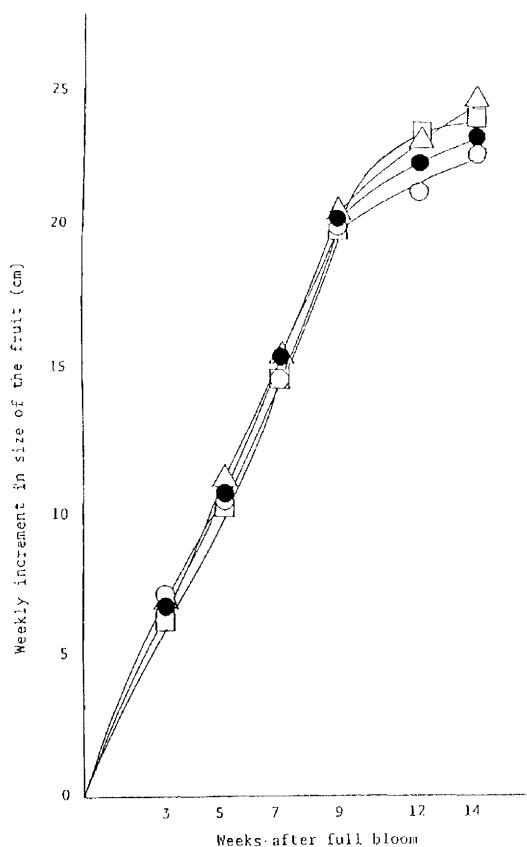


Figure 1 Weekly development in length of the fruits of durian as influenced by stage of flower thinning.

- Flower thinned 4 weeks before full bloom
- Flower thinned at full bloom
- △ Flower thinned 2 weeks before full bloom
- Control

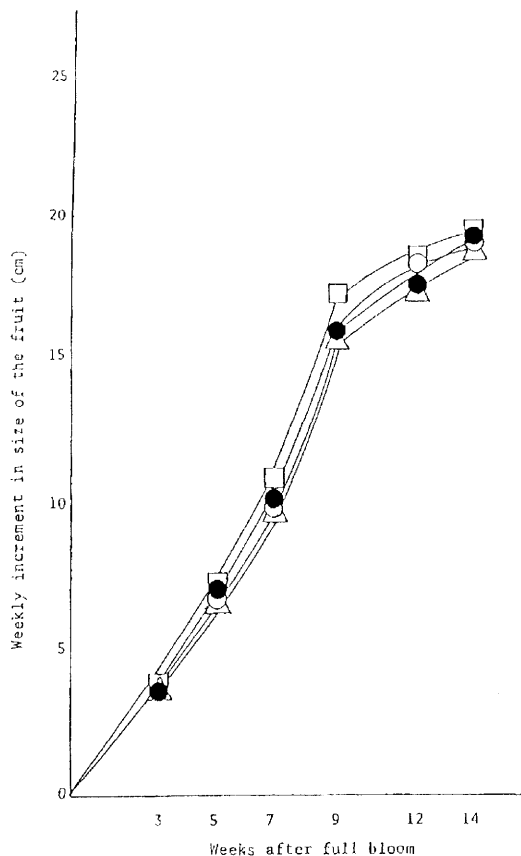


Figure 2 Weekly development in diameter of the fruits of durian as influenced by degree of flower thinning.

- Flower thinned 4 weeks before full bloom
- Flower thinned to 50% remaining
- △ Flower thinned to 10% remaining
- ▽ Flower thinned to 25% remaining
- Control