New Pomegranate Mite

russeting and cracking of peel characterize injury responsible for much culling

Walter Ebeling and Roy J. Pence

Pomegranate growers in a section some five miles north of Porterville in Tulare County began about six years ago to notice a russeting and cracking of the peel of pomegranate fruits in some orchards.

The malady each year became more severe and widespread. The cause was not known, but was believed by some to be due to thrips. By October 1947 about 75 acres of pomegranates were severely affected. It was estimated at the time of harvest that from 50% to 90% of the fruit was culled because of its unsightly appearance. In 1948 it was found that the malady was also extensively distributed in Fresno County.

The acreage of pomegranates in California is small, amounting to only 663 acres in 1947, confined almost entirely to Fresno and Tulare counties. Although many trees are grown in border rows for orchards of other fruit crops or for vineyards, there are also some orchards planted entirely to pomegranates. One such orchard near Mendota, Fresno County, contains 200 acres.

Species Identified

An examination of affected fruits on November 4, 1947 showed that in all cases cast skins of an unfamiliar species of mite were found in the cracks that are so characteristic of the injury. It was too late in the year at the time of the first survey in November to find many live mites, but such specimens as were found were identified as a species of the genus *Brevipalpus*, later named *lewisi*, which was first discovered near Porterville in the fall of 1942. At that time they were causing injury to tender wood and fruit stems of lemons, as well as causing a darkened, scarred area on the surface of the fruit.

Brevipalpus lewisi McGregor can hardly be seen without the aid of a magnifying glass, for it is only about 0.25 mm. long. It varies in color from a carrot to a salmon red. A dark area in about the center of the mite is characteristic of the species.

Mites Appear in Summer

The mites hibernate during the winter in large colonies under loose flakes of bark on the larger branches of the pomegranate trees. In July or August, depending on the season, the mites may be seen on the fruit, at first near the stem end, then extending progressively further downward. They cause a brownish discoloration which extends further from the stem end of the fruit as the season advances and may eventually envelop the entire fruit. This is followed by a cracking of the rind and the formation of scab tissue between the cracks.

A small percentage of the fruits will have a cracked and discolored surface whether mites are present or not. An inexperienced person might mistake this type of blemish for mite injury, but the two types of blemish can be distinguished readily.

In the accompanying illustration the two upper fruits are mite-infested. The checked area radiates out from the stem end and will be found at varying distances from the stem, depending on the age of the infestation. The light brown discolored area extends beyond the checked area and grades off in severity without

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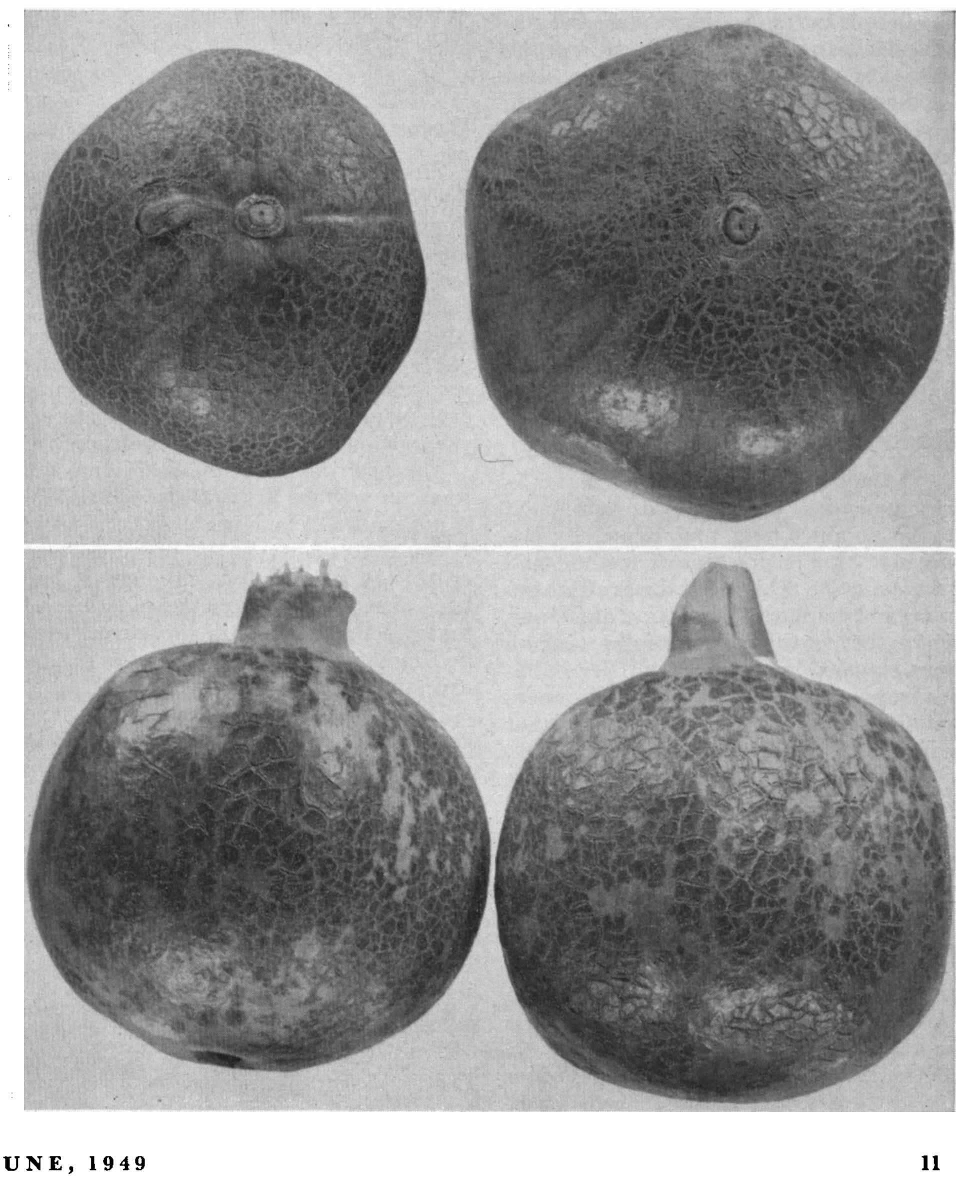

Above. Injury to pomegranates caused by the new mite *Brevipalpus lewisi*. Below. A checking and sharply delimited brownish discoloration occasionally found on pomegranates, but not caused by mites.

STORAGE

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to storage the grapefruit were washed with ½% soap solution, then treated with 1¼% of Exchange Wax No. 22.

Compared to nonsprayed fruit, those sprayed with either eight or 16 ppm 2,4-D had a reduced amount of surface decay, aging and black buttons throughout the storage. There was also a decrease in internal Alternaria decay as shown by cutting the black button fruit after storage.

After 15 weeks of storage, the fruit from trees sprayed with 16 ppm 2,4-D was rated the best with regard to firmness, color and general appearance. The eight ppm 2,4-D fruit rated next best, and the nonsprayed fruit was the poorest of the three lots.

2,4-D Treatment After Harvest

On May 17, 1948, after washing and waxing, both light green and green lemons from non-2,4-D-sprayed trees were dipped for two minutes in a lanolin emulsion containing either 500 or 1,000 ppm acid equivalent of the butyl ester of 2,4-D.

Another sample of green lemons was exposed for 69 hours to the vapor of the isopropyl ester of 2,4-D. After exposure, the treated lemons were placed in the storage chamber with the nontreated fruit.

Inspection showed that after 115 days of storage at 58° F to 60° F and 88% relative humidity, the nondipped light green lemons had 1.88% surface decay and 51.3% black buttons.

In contrast, after 162 days of storage, the light green 2,4-D-dipped lemons had only 3% with black buttons and none with Alternaria decay. At this time no surface decay had developed on the dipped fruit compared to 3.85% on the nondipped.

The green lemons dipped in either 500 or 1,000 ppm 2,4-D solutions had failed to develop a single fruit with a black button or Alternaria decay after 162 days of storage. Surface decay was 0.60% for the dipped fruit compared to 12.25% for the nondipped.

The 2,4-D vapor treatment of green lemons for 69 hours at the beginning of storage also reduced black buttons and Alternaria decay as well as surface decay compared to nontreated fruit. The reduction was much less than for the dip treatment.

Wax Preparations

In addition to the dip and vapor 2,4-D treatments, 500 ppm 2,4-D as the butyl ester was added to the Exchange Water-Wax preparations. In comparison to nontreated lemons in all color groups there was a remarkable reduction in percentage of fruit with black buttons, internal Alternaria decay and surface decay.

In a single storage test of Valencia oranges dipped in 2,4-D solutions, it was found that, as with the lemons, they developed fewer black buttons than the nontreated fruit.

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POMEGRANATES

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being sharply delimited. The lower two fruits have the blemish occasionally found on pomegranates, but not associated with the mites. The checked and dark brown discolored areas coincide and are sharply defined. There is no tendency for the blemished area to be concentrated at the stem end of the fruit.

Control

In experiments made in 1948 it was shown that all the commonly used mite treatments will control the *Brevipalpus* mite, but since sulfur dust is highly effective as well as being inexpensive, it is recommended as a control measure. Experimental and commercial control treatments made in June and July 1948 with one half pound of sulfur dust per tree, resulted in excellent control, while untreated check trees were severely infested, with a high percentage of blemished fruit.

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ALMOND

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There is a great variation in the type of hulls obtained in harvesting different varieties of almonds. Certain hulls, such as the IXL which were used in this test, are thick and meaty, while those from some other varieties are thin and papery. The nutritive value of the hulls undoubtedly varies accordingly. It is planned to do further work on almond hull feeding this fall.

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SULFUR

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yses of the lemon peel. Thus it was proved ground sulfur can enter citrus fruits as sulfur vapor or gas.

Sulfur vapor alone in a glass bottle heated to the melting point of sulfur will combine with hydrogen to produce hydrogen sulfide. Oxygen is needed for this reaction and sulfur dioxide is produced in the process.

Glass tubes having the same surface as the lemons used in the experiments were sulfur dusted and placed in a bottle which was kept at 105° F. At the end of two days time, no hydrogen sulfide nor sulfur dioxide gas had been formed. This, it is believed, shows that elemental sulfur must get into citrus fruit to make hydrogen sulfide and sulfur dioxide gases at atmospheric temperatures.

Plants need sulfur to build proteins. Sulfur, usually in the form of sulfate, is supplied to plants through the soil. The sulfate may be put on the soil as a neutral salt or as a weak solution of sulfuric acid. The roots absorb sulfate, but must be able to change the sulfate into other forms in order to build the sulfur into protein.

Enzymic Action Suggested

Another experiment was conducted to observe what would happen if citrus fruit were dipped in weak radioactive sulfuric acid and kept at about 115° F for several hours. The fruit yielded slightly radioactive sulfur dioxide and hydrogen sulfide gases, very radioactive sulfate and protein. The sap in the peel had become more acid.

It might be said in passing that the fruit resembled sulfur-burned fruit as did the fruit kept at 105° F in hydrogen sulfide or sulfur dioxide gas for a few hours.

This experiment suggests that enzymes are present in the fruit peel which can change sulfate to other forms of sulfur. But the rate of change of sulfur to sulfate is a more rapid process than the one changing sulfate back to other forms of sulfur.

Experiments are under way to determine the effect of temperature on the relative rates of changing sulfur to sulfate or vice versa.

Other experiments in which lemons are being treated with radioactive hydrogen sulfide and sulfur dioxide are being run. This and other work probably will bear out the evidence already found on how ordinary elemental sulfur is changed to sulfuric acid.

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