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Managing Melonworm in Pumpkins and Squash in the Mid-South

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Melonworm, *Diaphania hyalinata*, is a tropical moth species that occurs throughout Central and South America, as well as sub-tropical regions of the Southern United States. Melonworm is also referred to as rindworm or pickleworm, although the pickleworm is a related species of cucurbit-feeding caterpillar, *Diaphania nitidalis*, with a distinctly different biology and morphology that is not commonly found in most of the Mid-South. Melonworm larvae feed on the foliage and fruit of plants in the family Cucurbitaceae, including specialty crops such as squash, pumpkins and watermelon. Melonworm migrate to central and northern regions of the United States each year during the summer months and are commonly found in the Southeast. Melonworm can disperse as far north as the Great Lakes or northern regions of the Atlantic coast. In Arkansas, melonworm typically have the largest impact on fall cucurbit crops such as pumpkins and winter squash. This species does not overwinter in Arkansas and moves into the state from sub-tropical regions of the US during the summer, typically arriving in Arkansas in early fall.

Image 1. Melonworm adult moth perched on a ripe pumpkin. Photo by Ryan Keiffer.

Melonworm Biology

Adult melonworm moths lay eggs primarily at night, on the underside of new growth, stems, and even on flowers of cucurbit plants. Melonworm moths are often seen on plants during the day **(Image 1)** and will readily fly short distances when leaf canopies are disturbed. Larvae take around 14 days to develop, from egg to pupation, and the pupal stage lasts from 9-10 days, resulting in a generation time of

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25-30 days **(Images 2 and 3)** (Panthi et al. 2016). Immature melonworm are green caterpillars with two longitudinal, white stripes down their back and 4 sets of prolegs **(Image 4).** Larvae can quickly defoliate leaves of cucurbit plants when at high density and leave a "skeletonized" appearance with only the leaf veins remaining **(Image 5)** (Smith 1911). You can often find larvae encased in webbing, hiding under rolled or turned pumpkin leaves **(Image 6).** Melonworm larvae can quickly begin to feed on the rind of pumpkin fruit and burrow under the stem/handle which can cause the stem to pull off when picked up **(Image 7).** Feeding on the rind results in the fruit ultimately becoming unmarketable **(Image 8).** Many other species of caterpillars may be observed feeding on cucurbit leaves or fruit and could be confused with melonworm, including beet armyworm (*Spodoptera exigua*), cabbage looper (*Trichoplusia ni*), corn earworm (*Helicoverpa zea*) and garden webworm (*Achyra rantalis*).

Image 2. Melonworm larvae present on the underside of a pumpkin leaf. These larvae can be identified by their green color and the two white stripes on their back. Photo by Aaron Cato.

Image 3. Melonworm pupae inside a pumpkin leaf previously folded together with silk. Photo by Aaron Cato.

Image 4. Melonworm larvae pictured on a pumpkin leaf with four sets of prolegs present on their abdomen, which is a way to distinguish them from other caterpillars such as cabbage looper which are common on pumpkin. Photo by Aaron Cato.

Image 5. Defoliation of pumpkin plants by high densities of melonworm larvae, usually characterized by "skeletonized" leaves that only have veins remaining. Photo by Aaron Cato.

Image 6. Melonworm larvae encased within a silken structure on the underside of a pumpkin leaf. Photo by Aaron Cato.

Image 7. Melonworm larvae feeding just under the handle/stems of pumpkins, with other common signs of melonworm presence including silk and excrement (frass). Photos by Aaron Cato.

Melonworm Dispersal

Image 8. Unripe pumpkin fruit with several melonworm larvae feeding on the rind. Photo by Ryan Keiffer.

Melonworm doesn't overwinter in the Mid-South, and the timing of their arrival each year depends on the climatic conditions throughout the Spring and Summer months. From 2020-2025, melonworm was observed in Arkansas on cucurbit crops as early as early August in 2021 and as late as mid-October in 2023. When and where melonworm is first observed is a key aspect of predicting their impact each year. Infestations with the potential for widespread crop loss can occur when the pest is first found in northern Arkansas during August or early September. In our observations, arrival of the pest in northern Arkansas earlier than August generally results in increased negative impact to crop production, as successive generations result in exponential buildup of the pest prior to the main pumpkin harvest window. Melonworm tend to be more problematic in years in which tropical storm systems track along the Mississippi River from the Gulf Coast. These large storm systems accelerate the dispersal of moths.

Scouting for Melonworm

Pumpkins, winter squash and other fall cucurbit crops should be scouted for melonworm larvae and moths one to two times a week, starting in late July when melonworm may first appear. Scouting should target adult moths and feeding injury from larvae in the plant canopy. Melonworm trapping does not give a good indication of presence, as moths are hard to catch with sticky traps and no commercial pheromone lures currently exist for melonworm. Focus early scouting efforts on the first signs of melonworm, which include feeding on the underside of leaves **(Image 9)** and in new growth **(Image 10)**. It's also important to keep an eye out for moths **(Image 1)** and rolled leaves **(Image 6)**. Fruit injury can occur quickly after melonworm arrive, so fruit should be scouted for injury even when melonworm haven't yet been observed **(Images 7 and 8)**. The location of melonworm occurrence within in the plant canopy is often related to time of year and plant age. When plants are fully mature with ripening fruit, melonworm can be found throughout the canopy, whereas melonworm are usually restricted to the growing points and on leaves of younger plants with few maturing fruits **(Image 9 and 10)**.

Image 9. Signs of melonworm feeding from young larvae present on the underside of pumpkin leaves. Photo by Ryan Keiffer.

Image 10. Melonworm larvae feeding on the shoots of cucurbit runners. Photo by Aaron Cato.

Cultural Controls

Melonworm larvae prefer to feed on pumpkins and winter squash but can also be found on fall squash and zucchini. Preferential feeding by melonworm larvae among cultivars may exist and is most pronounced when several species of *Cucurbita* are planted adjacently. For example, melonworm often prefer jack-o-lantern pumpkin varieties over some ornamental types. Preference is rooted in the *Cucurbita* species from which each pumpkin is derived (more info can be found in FSA7093). Pumpkins planted to be picked in mid-September are less likely to be impacted by melonworm in some years, suggesting that planting date could be a useful way to help manage melonworm. However, planting date trials in years of early infestations suggest no benefit from planting early, even when pumpkins are picked in September. Row covers may be an option for home gardeners or small organic growers to prevent melonworm from laying eggs at night, although permanent row covers limit pollination, increase pests such as aphids and are unlikely to remain free of holes throughout the entire season (Webb and Linda 1992).

Insecticide Timing

Melonworm need to be managed with effective insecticides once they are observed. Data indicate that scouting for moths or larvae is the most sustainable way to time insecticide applications. In fact, melonworm dispersal seems to be relatively uniform in latitude and across geographically similar growing regions. Growers should initiate insecticide applications when nearby infestations are first found. For example, growers in Southeast Arkansas should consider insecticides when melonworm are found in other areas of southern Arkansas or anywhere northward in Arkansas. However, growers in central Arkansas should only consider insecticide applications if melonworm is found in northern or central Arkansas and should only increase scouting efforts when melonworm is found in the southern area of the state. In most years, we see melonworm move quickly into southern portions of the Mid-South, especially Southeastern regions, but this does not always translate into early infestations in central and northern growing regions of the Mid-South.

Insecticide Selection

Several insecticides have been found to be effective in controlling melonworm in pumpkins and squash **(Table 1)**. Once melonworm is found, it is likely that infestation pressure will continue until harvest is completed, with some increases in infestation density noticeable as successive generations emerge. Due to prolonged infestation pressure, insecticides should be selected and scheduled based on the

Table 1. Insecticides that can be used to manage melonworm including insecticide class and mode of action (MOA) and estimated residual activity.

Trade Name	Active Ingredient	Insecticide (MOA)[1]	Residual (days)
Brigade	bifenthrin	Pyrethroid (3A)	<7
Warrior II	lambda-cyhalothrin	Pyrethroid (3A)	<7
Mustang Maxx	zeta-cypermethrin	Pyrethroid (3A)	<7
Sevin	carbaryl	Carbamate (1A)	<7
Coragen eVo	chlorantraniliprole	Diamide (28)	21+
Harvanta	cyclaniliprole	Diamide (28)	21+
Exirel	cyantraniliprole	Diamide (28)	21+
Besiege	lambda-cyhalothrin + chlorantraniliprole	Pyrethroid (3A) + Diamide (28)	21+
Intrepid	methoxyfenozide	Growth Regulator (18)	14-21
Radiant	spinetoram	Spinosyn (5)	<7
DiPel[2]	*B. t* subsp. *kurstaki*	Microbial (11)	<7
Entrust[2]	spinosad	Spinosyn (5)	<7

[1]The Mode of Action (MOA) listed corresponds to the IRAC Group (Insecticide Resistance Action Committee) number for each insecticide.
[2]Insecticides that can be used in organic production (OMRI approved)

expected residual activity of the insecticide. University of Arkansas data indicate that short-lived, broad-spectrum insecticides, such as pyrethroids (bifenthrin, lambda-cyhalothrin, etc.) used to control cucumber beetles and squash bugs will also suppress melonworm. These insecticides may only offer two to five days of residual activity. They would need to be applied weekly and should only be relied on when also managing other pests that necessitate their use.

Broad-spectrum insecticides are not necessary for melonworm management and may do more harm than good, as broad-spectrum insecticides can flare populations of melon aphids and spider mites. In these instances, the use of selective insecticides can help to minimize the potential negative impacts of broad-spectrum insecticide usage. Data from Arkansas indicate that several selective insecticides offer excellent suppression of melonworm when used appropriately. Diamide insecticides (Mode of Action Group 28), those containing chlorantraniliprole, cyantraniliprole, etc., are selective insecticides that primarily kill caterpillars and offer 21 to 28 days of residual activity. Our data indicate that only one to two applications of insecticides containing chlorantraniliprole would be necessary per year if applications were timed at first detection of melonworm and repeated on 21-28 day intervals. University of Arkansas data also indicate that short-lived organic insecticides, such as those containing *Bt (Bacillus thuringiensis)* are effective when timed early and used weekly. Although we have not tested other organic insecticide options, we would expect those with proven efficacy on caterpillar pests, such as products containing spinosad, to be effective when sprayed weekly.

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