

# Thinning Apples With Blossom Sprays<sup>1,2</sup>

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THINNING a heavy set of apples is an old practice which offers many advantages. In general, thinning will result in better size, better color, higher average prices, less limb breakage, less cost in harvesting and handling, better pest control, maintains tree vigor, and is supposed to promote annual bearing. Even with these advantages growers have done little thinning because of obvious difficulties. Hand thinning involves a high labor cost and, when done at the usual time about the first week in July, after "June drop" is over, it conflicts with other work and usually is done too late to result in annual bearing. By the time the apples are large enough to thin those which are to be removed have used food and water that might have been used in formation of fruit buds for the following season.

In attempts to reduce cost of thinning various methods have been tried such as the use of rakes or brush brooms. Injury resulting from these methods showed them to be impractical. Hand pollination to space the set has been practiced in some western orchards. But a more effective and practical method seems to be spraying with some caustic chemical which will thin the blossoms and prevent heavy set. This method of thinning is coming into general use in leading apple producing centers, but until 1947 and 1949 results in Minnesota have been inconclusive. These more recent tests, however, have shown that chemical thinning may be well worth a trial by Minnesota growers under their own orchard conditions, particularly with the Haralson variety which is a pronounced biennial bearer.

## How Spray Works

Comments and suggestions by those who have studied blossom thinning elsewhere are of interest. The spray is said to act by killing pollen and pollen tubes that have just begun to grow. In the central, or "king" blossoms which have been pollinated a little earlier, the pollen tubes probably will have grown far enough down into blossom tissues to escape injury from the spray and insure set. The spray is said to be ineffective when the blossom season is prolonged. This seems to be the case with Haralson as that variety often opens from 5 to 10 per cent of its blossoms

after most of the flowers are shedding petals. On more vigorous trees very dilute sprays are said to be ineffective and slightly stronger sprays seem to be needed. Several investigators report that it was desirable to follow spray thinning with some light hand thinning.

Caustic chemicals used in blossom thinning at the Fruit Breeding Farm have been Elgetol and Krenite, trade names for sodium di-nitro ortho cresylate. Preliminary studies showed that only dilute sprays should be used. Concentrations stronger than 0.25 per cent caused severe foliage injury. In 1947 the strength used was 0.25 per cent, or one gallon of concentrate to 400 gallons of water. In 1949 0.18 per cent was used, or 3 quarts of concentrate to 400 gallons. Both dilutions caused slight injury to foliage of Haralson and Wealthy but the trees soon recovered. Some growers report good results with still weaker sprays.

## 1947 Trials

In 1947 the trees were sprayed on May 29 when the central blossoms had been open for about 24 hours. The trees were in full bloom on May 31 and June 1. A second spray was applied on June 2 to some of the same trees. In both Haralson and Wealthy there was not enough thinning with one spray and slight over-thinning with two sprays. Average yields per tree were as follows: Haralson; no thinning, 9 bushels; one spray, 8 bushels; two sprays, 6 bushels. Wealthy; no thinning, 7 bushels; one spray, 6 bushels; two sprays, 4 bushels. Blossom thinning in this case resulted in an increased crop value per tree of Wealthy of \$2.64 for one spray, and \$3.37 for two sprays. For Haralson crop values per tree were increased \$.52 for one spray and \$1.17 for two sprays. Although these gains per tree were not large, both size and color were improved by thinning. That some over-thinning may be desirable is suggested where only 4 bushels of Wealthy sprayed twice were worth 37 cents more than 7 bushels from trees not thinned. There was an additional gain from the over-thinning as the labor and expense of picking, hauling, grading and packing of 3 bushels per tree was avoided. In Haralson the more heavily thinned trees produced an average of 6 bushels which were worth \$1.17 more than the 9 bushels from the trees not thinned. Apparently good quality is worth more than large volume!

A study of tree performance was planned for 1948 to note any possible effect of blossom thinning in a heavy crop year upon blossoming and set in the "off" year. As the severe winter of 1947-48 followed the heavy crop and drouth of 1947 the trees were so weakened that no crop was produced and no such records could be made.

## Continued in 1949

The study was continued in 1949 when a profusion of fruit buds gave promise of another very heavy crop. On May 13 a single spray of 0.18 per cent was applied at about 90 per cent of full bloom and when petals were falling from some of the central blossoms. A three man crew using a 400 gallon sprayer at 600 pounds pressure sprayed 100 Haralson and 88 Wealthy trees in 2½ hours actual spraying time, or at the rate of less than a minute per tree. Counting labor, materials and use of sprayer the cost per tree was not over 10 cents. As spraying operations were slowed down somewhat in order to avoid spraying the check plots it is likely that straight-away spraying in a commercial orchard can be done at an even lower cost per tree.

About half of the 18 year old Haralson check trees, which were not blossom thinned, were hand thinned on July 1 as "June drop" ended. All clusters were thinned to one apple and a graduated spacing varying from 4 inches on the outside to 8 inches inside the tree heads was followed. Practically all this thinning was from the ground or from 8 foot ladders with little or no thinning in the tops. Records of the time spent in hand thinning showed that it required one man-hour per tree at a cost of approximately 75 cents per tree. From these figures it is apparent that hand thinning was relatively very slow and cost 7½ times as much as blossom thinning.

Effects of blossom thinning usually are measured by recording the number of apples set per 100 spurs. An attempt was made to obtain such records but the method was of no value in this case because of the extensive spur killing in the severe winter of 1947-48. Most of the 1949 set was produced at the tips of the year-old terminal shoots and from an extensive development of an unusual type of fruit bud in the axils of the leaves on these shoots. On Haralson terminal shoots there were from 10 to 12 blossom clusters developed from these

1. Paper No. 695 Miscellaneous Journal Series, Minnesota Agricultural Experiment Station.

2. These studies have been advanced materially by the efficiency and interest of the personnel at the Fruit Breeding Farm.

axillary fruit buds with from 50 to 60 individual blossoms. On Wealthy terminal shoots there were 6 to 10 blossom clusters totalling from 30 to 50 individual blossoms. As a general rule these axillary blossoms do not set, but when they do the apples produced have to depend upon a very limited leaf area for their development so usually are small and poorly colored. That so many fruits of this type set undoubtedly was reflected in the high percentages of small apples shown for Haralson trees in the accompanying table. Differences shown in the table between hand picked and total crop indicate that many of these apples were too small to be harvested profitably.

### Results in 1949

Comparisons between the thinned trees and those not thinned show interesting results with both Haralson and Wealthy. The accompanying table shows that the average total yield of the blossom thinned Haralson trees was 1½ bushels greater than for the check trees, and it was almost 6 bushels more than for the hand thinned trees. The figures for bushels harvested are somewhat smaller than for total crop because, as noted above, many of the apples which set from axillary buds were too small for market. The table shows, as could be expected, that there were some culls in the hand picked crop for all three treatments with Haralson. There also were some below the smallest marketable size of 2¼ inches. The table shows that almost half of the hand picked crop of the unthinned trees, or 6.7 bushels, was of this unmarketable size. That there were some of these small apples in the two thinning treatments indicates that the trees could have been more heavily thinned to advantage.

Of the hand picked crop of the trees not thinned, the table shows that prac-

tically all, or 5.6 bushels, were of the smallest marketable size of 2¼ to 2½ inches. Only one bushel graded 2½ to 2¾ inches, and not more than a dozen apples graded 2¾ inches or larger. In general, all the crop harvested from the unthinned trees was poorly colored. Based on market prices for the three grades the crop value for the unthinned trees was \$6.69. Figures for marketable fruit from the blossom thinned trees show a smaller volume (4.4 bu.) of the 2¼ to 2½ inch size compared to the unthinned trees. There was a marked increase in the 2½ to 2¾ inch size (5.5 bu.), and 2.7 bushels were graded 2¾ inches and over. Market value for this better grade of fruit was \$15.05, or a gain of \$8.36 per tree over those not thinned. Anyone will agree that this gain was a good bargain for the 10 cents spent for blossom thinning.

Hand thinning of Haralsons also paid well. The table shows that compared to the check trees there was a marked increase in the amount of larger size fruit with a gain in value of \$3.45 for the 75 cents per tree spent in thinning. In the E. N. Dumas orchard at Long Lake a hand thinning study carried on by Dr. L. C. Snyder gave a return of \$17.95 per tree for uniform spaced hand thinning compared to \$11.90 for trees not thinned, an increase of \$6.00 per tree for one hour of work. Such results are good, but blossom thinning gave larger returns for an almost negligible cost.

Similar records were made of the effects of blossom thinning with Wealthy but no hand thinning was attempted. As blossom thinning had little effect on total crop or grade these figures are not included in the table. The check trees produced a bushel more of the small unmarketable size than the blossom thinned trees. This seemed to be the only notable effect on volume and grade.

In crop value there was a gain of \$1.16 per tree from blossom thinning at a cost of 10 cents per tree. Thinning, therefore, was worthwhile, and the gain was more than cost, but there was definitely less effect with Wealthy than with Haralson. Similar studies of blossom thinning of Wealthy in other states have shown the same lessened response compared to other varieties.

We do not know at present if blossom thinning will result in better yields for Haralson in the "Off Year". Perhaps crop records for 1950 will tell that part of the story. From results obtained it is evident that blossom thinning is worth trying with Haralson when a heavy bloom is in prospect. Blossom thinning certainly is quicker, cheaper, and earlier than hand thinning. Perhaps its chief value is in early thinning which avoids the loss of water and food contained in the partially developed apples removed in hand thinning. Some growers have been trying blossom thinning and report fair success. Of course the degree of success cannot be predicted but at a cost of no more than 10 cents a tree the risk is small, and some over-thinning seems better than too little. A grower must be ready to spray on short notice as the effective time is short, perhaps no more than a single day for a given variety.

There seems to be little danger that bees will be killed by blossom sprays. The chemical is an active repellent and bees quickly leave as trees are sprayed. The spray dries quickly but also acts quickly to destroy blossoms. So far as observed bees usually do not return to a sprayed tree unless late blossoms develop.

At present blossom thinning seems to promise so much with the Haralson variety and cost so little that any grower should be willing to try the method under his own conditions.

## BLOSSOM THINNING OF HARALSON, 1949

Treatments	Average Yields Per Tree in Bushels							Value Marketable Fruit Dollars <sup>2</sup>	Thinning Cost Cents Per Tree
	Total Crop	Hand Picked	Grades of Picked Fruit						
			Culls	Less Than 2¼"	Marketable Sizes				
					2¼ to 2½"	2½ to 2¾"	2¾" and over		
Blossom Spray <sup>1</sup>	17.6	14.8	1.0	1.2	4.4	5.5	2.7	15.05	10
Hand Thinned	11.8	9.8	.9	.4	2.9	4.4	1.2	10.14	75
Check	16.1	13.9	.5	6.7	5.6	1.0	.1	6.69	—

1. Krenite at 0.1825 per cent.

2. 2¼ to 2½ size = \$.75 per bushel.  
2½ to 2¾ size = \$1.40 per bushel.

2¾ and over = \$1.50 per bushel.