RINGING DETRIMENTAL TO TOMATOES AND CHRYSANTHEMUMS.

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Ringing and its effects.

By cutting out a narrow ring of bark from the stem or branch of a fruit tree or grape vine, the grower sometimes adds to his profits. Early fruits and those of exceptional size often bring high prices; and ringing, in some cases, aids in securing such products and even increases the total yield for the season. The operation may also make barren plants set fruit.

This process of ringing is effective because of a peculiarity in the sap circulation of exogenous (outside growing) plants, such as are all our fruit trees, vines and bushes, most of our vegetables and many of our cultivated flowers. In such plants the sap, with its supply of crude food materials absorbed by the roots, moves upward to the leaves largely through the outer portions of the old wood; while the descending currents, loaded with the starch and other foods elaborated in the leaves, pass through the inner bark and the growing new wood, or cambium layer, just beneath it. If a ring of bark and cambium be removed, the rise of the sap can continue almost as before; but the downward flow is checked and the food remains in the parts of the plant above the ring. This additional supply of food stimulates these parts so that they may become productive or bear earlier and larger fruits.

It must be remembered, however, that the parts of the plant below the ring will suffer through lack of the food stored above. Ringing must, therefore, be used with caution; but it has been used with apparent advantage with grapes and apples in America and with these and many other fruits in Europe.

Ringing these fruit plants are all woody; but the operation can be performed with equal or greater facility on herbaceous, or soft-stemmed, plants. On theoretical considerations ringing would seem to promise good results with such soft-stemmed plants; for many of them are often grown in forcing houses in order to bring the product on the market out of the ordinary season. Yet very few records of the ringing of such plants

*This is a brief review of Bulletin No. 288 of this Station on Ringing Herbaceous Plants, by U. P. Hedrick, O. M. Taylor and Richard Wellington. Any one specially interested in the detailed account of the investigations will be furnished, on application, with a copy of the complete bulletin. The names of those who so request will be placed on the Station mailing list to receive future bulletins, popular or complete as desired. Bulletins are issued at irregular intervals, as investigations are completed, not monthly.
have been found, either in American or foreign horticultural literature; but the few trials mentioned were promising.

It was accordingly decided to test the process on a commercial scale on tomatoes and on chrysanthemums, two plants whose product should show plainly any benefit from ringing. The method could be used with safety on these plants, since any deteriorating effect would be of little consequence, as the plants are discarded after the fruits or flowers are harvested. The test on tomatoes included about 140 plants of the variety Lorillard, grown in one of the station forcing houses during the fall of 1905. These plants were selected from a much larger number and were very uniform at the start and were vigorous and productive throughout the test. They were trained to single stems.

One third of the plants were rings when the blossoms of the second cluster had set, one-third after two other clusters had set, and one-third were left as checks. By means of a double-bladed knife a ring of bark and cambium five-eighths of an inch wide was removed from the stem of each treated plant at a point just below the first leaf that developed under the first fruit cluster. In no case was there any immediate ill effect from the operation; but the ringed plants soon began to show irregular, bunchy swellings on the parts above the rings; and, later, the foliage of these plants became more or less abnormal. The leaves curved downward, showed elevated, cushiony areas and developed very succulent tissue. Many of them also showed slight yellowing, indicating an unhealthy condition. Examination of ringed and unringed plants showed great retardation of roots, due to the ringing. This same effect was even more observable with the chrysanthemums tested the next year; for the roots on ringed plants were few in number, small in size and generally lacking in vigor. This poor development of the roots, indicating root starvation, was greater, with both tomatoes and chrysanthemums, as the ringing was earlier.

These features show a severe disturbance of plant physiology, and indicate how serious a check upon growth ringing may be.

There were no compensating advantages in the yield of tomatoes; for the average number of fruits was decreased 18 per ct. by the first ringing and 10 per ct. by the second; and the corresponding losses in weight per plant were 16 per ct. and 12 per ct. respectively. The individual fruits from the plants first ringed averaged about one-sixteenth of an ounce heavier than those
from plants not ringed. Fruits from plants ringed later weighed about one-twentieth of an ounce less than those from the checks.

There was no gain in earliness of fruits in favor of ringing, neither was there any difference in flavor or color.

Test with chrysanthemums.

In the season of 1906 chrysanthemum cuttings of five different varieties were secured and one hundred good, uniform plants of each variety were selected for a test of the effect of ringing on flower production.

Each plant was trained to a single stem and only the terminal bud was allowed to develop. The ringing of one-third of the plants of each variety was done when the buds had just appeared, and of the second group twenty days later, while the remaining plants served as checks.

The injury to the foliage of the ringed plants was more pronounced than in case of the tomatoes, in some cases amounting to practical loss of all the leaves. Similar enlargement of the stems above the rings appeared, and on one variety, marked abnormal protuberances. With the chrysanthemums, though not with the tomatoes, the ringed plants were somewhat dwarfed.

The flowers were decreased in size by the ringing, one-half an inch in diameter by the first ringing and more than one-tenth of an inch by the second. The early ringing also hindered the opening of the buds of all but one variety; but the second ringing hastened the maturity of the flowers of four of the five varieties, though only to a slight extent.

As noted under the test with tomatoes, the roots were much retarded by ringing; and few or no suckers formed on the roots of the plants first ringed.

From these tests it appears very doubtful whether

Conclusions. ringing can ever be beneficial to herbaceous plants, since the visible loss in vigor is great and there are no compensating gains.

The tests also raise the question whether the deteriorating effect of ringing on woody plants has received sufficient attention. These plants must suffer in the same way as do herbaceous species from the decreased vigor of parts below the rings, though perhaps not to the same extent. The more apparent gains in early and larger fruit have received the greater notice, but it is possible that careful study would show deterioration great enough to overbalance these gains.