Egg traps monitor navel orangeworm

Richard E. Rice ▪ Lee L. Sadler

Increasing losses to the navel orangeworm, *Paramyelois transitella* (Walker), have led to a multi-disciplinary research program to find better methods of controlling this primary pest of almonds in California. One result of this research was the development of a new method for monitoring navel orangeworm (NOW) moth activity. The device used—an "egg trap"—enables growers, field men, and researchers to monitor female moth flights and egg-laying (oviposition) activity directly, rather than monitoring the flight of male moths, as when using sex pheromone traps.

The egg trap (fig. 1) consists of a 25-dram plastic vial with two large windows cut into the sides. The windows are covered with 160-mesh nylon organdy screening to permit air movement through the trap and to prevent entry of foreign material. Traps are baited with about 15 grams of a wheat bran, honey, glycerine, and water mixture, and are placed in the trees 6 to 7 feet above the ground in fully shaded locations. Volatile odors given off by the bait attract female NOW to the traps, where they lay eggs on the trap surface.

The eggs (fig. 2) are irregularly oval, flattened, and about 1 millimeter long. New eggs are creamy white, and they gradually darken in one to three days to a reddish-orange color. Preferred oviposition sites on the trap are around the rim of the cap, on roughened areas around the windows, along the edges of the organdy screening, and on the bottom of the trap. Eggs are not usually found on completely smooth plastic surfaces, nor on the smooth organdy mesh over the windows.

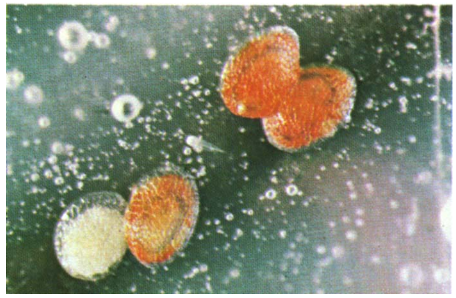

Fig. 2. Navel orangeworm eggs on trap surface.

Egg traps are normally placed in orchards before the expected first moth flight in the spring, usually by late March or early April. At least once but preferably twice weekly, the accumulated eggs should be counted and removed. Egg-laying trends can then be graphed as illustrated in figures 3 and 4.

The bait should be kept slightly moist and, with proper maintenance, should remain effective for at least one week before replacement is required. During hotter weather (over 90° F), small amounts of water may have to be added to moisten the bait at three- to four-day intervals to maintain trap efficiency. Bait that becomes soggy from rainfall or sprinklers must be replaced, because it will ferment, becoming moldy and nonattractive.

The number of egg traps required to accurately monitor NOW oviposition trends and egg hatching varies with the acreage. However, at least three traps should be used, regardless of the size of orchard. Rough guidelines for minimum trap densities in almond orchards are suggested as follows: up to 20 acres, one trap per 5 acres; 20 to 80 acres, one trap per 10 acres; over 80 acres, one trap per 20 acres. Additional traps are advised if orchards have uneven topography resulting in "cold" and "warm" areas which lead to varying rates of NOW egg development, or if orchards are adjacent to other sources of infestation.

Oviposition trends on egg traps placed in Nonpareil almonds near Caruthers, Fresno County, were compared with egg laying observed on the natural host mummy nuts (fig. 3). Egg-laying trends on traps and nuts were almost identical up to July 11, indicating that the traps accurately monitor oviposition activity. Collections of mummy nuts were terminated in midsummer due to the difficulty in finding enough nuts for an adequate sample.

The comparison points out advantages of the egg trap as a monitoring tool. The traps are a standard size and shape and contain a relatively uniform attractant, whereas mummy nuts may vary considerably in their attractancy. Egg traps also are easily obtained and replicated, thus ensuring the same number of sampling units throughout the sampling period.

Figure 4 shows seasonal NOW oviposition trends on egg traps at Caruthers. Egg laying during 1974 started in late March, but in 1975 was delayed until late April due to cool, wet weather that spring. Egg laying by the overwintered NOW population peaked during May and then declined to very low levels by mid-June in both years. A second egg-laying

Fig. 1. Standard 25-dram navel orangeworm egg trap placed in almond tree. Note space above bait, which allows air movement through windows.

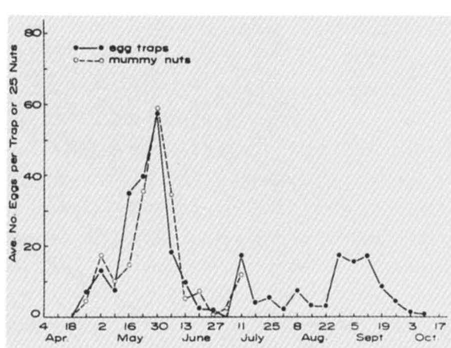

Fig. 3. Comparison of oviposition by navel orangeworm female moths on egg traps and mummy almonds. Caruthers, California, 1975.

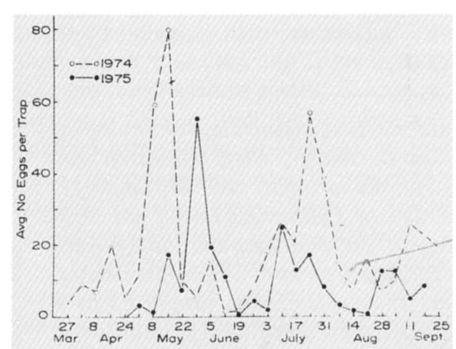

Fig. 4. Seasonal oviposition trends on egg traps by navel orangeworm in almonds. Hull split started on about July 15 in both years.

period started in mid- to late-June and increased up to the beginning of hull split on the new-crop almonds in about mid-July.

At this point the egg traps became less effective as a monitoring device, apparently because splitting almond hulls produced attractive odors, so that the nuts competed with egg traps as oviposition sites. The traps showed continued egg laying by female NOW after drying of hulls and harvest in August and September. At this time of year, eggs are laid on residual or mummy nuts in the trees to produce the overwintering (third) generation of navel orangeworm that will emerge the following spring.

Oviposition by moths from the overwintered generation extended through a considerable period—from March 20 to June 5, 1974, and from April 24 to June 12, 1975. Because of this normal spring activity, timing chemical sprays to control navel orangeworm is difficult. Research efforts are currently being directed toward timing chemical applications to the beginning of significant egg hatch, as indicated by the traps, rather than to the peak of egg laying, which may occur after many eggs have already hatched. Age of eggs and egg hatch under orchard conditions are readily determined by removing the bait and then isolating within the orchard several traps with newly laid eggs.

Some specific uses of the trap to date include the timing of insecticidal sprays based on observed egg laying and egg hatch, evaluation of orchard sanitation programs for NOW control, and improved methods for studying the biology of navel orangeworm under field conditions. Experience with these traps in almonds during the 1974-76 seasons indicates that they can be used to time chemical applications accurately. It should also be possible to use them as a monitoring device for navel orangeworm in other host crops, such as walnuts and pistachios.

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Electronic color sorting of cantaloupes for ripeness

Robert F. Kasmire

Electronic sorting of cantaloupes into maturity grades in commercial packing sheds appears possible by use of reflected light measured from fruit of different maturities (colors). In recent studies at the University of California, Davis, both dry and wet melons were tested. Measurements were made on 10 melons in each of four maturity grades—Partly Slipped, Hard Ripe, Eastern Choice, and Western Choice. Measurements were made with a Beckman Ratio Recording Spectrophotometer with a reflectance unit attached.

With dry melons, percent reflectance varied consistently between the melon classes in the green, yellow, orange, and red ranges of the spectrum; on wet melons, reflectance varied consistently only in the yellow, orange, and red ranges (fig. 1 and 2). In both groups, however, the reflectance increases were highest in the violet to yellow ranges and tapered off in the orange and red portion.

In spite of these differences, the data indicate that readings between fruit colors are sufficiently consistent and large enough, with wet as well as dry melons, that standard selection ranges could be established for automatic sorting equipment.

Commercial cantaloupe maturities used in this test were:

- Partly Slipped: full size; netting grayish green, background color dark green; abscission crack one-half to three-fourths developed.
- Hard Ripe: same as for partly slipped melons, but abscission crack completely developed.
- Eastern Choice: full size; netting light creamy color, background color light green to greenish yellow; abscission crack completely developed.
- Western Choice: full size; netting and background area creamy colored; abscission crack completely developed.

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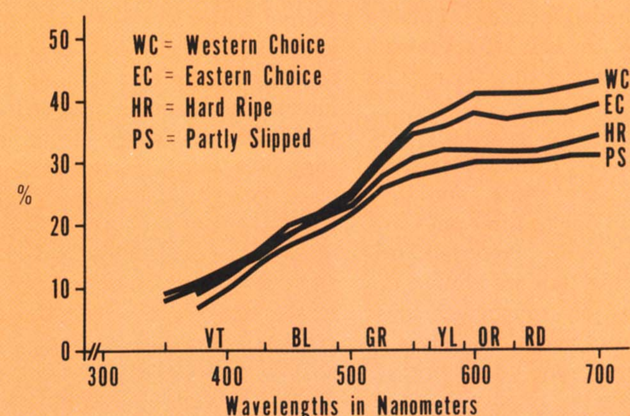

Fig. 1. Percent light reflectance from dry cantaloupes of various commercial maturities.

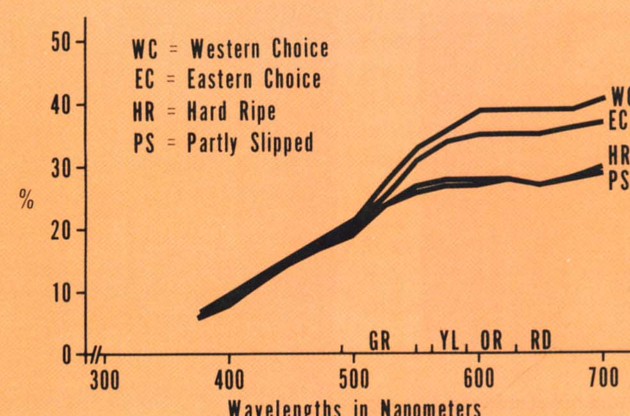

Fig. 2. Percent light reflectance from wet cantaloupes of various commercial maturities.