

Thrips on Santa Rosa Plums

tests establish surface injury to Santa Rosa and Beauty plums caused by the western flower thrips

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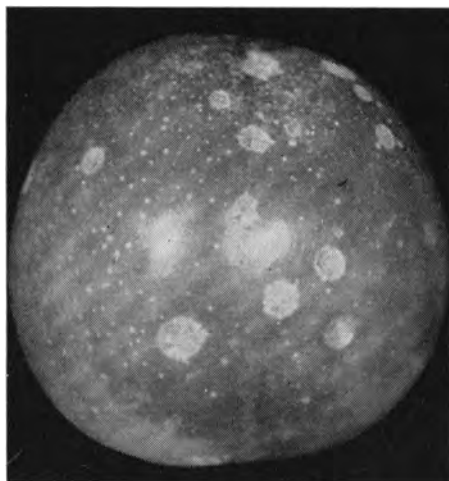
Santa Rosa plums in Kern County are subjected to noticeable damage in certain years.

Several types of injury appear on the fruit, but the type investigated in this study consists of small surface depressions that range from 1 mm.—millimeter—to 4 mm. in diameter, with an average of 2-3 mm.; they vary in depth from 1/4 to 1 1/4 mm., depending on whether they are flat-bottomed or spiraled. The bottoms of all of these holes are roughened but this scabbing effect is more apparent in the shallow holes. This injury is further typified by a halo surrounding the opening.

Injury of this type on Santa Rosa plums has appeared irregularly for several years, but investigations pointed out that it was more serious following mild winters with low rainfall. The winter of 1950-51 was mild and the plum growers suffered severe losses because of this injury; on the other hand, the winter of 1951-52 was severe with heavy rainfall and there was little injury of this type.

Because 1953 gave indications of being another comparatively mild winter, a project was set up to study the cause and possible controls for this problem.

Prior study indicated that it was not caused by mechanical means such as wind, hail or leafrub, or by a disease and therefore an insect was suspected as the causal agent. The suspected insects, because of the type of injury incurred, were thrips, lygus bugs, stink bugs, and the Pacific grass bug. The stink bugs were confined to the alfalfa and oats trap crop bordering the orchard, while the thrips were in the alfalfa and the leguminous cover crop in the orchard.



Mature Santa Rosa plum showing damage.

After a preliminary insect survey, fine mesh plastic screen sleeves were inserted over limbs of certain trees in order to define the area of injury by these pests. Thrips were confined in certain cages and stink bugs in others with the remainder being used for checks. This caging was done in February before bloom in order to insure a freedom from injury from outside sources. Because hand pollination had to be done inside the cages, a good fruit set was not obtained. Also, confining the thrips was not successful and therefore conclusive results on thrips' feeding could not be obtained. However, the stink bugs survived very well and there was no sign of feeding by these insects on the young fruits. The evidence pertaining to the stink bugs was fairly conclusive that they were not implicated in this problem. This then left only the thrips which could be caus-

ing the damage. Further tests with chemicals bore this out conclusively. The thrips involved was that species generally called the western flower thrips, known as: *Frankliniella occidentalis* (Perg.) and also as *F. moultoni* Hood.

Because thrips were the primary suspect in this problem chemical treatments with DDT were made for the control of these pests. The first application was made to a block five tree rows wide and 32 trees long with a DDT spray containing two pounds of 50% wettable powder per hundred gallons, applied at a rate of 600 gallons per acre. The first spray was made on February 18, during the popcorn stage. On March 2, two days after full bloom, and during light petal fall, a second application was made to half of the first treated block and all of another previously untreated block. A similar-sized area was left completely untreated as a check. All treatments and checks were separated in each case with three tree rows of plums of the Beauty variety.

Two days after the first spraying, the cover crop of peas was disked in and the thrips population in the trees increased noticeably. The stink bugs did not move into or develop in the orchard and the only observed insects were thrips. By March 16 thrips adults and larvae were abundant in the unsprayed trees. The first count of injured fruit was made on March 27 shortly after the fruit emerged from the jacket. These counts were based on 200 fruit samples from each treatment and check; at this time a very definite difference was noted between the amount of injury in the

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Injured Fruit at Harvest
Santa Rosa Plums

Treatment 2# 50% WP DDT/100 gal. water	Date of Count	% Clean Fruit	Per Cent Injured Fruit					Total
			Light*	Medium**	Heavy***	Scarred†	Suspicious††	
Popcorn 2/18 . . .	6/4	84.5	6.5	2.5	.5	4.5	1.5	15.5
Petal Fall 3/2 . . .	6/4	93.5	.5	0	.5	5.0	.5	6.5
Popcorn and petal fall 2/18 & 3/2.	6/4	95.5	1.0	0	0	3.5	0	4.5
Check	6/4	54.5	23.5	10.5	7.0	3.0	1.5	45.5

* 1-3 holes per fruit
** 4-5 holes per fruit
*** Over 5 holes per fruit

† Scarred and rough surface
†† Slight indentations

Marketable Fruit at Harvest
Santa Rosa Plums

Treatment: 2# 50% WP DDT/100 gal. water	Date of Count 1953	% Market- able*	% Not Market- able**
Popcorn	6-4	97	3.0
Petal fall . . .	6-4	99.5	0.5
Popcorn and Petal fall . . .	6-4	100.0	0.0
Check	6-4	82.5	17.5

* Clean, light, suspicious, scarred (some scarred may not be marketable). Based on classification in other table.

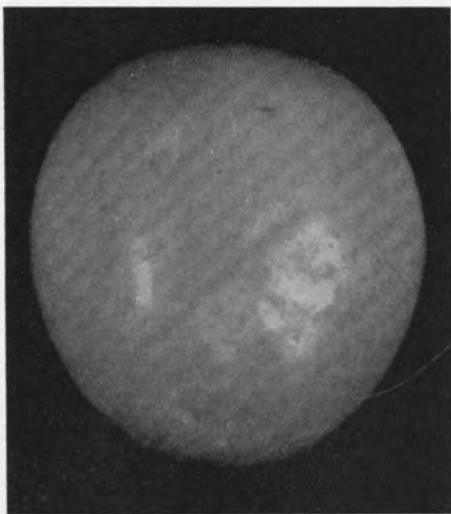
** Medium heavy damage. Based on classification in other table.

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treated and untreated areas. There was also a difference between the popcorn stage treatment, the petal fall treatment and the combination of both of these treatments. The double treatment was superior to all others and this was followed by the petal fall and then the popcorn treatment. The fruit of the untreated plot was definitely the most severely damaged.

Successive examinations resulted in a noticeable improvement in all plots,



Pansy spots on a pre-harvest Santa Rosa plum.

probably because some of the earliest fruit were the most severely injured and a natural drop occurred.

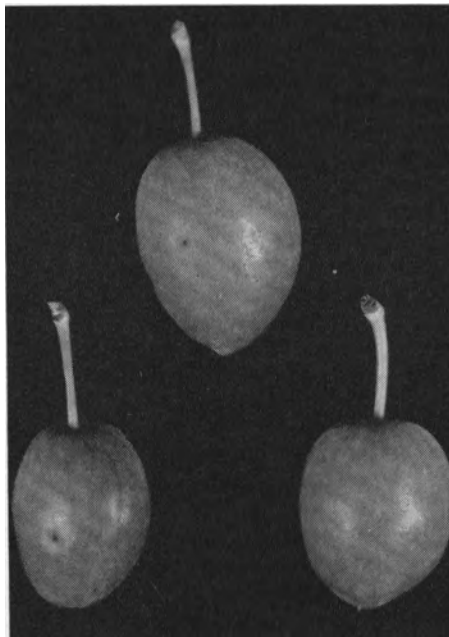
A pre-thinning count made on April 14 indicated that a dilution factor of later-developing fruit plus the loss of severely injured fruit due to natural drop improved the percentage of clean fruit in all plots. The popcorn treatment jumped from 67% clean to 76% clean; the petal fall treatment from 86% clean to 92% clean; the popcorn plus petal fall treatment from 91% clean to 93½% clean; and the check, from 42½% clean to 52% clean. Although this is a noticeable change in most cases, it is significant to note that no further damage of the type being investigated developed in any plots.

A further improvement appeared in all plots following thinning, and this again was the result of further dilution of the injury through the removal of some of the most obviously damaged fruits during the manual thinning operation. The changes at this time were about in the same degree in all plots as mentioned above. The final count made just before harvest showed a slight decrease in the number of clean fruit in all plots both treated and untreated. This was because of superficial surface scarring caused by thrips feeding on the

outer skin at a later stage of fruit development. This type of injury had not been noticeable until this time. Under ordinary circumstances surface scarring is not very prevalent and in this case would not have by itself caused a noticeable loss.

As the season progressed three distinct types of thrips injury showed up in these plots: 1, holes or depressions with a halo surrounding them, 2, thrips egg punctures or pansy-spots, and 3, fruit scarring in large or small blotches. Of the three types present, the most numerous and that causing the most concern were the holes because of their abundance on individual fruits. However, the pansy spot or the deeply scarred surface injuries were more severe.

Although total injured plums ran as high as 45% of the crop in the untreated areas at harvest time, not all of this was a loss because only the most severe categories of injury were considered unmarketable. At harvest 3% of fruit from the



Holes in the surface of injured young fruit.

popcorn treatment, 0.5% of the fruit from the petal fall treatment, and none of the fruit from the popcorn plus petal fall treatment were considered unmarketable. The check averaged 17.5% unmarketable fruit.

When the plums are very small this injury assumes various forms. Sometimes it is already a pronounced hole, other times it appears only as a slight puncture and frequently it is just a suspicious-looking area on the surface of the plum. However, by tagging individual plums showing all of these characteristics, it was possible to prove that they all develop later into the same type of injury and the difference and appearance are due only to the stage of develop-

ment of the fruit and time of insect feeding.

A survey of five other Santa Rosa orchards in the vicinity showed that total injury in all classifications ranged from 33% to 63% of the fruit sampled. The per cent of unmarketable fruit in these orchards ranged from 4% to 12%.

Plums of the Beauty variety bloom later than those of Santa Rosa and, therefore, were not subjected to the same early injury that occurred to the Santa Rosa plums. However, Beauties showed a great deal of thrips surface scarring later on in the season. This type of injury was much higher in the Beauties than in the Santa Rosas.

A fruit tree leaf roller infestation occurred during the tests and the DDT sprays applied against the thrips also helped to control this pest. A count of the rolled leaves on one primary scaffold limb, roughly ¼ of the tree volume, on 16 trees in each plot showed 244 feeding areas in the popcorn spray block; 29 in the petal fall spray block; and only nine feeding areas in the popcorn plus petal fall spray block. On the other hand, the untreated trees had 459 feeding areas. The remainder of the orchard was treated with three pounds of 50% wettable DDT powder per 100 gallons of water by the grower on March 25 with excellent control resulting.

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Joe Lytle, Elmer Stark, and B. Hartley cooperated in the studies reported above.

Egg punctures, or pansy spots, on young plums.

