NAVEL ORANGEWORM (NOW)

Amyelois transitella

Description:

Adults:

Adults range from 0.5-1 in (1.5-2.5 cm) in size and have irregular, silver gray and black patterns on the forewings and a small, snout like projection at the front of the head. Females begin laying on mummy nuts or new crop nuts two nights after emergence. Do not confuse NOW adults with the meal moth *(Pyralis farinalis)* adults that are light brown with dark brown bands on the wings.

Eggs:

Opaque white when first laid. After about a day they turn pink, then reddish orange.

Larvae:

Newly hatched larvae are reddish orange, varying from milky white to pink upon maturing, with a pair of crescent-shaped marks on the second segment behind the head. These marks are absent on codling moth larvae. Several larvae may infest one nut.

Pupae:

Light to dark brown, encased in a woven cocoon, and found inside nuts or between hulls and shells.

Top: NOW adult (source: entomologytoday.org). Bottom left: NOW larva with crescent-shaped mark on segment behind head and bottom right: CM larva without mark behind head (UC ANR).

Hosts:

Almond, pistachio, walnut, fig, and pomegranate.

Damage:

Almonds and Pistachios:

- Larvae do not damage nuts until hulls begin to split.
- First instar larvae bore into the nutmeat, and later instars can consume most of the nut, producing large quantities of webbing and frass which can lead to fungal infections.
- More than one larva can be found feeding in a nut.
- Some later-maturing softshell almond varieties are more susceptible to damage.
- Pistachio nuts are susceptible to infestation as soon as hull split occurs.

Left: NOW larvae infesting almond (source: UC IPM). Right: NOW larva inside pistachio (USDA ARS).

Walnuts:

- Females of the overwintering generation lay eggs singly on mummy nuts, codling moth infested nuts, or blighted nuts where the first generation and most of the second is completed.
- Larvae do not damage nuts until husks begin to split.
- NOW damage can be identified by the presence of large amounts of frass and webbings; in contrast CM damaged area inside looks a lot cleaner and only a single larva is present.
- Nuts infested solely by NOW show no external symptoms. Heavily infested nuts have an oily appreance.

Walnut damaged by (left) NOW and (right) codling moth (source UC IPM).

Phenology:

- Overwinters as larva in mummy nuts on trees or ground.
- Emerges in late March to early April.
- Three to four generations per year depending on emergence date and temperatures throughout the growing season.

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NAVEL ORANGEWORM (NOW), *Amyelois transitella*

Lure Type and Maintenance:

Lure Type	*Atractant Type*	*Replacement*
PHEROCON® IV NOW Egg Trap Bait	Female ovipositional attractant	2 weeks
PHEROCON® NOW L²-H	Male only attractant	6-8 Weeks
PHEROCON® NOW L²-L	Male only attractant	4-6 Weeks
PHEROCON NOW PPO-HR L²	Multigender attractant – male and female capture	12 weeks

Lure Storage:

- Store in unopened factory sealed packages in a cool place (< 74° F or 24° C maximum) for short periods or refrigerate longer term.
- Refrigerate or freeze unopened packages to carry over for annual storage.

Trap Design:

PHEROCON® NOW Bait:

- PHEROCON® IV NOW Egg Trap.

PHEROCON® NOW L²-H, NOW L²-L, and PPO-HR L²:

- PHEROCON® VI DELTA, VI DELTA Modified, 1C, or 1CD QUICK-CHANGE™.

Placement Time:

- Place traps in the orchard by March 15.

Placement Pattern:

- Within the orchard in a grid pattern; 5-7 ft (1.5-2.1 m) high on north side of tree.
- Traps with different lure types should be placed in separate neighboring trees.

Trap Density:

PHEROCON IV NOW Egg Trap and Bait:

- Use 1 trap per 10 acres, or a minimum of 4 traps per orchard and maximum of 10.

PHEROCON® NOW L²-H, NOW L²-L, and PPO-HR L²:

- For orchards less than 40 acres (16 hectares): use 1 trap per 10 acres, or a minimum of 4 traps per orchard.
- For orchards greater than 40-160 acres: use 1 trap per 40 acres, and a maximum of 8-10 traps per orchard.
- Place 4 traps on the interior of the block.
- Place 4-6 traps on the edges of the block, in the border row on second row from edge.

Trap Maintenance:

PHEROCON IV NOW Egg Trap and Bait:

- Check traps twice per week until biofix (first of two dates where egg laying increases in 75% of the traps) is established.

PHEROCON® NOW L²-H, NOW L²-L, and PPO-HR L²:

- Check daily until biofix, then weekly thereafter.
- Remove insects and stir glue when checking.
- Replace trap liners every 4 weeks or when fouled with dust or insect debris.

Recommendations:

PHEROCON IV NOW Egg Trap and Bait:

- Use egg traps to track oviposition and egg development, set biofix, and assess timing for treatment decisions.
- Egg traps are most effective during the first flight in April and May.
- Fertile new eggs are creamy white, then darken in 3-4 days to pink, then to red orange.
- Determine when eggs will hatch in relation to hull split so treatment can be precisely timed.
- Watch for hatch, about 10 days. Spray at hatch.

PHEROCON® NOW L²-H, NOW L²-L, and PPO-HR L²:

- Use pheromone traps (NOW L2-L or L2-H) to monitor the flights of male moths, set biofix, and monitor trap shutdown in mating disrupted orchards.
- Use NOW PPO-HR L2 to track phenology of male and female moths in mating disrupted orchards.
- Combine PHEROCON® NOW PPO-HR L2 and PHEROCON® NOW L2-L lures in a single trap for optimal capture.
- Use the UCCE navel orangeworm pest model to calculate degree-days for NOW in almond and *degree-days for NOW in pistachio* for your location to time treatment decisions.

Best Practices:

- Excellent fall and winter sanitation practices include removal and destruction of mummy nuts from trees and orchard floor.
- Early harvest of nuts before third generation eggs are laid reduces the risk of NOW infestation in early-harvested varieties.
- Use mating disruption as a supplemental management tool in conjunction with monitoring systems and strategically applied insecticides.
- For the highest confidence of damage risk, it is recommended that the use of the PHEROCON® NOW L2-L or -H lure, PHEROCON® NOW PPO-HR L2 lure, the PHEROCON® IV Egg Trap, and PHEROCON® PREDATOR Trap be used in combination and incorporated into your IPM strategies.

Source: Recommendations and certain other sections were sourced from UC IPM Navel Orangeworm Pest Management Guidelines for Almond, Guidelines for Pistachio, and Guidelines for Walnut.

Note, always:

- Count and record captures as recommended.
- Change trap as needed.
- Discard lures in trash far from the area of use and remove trash afterwards.
- Follow recommendations.
- Contact local extension authorities and consultants for regional advice.

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