Causes of Avocado Leaf Injury

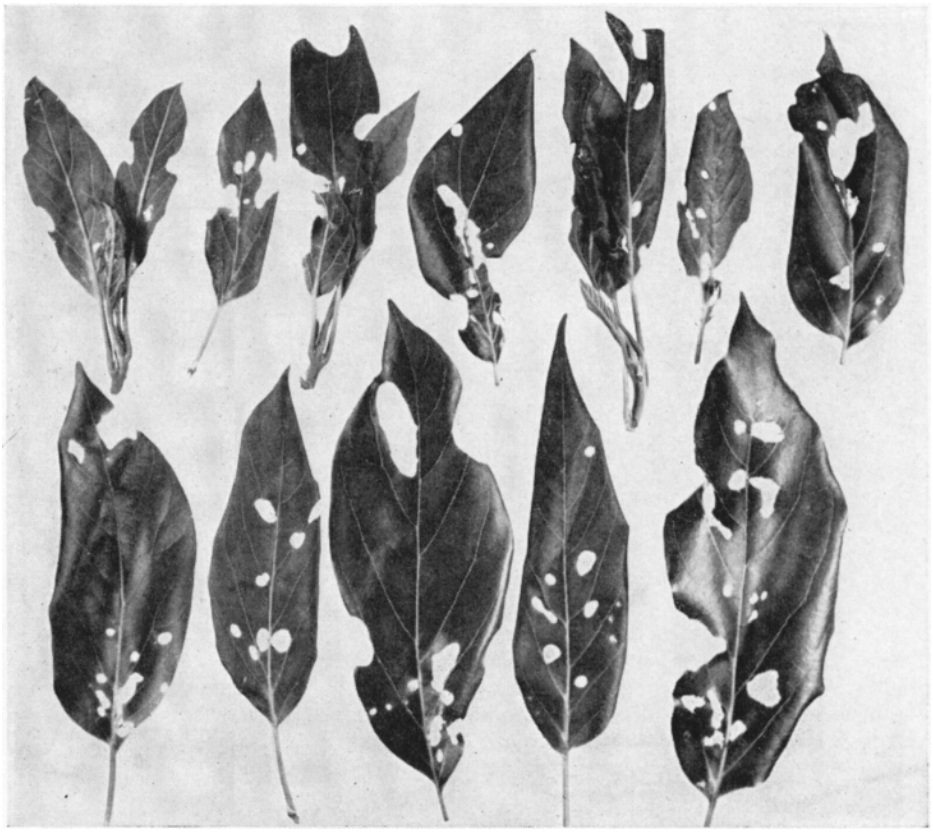
certain foliage injury often attributed to insect feeding may actually be the result of some physiological disorder

Walter Ebeling

Ability to distinguish between types of avocado foliage injury caused by different insects and injury from other causes is essential in making evaluations of insecticide treatments.

In recent years, evaluations have been made of insecticide treatments in certain avocado orchards by determining the relative amount of leaf injury in the treated plots as compared to the untreated checks.

It became apparent during such field comparisons—some were as long as a year after treatments—that much of the injury formerly considered to be caused by insects was actually caused by what appear to be physiological disorders. This type of injury—similar to that resulting from insect feeding—has never been found to be as serious as the injury resulting from the more severe infestations of insects, but it is more widely distributed and usually more abundant. It has been found in all parts of southern California, including the areas farthest removed from any possible influence of smog. The vigor or lack of vigor of the tree appears to have no effect on the incidence of this type of injury. It seems to have no relation to weather conditions, such as—for example—the dry north winds, for it is found just as commonly in a humid glasshouse.



***Upper row,* terminal avocado leaves injured by the amorbia. Some are still webbed together, with the larva inside. *Lower row,* injured leaves at various periods after they were fed upon by the amorbia larvae.**

Injury to Young Leaves

Most insect injury to avocado foliage is usually caused by the larvae of two species of moths: the amorbia—*Amorbia essigana* Busck—and the omnivorous looper—*Sabulodes caberata* Guenée—although June beetles, Fuller rose beetles, snails, and other pests may cause similar injury.

In the spring, the larvae of amorbia may sometimes be found feeding on the young terminal leaves they have webbed together. The amorbia injury consists primarily of small holes in the leaves, but to some extent the margins of the leaves also are eaten. As the leaves increase in size, the holes become larger and result in a rather typical type of injury, as shown in the upper photograph on this page.

The amorbia shows a marked varietal preference. For example, in May 1955,

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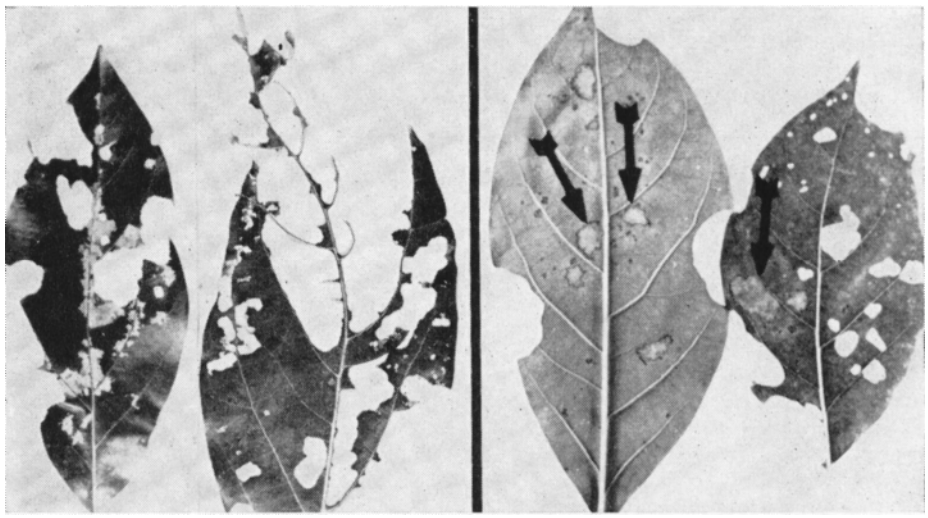
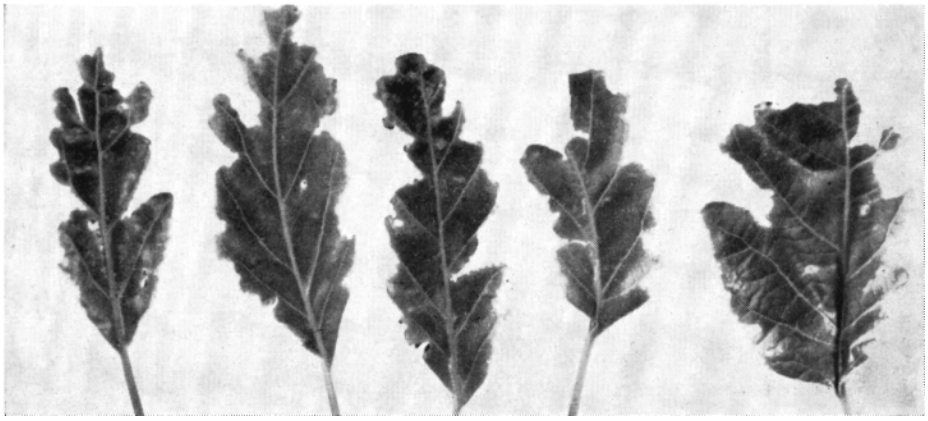


***Left,* injury to avocado leaves caused by the omnivorous looper. *Right,* lower and upper surfaces of avocado leaves showing injury caused by the dropping out of necrotic areas. Three of the necrotic areas that had not yet dropped out are shown by the arrows.**



A malformation of the terminal leaves of young Hass variety avocado trees caused by a necrosis that is apparently physiological in origin and is not caused by insects, mites, or fungi.

AVOCADO

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in an avocado orchard near La Habra, over half of the terminals were infested on the Anaheim variety, approximately 25% on the Hass variety, and only an occasional terminal was infested on the Fuertes.

A leaf injury similar in appearance to that caused by the amorbia can often be found on young terminal foliage in any avocado district. This injury—illustrated by the photograph on this page—has been generally attributed to insects, but it has been definitely established that neither insects nor fungi are involved. The malady seems to be physiological in origin. A striking example of this injury was observed on two-year-old avocado trees of the Hass variety in April 1955. Nearly all the young terminal growth was affected severely. However, this type of injury may be seen on trees of all varieties and ages.

As shown by the photographs on this and the preceding page, the injury from amorbia consists primarily of holes eaten into the leaves, whereas the injury shown in the picture on this page appears as if the leaves were eaten from the margins toward the midrib of the leaf. Only a few holes can be seen. The margins of the injured leaves have a narrow, yellowish border.

The malformations of the leaves often appear to originate from necrotic tissue that becomes apparent when the tiny leaves are first unfolding from the terminal clusters. This type of necrosis is mainly marginal and influences the pattern of growth the leaf is to take in its subsequent development. Some of the injured leaves have a tendency to fall when barely touched, and these will be found to have a blackish discoloration in the region of the abscission layer. It would seem that such a degree of injury to young terminal foliage would retard the growth and development of the tree.

Injury to Mature Leaves

The characteristic feeding injury of the omnivorous looper on mature leaves is shown in the lower photograph on page 9. Injury caused by other foliage feeders is somewhat similar in appearance. The insects have a tendency to eat the foliage right up to the midrib and larger veins, leaving these conspicuously isolated. Another reliable indication of insect injury results from the feeding of the first instar larvae of the omnivorous looper and the amorbia. They feed only on the surface of the leaf, leaving a thin membrane and network of veins which skeletonize the leaf. Some of this type of injury is shown on the leaf at the extreme left of the picture.

The right half of the photograph shows the type of injury on the older leaves caused by necrosis. The necrosis is plainly marked in definitely delimited areas both on the lower surface—with the two arrows—and upper surface—one arrow—of the leaf. When the necrotic areas drop out they leave the holes that have, in the past, been mistaken for insect injury. The edge of the leaf tissue left by the holes usually will be found—by careful examination—to have retained a narrow margin of necrotic tissue. In the case of the leaves with the arrows, none of the missing leaf tissue was lost because of insect injury. Even the large marginal areas that are missing fell off because of necrosis.

The necrosis is less apparent when a tree is viewed from the outside. The most striking evidences of injury are seen by looking inside the tree. Sometimes an average of 25% to 50% of the leaf surface on the leaves in the interior of the tree is lost because of this malady.

The cause of the necrosis is not known. It is not caused by insects or mites, and plant pathologists say it is not caused by fungi. Once the observer has identified this type of injury, he will find it to be common everywhere.

The photographs of necrotic injury to young terminal foliage and to mature leaves illustrate the importance of distinguishing necrotic injury from true insect injury in the evaluation of insecticide treatments.

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RED SCALE

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of untreated rows lies on either side of the treated pair. This program has resulted in good purple scale control, and neither the California red scale nor other pests have become serious. Apparently very little upset of natural enemy populations occurs because rapid dispersal of natural enemies takes place from the untreated trees back to the treated trees within a short time after treatment.

Another program being conducted in San Diego and Santa Barbara counties is promising. This program has involved comparison of untreated lemon plots with adjacent plots treated with materials for citrus bud mite control. Chlorobenzilate, which looks best, has given good bud mite control and has had no evident adverse effect on natural enemies of red scale or other pests.

The fundamental philosophy behind the field tests on periodic colonization of parasites was that red scale was the key pest on citrus, and if biological control could be obtained—at a cost for parasites not exceeding the cost of an insecticidal treatment—then natural control of most other pests might follow.

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