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Sting on Apples
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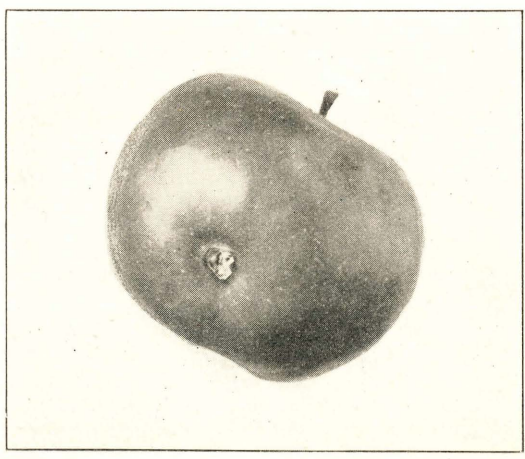
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Sting on Apples

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MICHIGAN STATE COLLEGE
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ENTOMOLOGICAL SECTION

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FOREWORD

The so-called "sting" of apples is a blemish, the cause of which has puzzled those interested in apple and pear culture for many years. Various opinions were held, not so much as to the insect which produced it, as to the reason for its occurrence in greatest numbers in well-sprayed orchards. All attempts to greatly reduce the numbers of these blemishes by varying the times of arsenical sprays proved futile, except as such sprays influenced the total number of codling moths present.

The present bulletin explains the reason for this consistent failure to control by treatments now in common use and suggests lines along which one must proceed in order to hope for effectual methods of control.

R. H. PETTIT,
Entomologist of Experiment Station.

STING ON APPLES

L. G. GENTNER

For many years Michigan apple growers, especially in the southern part of the state, have suffered serious losses from the so-called "sting" on apple. This "sting" is a blemish that is found on the fruit at the time of harvest, which causes many apples, so injured, to be thrown out of the Fancy class into the B grade, or even into the culls. The codling-moth had been strongly suspected as being responsible for this injury but there were no definite data on hand to prove it. Therefore the writer undertook to keep a close watch for the appearance of the blemish in order to determine definitely how it was produced. Observations were made during the season of 1925 at Fennville, Mich., in connection with other work on insect pests on fruit.

At the time that the apples are being picked, the blemishes may be

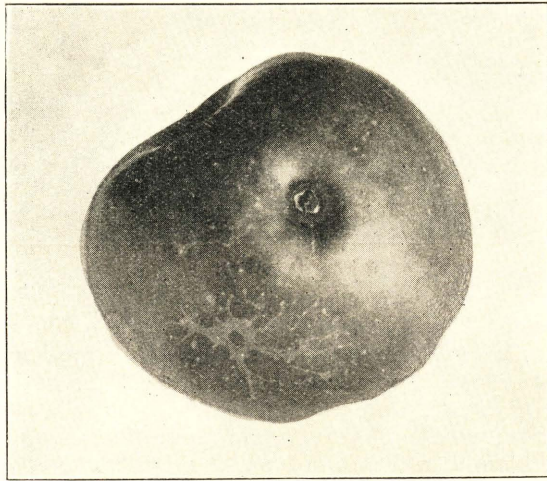


Fig. 1.—Larger form of blemish, caused by first-brood codling moth larvae.

found in two distinct forms. In the one form there is a noticeable depression in the side of the apple, usually more pronounced in the larger fruit. Near the center of this depression there is an irregular, somewhat circular area, varying from about one-eighth to about one-fourth of an inch in diameter, over which the epidermis or skin has sloughed off, and beneath which a thick, corky layer has formed. The ragged edges of the dead skin may still be found around the margins of the blemishes or may have disappeared entirely, and the corky layer is

usually cracked or split in various directions, due to the growth of the fruit. In the other form, there is scarcely any depression, but there is a conspicuous, dark-colored, circular blotch on the side of the apple. In the center of this blotch, there is a very small, somewhat crescent-shaped hole through the skin, which hole is only about one-fortieth of an inch in diameter.

The "sting" seems to be more prevalent in the southern part of the state, especially on the western side along Lake Michigan. As one goes farther north, the trouble decreases. Climatic conditions, no doubt, figure largely in this distribution. The injury occurs to a greater extent on Baldwins and to a lesser extent on such varieties as King, Grimes Golden, Spy and others. It is also more prevalent in blocks of old trees than in blocks of young ones. The old trees, of course, are

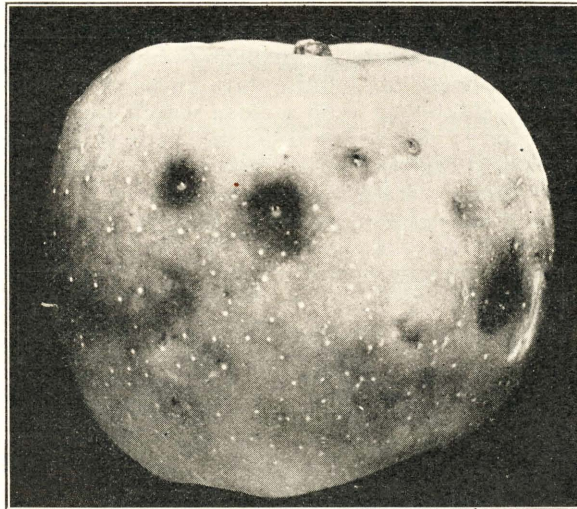


Fig. 2.—Smaller form of blemish, caused by second-brood codling moth larvae. Typical "sting."

much more difficult to cover thoroughly with spray, and offer more shelter for over-wintering codling-moth larvae, thus making conditions favorable for a greater initial infestation.

During the first week of July, a number of codling moth eggs in the "black-dot stage" were found on the fruit itself, in sprayed orchards, and a noticeable number of worms had just recently entered the fruit. By the middle of July, from ten per cent to fifteen per cent of the Baldwin apples, in many orchards, had one or more "stings" on them. Empty egg-shells could be found adhering to many of the apples which showed the blemish, or to adjoining ones. The larvae making the blemishes at this time came from eggs laid by some of the later-emerging moths of the first or spring brood.

About one hundred apples showing "stings" were tagged and developments were watched throughout the season. The larvae remained in the apples from one to several days before dying, and often caused

considerable injury. The typical "stings" at first appeared as very tiny holes through the skin of the fruit—not circular, but somewhat crescent shaped. Irregular areas, sometimes two and three times the area of the hole itself, where the larvae had scuffed off the surface of the skin before eating through, were found quite frequently, adjoining these holes. The size of the injuries increased with the growth of the apple until at harvest time they appeared as the typical large blemishes, before mentioned.

Most of the larvae which had entered the tagged apples had failed to establish themselves. Some of them made deeper excavations and some of them chewed away the pulp from beneath the skin surrounding the entrance hole, but most of them died without going deeply into the pulp. After the death of the larvae a whitish, frothy material exuded from some of the holes. As a rule in trying to heal over the wounds, the apples formed a corky layer over the exposed tissue. The appearance of this early "sting" at the time of maturity of the fruit depended upon the severity of the original injury, and upon the amount of growth taking place after the injury had occurred.

During the third and fourth weeks in August, fresh "stings" were appearing on the fruit. These were being made by larvae which had hatched from eggs laid by moths of the second or summer brood. The wounds corked over to some extent, but did not enlarge much. At harvest time these later "stings" appeared as the typical small holes with the dark-colored blotches surrounding them.

Observations have shown that the codling moth is the direct cause of the "sting," which injury has resulted in greater annual losses to apple growers in those regions where the "sting" is prevalent, than injury from any other insect. The "stings" appear directly in proportion to the percentage of infestation in an orchard. Where there are many moths, there are usually many "stings." It appears that the larger number of "stings" are made by larvae that hatch from eggs laid directly upon the fruit. Those larvae which hatch from eggs laid on the leaves, are likely to be poisoned before reaching the fruit, since they may feed on the foliage to some extent before trying to reach the fruit. In well-sprayed orchards there may be very few "worms" working in the interior of the fruit, but there may be many "stings" present, while in adjoining unsprayed orchards the opposite is true—there may be very few "stings" but many "worms" working in the fruit.

So far as is known to the writer, no measures have been worked out as yet, that will consistently control the "sting" caused by the codling moth. It seems to make little difference in the relative number of "stings" whether the second codling-moth spray is applied ten days or two or three weeks after petal fall, or whether or not the number of applications of arsenate of lead are increased. Of course, the larvae which make these blemishes, are killed, and do not produce "wormy" fruit, but they are not killed before they have eaten through the skin. Some investigators have observed that the larvae cast aside the material cut loose in entering.

Any practical measure that will reduce the amount of infestation in an orchard is of value in reducing the amount of "stings." We are

limited in the kinds of poison that we can use safely on apple trees. Even if we could use a poison that acts more quickly than arsenate of lead, it is not probable that the poison could act before many larvae could enter the fruit. Since most of the "stings" seem to be made by larvae hatching from eggs laid directly on the fruit, it would be reasonable to suppose that some contact spray to kill the eggs, applied as a supplementary spray to the regular schedule, may go far toward solving our problem. Some investigators have already carried on laboratory tests along this line with promising results.

CONCLUSIONS

The so-called "sting" on apple exists in Michigan, at harvest time, in two distinct forms—large, corked-over spots within depressions, and small holes surrounded by dark-colored blotches.

This "sting" is the result of entrance by a codling-moth larva of either the first or second generation, the earlier larvae producing the larger blemishes.

Larvae producing "stings" come mostly from eggs laid on the fruit itself. They die shortly after entering.

The blemish appears to occur in proportion to the general infestation in an orchard. Few "stings" are found in unsprayed orchards, but there may be much "wormy" fruit.

The proportion of "stung" fruits is not appreciably reduced by arsenical sprays.

To reduce the number of "stings," our hope lies in reducing the total number of codling-moths in an orchard, or in finding some way to destroy the eggs before they hatch.