Navel orangeworm control through early harvest

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Timing walnut harvest so that nuts are removed as soon as kernels are mature is an important concept both in terms of kernel quality and in the prevention of insect damage, particularly that from navel orangeworm.

For 2 years in a row experiments were conducted to show the effects of harvest timing on kernel quality and navel orangeworm damage. The correlation between kernel quality and harvest timing was presented in detail in the July 1974 issue of *California Agriculture*. The relationship between navel orangeworm damage and harvest timing is discussed here.

Navel orangeworm larvae cannot gain access to a nut through an intact hull. The larvae enter nuts damaged by walnut blight, sunburn, codling moth, or they can enter through cracks in the hull after hull dehiscence begins. Thus it is important that walnuts be harvested soon after dehiscence begins to help avoid navel orangeworm damage.

Practical harvest can begin when about 80 percent of the nuts can be removed from the trees and when hulls dehisce readily. A second harvest 7 to 10 days later is used to remove the remaining 20 percent of the crop. Due to practice or circumstances some growers delay harvest to remove all the nuts with one shake. These delays in harvest allow ample time for navel orangeworm larvae to enter the nut causing high offgrades as well as penalties in nut value.

A recent alternative to such harvest practices is to use a growth regulator to advance walnut harvest. Ethephon, which is now registered for use, is being used by some growers for this purpose. Application of this material when the kernels become mature (when the packing tissue becomes brown) will advance normal harvest about 7 to 10 days. In most cases it has brought about 100% nut removal with one harvest shake. Thus this material promotes hull splitting and facilitates a more rapid harvest before navel orangeworm can gain access to the nuts.

In 1974 three mature orchards, one of Ashley and two of Payne, representing the northern Sacramento Valley and the southern and central San Joaquin Valley, were selected for the experiment. Fifteen single tree replicates of the following treatments were used:

1) Early harvest with the aid of Ethephon applied at the rate of 500 ppm when the packing tissue became brown. Harvest (100%) commencing 7 to 10 days later.

2) Normal 2 shake harvest — approximately 80% removal first shake, 20% second shake.

3) Delayed 100% harvest.

Samples consisting of 500 grams of dried walnuts were taken from each replicate and evaluated by U.C. Cooperative Extension specialists for navel orangeworm damage. Treatment, harvest date, percent removal with one shake, and the percent navel orangeworm damage, are shown in table 1. With the exception of the central San Joaquin Valley, the Ethephon treatment provided for a complete harvest about 12 days earlier than the beginning of harvest and 3 to 4 weeks earlier than the delayed harvest.

Navel orangeworm damage increased in all districts as harvest was delayed. Significant increases occurred in both the northern Sacramento Valley and southern San Joaquin Valley. In the northern Sacramento Valley, navel orangeworm damage was reduced by 4.2% and in the southern San Joaquin Valley by 11.2% when early harvest was compared to delayed harvest treatment. Due to the percent navel orangeworm damage found in the samples, delayed harvest in the northern Sacramento Valley resulted in class 2 walnuts, which receive a 3-cent per pound (or $60 per ton) penalty. In the southern San Joaquin Valley delayed harvest resulted in class 4 walnuts which receive a 5-cent per pound (or $100 per ton) penalty. In the central San Joaquin Valley navel orangeworm damage was light; the early harvest had no worm damage, but late harvest had 0.3% navel orangeworm damage.

Delaying harvest in order to get a complete harvest with one shake is clearly a poor practice both in terms of potential navel orangeworm damage and nut value. The use of a growth regulator such as Ethephon is one method of advancing a complete harvest to minimize navel orangeworm damage.

However, growth regulators such as Ethephon are not for everyone. A prompt harvest must commence as soon as feasible to avoid loss in kernel quality. Therefore, growers who rely on others to do their harvesting for them may find use of this material a disadvantage. Furthermore, damage to walnut trees has been observed when growth regulators have been applied to trees under stress.

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TABLE 1. HARVEST TIMING AND NAVEL ORANGEWORM DAMAGE

Northern Sacramento Valley
Ashley Walnuts

Treatment	Harvest date	Percent Removal	Percent N.O.W. damage[1/, 2/]
Ethephon harvest	9/10	100	1.6a
Normal harvest[3/]	9/24 10/10	80 10	3.5b
Delayed harvest	10/10	100	5.8c

Southern San Joaquin Valley
Payne Walnuts

Treatment	Harvest date	Percent removal	Percent N.O.W. damage[1/, 2/]
Ethephon harvest	9/20	100	0.6a
Normal harvest[3/]	9/10	100	2.5b
Delayed harvest	9/20	100	11.7c

Central San Joaquin Valley
Payne Walnuts

Treatment	Harvest date	Percent removal	Percent N.O.W. damage[1/, 2/]
Ethephon Treatment	9/3	80	0.0a
Normal harvest[3/]	9/17 9/26	80 20	0.0a
Delayed harvest	9/20	100	0.3a

[1/] Values not followed by a common letter are significantly different at 0.01 level according to Duncan's multiple range test

[2/] Determined from 500 gram samples by U.C. Cooperative Extension.

[3/] Weighted average for the two picks.