

Taking Nut Samples at Harvest for Insect Damage Assessment

It's harvest time! Since we will begin harvesting almonds and walnuts soon, I'd like to remind you about how to take harvest samples and assess the damage inflicted by individual insect pests. Harvest sampling provides the actual damage on the current crop at harvest, which is higher than the reported damage by your processor because of losing some damaged nuts during the handling process (sweeping to processing). More importantly, the damage assessment will guide next year's pest management plan. Insect populations in orchards build over time; therefore, knowing the history of damage helps to manage the potential risks for next year's crop.

Harvest sampling in almonds.

Taking a minimum of 500 sample nuts anytime between shaking and sweeping is recommended. Infestation can vary across different sides of the tree, between edges and interior portions of the orchard, etc. We suggest collecting representative samples by taking these factors into account. Take paper bags and collect samples from different places (4-8 points) within the orchard. Keep the bags in the freezer until you have time to evaluate them. Crack open the nuts and look for damage signs associated with particular insect species described in the following paragraphs. Major insects for damage evaluation are navel orangeworm (NOW), peach twig borer (PTB), oriental fruit moth (OFM), ants, and leaffooted bugs (LFB).

Worm damage (NOW, PTB, OFM). Indications of NOW damage include deep feeding tunnels in the kernel (nutmeat) and presence of a significant amount of white frass and webbings (Fig. 1a). (All figures appear on page 8.) Since NOW and PTB often infest the same nut, NOW feeding damage often masks the PTB damage. Feeding damage by PTB and OFM on kernels looks similar (i.e. the presence of shallow tunnels and surface grooves on the kernels, no webbings) (Figs. 1b and 1c). In contrast to PTB, OFM larvae are present in multiple numbers and often leave small amounts of reddish frass on the hulls.

Ant damage. The extent of ant damage during harvest depends on how long the nuts were on the ground after shaking. The longer the duration, the more damage we can expect from ants. Furthermore, higher damage is expected in orchards with drip or sprinkler irrigation compared to flood irrigation. Cover crops in orchards often result in elevated ant problems compared to clean orchards. Nuts with tight seal shells or with narrower hull splits (<0.03 inch wide) have less ant damage; although, tightness of shells varies with variety, year, and other cultural practices. Ants can completely hollow out the nutmeats and leave a thin outer skin (i.e. pellicle). Other signs of ant damage are peeling skin, absence of webbings, and frass (Fig. 2a).

Leaffooted bug damage. Although leaffooted bug feeding causes aborted and shriveled nuts, leading to nut drop in May-June, their feeding after shell hardening can leave black stains on kernels (Fig. 2b). Varieties with soft shells such as Fritz, Sonora, Aldrich, Livingston, Monterey, and Peerless are more susceptible to bug damage for a longer period during the season.

Harvest sampling in walnuts.

Take a minimum of 1000 nuts after the harvest, crack them, and record the damage caused by NOW, codling moth (CM), ants, husk fly and sunburn. The damage signs associated with individual insect pests and sunburn are described in the following paragraphs.

Worm damage (NOW, CM). Damage from NOW can be identified by the presence of large amounts of white frass and webbings, giving the kernel a "messy appearance" (Fig. 3a). Larvae, present in a group, deeply bore into the kernel. Heavy infestation may give the nutshell an oily appearance. Damage from CM is indicated by a lot cleaner kernel. Frass is evident, but only at the entry point on the husk; very little webbing is present (Fig. 3b). A single larva infests the nut.

Ant damage. Similar to almond, nut damage by ants increases the longer the nuts stay on the ground. Ants enter into the nut from the soft tissues (i.e. stem end) and/or through a codling moth injury. Ant damage on nuts is identified by the presence of deep chewing channels with clean kernels (i.e. no frass, no webbings, no boring) (Fig. 4a).

Husk fly damage. Walnut husk fly larvae (technically maggots) feed in groups by boring into the husk. Early season damage results in shriveled and darkened kernels, with the increased potential for mold growth. Late season infestation causes little kernel damage (Fig. 4b); although, it may stain the shell, which makes the husk removal process difficult.

Sunburn damage. Sunburn damage on nuts can be confused with husk fly damage. In cases of sunburn, nutmeat is shriveled and darkened on one side of the nut. There is no evidence of frass, webbings, or larval presence (Fig. 4c). Husks can be removed from the shell during processing, which is not the case for nuts damaged by husk fly.

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Fig 1. Almond kernels (nutmeat) damaged by: a) navel orangeworm, b) peach twig borer, c) Oriental fruit moth



Fig. 2. Almond kernels damaged by: a) ants, b) leaffooted bugs

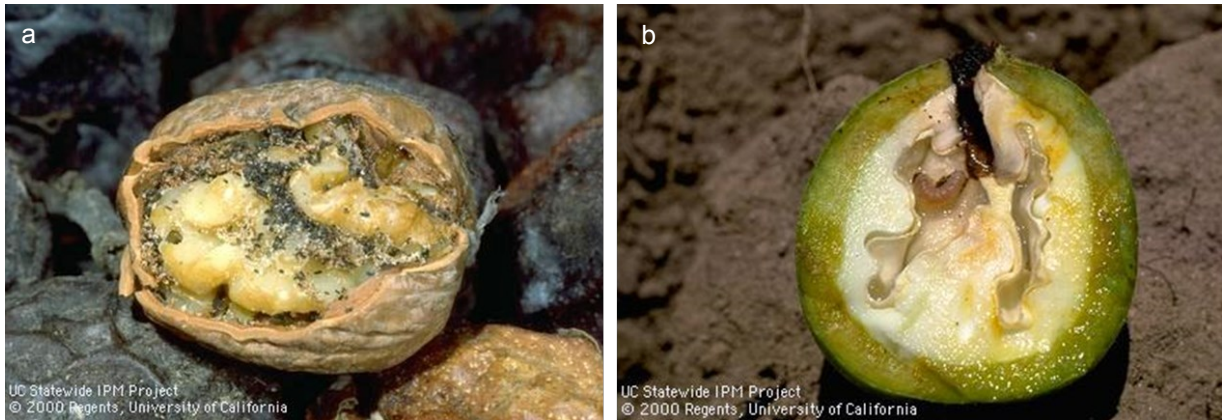


Fig. 3. Walnut damaged by: a) navel orangeworm, b) codling moth



Fig. 4. Walnut damaged by: a) ants; b) walnut husk fly; c) sunburn