

## Walnut Husk Fly: An Emerging Pest in the Southern San Joaquin Valley

*Elizabeth J. Fichtner, Farm Advisor, Tulare Co.*

*Walter Bentley, IPM Advisor, Kearney Agricultural Center*

Historically, walnut husk fly (*Rhagoletis completa*) has been a more prominent pest of commercial walnuts grown on the coast and in the Sacramento Valley than in the central and southern San Joaquin Valley. Over the past few years, however, there have been several reports of walnut husk fly in the southern San Joaquin Valley. Understanding of the lifecycle of the pest, in combination with a monitoring program allows growers and PCA's to effectively time chemical applications for husk fly management. Proper timing of treatments is critical to mitigate damage caused by this mid- to late-season pest. By the time substantial maggot infestation is observed in developing husks, it is generally too late to implement an effective spray program.

**Life Cycle.** The walnut husk fly has only one generation per year. Pupae overwinter in the soil and emerge as adults from June until early September, with peak emergence occurring between mid-July and mid-August. In Tulare County orchards, husk fly tends to emerge around the last week of June through around the third week in July. In a late year, such as 2011, adult emergence may not occur until mid-late July (Jim Stewart, personal communication). Adults are about the size of a house fly and have a yellow spot on their back, just below the region of wing attachment. Another diagnostic feature of the adult walnut husk fly is the dark triangular band at the tip of each wing. Approximately 8 days after emergence, the adults mate. Several days after mating, the female deposits clusters of eggs below the surface of the walnut husk. The duration of time between mating and egg-laying is not temperature or degree-day dependent, but rather dependent on food availability. Because the rate of egg development depends on food supply, the timing of egg deposition may vary between orchards within the same geographic region. Within 5 days of being laid, the eggs hatch. After feeding in the husk for three to five weeks, the maggots drop to the ground and burrow beneath the soil surface to pupate. Most pupae will emerge as adults the following summer, but some may survive in the soil as pupae for two years or more.

**Damage.** Maggots feed on the inside of the walnut husk, turning it soft and black. As the fleshy portion of the husk degrades, the nutshell is stained, rendering it unsuitable for in-shell sale. Early season infestations may cause darkening or shriveling of the kernel. Some early maturing cultivars such as "Payne" and "Serr" are susceptible, but others including "Ashley" and "Chico" may escape much damage. Many mid- and late-season cultivars including "Eureka", "Hartley", "Franquette", "Mayette", "Tulare", and "Vina" are susceptible. "Chandler" appears tolerant but not immune to walnut husk fly and may have some late-season damage.

**Monitoring Husk Fly Adult Populations.** Because the need for chemical management of husk fly varies between orchards and seasons, a monitoring program aimed at identifying the timing of adult emergence and female egg laying will help determine both the need and the time to spray. Yellow sticky rectangle traps "supercharged" with ammonium carbonate are commonly recommended for detecting walnut husk fly even at low insect populations. Generally, traps should be placed in the orchard between June 15 and July 1 in the Central Valley; however, in a late year (such as 2011), traps may be placed in the field around July 1 (Jim Stewart, personal communication).

- For small orchards (< 30 acres), hang at least three traps.
- For orchards between 30 and 100 acres, hang 1 trap per 10 acres.
- For orchards over 100 acres, hang 1 trap per 20 acres.

Traps should be placed high in the tree canopy in potential hot-spots of husk fly infestation including areas of the orchard with historic husk fly pressure, trees near black walnut (a preferred host of husk fly), or in damp areas. Traps should be checked two to three times a week, and fly populations counted and recorded before cleaning traps for replacement. The ammonium carbonate should be changed approximately every three weeks. If trap counts drop off in mid-summer and the drop-off is not related to very hot weather or spray applications, change the trap and supercharger.

**Determining Timing of Egg Laying.** To maximize efficacy of chemical spray applications, application must be applied in advance of female egg-laying. To monitor egg production, one must be able to differentiate between male and female husk flies on the sticky traps. The front legs of the females are yellow, whereas those of the male are black. Press on the abdomen of females with a pointed object (i.e. pencil point) and look for emergence of pearly white eggs (Fig 1). To prevent egg-laying, sprays must be applied within 1 week after eggs are first observed (unless using GF-120 bait, which is applied upon first detection of adult flies). Identifying females with eggs is tedious, but, if done correctly, will result in determining the most appropriate spray timing. If this is not possible, then time sprays to the period when walnut husk fly populations first begin to rise suddenly in traps.

**Management.** Though native parasites and predators of walnut husk fly do occur, they are not effective for control of the pest. Several organophosphate insecticides (i.e. Lorsban®, Malathion®, Imidan®) used in combination with NuLure® bait have offered walnut husk fly control at a reasonable cost; however, the long term availability of these products is uncertain. Pyrethroid insecticides (ie. Asana®, Pounce®) may offer an alternative to organophosphates; however, research suggests that they are not as effective as organophosphates for husk fly control, and their use may promote flare-ups of secondary pests, such as mites. Provado® and Assail®, both neonicotinoids (IRAC Group 4A) in combination with NuLure® bait and Dyne-Amic® surfactant has been shown to effectively reduce hull damage caused by walnut husk fly. Because insecticides are utilized in conjunction with a bait, coverage is not critical and alternate row applications, aerial application, and applications with hand-held spray equipment are all effective. A short-residual insecticide (i.e. Provado®) and bait will kill walnut husk fly for around 10 days. When adding the period needed for egg development to this time, each spray application offers around 3 weeks of protection. Consequently, multiple applications may be required in a season as determined by trap catches, presence of egg-laying females, and persistence of insecticide residues.

Recent studies demonstrate the efficacy of several reduced risk products for management of walnut husk fly, including GF-120®, Entrust®, or Success® (all spinosad products; IRAC Group 5). The GF-120® formulation already contains a bait, but Entrust® and Success® both require incorporation of a bait (such as NuLure®). Both Entrust® and GF-120® are labeled for organic use. If using Entrust® for organic production, it is important to utilize an organically-acceptable bait material. Applications of GF-120® should commence at the onset of adult walnut husk fly emergence (detection of egg-laying is not necessary with this compound), then continue at 7 to 14 day intervals until populations begin to decline in traps. GF-120 is recommended only for low populations of walnut husk fly.

For more information on management of walnut husk fly, visit UC IPM Online ([www.ipm.ucdavis.edu](http://www.ipm.ucdavis.edu)). You may also access the Walnut Research Reports through the UC Davis Fruit and Nut Information Center website (<http://walnutresearch.ucdavis.edu>) for detailed information on insecticide efficacy trials. Always read the label of the product being used, and note that all registered pesticides are not necessarily listed on the UC IPM Online website (<http://www.ipm.ucdavis.edu>) or in this newsletter. Always check with certifier to determine which products are organically acceptable.

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Fig 1. White eggs will emerge from the adult female walnut husk fly after pressing on the abdomen with a blunt tool.