

HAWAII AGRICULTURAL EXPERIMENT STATION  
UNIVERSITY OF HAWAII

## PROGRESS NOTES NO. 95

GIRDLING AS A MEANS OF PROMOTING FLOWER-BUD INITIATIONIN LITCHIBy  
Shigeru Nakata

Litchi (*Litchi chinensis* Sonn.) is generally unproductive in the Hawaiian Islands, although there have been reports of trees yielding over 300 pounds of fruits during some years. There are numerous reports of trees that have never fruited or which have given only a handful of fruits. The main difficulty in Hawaii appears to be excessive rainfall, which causes vegetative flushing during the period when the trees should be dormant. Secondly, the minimum temperature during the period of photoperiodic induction does not drop sufficiently to give the trees the physiological stimulus necessary to produce flower-buds. Hence, the problem is one of flower-bud initiation and not one of providing adequate fruit set following flowering. Several methods for controlling flower-bud initiation have been studied, with the objective of producing a good yield at least in alternate years and, if possible, every year. In 1947 attempts were made to force blossoming by the application of sodium naphthalene acetate, a growth regulator. The results of these studies have indicated that flower-bud initiation is directly correlated with the maturity of the leaf terminals during the period of flower initiation (2). A dormant period of several months prior to flowering appears essential for profuse blossoming.

Girdling of branches by the removal of a strip of bark completely encircling them will cause carbohydrates to accumulate; flushing then appears to be suppressed. Numerous papers have been published on girdling of citrus and apple trees to increase fruit set and to improve fruit quality in grapes. Of particular interest among these investigations is one indicating the effectiveness of girdling in hastening blossoming in juvenile seedling citrus (1). A study was undertaken in 1950 to ascertain the effectiveness of girdling as a means of inducing flower-bud initiation in the Brewster variety of litchi. In the initial test, branches about 1/2 inch in diameter were girdled by the removal of a strip of bark approximately 3/8 inch wide. Six branches were girdled monthly on each of 12 five-year old trees. Girdling dates were September 19, October 19, and November 21, 1950. A total of 72 branches were girdled each month, and 72 branches were also randomly selected and tagged in September to be used as checks. The results are presented in Table 1.

Table 1. Percent of branches with flower buds on March 1, 1951, and the total weight of fruits harvested

	Check	Date of girdling		
		Sept. 19, 1950	Oct. 19, 1950	Nov. 21, 1950
Percentage branches flowering	1.4	96.6	91.6	80.4
Total yield in pounds	0.2	5.1	3.5	4.2

Together with this first experiment, another series was conducted on eight-year old trees. Here, the trees were divided into two groups: Those that had not fruited in 1950 and those that had 25 to 60 pounds of fruits in that year. The result of the first half of this series was identical with that in the test on five-year trees; however, girdling did not substantially increase blossoming in the trees that had 25 to 60 pounds of fruits the previous year. This current year's work has shown that girdling promotes flower-bud initiation. However, a 3/8-inch girdle appeared to be too wide, as some branches took more than 12 months to heal over and a number of branches died.

More comprehensive tests were conducted during the 1952-53 season on ten-year old trees. All girdling conducted in these series was done by running a pruning saw completely around the branch and making a cut approximately 1/8 inch wide. In the first series, branches 2 to 4 inches in diameter were used. The trees were separated into those that did not fruit in 1952 and those that had 30 to 50 pounds of fruits that year. A total of ten branches, two branches on each of five trees, was girdled each month on September 19, October 20, and November 18, 1952. The results of this series are shown in Table 2.

Table 2. Total yield\* (in pounds) of girdled branches 2 to 4 inches in diameter

Description of trees	Check	Date of girdling		
		Sept. 23, 1952	Oct. 20, 1952	Nov. 18, 1952
No fruits in 1952	7.7	63.1	50.6	9.5
30-50 pounds of fruits in 1952	0	19.0	58.0	38.0

\* Including some small fruits.

On the trees that had no fruits in 1952, branches girdled in September produced the most fruits and those girdled in November the least. The difference in the response of yielding trend between the trees that had no fruits and those that had yielded 30 to 50 pounds of fruits in 1952 is due partly to the fact that some branches of the second group had leaf terminals that had not flushed since harvesting at the time of girdling.

In the next series, limbs 4 to 6 inches in diameter were girdled in September, October, November, and December. In girdling the limbs of these trees, attempts were made to divide the trees into two approximately equal parts as far as girdled and nongirdled sides were concerned. The results are presented in Table 3.

Table 3. Yield (in pounds) of individual trees on which limbs 4 to 6 inches in diameter were girdled

Date of girdling							
Sept. 23, 1952		Oct. 20, 1952		Nov. 18, 1952		Dec. 9, 1952**	
Girdled half	Nongirdled half	Girdled half	Nongirdled half	Girdled half	Nongirdled half	Girdled half	Nongirdled half
35.2	0	94.5	63.3	4	2.5	0	0
58.5	17.0	76.8	0	150	52.0	0	0
60.2	17.0	0*	0	0*	0	0	0
Av./tree							
53.3	11.3	57.1	21.1	52.3	18.2	0	0

\* Trees had leaf shoots 1 inch long emerging when girdled.

\*\* These trees flushed between October and December 2 and had nearly mature leaves when girdled.

In the last series, trunks of trees were girdled. Three trees were girdled in September, two in October, three in November, and three were designated as checks. The result of this series is presented in Table 4.

Table 4. Yields (in pounds) of individual trees with trunks girdled and ungirdled

Check	Date of girdling		
	Sept. 23, 1952	Oct. 20, 1952	Nov. 18, 1952
0	110	0*	80.5
0	117	147	68.0
0	153	---	4.0
Av./tree			
0	126.7	73.5	50.8

\* This tree had leaf shoots emerging when girdled.

In these two series, girdling has definitely promoted blossoming and fruit setting. However, girdling of limbs and trunks of trees that had started flushing in October and November was not effective. Girdling in September appears to give a more consistent positive result than girdling in November.

### Summary and Conclusion

These experiments indicate that girdling of branches, limbs, and trunks of Brewster variety of litchi tree will:

- (1) Force blossoming and increase fruit set. Even on trees that had moderate amounts of fruits on the ungirdled limbs, the girdled side had much more yield (Table 3).
- (2) Not promote flower initiation on trees that had flushed late in the season (October to November).
- (3) Not prevent or retard a flush from proceeding to its full development when the girdling was done after the new flush had been initiated.

September appears to be a better time to girdle than October or November. This is because an untimely, heavy rainfall in October or November, just before the flower-bud initiation period, tends to cause vegetative flushing. A narrow girdling, the width of a pruning saw, is sufficient for girdling litchi. It probably would be a good horticultural practice to paint the girdled surface with a pruning compound to prevent invasion of fungus and scolytid beetles.

Girdling is not a new technique but holds great promise of promoting flowering and fruit set. However, further experimentation will have to be carried out to determine the effect repeated girdling will have on growth and yield. Furthermore, tests will have to be conducted on other varieties of litchi to determine the effectiveness on varieties other than Brewster.

### Literature Cited

1. Furr, J. R., W. C. Cooper, and D. C. Reece. An investigation of flower formation in adult and juvenile citrus trees. Amer. Jour. Bot. 34: 1-8. Jan. 1947.
2. Shigeura, G. Blossom-bud formation and fruit setting in the litchi. Hawaii Agr. Expt. Sta. Biennial Rpt. 1946-1948: 138-140.