Pest Management in Pumpkins – A Roadmap for New Growers

By Aaron Cato

Over the last few months, I've received several calls from first time pumpkin growers across the state. Most of these new growers are new to specialty crops in general, with many knowing of the intensive spray schedules required for some crops and unsure what is necessary for success. Many of these new farms are in northeast Arkansas, with most being the result of a pressing need to diversify felt by many of our row crop growers. As a product of Mississippi County, I have always felt we have great sandy soil for vegetables and plenty of irrigation to keep things alive, but the hold up has of course always been labor availability and the lack of infrastructure and regional support. Pumpkins present an easier challenge than many other vegetable crops because they are a late season crop that isn't often impacted by nearby crop production, require very little infrastructure and in-season labor and are only picked a few times.

Pumpkins are a great crop to grow in the Midsouth to diversify farms and support agritourism. Pumpkins are typically thought of as low maintenance compared to many other specialty crops like tomato or strawberry, however, pumpkins do require weekly scouting for both diseases and insect pests, along with a preventative fungicide spray program. Pumpkins can very easily be wiped out by insects and most farms deal with several pests that must be controlled each year, which comes with the territory of a summer planted crop. In the Midsouth region, a basic fungicide program is necessary for disease prevention, and more targeted fungicides should be used if some major pumpkin diseases are present.

Below I will outline tactics for building a pest management plan for pumpkins, including what to scout for and what sustainable management tactics are likely to yield profit. Please consult the Southeastern US Vegetable Crop Handbook for additional recommendations and visit our Hort IPM page for updates on the arrival of pests like melonworm.

Disease Management

Cultural Control Tactics

Much of the disease risk in pumpkins can be mitigated by integrating cultural control tactics, such as sanitation and the use of resistant varieties into your production program.

1. Plant pumpkins in well-drained areas. We've seen many cases of soil-borne pathogens taking over fields that don't drain well or are quickly inundated with water.
2. Plant earlier when possible. Planting windows are generally based on market sources but being on the front part of that window can avoid increased risk of powdery and downy mildew that comes in the late Summer/early Fall.
3. Remove all dying plants as they are found, especially before transplanting into the field.

4. Avoid overhead irrigation. Many diseases are a function of leaf-wetness and sprinkler irrigation can lead to increased risk. Drip irrigation is a great option for both production efficiency and disease prevention.
5. Utilize crop rotation where possible. Integration of these tools is an important step to mitigate risk from many of the diseases like Fusarium.

Fungicide Spray Program

Pumpkins can be infected by a wide variety of pathogens and exhibit many diseases. Many of these diseases are prevented by implementing a very basic spray schedule. Pumpkins should receive an application of a fungicide that contains either chlorothalonil or mancozeb every 10 to 14 days. This application interval should be tightened to 10 days based on rainfall events that create a more ideal environment for disease-causing pathogens and are likely washing off protectant fungicides. This basic spray program along with cultural control tactics will likely get many growers through the entire growing season.

There are three diseases that all pumpkin growers need to scout for weekly to prevent major losses. These diseases are downy mildew, powdery mildew, and plectosporium blight (white blight). Each of these diseases occurs to varying degrees in Arkansas every year, and often growers can tell you which they tend to deal with. The good thing is that growers can respond to these diseases when they occur and don't typically need to use anything other than our basic spray schedule for prevention prior to these diseases occurring in their pumpkins. Growers may integrate extra products for diseases like powdery mildew preventatively if it is a yearly issue, as responding once the canopy closes up is unlikely to suppress the disease.

Below is a decision tool that growers can use to choose their foliar fungicides throughout the year **(Figure 1)**. It should be noted that the basic spray program will help to prevent these diseases throughout the season. Each disease will be discussed at length below to provide a guide on how to identify what's damaging your pumpkins. As always, many of these diseases can be difficult to identify based on leaf symptomology, and I recommend sending a sample into the Plant Health Clinic for confirmation.

Figure 1. Decision tool for pumpkin fungicide spray schedule. Chlorothalonil or mancozeb should be utilized every 10-14 days even if no disease is found to be present. Add additional fungicides if powdery mildew, downy mildew, or white blight is observed.

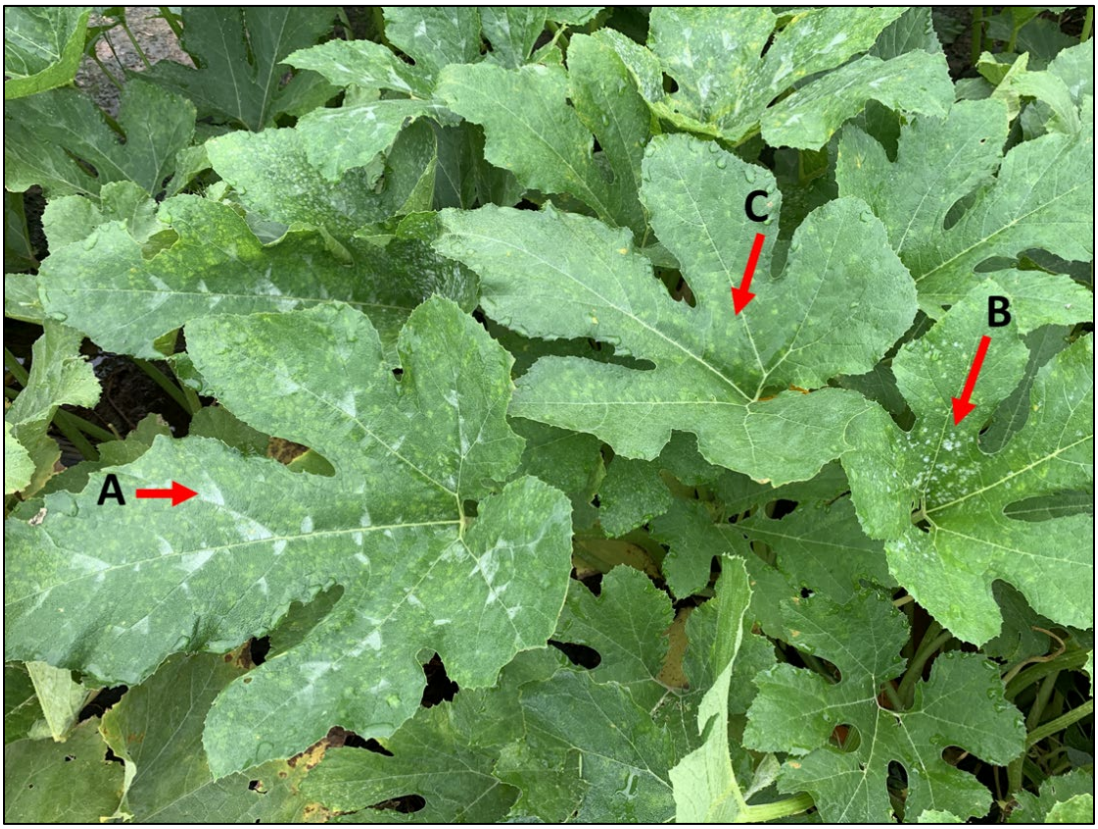
Diseases Observed	Response
No diseases	Chlorothalonil or mancozeb 10-14 days depending on rain events.
Powdery mildew	Alternate **TWO** effective powdery mildew products, tank mix with chlorothalonil or mancozeb.
Downy mildew	Alternate **TWO** effective downy mildew products, tank mix with chlorothalonil or mancozeb.
White blight	Alternate **TWO** effective white blight products, don't need to tank mix if using Flint or Cabrio.

Powdery Mildew

Cucurbit powdery mildew is a common disease in Midsouth pumpkin production that can range in severity from year-to-year. Cucurbit powdery mildew is caused by the fungal pathogens *Podosphaera xanthii* and *Erysiphe cichoracearum*. This disease causes white powdery growths on leaves, stems, and petioles **(Picture 1)**, which then leads to necrosis as the disease progresses. Infection generally starts in the shaded areas of plants on older leaves, but this diseases can quickly cover entire plants. Powdery mildew leads to an overall decline in plant health and lower plant yields and can quickly colonize large portions of fields and lead to great economic loss. We often see more advanced powdery mildew infestations where growers are spraying with Hi-boy sprayers with lower spray volumes. We recommend at least 30-40 GPA and the use of blower sprayer where possible.

Powdery mildew should be scouted for each week and is generally more severe after fruit set and in more dense plantings. Growers should scout the oldest leaves in the densest areas of their fields first and should also keep an eye out for spots in the field that are becoming chlorotic (turning yellow) **(Picture 2)**. Powdery mildew should not be confused with genetic silvering present on many pumpkin cultivars **(Picture 2)**. When powdery mildew begins to be found in fields, growers should add an effective fungicide to their spray program along with their base protectant fungicide on a 7-10 day spray interval. Fungicides effective against cucurbit powdery mildew include: **Gatten** (flutianil, FRAC U13), **Luna Experience** (fluopyram + tebuconazole), FRAC 7+3), **Quintec** (quinoxyfen, FRAC 13), and **Vivando** (metrafenone, FRAC 50). Growers should rotate effective modes of action between each spray to avoid potential issues with resistance, especially if utilizing quinoxyfen containing fungicides.

Picture 1. Cucurbit powdery mildew fungal spores present on the top of pumpkin leaves.



Picture 2. Cucurbit powdery mildew spores, chlorotic symptomology, and genetic silvering on pumpkin leaves. Genetic silvering (A) can be confused with powdery mildew due to its color, but it will appear within leaf veins and have a blocky shape. Powdery mildew spores (B) look more like powder and damage will be expressed as chlorosis (C) on the opposite side of the leaf.

Downy Mildew

Downy mildew is one of the most devastating diseases of cucurbits. In Arkansas, downy mildew of cucurbits is only occasionally observed outside of the southeastern portions of the state because the fungus that confers this disease, *Pseudoperonospora cubensis*, can only survive in living cucurbit plants. These plants do not survive the winter in Arkansas and therefore this disease does not overwinter in the state. However, this disease does overwinter in states further South, and it can work its way across the Southeast in the summer and throughout the entirety of Arkansas as spores are moved in the wind. This makes scouting very important for disease management, especially considering the limited number of products that provide good suppression.

Cucurbit downy mildew presents as angular, yellow/light-green spots early, which turn into necrotic yellow/brown lesions on the tops of leaves **(Picture 3)**. It can be further identified by gray/purplish spores on the underside of leaves **(Picture 4)**. Growers should keep an eye out for these symptoms and consider tropical storm events as likely accelerating events as the disease is blown up from Louisiana, Texas and Mississippi.

Growers should scout at least once a week for downy mildew in pumpkins. These scouting efforts should be intensified when forecasts indicate a risk for our area, or when we have confirmed cases in the state. Fungicide products that provide good control of downy mildew are **Elumin** (ethaboxam, FRAC 22), **Orondis Ultra** (oxathiapoprolin FRAC 49 + mandipropamid FRAC 40), **Orondis Opti** (oxathiapoprolin FRAC 49 + chlorothalonil FRAC M05), and **Ranman** (cyazofamid, FRAC 21). See the Southeastern US Vegetable Crop Handbook for further fungicide recommendations and products that provide fair control/prevention. None of these products will provide good control as a salvage application, making it necessary to scout often and respond quickly.

Picture 3. Downy mildew symptomology observed in Clay County. Leaves toward the bottom of the picture show signs of early symptomology with yellow angular lesions. Many leaves of this picture show advanced symptomology with leaves rolling inward. Photo by Allison Howell, Clay County UAEX.

Picture 4. Angular lesions exhibiting grey/purple spore growth on the underside of the leaf. This is a key characteristic of potential cucurbit downy mildew. Photo by Allison Howell, Clay County UAEX.

Plectosporium Blight

Plectosporium blight, which is also referred to as “white blight,” is a less common disease in Arkansas that can quickly overrun pumpkin plants and lead to quality and total fruit loss. Symptoms usually begin as white, diamond-shaped lesions that present on leaf midribs, stems, fruit handles, and the rind of fruit **(Pictures 5 and 6)**. These lesions can eventually bleach sections of fruit or stems, and lead to decline in the plant or the fruit quality. Plectosporium blight is not usually a major issue in Arkansas, but it isn’t hard to find it sporadically in fields across the state. Growers should scout for this disease and try to discern whether problems are beginning to worsen. Downward cupping of leaves and tan midribs can be a sign of worsening plectosporium blight, but abrasions should not be mistaken for lesions. A basic fungicide spray program along with cultural controls should prevent this disease in most cases, especially since it is more commonly observed in wet conditions. If symptoms begin to rapidly progress and if excessive rainfall persists, use one of the following fungicides on a 7-10 day schedule along with the basic spray schedule: **Cabrio** (pyraclostrobin, FRAC 11) or **Flint** (trifloxystrobin, FRAC 11).

Picture 5. Plectosporium blight lesions present on pumpkin stems. Lesions have progressed and are beginning to bleach portions of this plant. Effected areas of the plant are more brittle and prone to breaking.

Picture 6. Plectosporium blight lesions present on a ripe pumpkin fruit. Photo: William Nesmith, University of Kentucky.

Insect Management

Cucumber Beetles

Spotted and striped cucumber beetles are known to be an issue in Arkansas and can transmit bacteria that can cause bacterial wilt **(Picture 7 and 8)**. Adults feed on the foliage, flowers, and on the surface of the fruit, and plants are susceptible to wilt transmission as soon as they emerge or are transplanted. Younger plants (before the 4-leaf growth stage) are most susceptible to the disease, therefore scouting twice a week is necessary early on. Thresholds depend on the type of cucurbit you are trying to protect and the age of the planting. An insecticide application should be made to pumpkins when one cucumber beetle is found per plant on average until plants have 5 true leaves. After this growth stage an application should be made when populations reach a few beetles per plant on average. Cucumber beetles are known to migrate into fields quickly, which warrants frequent scouting. This is especially important after an insecticide application is made, as re-infestation at densities above threshold is possible in only a few days.

Many insecticides can be used to manage cucumber beetles, but considering that most can flare aphids, scout your fields to make sure applications are necessary. Effective insecticides include pyrethroids (IRAC 3A - bifenthrin, lambda cyhalothrin, etc.), neonicotinoids (IRAC 4A - imidacloprid, acetamiprid, dinotefuran, thiamethoxam, and clothianidin), carbamates (IRAC 1A - carbaryl), and organophosphates (IRAC 1B - malathion). We've seen some complaints about the pyrethroids we normally rely on, although no resistance has been reported in this pest. I recommend choosing bifenthrin over other pyrethroids as it usually offers the best control. Neonicotinoids such as imidacloprid and dinotefuran can also be applied as drip applications and may provide some aphid and squash bug suppression. We have seen excellent control with dinotefuran as a foliar spray for squash bugs. If you didn't use a neonicotinoid drip application at planting and are seeing high numbers of cucumber beetles, I recommend getting out an imidacloprid application (soil only) ASAP to help rotate effective insecticide mode of action (MOA – IRAC Code). If populations are excessive, use a knockdown foliar insecticide even when you still expect protection from a systemic drip applied insecticide. You may

consider mixing in another insecticide from a different MOA in foliar sprays if you feel like you aren't getting acceptable control.

Picture 7 – Spotted and striped cucumber beetles. Photo courtesy of Ric Bessin, University of Kentucky Entomology.

Picture 8 – Bacterial wilt disease symptomology.

Squash Bugs

Like cucumber beetles, squash bugs are an issue as soon as plants are in the field and can vector bacteria that cause cucurbit yellow vine disease, also known as yellow vine decline **(Picture 9, 10 and 11)**. Smaller fields are most susceptible, and numbers generally are the highest on field edges and during fruit-set and bloom. Fields should be monitored at least once a week and monitoring should be focused on the underside of leaves, at the base of plant, and under fallen leaves where squash bugs often congregate. Adults are difficult to manage, and applications should target young nymphs or eggs. Apply an insecticide when egg masses or nymphs are observed on every few plants. Effective insecticides include pyrethroids (IRAC 3A - bifenthrin, lambda cyhalothrin, etc.), neonicotinoids (IRAC 4A - imidacloprid, acetamiprid, dinotefuran, thiamethoxam, and clothianidin), and carbamates (IRAC 1A - methomyl). Neonicotinoids such as dinotefuran and imidacloprid (soil only) can also be applied as drip applications and may provide some aphid and cucumber beetle suppression. Foliar applications of dinotefuran containing insecticides have provided excellent control of squash bugs in our field trials.

Picture 9 – Squash bug adult pictured on a summer squash leaf.

Picture 10 – Squash bug eggs pictured on top of a pumpkin leaf.

Picture 11 – Yellow vine disease symptoms pictured on a pumpkin plant in Arkansas.

Melonworm

Melonworm, *Diaphania hyalinata*, is a tropical moth species **(Picture 12)** that occurs throughout Central and South America, as well as sub-tropical regions of the Southern United States. Melonworm is also referred to as rind worm or pickle worm, although the pickle worm is 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 **(Picture 13-16)**. Melonworm immigrate to central and northern regions of the United States each year during the summer months and commonly occur 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 north from sub-tropical regions of the US across the summer, typically arriving in early fall. Melonworms don't overwinter in Arkansas so their arrival each year depends on the climatic conditions for the year. In 2021 moths showed up much earlier than previous years (early August) and began multiplying rapidly before pumpkin harvest started. Significant damage was easy to see at many commercial pumpkin operations across Arkansas by late September. In 2022 only low numbers of melonworm were observed starting on September 19, and infestations were not widespread. The occurrence of moths or larvae in August or early September should be an early sign for growers that an insecticide application may be necessary. If growers can easily find these white and brown moths flying in plantings, or are seeing larvae on leaves, a pesticide application will be necessary.

Melonworm prefers to feed on pumpkins and winter squash, but can also be found on fall squash and zucchini. Variation among cultivars may exist and is most pronounced when several species of *Cucurbita* are used for one type of crop. For example, melonworm often prefer jack-o-lantern pumpkin varieties over some ornamental types grown and sold together. Preference is rooted in the *Cucurbita* species each pumpkin is derived from. 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. Melonworm trapping does not give a good indication of presence, as moths are hard to catch with sticky traps and no commercial pheromone lures exist for melonworm currently.

Melonworm need to be managed with effective insecticides once they are observed. Data indicates 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, which indicates that growers can consider infestations in nearby areas to time insecticide applications. For example, growers in Southeast Arkansas should consider insecticides when melonworm are found anywhere in Arkansas, or even just in other areas of southern 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.

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 expected residual activity of the insecticide. Data at the University of Arkansas 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, 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 they can flare melon aphids and spider mites. Many cucurbit operations open to the public are hesitant to apply insecticides to manage melonworm due to public perception. In these instances, selective insecticides can be used to assuage any fears of any potential impact. Data from Arkansas indicates 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 indicates that only 1 to 2 applications of chlorantraniliprole containing insecticides 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 very 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 options, we would expect those with proven efficacy on caterpillar pests, such as insecticides containing spinosad, to be effective when sprayed weekly.

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+
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.

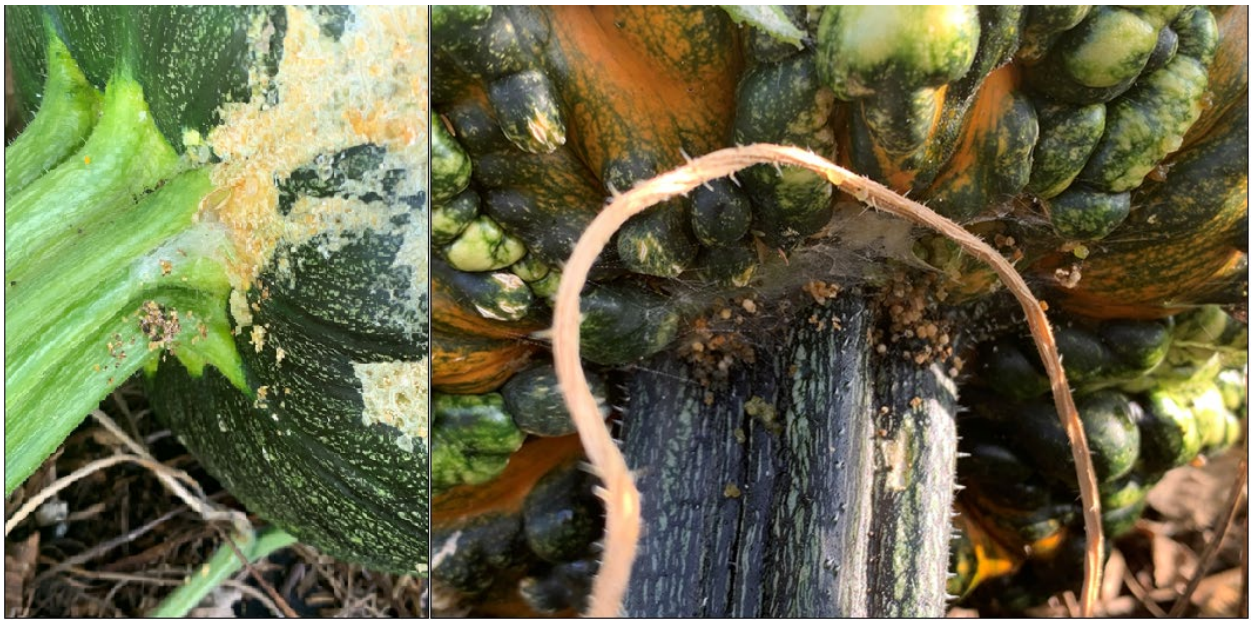
[2] Organic products

Picture 12 Melonworm moth on a mature pumpkin. These moths are easily observed on fruit or leaves during daytime hours and are easily disturbed.

Picture 13 – Melonworm caterpillars 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.

Picture 14 – Melonworm larvae pictured on a pumpkin leaf. Melonworm have 4 prolegs which will distinguish them from other caterpillars such as cabbage looper which are common on pumpkin.

Picture 15 – Feeding damage caused by melonworm which is usually characterized by "skeletonized' leaves that only have veins remaining (pictured right) or by rolled leaves (pictured left).

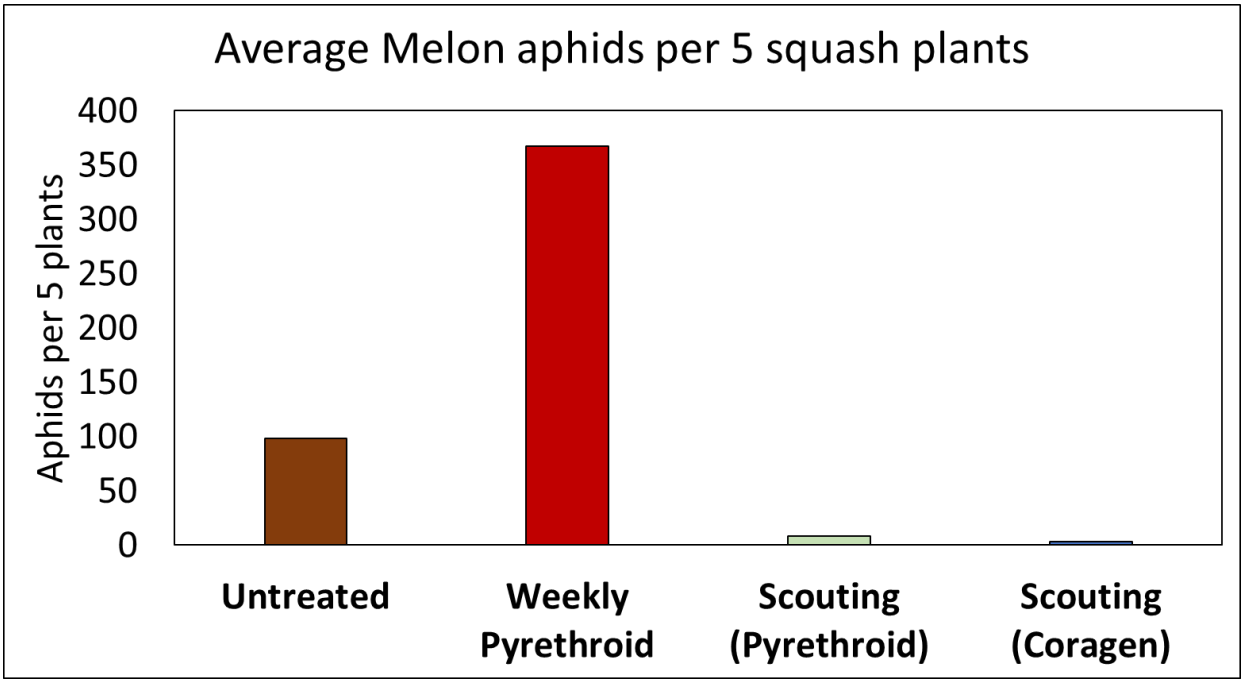


Picture 16 – Melonworm larvae feeding just under the handle/stems of pumpkins. Look for webbing or excrement, as shown in this picture, as an indication that larvae are feeding underneath.

Aphids

Melon aphid, *Aphis gossypii*, is considered a secondary pest in Arkansas pumpkin production **(Picture 17)**. Insecticides such as pyrethroids, pyrethrins, carbamates, or organophosphates that are used to control cucumber beetles, squash bugs, and other pests, kill the natural enemies that usually keep aphids suppressed **(Picture 18)**. If you have used broad-spectrum insecticides in your pumpkin patch this year, including many organic options, then you need to be scouting for aphids**.** There are many product options for aphid control such as acetamiprid (IRAC 4A- Assail, Tristar, and Anarchy), flupyradifurone (IRAC 4D - Sivanto Prime), sulfoxaflor (IRAC 4C - Transform), and Flonicamid (IRAC 9C - Beleaf). Acetamiprid, sulfoxaflor, or flupyradifurone are likely going to be the easiest products to find locally. Aphid control is necessary when populations are building on every few plants and the natural enemy complex was collapsed by recent broad spectrum insecticide sprays.

Picture 17– Melon Aphids on the underside of pumpkin leaves following a pyrethroid spray.



Picture 18 – Average melon aphids present on squash plants in Hope, AR in 2022. Plants were either untreated, sprayed weekly with a pyrethroid (Warrior II), or received an insecticide based on pests that were present (scouting pyrethroid and coragen). Scouting based plots received only 1 insecticide application and minimal aphids were observed. Plots receiving weekly pyrethroids had excessive aphid numbers and a large amount of plant stunting.

Management Plan

Many of the insecticides mentioned here will control both cucumber beetles and squash bugs, and in most production areas of the state, these pests are likely to be present at the same time. Due to the risk

of flaring melon aphids, a good strategy is to start early with a drip application of imidacloprid (Admire Pro) or dinotefuran (Venom or Scorpion) to prevent flaring aphids. These products usually give at least 3 weeks of suppression that should help protect from bacterial wilt or yellow-vine disease. Foliar applications of pyrethroids are usually relied on for cucumber beetle and squash bug suppression, but it is important to rotate in other **Modes of Action** like carbamates, neonicotinoids, or organophosphates where possible. Repeated use of one chemistry is likely to lead to lowered success of control. This is especially important when considering squash bug, as it is difficult to suppress this pest once infestations are excessive. Many growers also count on broad spectrum insecticides to suppress squash vine borer, which is not generally a serious pest of larger plantings. See our fact sheet about squash vine borer for more information.

Melonworm is not likely to be a serious pest every year, but the losses we incurred in 2021 and 2024 are a stark reminder that we need to be scouting every week beginning in August. Even in 2022 when populations were very low, we still observed significant damage in our plots and on grower operations. Rely on diamide products (IRAC 28) like Coragen or Exirel or Shenzi once moths or larvae are observed in fields. A second application may be necessary in 21 days if pumpkins still need to be protected. See our melonworm fact sheet for more information.

If you have any questions, give me a call at 479-249-7352.

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