

# Arkansas Common **CUCURBIT** Problems







# ARKANSAS COMMON CUCURBIT PROBLEMS

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# COMMON DISEASES IN CUCURBITS

Squash, pumpkin, cucumber, gourd, watermelon, and cantaloupe belong to the cucurbit family. Cucurbits (Cucurbitaceae) are high-value crops grown widely by both homeowners and commercial growers across Arkansas and the United States. Total field production most years covers 565,871 acres and is valued at \$1.43 billion. One of the limiting factors in production is disease control. Integrated Pest Management (IPM) protocols, that include the application of fungicides, disease resistance bred into cultivars, and cultural practices such as manipulating planting dates and utilizing crop rotation are essential for successful production.

## CUCURBIT ANGULAR LEAF SPOT

(*Pseudomonas syringae*, pv. *lachrymans* )

Most seasons Cucurbit Angular Leaf Spot, caused by *Pseudomonas syringae*, pv. *lachrymans* is not a serious problem. However, during seasons with prolonged wet conditions, crop losses can be substantial. All cucurbits are susceptible, including watermelon, cantaloupe, cucumbers, and gourds. This is a seed-borne pathogen that infests seed beneath the seed coat, resulting in infection of the cotyledons upon germination. On the leaves, Angular leaf spot first appears as small water-soaked lesions. The lesions expand, usually along a vein. During periods of high humidity, a clear to milky bacterial exudate appears on the surface of the lesions. Lesions later turn tan to brown, dry up and sometimes fall out, giving a tattered appearance to the leaves. Petioles, stems, and fruit may also become infected. Infection of watermelon fruit causes large water-soaked brown areas on the fruit. Infected fruit may become deformed, or completely rotted. The bacterium is carried from leaf to leaf and plant to plant by rain or irrigation splash, wind, or on equipment and field workers. It overwinters on crop debris and can persist for several years on dried leaves and stems.

**Cultural Controls:** Starting with clean seed and practicing crop rotation away from cucurbits for three years is the best way to minimize Angular leaf spot.

**Chemical Controls:** Seed treatment in water containing calcium propionate at 4.4 oz/gal water; or acidic cupric acetate at 6.7 oz/gal water for 20 minutes at 50°C kills much but not all of the bacterium. Repeated applications of a copper fungicide can be helpful to protect young plants. Sprays are generally ineffective once an epidemic is full-blown.



**Cucurbit Angular leaf Spot-*Pseudomonas syringae* pv. *lachrymans*** Photo Credit: Sherrie Smith, University of Arkansas Cooperative Extension

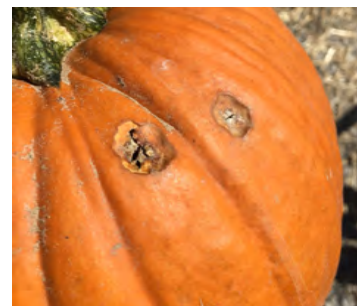
## CUCURBIT BACTERIAL SPOT

(*Xanthomonas campestris* pv. *cucurbitae*)

Bacterial Spot of pumpkin and other cucurbits, caused by the bacterium *Xanthomonas campestris* pv. *cucurbitae*, can be a serious disease of pumpkins, cucumbers, gourds, and squash. Yield losses in excess of 50% have been recorded in severely infested fields. Leaf symptoms appear as small, dark, angular lesions, with the centers of the lesions becoming translucent with age. However, the most damaging symptoms appear on the fruit. Fruit lesions begin as small, slightly sunken, circular spots, 1/16 to 1/18 inch in diameter. As the lesions enlarge the cuticle and epidermis crack. Larger lesions may have a scabby appearance with tan, raised blisters. Saprophytic fungi often colonize the older lesions, giving them a pinkish-white or green color depending on the species of saprophyte involved. The unsightliness of the lesions diminishes the marketability of the fruit as well as leading to significant rot in the field and in storage. The pathogen is seed-borne and can also survive in crop residue. Bacterial spot is more of a problem during high temperatures coupled with rainy weather or overhead irrigation. Inoculum is splashed onto young fruit before it develops its protective waxy cuticle.

**Cultural Controls:** Good sanitation and crop rotation with non-cucurbit crops help limit inoculum in the field. Only clean seed should be used. Therefore it is advisable to not save seed from a previous crop.

**Chemical Controls:** Copper fungicides may be applied during early formation and fruit expansion to protect developing fruit. Once bacterial lesions are observed on mature fruit there is nothing to be done except to practice ruthless culling of diseased fruit.



**Pumpkin with bacterial spot lesions on fruit.** Photo Credit: Richard Klerk

## CUCURBIT DOWNY MILDEW (*Pseudoperonospora cubensis*)

Cool, moist weather conditions are favorable for the development of Downy Mildew of cucurbits, caused by *Pseudoperonospora cubensis*. This is a devastating fungal disease of cucurbits including cucumber, squash, pumpkin, and watermelon. On all hosts, upper leaf symptoms begin as chlorotic flecks or spots on the surface of the leaves. Gray-brown to purplish-black downy sporulation occurs on the corresponding spots on the underside of the leaves. Downy mildew can progress extremely rapidly within a field, causing the leaves to turn brown, necrotic, and curl upwards. Older leaves are typically infected first. As the disease progresses, they become burned looking, shrivel and die. Although fruit and blooms are occasionally infected, the leaf loss results in reduced yields. Misshapen fruit and damaged fruit from sunburn occur as the leaves die and the fruit lose their protective shade. It is important to begin control measures as soon as Downy Mildew is confirmed in your field.

**Cultural controls:** Encourage airflow and reduce leaf wetness. Trellising cucurbits, increasing plant or row spacing or growing in passive or traditional greenhouses can help reduce relative humidity and leaf wetness. Planting earlier in the spring may help avoid the disease. Host resistance is desirable but may not hold up in a season with high disease pressure.

**Chemical Controls:** Homeowners may use Bonide Mancozeb Flowable w/Zinc in rotation with a vegetable fungicide containing chlorothalonil. The use of resistant cultivars helps delay infection. Commercial growers may use Reason 500 SC (fair), or Cabrio 20EC, or Flint 50 WG, or Pristine 38 WG, or Ranman 400 SC (good), Curzate 60 DF, or Previcur Flex 6 F, or Omega 500 F, or Aliette 80 WDG, or Forum 4.18 F, or Revus 2.08 S, or Presidio 4 F, or Dithane DF (fair), or Tanos 50 WP (fair), or Ridomil Gold Bravo SC, or Gavel 75 DF, or Orondis Opti 3.37 SC (good, or Orandis Ultra 2.33 SC (good).

Cucurbit downy mildew symptoms on pumpkin leaf.



Photo Credit: Sherrie Smith, University of Arkansas Cooperative Extension

## CUCURBIT CHOANEPHORA (*Choanephora cucurbitarum*)



Squash fruit affected by choanephora. Photo Credit: Clemson University - USDA Cooperative Extension Slide Series

Choanephora Blight, caused by the fungus *Choanephora cucurbitarum*, is associated with high humidity and injury to flowers and developing pods. The disease is also common on pumpkin, okra, snap bean, and squash. It is most prevalent during periods of large amounts of rain and high temperatures. Choanephora Blight spreads by wind, water, on clothing, tools, garden equipment, and by insects. The newest foliage, flowers, and fruits are vulnerable. Foliar symptoms begin as water-soaked areas that darken and dry out with age. A dark gray to silvery fungal growth and rot becomes apparent in a matter of hours under environmental conditions conducive for disease. Pods and flowers develop a wet rot that becomes covered with a fuzzy, silvery mass of fungal growth. The disease is most severe in dense plantings and extended wet periods. Once drier conditions prevail, new infections decline. This disease is difficult to control with fungicides.

**Cultural Controls:** Diseased plant parts should be removed from the planting. All crop residue should be cleaned up at the end of the season. Overhead irrigation should be avoided in favor of drip irrigation. It is helpful if fruit and flowers do not touch the ground.

**Chemical Controls:** Not recommended.

## CUCURBIT GUMMY STEM BLIGHT (*Stagonosporopsis curcubitacearum*)



Gummy stem blight lesion on stem showing pycnidia. Photo Credit: Rebecca A. Melanson, Mississippi State University Extension, Bugwood.org



Advanced gummy stem blight lesion showing oozing. Photo Credit: Sherrie Smith, University of Arkansas Cooperative Extension

Gummy stem blight caused by *Stagonosporopsis curcubitacearum*, teleomorph synonym *Didymella byroniae* is a serious disease of cucurbits, affecting melons, squash, and cucumbers. Early leaf symptoms are water soaked gray-green spots on cotyledons and leaves. Spots enlarge, become irregular and dark brown. Small black fruiting bodies may be seen in the spots. Lesions on stems are oblong water-soaked areas that turn brown to dark brown and can eventually girdle the stem causing the collapse of the plant. Brown sticky exudates often ooze from the lesions. The disease is sometimes called black rot when fruit is infected. Initial symptoms on fruit are water-soaked spots that enlarge, become dark, and have the typical oozing from the lesions. Under moist conditions white mycelium will form. Fruit can rot completely in 2-3 days under conditions favorable for disease development. Black fruiting bodies may be found on infected fruit as well as stems and leaves. Fruit injured by insects or poor cultural practices are more vulnerable. The fungus can survive on seed, crop debris, and in soil.

**Cultural controls:** A two-year crop rotation with non-cucurbits, clean seed.

**Chemical Controls:** Resistance to FRAC code 11 fungicides has become common in some fields. Luna Experience 3.3 F has proven to be a good choice. It may be used in rotation with fungicides with a different FRAC code. Homeowners must depend on fungicides containing chlorothalonil and mancozeb.



Gummy stem blight lesions on a leaf. Photo Credit: Sherrie Smith, University of Arkansas Cooperative Extension

## CUCURBIT POWDERY MILDEW (*Podosphaera xanthii*)

A common and widespread disease of cucurbits is powdery mildew, caused by *Podosphaera xanthii*, previously known as *Sphaerotheca fuliginea*. *Erysiphe cichoracearum* also causes powdery mildew on cucurbits but is less common. Symptoms usually begin on the undersides of crown leaves and on shaded lower leaves as white powdery spots or patches. Often, yellow spots form on the upper surfaces opposite the powdery mildew colonies. Eventually both surfaces of the leaves become covered with powdery mildew as well as stems and petioles. Badly infected leaves wither and die.

Fruit production may be reduced in both quality and quantity. Dense plant growth along with low-intensity light and high relative humidity is favorable for initial infection. Dry conditions favor sporulation.

**Cultural Controls:** The best defense is the use of resistant cultivars.

**Chemical Controls:** Fungicide applications must begin at the first sign of disease. Rallevy 40 WSP, or Velum Prime, or Fontelis 1.67 SC, or Quintec 2.08 SC, or Bravo Weatherstick, or Torino 0.85 SC, or Gatten, or Inspire Super 2.82 SC, or Luna Experience 3.3 F, or Switch 62.5 WG, or Quadris Top 1.67 SC, or Pristine 38 WG, or Quadris Opti 1.0 SC, or Aprovia Top 1.62 EC, or Orandis Opti 3.37 SC, are labeled for treatment of Powdery Mildew in cucurbits. Homeowners must rely on fungicides containing chlorothalonil.

Powdery mildew on a leaf.

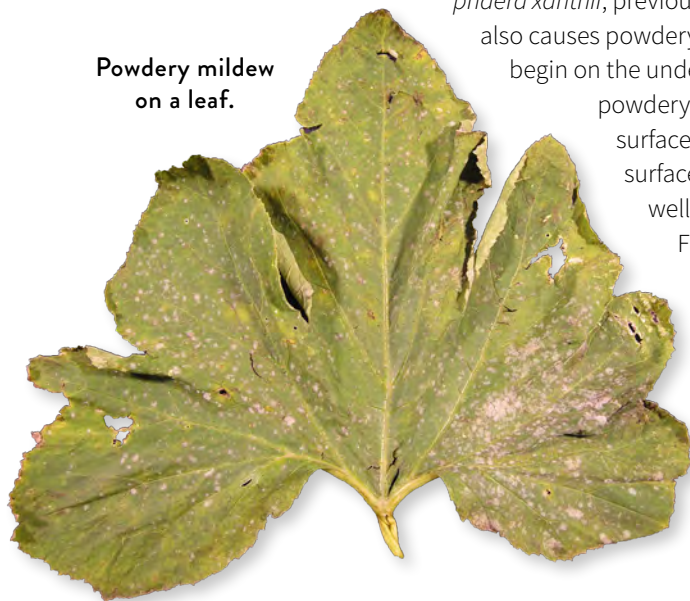


Photo Credit: Sherrie Smith, University of Arkansas Cooperative Extension



## CUCURBIT ANTHRACNOSE (*Colletotrichum obiculare*)

Anthracnose of cucurbits is found wherever cucurbits are grown. Cucumber, watermelon, squash, and gourds are all susceptible. *Colletotrichum obiculare*, synonym *C. lagenaria* is the causative agent of this fungal disease. All parts of the plant may be infected, including leaves, petioles, stems, and fruits. Lesions begin as yellowish water-soaked spots that turn brown to black. The spots enlarge and dry out. The centers of older lesions fall out leaving a shot hole effect. Infected fruit have sunken circular black spots of different sizes.

**Cultural Controls:** Crop rotation and destruction of old vines go a long way toward controlling this problem.

**Chemical Controls:** Fungicide applications of Topsin, or Quadris 2.08 SC, or Cabrio 20 EC, or Bravo Weatherstick, or Dithane, or Aprovia Top 1.62 EC, or Inspire Super 2.82 SC, or Luna Experience 3.3 F, or Luna Sensation 1.67 F, or Switch 62.5 WG, or Quadris Top 1.67 SC or Pristine 38 WG, or Tanos 50 WP, or Quadris Opti, or Gavil 75 DF, or Orondis Opti 3.37 SC, or Orondis Ultra 2.33 SC. Homeowners may use Bonide Fung-onil RTU\*, or Bonide Fung-onil Concentrate, or Garden Tech Daconil Concentrate, or Ferti-lome Liquid Fungicide, or Hi-Yield Vegetable, Flower, Fruit And Ornamental Fungicide, or Monterey Fruit Tree, Vegetable & Ornamental Fungicide, or Bonide Mancozeb FL with Zinc Concentrate.



**Anthracnose lesions on a leaf**  
Photo Credit: Sherrie Smith,  
University of Arkansas  
Cooperative Extension

## WATERMELON BACTERIAL FRUIT BLOTCH (*Acidovorax avenae* subsp. *citrulli*)

Watermelon Bacterial Fruit Blotch, caused by *Acidovorax avenae* subsp. *citrulli*, can attack all members of the cucurbit family, including honeydew, musk melons, cantaloupe, pumpkin, citron, squash, and watermelon. However, watermelon is the primary host for Bacterial Fruit Blotch. Symptoms on cotyledons are irregularly shaped, water-soaked lesions that become red brown with age. Infection can cause seedlings to collapse and die. Leaf lesions begin as small, water-soaked, irregular spots that enlarge, and turn brown to black with angular edges. The fruit develop irregularly shaped water-soaked lesions that are dull gray green to dark green that rapidly enlarge to cover most of the fruit. Older lesions may become brown to red-brown, and necrotic with white colored bacterial oozing from the lesion. These areas may turn black as secondary decay organisms colonize the fruit. Watermelon cultivars with dark green striped rinds tend to have smaller lesions on the lighter green stripe. This is a seed-borne pathogen.

**Cultural Controls:** Only seed that has been tested and found to be free of the fruit blotch bacterium should be planted. Transplants with suspicious symptoms should be destroyed. Practices in the greenhouse should include hand washing before and after handling plants; decontamination of plant containers, and tools; and avoidance of overhead irrigation. Greenhouses with contamination should be disinfected with a 10% bleach solution and remain empty of plants for a minimum of two to three weeks. All plant debris in the field should be plowed under. Wild cucurbits and volunteer watermelons should be destroyed. Working in the field while foliage is wet must be avoided.

**Chemical Controls:** Fungicide applications of copper have reduced the incidence of Bacterial fruit blotch symptoms when applications were started prior to fruit set. At least two to three copper applications and thorough coverage of the foliage are essential for good disease control. Applications should begin at first flower, or earlier, and continue until all fruit are mature. Fungicides applied after fruit is infected are ineffective. Include symptomatic leaves when submitting a sample to the Plant Health Clinic.



**Advanced fruit lesion.** Photo Credit: David Freeze,  
University of Arkansas Cooperative Extension

## CUCURBIT BACTERIAL WILT (*Erwinia trachiphilea*)



**Cucurbit bacterial wilt causing wilt of watermelon in the field.**  
Photo Credit: Ron Matlock, University of Arkansas Cooperative Extension



**Spotted cucumber beetle.** Photo Credit: Joseph Berger, Bugwood.org

Bacterial Wilt of cucurbits, caused by the bacterium *Erwinia trachiphilea*, occurs throughout the United States. It affects all cucurbits including cucumbers, muskmelons, squash, pumpkins, white gourds, wild gourds, wild cucurbits, and watermelon. Cucumbers and melons are the most susceptible with watermelon rarely seriously affected. Bacterial wilt is principally spread by the striped cucumber beetle, *Acalymma vittata*, and the spotted cucumber beetle, *Diabrotica undecimpunctata howardi*. Both species of cucumber beetle are common in Arkansas. Cucumber beetles have an enormous host range, attacking over 270 plants in 29 families. For example, they feed on asparagus, broad beans, eggplants, potatoes, certain fruit trees, tomatoes, peas, squash, corn, cucumbers, potatoes, and fruits, as well as cucurbits. Overwintering beetles already contaminated with the bacterium transmit it to uninfected plants during feeding in the spring. Wilting of individual leaves or entire vines is the most obvious symptom. Affected leaves become a characteristic dull green. Sticky, stringy, sometimes milky sap is exuded when infected stems are cut. Bacterial wilt is not curable.

**Cultural Controls:** Fields and gardens should be scouted twice a week for the beetles, especially when plants have less than five leaves. Be sure to check the underside of the leaves.

**Chemical Controls:** Admire applied as a pre-plant soil drench is highly effective against cucumber beetles. Foliar treatments of Sevin, or Karate Z, or Hero, or Lannate, or Mustang Maxx may also be used for control. Follow the label as there are certain crop restrictions with some of these compounds. Homeowners have fewer options, but may use Sevin, or sticky traps. Sevin is highly toxic to bees so care must be taken to apply during late afternoon or evening when bees are less likely to be foraging. Wilted plants should be destroyed to prevent beetles from feeding on them and spreading the disease to healthy adjacent plants.

## FUSARIUM WILT (*Fusarium oxysporum* f. sp. *Niveum*)

Fusarium wilt of cucurbits, caused by *Fusarium oxysporum* f. sp. *Niveum*, is a serious soil borne disease. On susceptible cultivars, yield losses may be serious. When inoculum levels are high, seedlings may wilt and die in the field (damp off). However, most symptoms occur on older plants after fruit set. Yellowing and wilting of one runner or one side of the plant, along with external lesions on the runner from the crown to runner tip are diagnostic. The tip of the runner turns bright yellow. The entire plant may have these symptoms instead of one side or one runner. A dark brown vascular discoloration occurs inside the crown and roots. The discoloration may be confused with Cucurbit Yellow Vine Disease. With Yellow Vine, the discoloration occurs in the phloem tissue. With Fusarium wilt the discoloration occurs in the xylem tissue. Vines with Fusarium wilt may wilt during the heat of the day but appear to recover in the evening. Eventually, most affected vines wilt permanently. Those that don't die are stunted and have considerably reduced yields. Diseased plants often occur in clusters in the field, corresponding to the distribution of inoculum in the soil. Cucurbits grown in fields with light, sandy, acidic soils are most susceptible to severe outbreaks of Fusarium wilt, especially when temperatures are between 77-81°F. Higher temperatures are thought to slow the progression of the disease.



**Watermelon stem with yellowing in xylem.** Photo Credit: Sherrie Smith, University of Arkansas Cooperative Extension

**Cultural Controls:** Many methods of control have been tried, including soil fumigation, soil solarization, crop rotation, and the use of resistant cultivars. Crop rotations of at least 5-7 years or longer between cucurbit crops are recommended, as fusarium has a long residual in the soil. Fumigation and soil solarization have some effectiveness but will not completely exclude the pathogen. The best control is choosing resistant cultivars. None are completely resistant under high disease pressure, but cultivars with resistance can often finish producing before succumbing to the wilt. There is evidence that Fusarium wilt can also be seed borne. Seedlings started in the greenhouse should be culled at the first sign of wilting or damping off. Seed trays should not be reused without sterilization.

**Chemical Controls:** None.



## CUCURBIT YELLOW VINE DISEASE

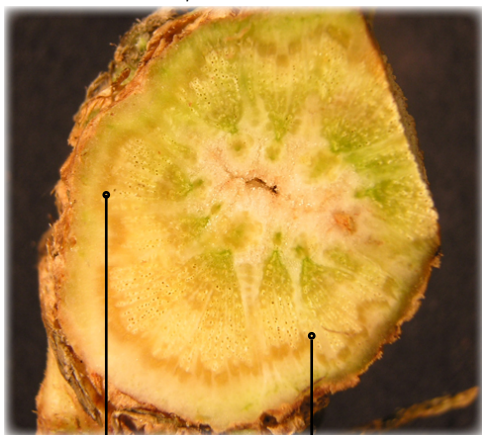
**Cucurbit Yellow Vine Disease, (CYVD)**, is a bacterial wilt disease of squash, pumpkin, and melon. CYVD has been confirmed in Texas, Oklahoma, Arkansas, Colorado, Kansas, Nebraska, Massachusetts, Missouri, and Connecticut. The causal agent is the bacterium *Serratia marcescens*. The phloem of the vine is plugged by the bacterium causing a brown phloem ring, yellowing of the foliage, stunting, wilting, and vine death. Wilting and death typically occur about 14 days before harvest. The disease is vectored by the squash bug (*Anasa tristis*). They are a common pest of cucurbits, often found in large groups feeding on the foliage. In areas with a history of CYVD, control must start the day of planting. Start scouting fields early for squash bug. Weekly foliar treatments with Pounce or Bifenthrin, Mustang Maxx, or Karate Z are recommended when threshold numbers are found. Homeowners may use Malathion or Sevin. Research has been done using row covers to keep the bugs off the crop with some success. Growers in some heavily infected areas of the country have used a trap crop with excellent results. They plant the trap crop 2-3 weeks earlier than the crop they are trying to protect, using a straight neck summer squash such as 'Lemon Drop' or 'Hyrific'. The trap crop is planted in the border rows of crop being protected. The squash bugs are then killed by insecticides before they can move into the crops being protected.



*Cucurbit yellow vine decline.* Photo Credit: Edward Sikora, Auburn University, Bugwood.org

## CUCURBIT YELLOW VINE DISEASE VS. CUCURBIT FUSARIUM WILT

**Watermelon cucurbit yellow vine disease.**  
Photo Credit: Sherrie Smith, University of Arkansas Cooperative Extension



Watermelon stem showing phloem yellowing caused by cucurbit yellow vine disease.

**Watermelon fusarium wilt. Watermelon cucurbit yellow vine disease.** Photo Credit: Sherrie Smith, University of Arkansas Cooperative Extension



Watermelon stem showing yellowing in xylem caused by fusarium wilt



# CUCURBIT VIRUSES



**Squash Mosaic Virus.** Photo Credit: Alton N. Sparks, Jr., University of Georgia, Bugwood.org

There are a number of viruses that affect cucurbits, including Watermelon Mosaic Virus, Cucumber Mosaic Virus, Squash Mosaic Virus, and Zucchini Yellow Mosaic Virus, among others. The most common symptoms are leaf mottling and distortion, stunting, along with fruit deformities and mottling. Squash Mosaic Virus (SqMV) is a comovirus. It is transmitted by seed and by insects, notably the striped cucumber beetle. Watermelon Mosaic Virus (WMV) is a Potyvirus. Potyviruses are aphid transmitted viruses. The green peach aphid, cowpea aphid, spirea and potato aphid, among others are known to transmit the virus. Zucchini Yellow Mosaic Virus, (ZYMV), is an important virus found worldwide. It can sometimes cause significant crop losses. Symptoms on leaves are extreme distortion, dark green blisters, and filiform or laciniate leaves. Fruit commonly are greatly distorted and have knobs, swellings, and cracks. ZYMV is vectored by aphids and can be seedborne. Papaya Ringspot Virus (PRSV-W) is another potyvirus that causes leaf and fruit distortion and ringspots. Cucumber Mosaic Virus (CMV) is transmissible through infected seed, and by the parasitic weed dodder, and by many species of aphid. Viruses are not curable.

**Cultural Control:** The best management is selection of resistant cultivars. Plants with viruses should be removed from the field. Insect vectors should be monitored and controlled.

**Chemical Controls:** None available for viruses.

**Papaya  
Ringspot  
Virus**



Photo Credit: Sherrie Smith, University of Arkansas Cooperative Extension

**Watermelon  
Mosaic Virus**



Photo Credit: Sherrie Smith, University of Arkansas Cooperative Extension

**Zucchini Yellow  
Mosaic Virus**



Photo Credit: Sherrie Smith, University of Arkansas Cooperative Extension

CUCURBIT VEGETABLE DISEASES (COMMERCIAL PRODUCTION)						
DISEASE	PRODUCT	ACTIVE INGREDIENT	FRAC CODE	RATE	DAYS TO HARVEST	COMMENTS
<b>Angular leaf spot</b> ( <i>Pseudomonas syringae</i> pv. <i>lachrymans</i> )	Kocide 2000	copper hydroxide	M1	1-2.25 lb		Crop injury may occur at high rates.
<b>Alternaria leaf spot</b>	Topsin or T-Methyl 70W	thiophanate-methyl	1	16 oz	0	Not for Alternaria or Cercospora. See Fungicide resistance management guidelines.
<b>Anthrachnose</b> ( <i>Colletotrichum</i> spp.)	Topsin or T-Methyl 4.5F	thiophanate-methyl	1	10 oz	1	Not for Alternaria or Cercospora. See Fungicide resistance management guidelines.
<b>Cercospora leaf spot</b> ( <i>Cercospora citrulina</i> )	Quadris 2.08 SC	azoxystrobin	11	11 - 15.5 fl oz	1	See Fungicide resistance management guidelines.
	Cabrio 20 EC	pyraclostrobin	11	12 - 16 oz	0	See Fungicide resistance management guidelines.
	Bravo Weatherstick (multiple generics)	chlorothalonil	M5	12 - 16 oz	3	See label on other chlorothalonil fungicides.
<b>Gummy stem blight</b> ( <i>Didymella bryoniae</i> )	Dithane DF (multiple generics)	mancozeb	M3	32 - 48 oz	5	
	Aprovia Top 1.62 EC	difenoconazole + benzovindiflupyr	3 + 7	10.5 - 13.5 fl oz	0	
	Inspire Super 2.82 SC	difenoconazole + cyprodinil	3 + 9	16 - 20 fl oz	7	
<b>Target spot</b> ( <i>Corynespora cassiicola</i> )	Luna Experience 3.3 F	fluopyram + tebuconazole	7 + 3	8 - 17 fl oz	0	
	Luna Sensation 1.67 F	fluopyram + trifloxystrobin	7 + 11	7.6 fl oz	0	
	Switch 62.5 WG	cyprodinil + fludioxonil	9 + 12	11 - 14 oz	0	
	Quadris Top 1.67 SC	azoxystrobin + difenoconazole	11 + 3	12 - 14 fl oz	0	
	Pristine 38 WG	pyraclostrobin + boscalid	11 + 7	12.5 - 18.5 oz	0	
	Tanos 50 WP	famoxadone + cymoxanil	11 + 27	8 oz	3	Only Alternaria and Anthracnose.
	Quadris Opti	azoxystrobin + chlorothalonil	11 + M5	3.2 pt	1	
	Gavel 75 DF	zoxamide + mancozeb	22 + M3	1.5 - 2.0 lb	5	Cercospora and Alternaria only.
	Orondis Opti 3.37 SC	oxathiapiprolin + chlorothalonil	49 + M5	1.75 - 2.5 fl oz	0	
	Orondis Ultra 2.33 SC	oxathiapiprolin + mandipropamid	49 + 40	5.5 - 8.0 fl oz	0	
<b>Downy Mildew</b> ( <i>Pseudoperonospora cubensis</i> )	Reason 500 SC	fenamidone	11	5.5 oz	14	See Fungicide resistance management guidelines.
	Cabrio 20 EC	pyraclostrobin	11	8 - 12 oz	0	See Fungicide resistance management guidelines.
	Flint 50 WG	trifloxystrobin	11	4 oz	0	See Fungicide resistance management guidelines.
	Pristine 38 WG	pyraclostrobin + boscalid	11 + 7	12.5 - 18.5 oz	0	
	Ranman 400 SC	cyazofamid	21	2.0 - 2.75 fl oz	0	
	Curzate 60 DF	cymoxanil	27	3.5 - 8 oz	3	
	Previcur Flex 6 F	propamocarb	28	1.2 pt	2	
	Omega 500 F	fluazinam	29	0.75 - 1.5 pt	30	
	Aliette 80 WDG	fosetyl-AL	33	2 - 5 lb	1	
	Forum 4.18 F	dimethomorph	40	6 fl oz	0	
	Revus 2.08 SC	mandipropamid	40	8 fl oz	1	

CUCURBIT VEGETABLE DISEASES (COMMERCIAL PRODUCTION)						
DISEASE	PRODUCT	ACTIVE INGREDIENT	FRAC CODE	RATE	DAYS TO HARVEST	COMMENTS
<b>Downy Mildew</b> <i>(Pseudoperonospora cubensis)</i> Continued	Presidio 4 F	fluopicolide	43	6 fl oz	2	
	Dithane DF (multiple generics)	mancozeb	M3	32 - 48 oz	5	
	Tanos 50 WP	famoxadone + cymoxanil	11 + 27	8 oz	3	
	Ridomil Gold Bravo SC 3. 67	mefenoxam + chlorothalonil	4 + M5	2 lb	7	
	Gavel 75 DF	zoxamide + mancozeb	22 + M3	1.5 - 2.0 lb	5	
	Orondis Opti 3.37 SC	oxathiapiprolin + chlorothalonil	49 + M5	1.75 - 2.5 fl oz	0	Good on downy mildew
	Orondis Ultra 2.33 SC	oxathiapiprolin + mandipropamid	49 + 40	5.5 - 8.0 fl oz	0	
<b>Powdery Mildew</b> <i>(Sphaerotheca spp. or Erysiphe cichoracearum)</i>	Powdery Mildew of cucurbits is caused by two fungal genera, Sphaerotheca and Erysiphe, that can quickly (high risk) develop resistance to fungicides. Use a tank mix or premix with two modes of action (different FRAC Code numbers) and avoid sequential use of a single chemistry (same FRAC Code number) within the same season.					
	Ralley 40 WSP	myclobutanil	3	2.5 - 5 oz	1	
	Velum Prime	fluopyram	7	6.5 - 6.8 fl oz	0	
	Fontelis 1.67 SC	penthiopyrad	7	12 - 16 fl oz	0	
	Quintec 2.08 SC	quinoxifen	13	4 - 6 oz	3	
	Bravo Weatherstick (multiple generics)	chlorothalonil	M5	16 - 24 oz	3	See label on other chlorothalonil fungicides.
	Torino 0.85 SC	cyflufenamid	U06	3.4 oz	0	Resistance is known in some populations.
	Gatten	flutianil	U13	6 - 8 fl oz	0	Cantaloupe, cucumber, and squash only.
	Inspire Super 2.82 SC	difenoconazole + cyprodinil	3 + 9	16 - 20 fl oz	7	
	Luna Experience 3.3 F	fluopyram + tebuconazole	7 + 3	8 - 17 fl oz	7	
	Switch 62.5 WG	cyprodinil + fludioxonil	9 + 12	11-14 oz	1	
	Quadris Top 1.67 SC	azoxystrobin + difenoconazole	11 + 3	12 - 14 fl oz	1	
	Pristine 38 WG	pyraclostrobin + boscalid	11 + 7	12.5 - 18.5 oz	0	
	Quadris Opti 1.0 SC	azoxystrobin + chlorothalonil	11 + M5	3.2 qt		
	Aprovia Top 1.62 EC	difenoconazole + benzovindiflupyr	3 + 7	10.5 - 13.5 fl oz	0	
	Orondis Opti 3.37 SC	oxathiapiprolin + chlorothalonil	49 + M5	1.75 - 2.5 fl oz	0	



CUCURBIT VEGETABLE DISEASES (HOMEOWNER)						
DISEASE	PRODUCT	ACTIVE INGREDIENT	FRAC CODE	RATE	DAYS TO HARVEST	COMMENTS
<b>Bacterial Leaf and Fruit Spots</b> (copper mostly effective against bacterial diseases, but labeled also for fungal diseases)	Serenade Garden Disease Control**	Bacillus subtilis	44	RTU*	0 - 14 days (See label)	
	Natria Disease Control**	Bacillus subtilis	44	RTU*	0	Approved for organic use
	Bonide Copper Dust	copper hydroxide	M1	2.25 - 6 oz/gal.	0	Begin to apply in plant bed as soon as plants are established. Repeat at 4-14 day intervals throughout growing season
	Bonide Liquid Copper Fungicide Concentrate	copper sulfate	M1	0.5- 2 oz/gal.	0	Also available RTU*
	Natural Guard Copper Soap RTU*	copper soap	M1	RTU*	Label	Apply at first evidence of disease
<b>Fungal leaf spots</b>	Serenade**	Bacillus subtilis	44	2-4 fl oz/gal.	0	Spray plants to run-off, covering both top and bottom surface of foliage to ensure thorough coverage
	Serenade Garden Disease Control**	Bacillus subtilis	44	RTU*	0 - 14 days (See label)	
	Ortho Garden Disease Control	chlorothalonil	M5	1 tbs/gal.	0 - 14 days (See label)	Apply in early morning or late evening using 1 gal spray per 250 sq ft of garden (10 x 25 ft). Good coverage is essential. Apply at first sign of disease and every 7 - 14 days as needed
	Bonide Fung-onil RTU*	chlorothalonil	M5	RTU*	0 - 14 days (See label)	Apply at first sign of disease and every 7 - 14 days as needed
	Bonide Fung-onil Concentrate	chlorothalonil	M5	2 - 2.75 tsp/gal.	0 - 14 days (See label)	Apply at first sign of disease and every 7 - 14 days as needed
	Garden Tech Daconil Concentrate	chlorothalonil	M5	1.5 tsp - 1 tbs/gal.	0 - 14 days	Apply at first sign of disease and every 7 - 14 days as needed
	Ferti-lome Liquid Fungicide	chlorothalonil	M5	2 tbs/gal.	0	Apply at first sign of disease and every 7 - 14 days as needed
	Hi-Yield Vegetable, Flower, Fruit And Ornamental Fungicide	chlorothalonil	M5	6 tsp/gal.	0	Begin applications when dew or rain occur and Disease threatens. Use the highest rate and shortest interval specified when Disease conditions are severe.
	Monterey Fruit Tree, Vegetable & Ornamental Fungicide	chlorothalonil	M5	2 1/2 tsp. /gal for 200 sq ft.	0	Begin applications when dew or rain occur and disease threatens. Use the highest rate and shortest interval specified when disease conditions are severe.
	Bonide Mancozeb FL with Zinc Concentrate	mancozeb	M3	2 - 5 tsp/gal	3 - 14 days (see label)	Use sufficient water for thorough coverage.

CUCURBIT VEGETABLE DISEASES (HOMEOWNER)						
DISEASE	PRODUCT	ACTIVE INGREDIENT	FRAC CODE	RATE	DAYS TO HARVEST	COMMENTS
<b>Fungal leaf spots</b> <i>Continued</i>	Neem (various brands)	neem oil	NC***	RTU*	0	This product is most effective when applied on a 7 - 14 day schedule.
	GreenCure**	potassium bicarbonate	NC***	1 - 2 tbs/ gal	1	Potassium bicarbonate fungicide primarily targets powdery mildew on many vegetables. Labeled for organic use.
	Kaligreen**	potassium bicarbonate	NC***	2.5 - 3 lb/A		
	MilStop**	potassium bicarbonate	NC***	2.5 - 3 lb/A		
	Actinovate® Lawn and Garden** (foliar and Pythium, Phytophthora, Rhizoctonia, Fusarium root rots)	Streptomyces lydicus WYEC 108	NC***	1/2 - 2 tsp/ 2 gal	0	May be used as a foliar spray or root drench. See label.
	Natria Fruit and Vegetable Ready to Use	sulfur + pyrethrins	M2	RTU*	1	For best control apply as a protective spray early in the season before the diseases are noticed. Re-spray every 7 - 10 days or after rain.
	Bonide Tomato and Vegetable Concentrate	sulfur + pyrethrins	M2	5 oz/gal	1	Thoroughly spray all areas of the plant, especially new shoots and the underside of leaves.
	Miracle-Gro Nature's Care 3-in-1 Insect, Disease, and Mite Control RTU*	sulfur + pyrethrins	M2	RTU*	1	
<b>Virus Diseases</b>	No chemical controls					

# COMMON INSECT PESTS IN CUCURBITS

**Cultural and Mechanical controls:** Cultural and mechanical control tactics can be used successfully to control insect pests of cucurbits. Some methods are more suited to larger plantings while others are suitable for smaller home gardens. Individually, these methods may lack the efficacy of insecticidal sprays, but a combination of techniques can provide comparable degrees of protection or prevent infestations entirely. Specific methods include crop rotation to non-cucurbit crops or allowing the planted area to lay fallow for a year, utilizing resistant crop varieties, utilizing field sanitation and tillage, utilizing perimeter trap cropping, timing of planting to avoid periods of high pest pressure, use of floating row covers to prevent pest access, use of reflective mulches, and finally hand removal is always an option in small garden areas.

**Biological controls:** Many species of parasitoids and predatory insects attack cucurbit insect pests. Careful monitoring of pest species and using insecticidal control measures only when warranted can help preserve natural enemies and allow them to help maintain pest species populations below damaging levels.

## SQUASH VINE BORER

It is too late to control Squash vine borer in summer squash once vine wilting occurs. Control measures should have been started as soon as vines began to run in spring and early summer. If you keep an eye out for the adults at that time of year, you will often see them flying through the vegetable garden in the spring looking for suitable host plants. The borers are the larvae of a clearwing moth, *Melittia satyriniformis*, which emerges from the soil in the spring and lays eggs singly on the undersides of squash and pumpkin vines, usually at the base of the plant. When the larvae hatch, they burrow into the stem and start feeding. This causes the eventual collapse and death of the vine. Growers don't notice anything wrong until the vine starts wilting. Large white worms with brown heads can be seen if stems are cut open. You can sometimes find the larvae in the squash fruit as well. Mature larvae eventually exit the plants, burrow into the soil where they pupate until the following spring. Products containing bifenthrin, or Malathion applied as sprays or dusts are effective. Continue on a 7 to 10-day reapplication schedule for 3 to 5 weeks.



Squash vine borer larvae in a collapsed squash stem. Photo Credit: Sherrie Smith, University of Arkansas Cooperative Extension

## SQUASH BUGS



Squash bug eggs on the underside of leaf. Photo Credit: Sherrie Smith, University of Arkansas Cooperative Extension



Squash bug. Photo Credit: Whitney Cranshaw, Colorado State University, Bugwood.org.

Squash bugs, *Anasa tristis*, are possibly the most aggravating insect pest in vegetable gardens. Squash bugs feed on plant foliage using specialized mouthparts to pierce the foliage and suck plant sap. Symptoms of their feeding are brown necrotic areas on the leaves/stems, and fruit. Large numbers cause plants to wilt and sometimes die. They attack cucurbit crops, preferring pumpkin and squash. Adults overwinter in debris such as leaves, rocks, wood, and grasses. In the spring they fly to a host plant to mate

and lay eggs. Their eggs are small, reddish-brown ovals laid in clusters on the underside of the leaves. The nymphs hatch and immediately start feeding on the plant. It takes 4-6 weeks for them to mature. Populations can skyrocket almost overnight. Sanitation is very important in squash bug control. In the fall, all garden debris as well as dead leaves should be cleaned up. Scout for the egg clusters early and squash them when found. Place a flat board in the garden next to plants. At night the squash bugs will congregate underneath it and can be easily killed. Insecticides are most effective if applied while nymphs are small. Products containing bifenthrin (Ortho), carbaryl (Sevin), or cyfluthrin (Bayer) are labeled for control. Commercial growers may use Brigade, or Thionex, or Asana XL.



## APHIDS

Melon aphids (*Aphis gossypii*) and several other aphid species attack cucurbits, particularly melons and cucumbers. Usually, cucurbits are not attacked by aphids until the vines form runners. Look for these insects on the undersides of the leaves.

Aphids are small, soft-bodied, pear shaped insects. The largest ones are not much longer than one-sixteenth of an inch in length. Their color varies from pale yellow to dark green to almost black. A pair of small tube-like/tail-pipe structures called cornicles extends backward and upward from the posterior of the aphid. The first individuals to colonize a plant will usually have wings, but then wingless aphids become the dominant form until crowding occurs or the plant deteriorates. Then winged aphids will again be produced allowing for dispersal to other plants.

Aphids feed by inserting their long, piercing-sucking mouthparts into the plant's vascular system and suck out plant sap. In doing so, they excrete large amounts of sugary, sticky honeydew. Honeydew is a source of food for a black fungus known as sooty mold and for ants. Aphid tending ants will actually protect the aphids from attack by other beneficial insects and may move aphids to other leaves.

Aphids aren't normally an issue in commercially grown pumpkins in Arkansas. On watermelon and cantaloupe, the first sign of aphid damage is a downward curling and crumpling of the leaves, which also appear thickened and may glisten with sticky honeydew.

On squash, aphids are often found on lower leaves and on flower buds and flowers. If plants are heavily attacked when very young they may be killed, otherwise, aphid infestations can cause a reduction in the quality and quantity of the fruit. Aphids are also involved in the spread of several viruses that affect all cucurbits and can transmit viruses to crops even when present in low numbers. However, most modern cucurbit varieties are resistant to common viruses. Insecticidal control of aphids will not control the spread of virus; instead, use of row covers over new plantings until first flowers are present, use of stylet oil sprays, and use of reflective mulches (aluminum foil-covered beds) can delay virus spread.

Insecticides such as pyrethroids, pyrethrins, or organophosphates that are used to control other cucurbit pests kill the natural enemies that usually keep aphids in check and can lead to flare-ups of spider mites and aphids. If you've used insecticides in your commercially grown cucurbits during the growing season, including many organic options, then you need to be scouting for aphids. There are many product options for aphid control in commercially grown cucurbits such as acetamiprid (Assail, Tristar, and Anarchy), flupyradifurone (Sivanto Prime), and flonicamid (Beleaf). Aphid control is necessary when populations are building on every few plants and the natural enemy complex was collapsed by other insecticide sprays.

In the home garden, aphid populations may be held in check by natural factors including rain, wind, parasitoids (e.g., tiny wasps) and predators (e.g., lady beetles). Spraying leaves with soapy water then rinsing with clear water, spraying with insecticidal soap, and using yellow sticky card traps (which are attractive to aphids) are also effective control measures, especially in greenhouses. Products for use by homeowners in the home garden to control aphids on cantaloupes, cucumbers, pumpkins, squash, and watermelons include: acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer); bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-G-Gon Insect Killer for Lawns and Gardens); cyfluthrin 0.75% (Bayer Advanced) **for Squash, Pumpkin, and Watermelon ONLY**; esfenvalerate 0.425% (Monterey); imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate); malathion 50% (Ortho, Bonide); and soap (insecticidal, M-Pede 49 EC). To obtain effective aphid control, you must obtain good spray coverage. Sprays must be directed at the feeding sites on the undersurface of leaves.



**Melon Aphids, *Aphis gossypii*.** Photo Credit: University of Massachusetts Amherst Extension

## PICKLE WORMS

The pickleworm can be a common late season pest of commercial cucurbits in Arkansas and can affect cucurbits in the home garden. Control is rarely required before August, but damage is common if this insect is ignored during August and September. Pickleworm is a tropical insect that routinely survives the winter only in south Florida and possibly south Texas and successive generations migrate north becoming a late summer pest in Arkansas cucurbits as mentioned above. The pickleworm can complete its life cycle (egg to adult) in about 30 days. Early instar pickleworm larvae have spots which disappear in later instars. Over much of its range, multiple and overlapping generations may occur.

Pickleworm feeds on both wild and cultivated cucurbit species. Summer squash and the winter squash species are favored hosts. Pumpkin is of variable quality as a host.



**Old pickleworm larvae.** Photo Credit: Clemson University - USDA Cooperative Extension Slide Series

Cucumber and cantaloupe, are attacked but not preferred and watermelon would be considered an unusual host. Among all cucurbits, summer squash is most preferred, and most heavily damaged. Cultivars vary widely in susceptibility to attack, but truly resistant cultivars are not available.

Pickleworm has several natural enemies (insect predators and parasites), but none reliably suppress

damage. It is very difficult to scout for this insect and predict its appearance. Moths are not attracted to light traps, and pheromone traps are not commercially available.

Where pickleworm damage is likely to occur and because the internal feeding behavior of larvae is so difficult to detect preventative applications of chemical insecticides are recommended from the onset of fruiting through harvest. In areas where pickleworm occurs only sporadically there are many seasons when damage will not occur, but commercial producers routinely apply insecticides as a preventative measure because prediction of occurrence is so unreliable.

Honey bees and other pollinators are very important in cucurbit production, and insecticide application can interfere with pollination by killing bees. If insecticides are to be applied when blossoms are present, it is advisable to use insecticides with little residual activity, and to apply insecticides late in the day, when honey bee activity is minimal.

The use of row covers to prevent moths from laying eggs on the cucurbit foliage can be a useful cultural control for pickleworm. But, given that plants must be pollinated, usually by honey bees, plants should be uncovered during the day when honey bees are active and covered at night when the night-flying pickleworm moths are actively laying eggs. This is a practice that could be feasible for home gardens.

Insecticides recommended for pickleworm control in the home garden include acetamiprid, azadirachtin, bifenthrin + zeta-cypermethrin, cyfluthrin, esfenvalerate, and malathion. Repeated use of pyrethroid insecticides can lead to flare-ups of spider mites and aphids.



**Young pickleworm larva.** Photo Credit: Clemson University, USDA Cooperative Extension Slide Series, Bugwood.org



## THRIPS

Thrips are not usually a significant pest of home garden cucurbits in Arkansas. They are very small insects that rasp, tear, and remove nutrients from leaves, causing a silver streaking of the leaf tissue and leaf curling. Blooms and fruit can also be damaged. Thrips also feed on pollen and some species are predaceous. Thrips have a single (left) mandible. This rasp-like mandible is extruded when the mouth cone is compressed on plant tissue. The extruded mandible slashes open epidermal cells and the contents of opened cells are then sucked in through the cone. They often are very abundant early in the season and the damage may be very noticeable on cotyledons and first true leaves.



**Thrips damage on cucumber leaves.** Photo Credit: P.M.J. Ramakers, Applied Plant Research, Bugwood.org

Generally, plants outgrow the damage and often control is not necessary. When thrips are extremely abundant, or if they are damaging blooms or fruit, control may be warranted. Insecticides recommended for control include acetamiprid, azadirachtin, imidacloprid, insecticidal soap, malathion, and spinosad. Organic control may be achieved by repeated, direct applications of neem oil or pyrethrum.

## SPIDER MITES

Two-spotted spider mites (*Tetranychus urticae*) can be a serious problem on cucurbits grown in the home garden, especially watermelons and cantaloupes, during hot, dry weather. They can also build to high densities on cucumbers, most commonly in July or August. This mite pest is more of a sporadic pest on squash and pumpkins. High mite populations are often associated with the use of pyrethroid insecticides.

These tiny mites feed on the contents of individual leaf cells. This damage appears as pale yellow and reddish-brown spots ranging in size from small specks to large areas on the upper sides of leaves. Webbing similar to spider webs may be present around colonies on leaves, stems, and fruit. Damage from large populations can develop very quickly and can kill leaves and reduce yield. Because of their small size, spider mites are hard to detect until vines are damaged with hundreds of mites on each leaf. Certain insecticides applied at planting or as foliar sprays for control of other insect pests can contribute to severe outbreaks of mites on cucurbits by killing their natural enemies (predatory mites and beneficial insects such as lady beetles and minute pirate bugs). Spider mites do not always develop to damaging levels, so plants in the home garden should be visually monitored on a regular basis (look for leaf symptoms and mites on the underside of leaves). Also, the use of insecticides for control of spider mites should be on an as-needed basis.

In the home garden, control can be achieved with applications of insecticidal soaps, making certain to obtain good spray cov-



**Twospotted Spider Mite Stippling Injury to Pumpkin Leaves.** Photo Credit: Whitney Cranshaw, Colorado State University, Bugwood.org

erage. These sprays should be initiated before the spider mite numbers get too high and must be directed at the feeding sites on the underside of leaves. Repeat applications may be necessary. Squash leaves are easily burned by insecticidal soaps, so use the most dilute concentration recommended, and use sparingly. Infested plants can also be washed thoroughly with a directed stream of water early in the morning to physically remove mites. This timing allows cucurbit foliage to dry before evening. Insecticides labeled for spider mite control in cucurbits (see product label for specific crop use) include insecticidal soap, pyrethrins + sulfur, and malathion.



## WHITEFLIES

Whiteflies are a sporadic pest that can attack commercial cucurbits in Arkansas but rarely causes trouble in home gardens. Several species can occur in cucurbits including the silverleaf, greenhouse, and sweetpotato whitefly. Adult whiteflies are small insects that are slightly less than 1/16 of an inch in length and disperse in clouds when disturbed. The body and wings of adults are covered with a fine, whitish powdery wax that is opaque in appearance. Wings of the silverleaf whitefly are held tent-like over a yellow body while at rest. Adult females oviposit on the underside leaves and lay pointed oblong yellow eggs that darken at the tip just before hatching. A mobile first instar or crawler stage settles on the leaf and develops through immobile second, third, and fourth instars which look like semi-transparent, flat, oval scales. Later instars are more yellow and more easily seen without the aid of a hand lens, typically have very distinct eyespots and are referred to as “red-eyed nymphs.” The life cycle takes about 40 days, depending on temperature but can be as short as two weeks under very warm temperatures. Eggs and early immature stages of whitefly generally occur on the underside of younger leaves. Whitefly adults also concentrate on younger leaves where they lay the most eggs. Larger nymphs are typically more numerous on older leaves. Whiteflies feed in the plant vascular system (phloem) through a stylet similar to that of aphids and, like aphids, process a relatively large volume of plant sap and excrete the excess liquid in the form of honeydew. When whiteflies are very numerous, the sticky honeydew they produce supports the growth of sooty mold on leaves. Squash and pumpkin are susceptible to silverleaf, a disorder caused by feeding of immature stages. For unknown reasons, epidermal cells separate from the cells below them, leaving air spaces, which make the leaves appear silver. New growth will be normal once whiteflies are controlled. Silverleaf whitefly can affect cucurbits directly by its feeding and by acting as a vector of several serious viruses diseases.

In the home garden, cultural, mechanical, and biological controls may hold low populations in check. Isolate and treat infestations (or discard plants) early before the insects have a chance to spread. A number of beneficial insects (parasites and predators) attack whiteflies, such as parasitic wasps, lady beetles, green lacewings and various predaceous bugs. These natural enemies do not remove the whiteflies but they can reduce their numbers so that little damage results. Yellow sticky boards have been used with some success in the control of adult whiteflies. This method may be most useful in a home greenhouse. Whiteflies have a natural attraction to the color yellow, and if yellow boards are painted with a sticky material, whiteflies will fly to them and adhere.

This insect is difficult to manage and multiple insecticide applications over the approximately 40 day life cycle are required as the life stages overlap and susceptibility to insecticides differ with different life stages. When using insecticides good coverage of leaf undersides is important for control. Repeat sprays may be needed. Recommended insecticides for controlling higher populations include acetamiprid, azadirachtin, bifenthrin + zeta-cypermethrin, cyfluthrin, esfenvalerate (not cantaloupe), imidacloprid, insecticidal soap, and malathion



**Silverleaf Whitefly Adults.** Photo Credit: Scott Bauer, USDA Agricultural Research Service, Bugwood.org - Description: Silverleaf Whitefly Adults. Scott Bauer, USDA Agricultural Research Service, Bugwood.org

CUCURBITS VEGETABLE INSECT CONTROL RECOMMENDATIONS (COMMERCIAL)							
CROP	INSECT	INSECTICIDE	FORMULATION PER ACRE	LB AI/ACRE	APPLICATION	REMARKS/ PRECAUTIONS	DAYS TO HARVEST
<b>CUCURBITS</b> (Cantaloupe, cucumber, melons, pumpkin, squash, summer squash and watermelon)	<b>Aphids</b>	acetamiprid Assail 30 SG	2.5 oz-4 oz	0.048-0.077			0
		acetamiprid + bifenthrin Savoy	9.6-12.9 oz			Maximum of 38.7 oz a season	3
		flonicamid Beleaf 50SG	2-2.8 oz	0.062-0.089			0
		flupyradifurone Sivanto Prime	7-14 fl oz	0.09-0.18		DO NOT use foliar applications in muskmelon, cantaloupe, or honeydew melon	1
		sulfoxaflor Transform WG	0.75	0.023		Check label for crop rotation restrictions	1
	<b>Cucumber beetles</b>	acetamiprid Assail 30 SG	2.5 oz-5.3 oz	0.05-0.1			1
		acetamiprid + bifenthrin Savoy	6-12.9 oz			Maximum of 38.7 oz a season	3
		beta-cyfluthrin Baythroid XL	2.4-2.8 oz	0.019-0.022			0
		bifenthrin (R) Brigade 2 EC	2.6-6.4 fl oz	0.04-0.1			3
		Carbaryl Sevin XLR Plus Sevin 4F	1 qt 1 qt	1.0	When insects first appear	Sevin is highly toxic to honeybees. Avoid excessive applications. DO NOT apply when foliage is wet. DO NOT apply during bloom.	3
		clothianidin Belay 50 WDG	3 – 4 oz	0.05-0.067		DO NOT use adjuvant with foliar applications. DO NOT use after 4th true leaf.	
		dinotefuran Venom 70 SG Scorpion 35 SL	3-4 oz 2-7 fl oz	0.05-0.18			1
		imidacloprid Admire Pro 4.6 F	7-10.5 fl oz	0.28-0.38		Admire applied into soil is highly effective against cucumber beetles and can reduce seedling loss. Soil Application Only.	21
		lambda-cyhalothrin (R) Karate Z	1.28-1.92 fl oz	0.02-0.03			1
		malathion Malathion 5 EC	1.5-2.75 pt	0.94-1.7		Use no more than 1.5 pints on winter squash or pumpkins or 2 pints on watermelons.	1
		methomyl (R) Lannate 2.4 LV Lannate SP	1.5-3 pt 1/2-1 lb	0.45-0.9		DO NOT use Lannate on pumpkins.	1 (lower rate) 3 (higher rate)

CUCURBITS VEGETABLE INSECT CONTROL RECOMMENDATIONS (COMMERCIAL)							
CROP	INSECT	INSECTICIDE	FORMULATION PER ACRE	LB AI/ACRE	APPLICATION	REMARKS/ PRECAUTIONS	DAYS TO HARVEST
<b>CUCURBITS</b> (Cantaloupe, cucumber, melons, pumpkin, squash, summer squash and watermelon)	<b>Cucumber Beetles</b>	zeta-cypermethrin (R) Mustang Maxx 0.8 EC	2.8-4.0 oz	0.0175-0.025			1
		zeta-cypermethrin + bifenthrin Hero	10.3 oz	0.1			3
	<b>Flea beetles</b> Tobacco budworm, Beet armyworm	methomyl (R) Lannate 2.4 LV Lannate SP	1 1/2-3 pt 1/2-1 lb	0.45-0.9	When insects first appear	One day up to 2 pt, over 2 pt 3 days. DO NOT apply to pumpkins.	1-3
		methoxyfenozide Intrepid 2F	4-10 oz	0.06-0.16		Not for control of tobacco budworm.	3
		spinosad SpinTor 2 SC	4-8 fl oz	0.0625-0.125		Not labeled for flea beetles.	3
	<b>Mites</b> (Mites are primarily a problem on cucumber and watermelon)	abamectin Agri-Mek 0.7 SC	1.75-3.5 oz	0.01-0.019		Must be mixed with an adjuvant (NIS surfactant)	7
		bifenazate Acramite 50 WS	0.75-1 lb	0.375-0.5		Only one application per season.	3
		extazole Zeal 2.88 SC	4-6 fl oz	0.09-0.135		Does not kill Adults. Do Not make more than 1 application per season	7
		spiromesifen Oberon 2 SC	7-8.5 oz	0.11-0.13			7
	<b>Pickleworm, Melonworm, Cutworms</b>	acetamiprid + bifenthrin Savoy	6-12.9 oz			Maximum of 38.7 oz a season	3
		beta-cyfluthrin Baythroid XL	1.6-2.4 oz	0.013-0.019			0
		bifenthrin (R) Brigade 2 EC	2.6-6.4 fl oz	0.04-0.1		Bifenthrin is the only registered insecticide that provides moderate control of squash bug	3
		carbaryl Sevin XLR Plus Sevin 4F	1 qt 1 qt	1.0	When insects or damage first appears.	Avoid excessive applications. DO NOT apply when foliage is wet. DO NOT apply during bloom.	3
		chlorantraniliprole Coragen 1.67 SC	2-3.5 fl oz	0.025-0.045			3
		Cyantraniliprole Exirel 0.83 EC	7-13.5 fl oz	0.45-0.88			1
		esfenvalerate (R) Asana XL 0.66 EC	5.8-9.6 oz	0.03-0.05		Asana may cause some phytotoxicity to zucchini squash	3
		lambda-cyhalothrin (R) Karate Z	1.28-1.92 oz	0.02-0.03			1
		methoxyfenozide Intrepid 2F	4-10 fl oz	0.06-0.15			3



CUCURBITS VEGETABLE INSECT CONTROL RECOMMENDATIONS (COMMERCIAL)							
CROP	INSECT	INSECTICIDE	FORMULATION PER ACRE	LB AI/ACRE	APPLICATION	REMARKS/ PRECAUTIONS	DAYS TO HARVEST
<b>CUCURBITS</b> (Cantaloupe, cucumber, melons, pumpkin, squash, summer squash and watermelon)	<b>Pickleworm, Melonworm, Cutworms</b>	permethrin (R) Ambush 2.0 EC Pounce 3.2 EC	6.4-12.8 oz 4-8 oz	0.1-0.2	When insects or damage first appear		0
		spinetoram Radiant 1 SC	5-10 oz	0.038-0.079			3
		spinosad SpinTor 2 SC	4-8 oz	0.062-0.125		Follow label directions. SpinTor does not control squash bug	3
		zeta-cypermethrin + bifenthrin Hero	10.3 oz	0.1			3
	<b>Squash Bug</b> (Rarely a pest of cucumber or watermelon)	acetamiprid + bifenthrin Savoy	12.9 oz			Maximum of 38.7 oz a season	3
		beta-cyfluthrin Baythroid XL	1.6-2.4 oz	0.013-0.019			0
		bifenthrin (R) Brigade 2 EC	2.6-6.4 fl oz	0.04-0.1		Bifenthrin is the only registered insecticide that provides moderate but effective control of squash bug nymphs. Almost no control should be expected of adult squash bugs.	3
		carbaryl Sevin XLR Plus Sevin 4F	1 qt 1 qt	1.0	When insects or damage first appear	Avoid excessive applications. DO NOT apply when foliage is wet. DO NOT apply during bloom.	3
		esfenvalerate (R) Asana XL 0.66 EC	5.8-9.6 oz	0.03-0.05		Asana may cause some phytotoxicity to zucchini squash.	3
		lambda-cyhalothrin (R) Karate Z	1.28-1.92 fl oz	0.02-0.03			1
		permethrin (R) Ambush 2.0 Pounce 3.2	6.4-12.8 oz 4-8 oz	0.1-0.2	When insects or damage first appear		0
		Zeta-cypermethrin + bifenthrin Hero	10.3 oz	10.3 oz			3
	<b>Squash Vine Borer</b> (Only attacks squash and pumpkin)	acetamiprid Assail 30 SG	5 oz	0.1		Not generally a serious issue in large plantings of squash or pumpkin. Consider a blue hubbard squash trap crop for control.	0
		acetamiprid + bifenthrin Savoy	6-12.9 oz	0.1			3

CUCURBITS VEGETABLE INSECT CONTROL RECOMMENDATIONS (COMMERCIAL)							
CROP	INSECT	INSECTICIDE	FORMULATION PER ACRE	LB AI/ACRE	APPLICATION	REMARKS/ PRECAUTIONS	DAYS TO HARVEST
<b>CUCURBITS</b> (Cantaloupe, cucumber, melons, pumpkin, squash, summer squash and watermelon)	<b>Squash Vine Borer</b> (Only attacks squash and pumpkin)	bifenthrin (R) Brigade 2 EC	2.6-6.4 fl oz	0.04-0.1			3
		chlorantraniliprole Coragen 1.67 SC	3.5-5 fl oz	0.045-0.065			3
		lambda-cyhalothrin (R) Karate Z	1.28-1.92 fl oz	0.02-0.03			1
	<b>Whiteflies</b>	acetamiprid Assail 30 SG	2.5 oz-4 oz	0.048-0.077		Insecticide use will not effectively reduce high populations of whiteflies. Removal of alternate host plants (Weeds) along with field plowing immediately after harvest aids in population suppression.	0
		acetamiprid + bifenthrin Savoy	6-12.9 oz				3
		chlorantraniliprole Coragen 1.67 SC	5-7 fl oz	0.065-0.09	Use on nymphs only		1
		Cyantraniliprole Exirel 0.83 EC	13.5-20 fl oz	0.088-0.133			1
		pyriproxyfen Knack 0.86 EC	8-10 oz	0.05-0.067			7
		sulfoxaflor Transform WG	2.0-2.25	0.063-0.071			1
		thiomethoxam Actara 25 WDG	3-5.5 oz	0.047-0.086	Follow label directions		0

## CUCURBITS VEGETABLE INSECT CONTROL RECOMMENDATIONS (HOME GARDEN)

CROP	INSECT	INSECTICIDE & FORMULATION	FORMULATION PER GALLON OF SPRAY	DAYS BETWEEN LAST APPLICATION AND HARVEST	REMARKS/ PRECAUTIONS
CANTALOUPE	Aphids, thrips	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Aphids ONLY. Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		esfenvalerate 0.425% (Monterey)	1 fl oz	3	Aphids ONLY. Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho, Bonide)	see label	1	Refer to label.
		soap (insecticidal, M-Pede 49 EC)	2 Tbsp	0	On foliage as needed.
		spinosad 0.5% (Bonide, Monterey, Natural Guard)	2.0 fl oz	3	Thrips ONLY. Refer to Label
	Cucumber beetle (spotted and striped), pickleworm, squash bug, squash vine borer	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	APHIDS only. Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		carbaryl (various brands)	see label	3	Repeat applications as needed up to a total of 6 times but not more than once every 7 days. For optimum control of squash bugs, apply sufficient spray volume for thorough coverage and time sprays for early morning or late afternoon.
		cyfluthrin 0.75% (Bayer Advanced)	0.5 fl oz	0	NOT for squash vine borer. DO NOT spray more than 4 times per season.



CUCURBITS VEGETABLE INSECT CONTROL RECOMMENDATIONS (HOME GARDEN)					
CROP	INSECT	INSECTICIDE & FORMULATION	FORMULATION PER GALLON OF SPRAY	DAYS BETWEEN LAST APPLICATION AND HARVEST	REMARKS/ PRECAUTIONS
CANTALOUPE	Cucumber beetle (spotted and striped), pickle-worm, squash bug, squash vine borer <i>Cont'd.</i>	esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	Cucumber beetles ONLY. This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho, Bonide)	see label	1	Refer to label. NOT for squash bug.
	Leafhopper	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		cyfluthrin 0.75% (Bayer Advanced)	0.5 fl oz	0	DO NOT spray more than 4 times per season.
		esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho)	1 Tbsp	1	Refer to label.
	Spider mite	malathion 50% (Ortho, Bonide)	see label	1	Refer to label.
		soap (insecticidal, M-Pede 49 EC)	2 Tbsp	0	On foliage as needed.

CUCURBITS VEGETABLE INSECT CONTROL RECOMMENDATIONS (HOME GARDEN)					
CROP	INSECT	INSECTICIDE & FORMULATION	FORMULATION PER GALLON OF SPRAY	DAYS BETWEEN LAST APPLICATION AND HARVEST	REMARKS/ PRECAUTIONS
CANTALOUPE	Whitefly	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-G-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		cyfluthrin 0.75% (Bayer Advanced)	0.5 fl oz	0	Adults ONLY. DO NOT spray more than 4 times per season.
		esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho)	1 Tbsp	1	Refer to label.
CUCUMBER	Aphids	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-G-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho, Bonide)	see label	1	Refer to label.

CUCURBITS VEGETABLE INSECT CONTROL RECOMMENDATIONS (HOME GARDEN)					
CROP	INSECT	INSECTICIDE & FORMULATION	FORMULATION PER GALLON OF SPRAY	DAYS BETWEEN LAST APPLICATION AND HARVEST	REMARKS/ PRECAUTIONS
CUCUMBER	Cucumber beetle (spotted and striped), pickleworm, squash bug	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		carbaryl (various brands)	see label	3	Repeat applications as needed up to a total of 6 times but not more than once every 7 days. For optimum control of squash bugs, apply sufficient spray volume for thorough coverage and time sprays for early morning or late afternoon.
		cyfluthrin 0.75% (Bayer Advanced)	0.5 fl oz	0	DO NOT spray more than 4 times per season.
		esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	Cucumber beetles ONLY. This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
	Leafhopper	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		cyfluthrin 0.75% (Bayer Advanced)	0.5 fl oz	0	DO NOT spray more than 4 times per season.
		esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.

CUCURBITS VEGETABLE INSECT CONTROL RECOMMENDATIONS (HOME GARDEN)					
CROP	INSECT	INSECTICIDE & FORMULATION	FORMULATION PER GALLON OF SPRAY	DAYS BETWEEN LAST APPLICATION AND HARVEST	REMARKS/ PRECAUTIONS
CUCUMBER	Leafhopper	imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho)	see label	1	Refer to label.
	Spider mite	malathion 50% (Ortho, Bonide)	see label	1	Refer to label.
		soap (insecticidal, M-Pede 49 EC)	2 Tbsp	0	On foliage as needed.
	Thrips	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho)	See label	1	Refer to label.
		spinosad 0.5% (Bonide, Monterey, Natural Guard)	2.0 fl oz	1	Refer to Label
	Whitefly	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		cyfluthrin 0.75% (Bayer Advanced)	0.5 fl oz	0	Adults ONLY. DO NOT spray more than 4 times per season.
		esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.



CUCURBITS VEGETABLE INSECT CONTROL RECOMMENDATIONS (HOME GARDEN)					
CROP	INSECT	INSECTICIDE & FORMULATION	FORMULATION PER GALLON OF SPRAY	DAYS BETWEEN LAST APPLICATION AND HARVEST	REMARKS/ PRECAUTIONS
CUCUMBER	Whitefly	malathion 50% (Ortho)	see label	1	Refer to label.
		soap (insecticidal, M-Pede 49 EC)	2 Tbsp	0	On foliage as needed.
SQUASH, PUMPKIN	Aphids	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	7	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		cyfluthrin 0.75% (Bayer Advanced)	0.5 fl oz	0	DO NOT spray more than 4 times per season.
		esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho, Bonide)	see label	1 (squash) 3 (pumpkin)	Refer to label.
		soap (insecticidal, M-Pede 49 EC)	2 Tbsp	0	
	Cucumber beetle (spotted and striped), flea beetle, leafhopper	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		carbaryl (various brands)	see label	3	Repeat applications as needed up to a total of 6 times but not more than once every 7 days.
		cyfluthrin 0.75% (Bayer Advanced)	0.5 fl oz	0	DO NOT spray more than 4 times per season.
		esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.

CUCURBITS VEGETABLE INSECT CONTROL RECOMMENDATIONS (HOME GARDEN)					
CROP	INSECT	INSECTICIDE & FORMULATION	FORMULATION PER GALLON OF SPRAY	DAYS BETWEEN LAST APPLICATION AND HARVEST	REMARKS/ PRECAUTIONS
SQUASH, PUMPKIN	Cucumber beetle (spotted and striped), flea beetle, leafhopper	imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho, Bonide)	see label	1 (squash) 3 (pumpkin)	Refer to label.
	Pickleworm	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		carbaryl (various brands)	see label	3	Repeat applications as needed up to a total of 6 times but not more than once every 7 days.
		cyfluthrin 0.75% (Bayer Advanced)	0.5 fl oz	0	DO NOT spray more than 4 times per season.
		esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		malathion 50% (Ortho, Bonide)	see label	1 (squash) 3 (pumpkin)	Refer to label.
	Spider mite	malathion 50% (Ortho, Bonide)	see label	1 (squash) 3 (pumpkin)	Refer to label.
	Squash bug	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		carbaryl (various brands)	see label	3	Repeat applications as needed up to a total of 6 times but not more than once every 7 days. For optimum control of squash bugs, apply sufficient spray volume for thorough coverage and time sprays for early morning or late afternoon.
		cyfluthrin 0.75% (Bayer Advanced)	0.5 fl oz	0	DO NOT spray more than 4 times per season.

CUCURBITS VEGETABLE INSECT CONTROL RECOMMENDATIONS (HOME GARDEN)					
CROP	INSECT	INSECTICIDE & FORMULATION	FORMULATION PER GALLON OF SPRAY	DAYS BETWEEN LAST APPLICATION AND HARVEST	REMARKS/ PRECAUTIONS
SQUASH, PUMPKIN	Squash Bug	esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
	Squash vine borer	bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-G-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		malathion 50% (Ortho, Bonide)	see label	1 (squash) 3 (pumpkin)	Refer to label.
		acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
	Thrips	imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho)	see label	1 (squash) 3 (pumpkin)	Refer to label.
		spinosad 0.5% (Bonide, Monterey, Natural Guard)	2.0 fl oz	3	Refer to Label
		acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
	Whitefly	bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-G-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		cyfluthrin 0.75% (Bayer Advanced)	0.5 fl oz	0	Adults ONLY. DO NOT spray more than 4 times per season.

## CUCURBITS VEGETABLE INSECT CONTROL RECOMMENDATIONS (HOME GARDEN)

CROP	INSECT	INSECTICIDE & FORMULATION	FORMULATION PER GALLON OF SPRAY	DAYS BETWEEN LAST APPLICATION AND HARVEST	REMARKS/ PRECAUTIONS
SQUASH, PUMPKIN	Whitefly	esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho)	see label	1 (squash) 3 (pumpkin)	Refer to label.
WATERMELON	Aphids	acetamiprid (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		cyfluthrin 0.75% (Bayer Advanced)	0.5 fl oz	0	DO NOT spray more than 4 times per season.
		esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho, Bonide)	see label		Refer to label.
		soap (insecticidal, M-Pede 49 EC)	2 Tbsp	0	On foliage as needed.
	Cucumber beetle (spotted and striped)	acetamiprid (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	7	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		carbaryl (various brands)	see label	3	Repeat applications as needed up to a total of 6 times but not more than once every 7 days.



## CUCURBITS VEGETABLE INSECT CONTROL RECOMMENDATIONS (HOME GARDEN)

CROP	INSECT	INSECTICIDE & FORMULATION	FORMULATION PER GALLON OF SPRAY	DAYS BETWEEN LAST APPLICATION AND HARVEST	REMARKS/ PRECAUTIONS
WATERMELON	Cucumber Beetle (spotted and striped)	cyfluthrin 0.75% (Bayer Advanced)	0.5 fl oz	0	DO NOT spray more than 4 times per season.
		esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho, Bonide)	see label	1	Refer to label.
	Leafhopper	acetamiprid (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-Gon Insect Killer for Lawns and Gardens)	1.5 fl oz	3	Apply when insects first appear. Reapply as necessary to maintain control waiting at least 7 days between applications.
		cyfluthrin 0.75% (Bayer Advanced)	0.5 fl oz	0	DO NOT spray more than 4 times per season.
		esfenvalerate 0.425% (Monterey)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho)	see label	1	Refer to label.
	Pickleworm	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		bifenthrin 0.3% + zeta-cypermethrin 0.075% (Ortho Bug-Gon Insect Killer for Lawns & Gardens)	1.5 fl oz	3	Apply when insects first appear. Re-apply as necessary to maintain control waiting at least 7 days between applications.
		cyfluthrin 0.75% (Bayer Advanced Vegetable & Garden Insect Spray Concentrate)	0.5 fl oz	0	Adults only. Do not spray more than 4 times per season

## CUCURBITS VEGETABLE INSECT CONTROL RECOMMENDATIONS (HOME GARDEN)

CROP	INSECT	INSECTICIDE & FORMULATION	FORMULATION PER GALLON OF SPRAY	DAYS BETWEEN LAST APPLICATION AND HARVEST	REMARKS/ PRECAUTIONS
WATERMELON	Pickleworm	esfenvalerate 0.425% (Monterey Bug Buster II)	1 fl oz	3	Spray plants to wet upper and lower leaf surfaces until dripping. Apply as necessary to maintain control waiting at least 7 days between each application.
		malathion 50% (Ortho, Bonide)	see label	1	
	Spider mite	malathion 50% (Ortho, Bonide)	see label	1	Refer to label.
		soap (insecticidal, M-Pede 49 EC)	2 Tbsp	0	
	Thrips	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		carbaryl (various brands)	see label	3	Repeat applications as needed up to a total of 6 times but not more than once every 7 days.
		imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho)	see label	1	Refer to label.
		soap (insecticidal, M-Pede 49 EC)	2 Tbsp	0	
		spinosad 0.5% (Bonide, Monterey, Natural Guard)	2.0 fl oz	3	Refer to Label
	Whitefly	acetamiprid 0.5% (Ortho Flower, Fruit & Vegetable Insect Killer)	1.5 fl oz	0	Maximum applications per season (5). Days to wait to reapply (5).
		carbaryl (various brands)	see label	3	Repeat applications as needed up to a total of 6 times but not more than once every 7 days.
		imidacloprid 0.235% (Bayer Advanced Fruit, Citrus and Vegetable Insect Control Concentrate)	0.5 fl oz/1 qt of water/10 sq ft of row as a drench	21	This systemic insecticide dissolved in water moves down through the soil, where it is absorbed by the roots. Once absorbed, it moves up through the plant providing insect protection.
		malathion 50% (Ortho)	see label	1	Refer to label.
		soap (insecticidal, M-Pede 49 EC)	2 Tbsp	0	
		spinosad 0.5% (Bonide, Monterey, Natural Guard)	2.0 fl oz	3	Refer to Label

## WEED CONTROL IN CUCURBIT PRODUCTION

Cucurbits are high-value crops and can be labor intensive for transplanting, for harvest, for shipment, and unfortunately, for weed control. Weeds are problematic because they compete with crops for light, nutrients, and water. The prostrate growth habit of cucurbits makes them relatively non-competitive against erect growing weeds, such as Palmer amaranth. Shaded cucurbits will not yield as well as those receiving full sun. Also, weeds growing alongside your cucurbits will take up portions of your irrigation water and fertilizer, robbing your crop of much needed resources!

A specific problem for larger cucurbit vines, such as watermelon or pumpkins, is that the seeds or transplants are positioned with wide spaces between rows and within rows. Eventually, mature vines will fill those gaps, but these open spaces early in the season leave room for problematic weeds to emerge and grow before the crop can shade them out. Additionally, pumpkins and watermelons typically require an extended growing season, which allows weeds to grow to towering heights and drop thousands of seeds for next year's crop. Thus, weed management is of paramount importance for successful cucurbit production. Because weeds are generally prolific seed producers, one weedy year can cause problems for many subsequent growing seasons.

The best options for weed control in cucurbits is the use of preventative measures: mulching around plants, use of preemergent herbicides, or use of transplants to speed-up canopy closure (vs. direct seeded). These practices are especially important due to the relatively limited number of chemical weed control options. Unfortunately, cucurbits are sensitive to many herbicide products, so the options are limited. Further, many chemicals require applications using specialized equipment, such as a shielded or hooded sprayer to prevent herbicides contacting the cucurbit foliage.

### **Before using herbicides, it is important to keep a few tips in mind:**

Soil-applied, preemergent herbicides require a rainfall or irrigation event soon after application to ensure maximum efficacy. Be sure to look at weather forecasts or use irrigation to activate soil applied herbicides, if no rain is in the forecast.

Postemergent products often require a surfactant to increase uptake by the weeds; be sure to check the label for instructions. Postemergent weed control is dependent on weed size, and smaller weeds are easier to kill than large plants.

Always read and follow label instructions. The herbicide label includes all the information needed for a safe and effective application of a herbicide. Further, it is a violation of federal law to make any application in violation of label instructions. Read and follow the label!

### **Hand-pulling or Hoeing?**

One last consideration is whether your production area small enough to be managed mechanically or even pulled by hand? In many cases, a vegetable garden in the backyard is most easily weeded by hoeing or by hand-pulling rather than through chemical means. However, even a quarter acre can become overgrown with weeds so densely that hand-pulling is not feasible. The information below will help you decide which weed control options would be effective for controlling some of the most common and problematic weeds in cucurbit production. When applying chemical herbicides, be sure to check the product labels for specific rates and application timings.

## LARGE CRABGRASS (*Digitaria sanguinalis*)



Large crabgrass is a summer annual grass weed that is covered with fine hairs.  
**Close-up: Seedling crabgrass.** Photo Credit: John Boyd, University of Arkansas Cooperative Extension

Large crabgrass is a summer annual weed that germinates well in disturbed soils, such as those prepared for cucurbit planting. Its seed can easily invade from field margins as soil is worked or grass is mowed; and if unmanaged, it can grow to sizeable plant, a broad base with many elongated tillers. As an annual weed, it reproduces exclusively by seed. Thus, effective preemergent herbicides could prevent this weed from becoming a problem. However, extended growing seasons for some cucurbits and label restrictions may make season-long chemical control unviable. Fortunately, selective chemistry is labeled for in-season treatment of large crabgrass without harming the crops.

**Cultural control:** Plastic mulch, straw mulch, or shallow cultivation between rows can prevent early season establishment of this weed. However, it may become a problem toward season's end as cucurbit vines run together and cultivation is no longer possible. Mulch integrity is very important to prevent emergence of this species. Tears in plastic or tire tracks through straw may create openings for this weed to germinate.

**Chemical control:** Many preemergent herbicides can prevent this annual weed from interfering with early season cucurbit growth (e.g., Command®, Strategy™, Dual Magnum®<sup>1</sup>/Brawl™, Treflan™<sup>2</sup>, Curbit®); however, late season flushes of crabgrass can breakthrough if preemergent herbicides degrade over time. In these instances, a postemergent application of Poast® (sethoxydim) or Select® (clethodim) are effective options to kill this weed. It is important to treat these weeds when they are small for effective control.

<sup>1</sup>Dual Magnum has a Section 24(c) special local needs label for use in watermelon and requires applicators to access supplemental documentation from the manufacturer website prior to application.

<sup>2</sup>Treflan is labeled for use in row middles only.



## GOOSEGRASS (*Eleusine indica*)

This annual grass species grows well in compacted soils, particularly where implements pass through the field. You may notice dense growth of this weed where tire-tracks compressed the soil between planting rows. Unfortunately, it can also be spotted within rows and along irrigation lines. Goosegrass can be identified by its flattened stems, white coloration at the base of leaf sheaths, and a characteristic flattened center with tillers extending outward. As an annual weed, it returns each year via seed; thus, any management strategy that prevents seed production should be emphasized.

**Cultural control:** Plastic mulch, straw mulch, or shallow cultivation between rows can prevent early season establishment of this weed. However, it will become a problem toward season's end as cucurbit vines run together and cultivation is no longer possible. Mulch integrity is very important to prevent emergence of this species. Tears in plastic or tire tracks through straw may create openings for this weed to germinate.

**Chemical control:** Many preemergent herbicides can prevent this annual weed from interfering with early season cucurbit growth (e.g., Command®, Strategy™, Dual Magnum®<sup>1</sup>/Brawl™, Treflan™<sup>2</sup>, Curbit®); however, late season flushes of goosegrass can breakthrough if preemergent herbicides degrade over time. In these instances, a postemergent application of Poast® (sethoxydim) or Select® (clethodim) are effective options to kill this weed. It is important to treat these weeds when they are small for effective control.

<sup>1</sup>Dual Magnum has a Section 24(c) special local needs label for use in watermelon and requires applicators to access supplemental documentation from the manufacturer website prior to application.

<sup>2</sup>Treflan is labeled for use in row middles only.

Goosegrass is a summer annual grassy weed, typically found in compacted soils. It grows as a bunch grass with prostrate tillers extended outward. Close-up: Flowers of goosegrass.



Photo Credit: John Boyd, University of Arkansas Cooperative Extension

## BROADLEAF SIGNALGRASS (*Urochloa platyphylla*)

Broadleaf signalgrass is a bunch-type summer annual grass, native to the southeastern and south-central United States. It can be distinguished by its relatively short and wide leaf blades which are characteristically folded or creased toward the tip. Because it is an annual weed, any management strategy that can reduce seed production should be a high priority to reduce the population of this pest in fields.

**Cultural control:** Plastic mulch, straw mulch, or shallow cultivation between rows can prevent early season establishment of this weed. However, it will become a problem toward season's end as cucurbit vines run together and cultivation is no longer possible. Mulch integrity is very important to prevent emergence of this species. Tears in plastic or tire tracks through straw may create openings for this weed to germinate.

**Chemical control:** Many preemergent herbicides can prevent this annual weed from interfering with early season cucurbit growth (e.g., Command®, Strategy™, Dual Magnum®<sup>1</sup>/Brawl™, Treflan™<sup>2</sup>, Curbit®); however, late season flushes of broadleaf signalgrass can breakthrough if preemergent herbicides degrade over time. In these instances, a postemergent application of Poast® (sethoxydim) or Select® (clethodim) are effective options to kill this weed. It is important to treat these weeds when they are small for effective control.

<sup>1</sup>Dual Magnum has a Section 24(c) special local needs label for use in watermelon and requires applicators to access supplemental documentation from the manufacturer website prior to application.

<sup>2</sup>Treflan is labeled for use in row middles only.



**Broadleaf signalgrass is a summer annual grassy weed with a distinctive, short leaf blade, relative to many other grasses.** Photo Credit: John Boyd, University of Arkansas Cooperative Extension



## CROWFOOT GRASS (*Dactyloctenium aegyptium*)

Crowfoot grass is a bunch-type summer annual grass, native to the southeastern and south-central United States. It is most easily identified by its seed heads which have 4 to 6 combed spikelets. Additionally, this grass is fairly unique due to its fine hairs along the entire margin of the leaf blade. Because it is an annual weed, any management strategy that can reduce seed production should be a high priority to reduce the population of this pest in fields.

**Cultural control:** Plastic mulch, straw mulch, or shallow cultivation between rows can prevent early season establishment of this weed. However, it will become a problem toward season's end as cucurbit vines run together and cultivation is no longer possible. Mulch integrity is very important to prevent emergence of this species. Tears in plastic or tire tracks through straw may create openings for this weed to germinate.

**Chemical control:** Many preemergent herbicides can prevent this annual weed from interfering with early season cucurbit growth (e.g., Command®, Strategy™, Dual Magnum®<sup>1</sup>/Brawl™, Treflan™<sup>2</sup>, Curbit®); however, late season flushes of broadleaf signalgrass can breakthrough if preemergent herbicides degrade over time. In these instances, a postemergent application of Poast® (sethoxydim) or Select® (clethodim) are effective options to kill this weed. It is important to treat these weeds when they are small for effective control.

<sup>1</sup>Dual Magnum has a Section 24(c) special local needs label for use in watermelon and requires applicators to access supplemental documentation from the manufacturer website prior to application.

<sup>2</sup>Treflan is labeled for use in row middles only.



Crowfoot grass has distinct comb-like inflorescences when mature, usually in groups of 4 to 6. Photo Credit: John Boyd, University of Arkansas Cooperative Extension



Crowfoot grass has short hairs that extend from the margins of the leaf blade. Photo Credit: John Boyd, University of Arkansas Cooperative Extension

## PURPLE AND YELLOW NUTSEGE (*Cyperus rotundus* and *Cyperus esculentus*)

Purple and yellow nutsedge are perineal sedges, commonly recognized as the most troublesome weeds in the world. Sedges appear superficially similar to grass species, with parallel veins and extended leaf blades; however, sedges are distinct from grasses physiologically and morphologically. This is important because the recommended herbicides for control of grass species will have no effect on these sedge species! Additionally, purple and yellow nutsedge are capable of reproducing via below-ground tubers, which are small, hard storage organs borne on the ends of subterranean rhizomes. A trick for distinguishing sedges from other grass species is to check for a triangular stem, a feature of these perennial sedge species.

**Cultural control:** Unfortunately, plastic mulch is not sufficient to suppress nutsedge emerging from tubers. These plants can penetrate the mulch and will actually grow more rapidly than if they had emerged on bareground. Note: it is counter-productive to lightly-till when these plants emerge. A single tillage event will only spread tubers across your property, causing more widespread infestation with these problematic weeds. Multiple tillage events could help, but weather and planting may not make that possible.

**Chemical control:** Fumigation is an effective option but requires specialized equipment and chemicals that are not readily available from distributors in the area. Instead, preemergent applications with Dual Magnum<sup>®1</sup>/Brawl<sup>™</sup> (S-metolachlor), Sandea<sup>®</sup>/Profine<sup>™</sup> (halosulfuron), or League<sup>®</sup> (imazosulfuron) can be used for suppression of this weed. However, complete control may not be achieved with a preemergence treatment. If your crop is cantaloupe, cucumber, or pumpkin, broadcast applications of Sandea<sup>®</sup>/Profine<sup>™</sup> are permitted after the crop has reached to 3 to 5 leaves but before the first female flower appears. However, these applications are not permitted for squash and watermelon. In these crops, Sandea<sup>®</sup>/Profine<sup>™</sup> must be applied to row middles with hooded or shielded sprayers to prevent contact with the crop foliage. If using a shielded sprayed for row middles, glyphosate is another good postemergent option on small nutsedge plants. These herbicides have crop-specific restrictions relating to application timing and placement, and further restrictions relating to plastic mulch and specific cucurbit crops. Be sure to carefully check the herbicide label to avoid crop injury or illegal applications for your specific cucurbit crop.



Purple nutsedge produces purple flowers when mature.

Photo Credit: Matt Bertucci, University of Arkansas Cooperative Extension



Purple and yellow nutsedge are capable of penetrating plastic mulch, making weed control very challenging within planting rows. Photo Credit: Matt Bertucci, University of Arkansas Cooperative Extension

<sup>1</sup>Dual Magnum has a Section 24(c) special local needs label for use in watermelon and requires applicators to access supplemental documentation from the manufacturer website prior to application.

Yellow nutsedge grows in dense clumps and produces yellow flowers when mature. Close-up: Purple and yellow nutsedge have triangular stems. Photo Credit: John Boyd, University of Arkansas Cooperative Extension



## COMMON PURSLANE AND PINK PURSLANE

(*Portulaca oleracea* and *Portulaca pilosa*)

These purslane species are a summer annual weeds with fleshy, succulent stems and leaves. Brightly colored yellow petals and somewhat spoon shaped leaves are characteristic of common purslane, while pink purslane exhibits pointed leaves, pink-petaled flowers, and fine hairs along the stem. Leaves of these plants have a thick cuticle, which grows thicker in times of drought stress. This thickened cuticle can be an effective barrier if herbicides are not properly mixed with a surfactant!

**Cultural control:** Plastic mulch, straw mulch, or shallow cultivation between rows can prevent early season establishment of this weed. However, it will become a problem toward season's end as cucurbit vines run together and cultivation is no longer possible. Mulch integrity is very important to prevent emergence of this species. Tears in plastic or tire tracks through straw may create openings for this weed to germinate.

**Chemical control:** Many preemergent herbicides can prevent this annual weed from interfering with early season cucurbit growth (e.g., Command®, Strategy™, Dual Magnum®<sup>1</sup>/Brawl™, Treflan™<sup>2</sup>, Curbit®). Postemergent control of purslane is more difficult, and the best chemical options would be glyphosate applied to row middles, using a shielded or hooded sprayer. Check the herbicide label for mixing surfactants, so the herbicide can penetrate the cuticle.

<sup>1</sup>Dual Magnum has a Section 24(c) special local needs label for use in watermelon and requires applicators to access supplemental documentation from the manufacturer website prior to application.

<sup>2</sup>Treflan is labeled for use in row middles only.



Common purslane has rounded, succulent leaves and stems. Its stem is reddish in color, and it produces yellow flowers when mature. Photo Credit: John Boyd, University of Arkansas Cooperative Extension



Pink purslane has pointed, succulent leaves and stems. Its stem is covered in fine hairs. Close-up: Pink purslane produces bright pink flowers when mature. Photo Credit: Charles Peacock, North Carolina State University Extension

## ANNUAL SEDGE (*Cyperus compressus*)

Annual sedge is a summer annual weed that looks superficially similar to grass species, displaying parallel veins and extended leaf blades. However, sedges are distinct from grasses physiologically and morphologically. This is important because the recommended herbicides for control of grass species will have no effect on these sedge species! A trick for distinguishing sedges from other grass species is to check for a triangular stem, a feature of sedges. Annual sedge is a smaller plant than the nutsedge species and can typically be found in dense clusters, when present in a field. Because this is an annual weed species, elimination of seed production should be a high priority for management.



Annual sedges may appear similar to grasses, but they are from different plant families. Close-up: flowers of annual sedge. Photo Credit: John Boyd, University of Arkansas Cooperative Extension

**Cultural control:** Plastic mulch can prevent emergence of this weed in rows. Between-row cultivation or straw mulch between rows may prevent early season encroachment by this weed. Eventually, vines will begin to run and prevent cultivation between rows, so late flushes of this weed may become a problem on bareground areas.

**Chemical control:** Preemergent applications with Dual Magnum<sup>®1</sup>/Brawl<sup>™</sup> (S-metolachlor), Sandea<sup>®</sup>/Profine<sup>™</sup> (halosulfuron), or League<sup>®</sup> (imazosulfuron) can be used for suppression of this weed. However, complete control may not be achieved with a preemergence treatment. If your crop is cantaloupe, cucumber, or pumpkin, broadcast applications of Sandea<sup>®</sup>/Profine<sup>™</sup> are permitted after the crop has reached to 3 to 5 leaves but before the first female flower appears. However, these applications are not permitted for squash and watermelon. In these crops, Sandea<sup>®</sup>/Profine<sup>™</sup> must be applied to row middles with hooded or shielded sprayers to prevent contact with the crop foliage. If using a shielded sprayed for row middles, glyphosate is another good postemergent option on small sedge plants. These herbicides have crop-specific restrictions relating to application timing and placement, and further restrictions relating to plastic mulch and specific cucurbit crops. Be sure to carefully check the herbicide label to avoid crop injury or illegal applications for your specific cucurbit crop.

<sup>1</sup>Dual Magnum has a Section 24(c) special local needs label for use in watermelon and requires applicators to access supplemental documentation from the manufacturer website prior to application.



## PALMER AMARANTH (*Amaranthus palmeri*)

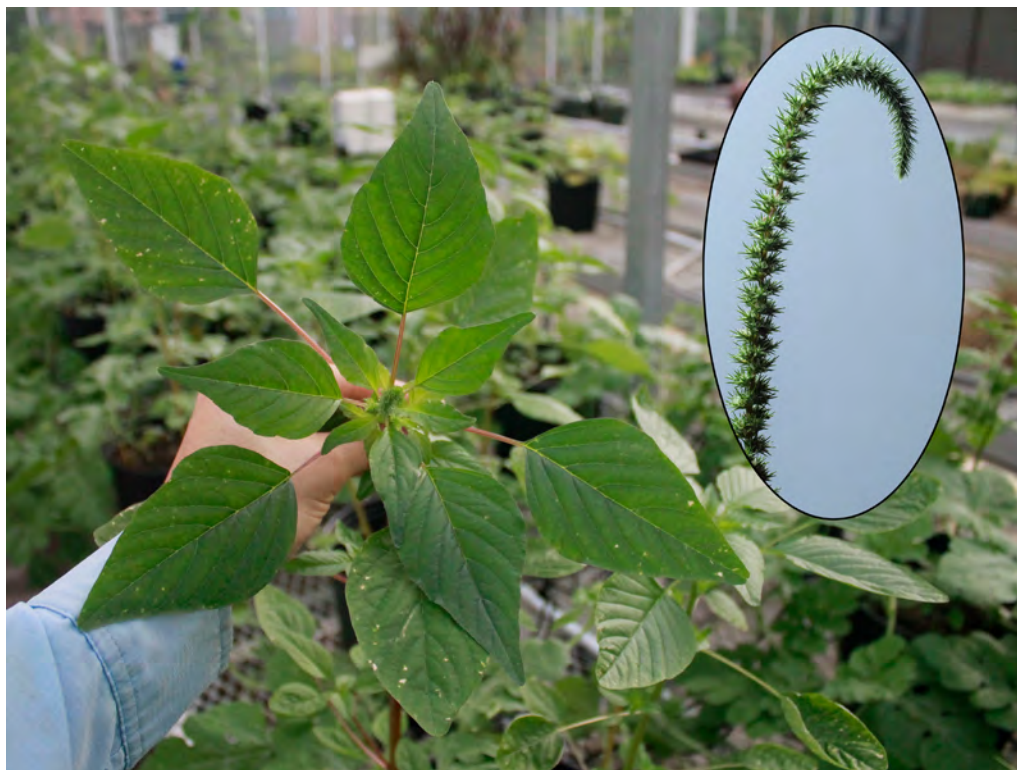
Palmer amaranth is probably the most infamous weed in the country, though many people may know it by its nickname “pigweed”. Its rapid growth, prolific seed production (a single female can produce over 600,000 seed!), and development of herbicide resistance make Palmer amaranth a very troublesome weed for row crop producers. In horticultural production, this weed can be just as problematic; but hopefully, proactive weed management strategies can prevent severe infestations of this weed in your fields. While true of all annual weeds, it is especially important to eliminate seed production this weed!

**Cultural control:** Plastic mulch, straw mulch, or shallow cultivation between rows can prevent early season establishment of this weed. However, it will become a problem toward season’s end as cucurbit vines run together and cultivation is no longer possible. Mulch integrity is very important to prevent emergence of this species. Tears in plastic or tire tracks through straw may create openings for this weed to germinate. If female plants are identified, chopped, then removed from a field, the seed contribution will be greatly reduced.

**Chemical control:** Preemergent herbicide options for control of Palmer amaranth in cucurbits includes Dual Magnum®<sup>1</sup>/Brawl™ (S-metolachlor) and Curbit® (ethalfluralin). Postemergent control is more difficult, and the best chemical options would be glyphosate<sup>2</sup>, Sandea®/Profine™ (halosulfuron)<sup>2</sup>, or Aim® (carfentrazone) applied to row middles, using a shielded or hooded sprayer. Because Palmer amaranth grows upright and taller than cucurbit crops, glyphosate or Sandea®/Profine™ could also be applied using a wiper applicator.

<sup>1</sup>Dual Magnum has a Section 24(c) special local needs label for use in watermelon and requires applicators to access supplemental documentation from the manufacturer website prior to application.

<sup>2</sup>Treflan is labeled for use in row middles only.



Palmer amaranth is a tall-growing summer annual broadleaf weed. A single plant can produce hundreds of thousands of seeds. Close-up: The flowers of Palmer amaranth are spiny and arranged on terminal spikes.

Photo Credit: Matt Bertucci, University of Arkansas Cooperative Extension, and David Suchoff, North Carolina State University Extension

## CARPETWEED (*Mollugo verticillata*)

Carpetweed is a summer annual weed with whorled leaves and a decumbent growth habit, growing mostly flat. Between rows, this weed can form dense mats close to the soil line. When growing alongside other vegetation, carpetweed will respond and grow more vertically reaching heights of 8 to 10 inches. Generally, this weed not a major limitation for watermelon production, but dense populations could increase canopy moisture levels, a condition favoring development of foliar diseases.

**Cultural control:** Plastic mulch, straw mulch, cover crops or between-row cultivation can prevent emergence of this weed. However, this opportunistic weed will emerge where mulch is not present. Mulch integrity is critically important to prevent infestations.

**Chemical control:** Preemergent herbicide options for control of carpetweed in cucurbits includes Dual Magnum<sup>®1</sup>/Brawl<sup>™</sup> (S-metolachlor), Curbit<sup>®</sup> (ethalfluralin) or Treflan<sup>™2</sup> (trifluralin). The best options for postemergent control are glyphosate or Aim<sup>®</sup> (carfentrazone) applied to row middles with a shielded sprayer.

<sup>1</sup>Dual Magnum has a Section 24(c) special local needs label for use in watermelon and requires applicators to access supplemental documentation from the manufacturer website prior to application. <sup>2</sup>Treflan is labeled for use in row middles only.



Carpetweed can be identified by its whorled leaf arrangement, spatulate leaf shape, and small white flowers born on nodes. Photo Credit: John Boyd, University of Arkansas Cooperative Extension

## HORSENETTLE (*Solanum carolinense*)



Horsenettle is a perennial weed that grows back from rhizomes beneath the ground. Close-up: Horsenettle stems are covered with spines as the plant matures. Photo Credit: John Boyd, University of Arkansas Cooperative Extension

Horsenettle is a perennial broadleaf weed that grows each summer. It can be identified by its deeply lobed leaves and a series of large spines along the underside of the leaf midveins and stems. Horsenettle is a member of the nightshade family (like eastern black nightshade and ground cherry), and it produces white flowers and small fruit which appear green initially but turn yellow as they mature. It roots in the soil with a deep taproot and can spread outward with underground rhizomes. This weed can be problematic in no-till systems where the soil is relatively undisturbed, particularly in vineyards, orchards, and pastures.

**Cultural control:** Cultivation can disrupt underground rhizomes and slow growth. Plastic mulch can prevent emergence in rows.

**Chemical control:** Unfortunately, preemergent herbicides that affect germinating seeds will not affect horsenettle emerging from vegetative structures, like rhizomes. Glyphosate is the only labeled postemergent

option and would require shielded sprayers to prevent contact with cucurbit foliage. However, with horsenettle, which is commonly found in small patches of a field, the most effective chemical control would be to use spot-spray treatments of glyphosate with a small backpack sprayer.



Horsenettle fruit appear green initially and will turn yellow as they ripen. Photo Credit: John Boyd, University of Arkansas Cooperative Extension



## MORNINGGLORIES (*Ipomea* spp.)

While sometimes valued for their attractive flowers, morningglories can be very problematic weeds in cucurbit production. The trailing vine growth habit of morningglories allows them to entangle cucurbit vines or foliage and open leaves directly above the crop canopy. This is especially apparent when morningglories overrun a trellis system installed for cucumber production. Additionally, morningglories are large seeded annual weeds, which means their seeds can germinate from deeper in the soil profile and may not be susceptible to many preemergent herbicides.



Morningglories grow as trailing vines and have showy flowers.

Photo Credit: John Boyd, University of Arkansas Cooperative Extension

**Cultural control:** Mulch can discourage growth of morningglory species, particularly plastic mulch in rows. Additionally, shallow cultivation can kill emerged seedlings. However, emerged morningglories can quickly grow outward, so morningglories in row middles may grow toward cucurbit plants and become entangled. If the cucurbit and morningglories are entangled, cultivation or tillage could damage desirable plants, and caution is merited.

**Chemical control:** Unfortunately in cucurbit production, the labeled preemergent herbicides with residual activity do not provide good control of morningglory species. Instead, a preplant burndown is possible with glyphosate, Aim® (carfentrazone), or ET® (pyraflufen ethyl). Within the growing season, row-middles can be treated with shielded sprayer applications of the same chemistries: glyphosate, Aim®, or ET®.

## COMMON LAMBSQUARTERS (*Chenopodium album*)

Common lambsquarters is an erect summer annual broadleaf weed. It can most easily be recognized by a mealy gray powder on leaf surfaces. Leaf margins can vary but are often slightly lobed. Its flowers are small and borne on the spikes at the tips of branches. As a summer annual weed, any practice that minimizes or eliminates seed production should be emphasized for management of this weed.

**Cultural control:** Plastic mulch, straw mulch, or shallow cultivation between rows can prevent early season establishment of this weed. However, it will become a problem toward season's end as cucurbit vines run together and cultivation is no longer possible. Mulch integrity is important to prevent emergence of this species. Tears in plastic or tire tracks through straw may create openings for this weed to germinate.

**Chemical control:** Preemergent herbicide options for control of common lambsquarters in cucumbers includes Dual Magnum®<sup>1</sup>/Brawl™ (S-metolachlor), Curbit® (ethalfluralin), Command® (clomazone), and Sandea®/Profine™ (halosulfuron). Postemergent control is more difficult due to the sensitivity of cucurbit crops. If your crop is cantaloupe, cucumber, or pumpkin, broadcast applications of Sandea®/Profine™ are permitted after the crop has reached to 3 to 5 leaves but before the first female flower appears. However, these applications are not permitted for squash and watermelon. In these crops, Sandea®/Profine™ must be applied to row middles with hooded or shielded sprayers to prevent contact with the crop foliage. If using a shielded sprayed for row middles, glyphosate or Aim® (carfentrazone) are good postemergent option on small plants. These herbicides have crop-specific restrictions relating to application timing and placement, and further restrictions relating to plastic mulch and specific cucurbit crops. Be sure to carefully check the herbicide label to avoid crop injury or illegal applications for your specific cucurbit crop.

<sup>1</sup>Dual Magnum has a Section 24(c) special local needs label for use in watermelon and requires applicators to access supplemental documentation from the manufacturer website prior to application.



Common lambsquarters is a summer annual broadleaf weed. It is easy to identify based on its crenate leaf margin and powdery gray material on new leaves. Photo Credit: John Boyd, University of Arkansas Cooperative Extension

## EASTERN BLACK NIGHTSHADE (*Solanum ptycanthum*)

Eastern black nightshade is a summer annual weed in the nightshade family, which is the same family as tomatoes, tobacco, and many weed species. It can be identified by its upright growth habit, purplish tint on the underside of young leaves, and distinctive flowers. The leaf margins are often slightly lobed, but can vary based on environment. Early fruit will appear green before maturing to purplish-black berries.

**Cultural control:** Plastic mulch, straw mulch, or shallow cultivation between rows can prevent early season establishment of this weed. However, it will become a problem toward season's end as cucurbit vines run together and cultivation is no longer possible. Mulch integrity is important to prevent emergence of this species. Tears in plastic or tire tracks through straw may create openings for this weed to germinate.

**Chemical control:** Preemergent herbicide options for control of Eastern black nightshade in cucurbits includes Dual Magnum®<sup>1</sup>/Brawl™ (S-metolachlor) and Command® (clomazone). Postemergent control is more difficult, and the best chemical options would be glyphosate or Aim® (carfentrazone) applied to row middles, using a shielded or hooded sprayer. Because Eastern black nightshade grows upright and taller than cucurbit crops, glyphosate could also be applied using a wiper applicator.

<sup>1</sup>Dual Magnum has a Section 24(c) special local needs label for use in watermelon and requires applicators to access supplemental documentation from the manufacturer website prior to application.



Eastern black nightshade is a summer annual weed with white flowers. Sometimes it leaves will exhibit purple coloring on the underside.

Photo Credit: John Boyd, University of Arkansas Cooperative Extension

## CUCURBITS - PREPLANT BURNDOWN

CROP, SITUATION, & ACTIVE CHEMICAL PER BROADCAST ACRE	WEEDS CONTROLLED	FORMULATED MATERIAL PER BROADCAST ACRE	TIME OF APPLICATION	METHOD OF APPLICATION AND PRECAUTIONS
<b>carfentrazone</b> @ Up to 0.03 lb/A	Annual broadleaves, excellent control of morningglories	<b>Aim 2 EC</b> Up to 2 fl oz/A	Apply to actively growing weeds less than 4 inches tall.	<b>Crops: All transplanted cucurbits</b> Apply to preformed beds. <b>Transplants:</b> Apply no later than 1 day before transplanting. <b>Seeded:</b> Apply no later than 7 days prior to seeding cantaloupe. <b>Not registered for direct-seeded cucumber, pumpkin, squash, watermelon.</b>
<b>glyphosate</b> @ 0.5 to 1 lb/A	Annual grasses and broadleaf weeds	Annual grasses and broadleaf weeds	Apply to emerged and actively growing weeds.	<b>Crops: All cucurbits</b> Apply at least 3 days prior to seeding or transplanting. When applying to plastic mulch, take care to wash herbicide from mulch before transplanting, via 0.5 inch sprinkler irrigation or rainfall.
<b>pyraflufen-ethyl</b> @ 0.0008 to 0.0003 lb/A	Emerged broad-leaf weeds	<b>ET Herbicide</b> 0.208 EC 0.5 to 2 oz/A	Apply as a preplant burndown to emerged weeds.	<b>Crops: All cucurbits.</b> Higher carrier volume will help with efficacy. Addition of 1 to 2% COC is recommended for control. When applying to plastic mulch, take care to wash herbicide from mulch before transplanting, via 0.5 inch sprinkler irrigation or rainfall.

## CUCURBITS - PREEMERGENCE

<b>bensulide @ 5 to 6 lb/A</b>	Annual grasses	<b>Prefar 4 E</b> 5 to 6 qt/A	Apply preplant and incorporate into the soil. Or apply to soil surface after seeding and activate with irrigation	<b>Crops: All cucurbits</b> Incorporate 1 to 2 inches if preplant. Activate with irrigation or rainfall if applied to seeded field.
<b>clomazone @ 0.15 to 0.48 lb/A</b>	Annual grasses and broadleaf weeds; weak on pigweeds and morningglories	<b>Command 3 ME</b> 0.4 to 1.3 pt/A Rate varies with each crop. Check label for specific rates.	Apply immediately after seeding or just prior to transplanting	<b>Crops: All cucurbits</b> For seeded crops, apply after seeding but before emergence. For transplanted crops, ensure the roots of the transplant are below the chemical barrier when planting.
<b>ethalfluralin @ 1.1 to 1.7 lb/A</b>	Annual grasses and some small-seeded broadleaves	<b>Curbit 3 EC</b> 3 to 4.5 pt/A	Apply to the soil surface immediately after seeding. May be banded to row-middles after emergence or for transplanted crops.	<b>Crops: All cucurbits</b> Activation is required via irrigation or rainfall. Crop injury may occur if planting depth is too shallow.
<b>ethalfluralin + clomazone @ 0.4 to 1.2 lb/A + 0.125 to 0.375 lb/A</b>	Small-seeded broadleaves and annual grasses	<b>Strategy 2.1 L</b> 2 to 6 pt/A	Apply following planting before weed emergence.	<b>Crops: All cucurbits</b> Do not apply prior to planting crop. Do not soil incorporate. May be banded between rows of transplanted crops. Do not broadcast over plastic mulch.
<b>pendimethalin @ up to 2.1 pt/A</b>	Annual grasses and some small-seeded broadleaves	<b>Prowl H2O</b> Up to 1 lb/A	Apply to row middles prior to weed emergence. May be reapplied 21 days later.	<b>Crops: cantaloupe, muskmelon, watermelon</b> Apply to row middles before crop has emerged or using shielded sprayers after crop emergence. Do not apply within 35 days of harvest.

\* Use of the Dual Magnum 24(c) labels for spinach, collards, kale, mustard greens, turnip greens, cantaloupe, cucumber, summer squash, watermelon, transplanted broccoli, cabbage and Chinese cabbage requires agreeing to Syngenta's waiver of liability and indemnification agreement. To accept, go to the website, [www.syngenta-us.com/labels/indemnified-label-login](http://www.syngenta-us.com/labels/indemnified-label-login), and register to set up an account. After registering go to the top left of the home page, click on Products and then Indemnified Labels. You will then be prompted to select the state, Arkansas, the product, Dual Magnum and the crop. Read the waiver of liability and indemnification agreement and either accept or decline. If the conditions are unacceptable, return the Dual Magnum herbicide at once unopened or use the Dual Magnum herbicide for a different approved use in accordance with the label on the product container.



CUCURBITS PREEMERGENCE - CONT'D				
CROP, SITUATION, & ACTIVE CHEMICAL PER BROADCAST ACRE	WEEDS CONTROLLED	FORMULATED MATERIAL PER BROADCAST ACRE	TIME OF APPLICATION	METHOD OF APPLICATION AND PRECAUTIONS
<b>halosulfuron @ 0.024 to 0.048 lb/A</b>	Sedges, ragweed, pigweed, smartweed, morning-glory	<b>Profine 75 DG, Sandea 75 DG 0.5 to 1 oz/A</b>	Apply to soil surface 7 days pre-transplant or 7 days before seeding, before plastic installation	<b>Crops: All cucurbits</b> If applying in a mulch system, apply product to formed beds just prior to installation of plastic.
<b>S-metolachlor @ up to 1.27 lb/A</b>	Annual broad-leaves, grasses, and yellow nutsedge	<b>Dual Magnum, Brawl 7.62 EC 1 to 1.33 pt/A</b>	Apply before weed emergence between planting rows.	<b>Crops: Pumpkin</b> Applications made as a broadcast spray over the planted row, hill, or directly to crop foliage will increase chance of crop injury.
<b>S-metolachlor @ up to 1.27 lb/A</b>	Annual broad-leaves, grasses, and yellow nutsedge	<b>Dual Magnum, Brawl 7.62 EC 0.4 to 1.3 pt/A</b> Rate varies with each crop. Check label for specific rates.	Apply before weed emergence. Herbicide will not control emerged weeds.	<b>Section 24(c) label</b> <b>Crops: cantaloupe, cucumber, squash, watermelon</b> Depending on crop and growth stages, may be applied as a broadcast application or to row middles. Check label for specific instructions.
CUCURBITS POSTEMERGENCE				
<b>sethoxydim @ 0.2 to 0.3 lb/A</b>	Annual and perennial grasses only	<b>Poast 1.5 EC 1 to 1.5 pt/A</b>	Apply to emerged grasses. Do not apply within 3 days of harvest for cantaloupe and cucumber or within 14 days of harvest for other cucurbits.	<b>Crops: All cucurbits</b> Addition of 1 qt crop oil concentrate will help with control, but may increase chance of crop injury.
<b>clethodim @ 0.07 to 0.125 lb/A</b>	Annual and perennial grasses only	<b>Arrow, Clethodim Intensity, Select 2 EC 6 to 8 oz/A</b> <b>Intensity One, Select Max 1 EC 9 to 16 oz/A</b>	Apply to actively growing grasses not under drought stress.	<b>Crops: All cucurbits</b> Add 1% crop oil concentrate for 2 EC formulations and 0.5% non-ionic surfactant for 1 EC formulations. Do not apply within 14 days of harvest.
<b>DCPA @ 6 to 7.5 lb/A</b>	Annual grasses and some small-seeded broadleaves	<b>Dacthal W 75 8 to 10 lb/A</b> <b>Dacthal 6 F 8 to 10 pt/A</b>	Must be applied after crop has 4 to 5 leaves and is well-established. This product may offer extended preemergence control of late-emerging weeds.	<b>Crops: Cantaloupe, watermelon</b> Not labelled for transplanted crop. Does not control emerged weeds.

\* Use of the Dual Magnum 24(c) labels for spinach, collards, kale, mustard greens, turnip greens, cantaloupe, cucumber, summer squash, watermelon, transplanted broccoli, cabbage and Chinese cabbage requires agreeing to Syngenta's waiver of liability and indemnification agreement. To accept, go to the website, [www.syngenta-us.com/labels/indemnified-label-login](http://www.syngenta-us.com/labels/indemnified-label-login), and register to set up an account. After registering go to the top left of the home page, click on Products and then Indemnified Labels. You will then be prompted to select the state, Arkansas, the product, Dual Magnum and the crop. Read the waiver of liability and indemnification agreement and either accept or decline. If the conditions are unacceptable, return the Dual Magnum herbicide at once unopened or use the Dual Magnum herbicide for a different approved use in accordance with the label on the product container.



CUCURBITS - POSTEMERGENCE (ROW MIDDLES ONLY) - CONT'D				
CROP, SITUATION, & ACTIVE CHEMICAL PER BROADCAST ACRE	WEEDS CONTROLLED	FORMULATED MATERIAL PER BROADCAST ACRE	TIME OF APPLICATION	METHOD OF APPLICATION AND PRECAUTIONS
<b>halosulfuron @ 0.024 to 0.048 lb/A</b>	Sedges, ragweed, pigweed, smartweed, morning-glory	<b>Profine 75 DG, Sandea 75 DG</b> 0.5 to 1 oz/A	Following crop emergence, apply between rows of direct-seeded or transplanted crop. Avoid contact of herbicide with the crop.	<b>Crops: All cucurbits</b> If applying to a plastic mulch system, avoid contact of equipment with the plastic. Add 0.25% non-ionic surfactant for all postemergence applications. Do not apply within 57 days of harvest for watermelon and cantaloupe. Do not apply within 30 days of harvest for squash and cucumber.
<b>trifluralin @ 0.5 to 1 lb/A</b>	Annual grasses and small-seeded broadleaf weeds	<b>Treflan HFP, Trifluralin, Treflan 4 EC</b> 1 to 2 pt/A	Apply as a directed application between rows, following crop emergence, when crops have reached 3- to 4-true leaf stage.	<b>Crops: All cucurbits</b> Avoid contact with crop foliage. Do not apply within 30 days of harvest, except for watermelon which has a 60 preharvest interval.
<b>carfentrazone @ Up to 0.03 lb/A</b>	Most broadleaf weeds less than 4 in. tall or rosettes less than 3 in. in diameter, does not control grasses.	<b>Aim 2 EC</b> Up to 2 fl oz/A	Apply post-directed to row middles for control of emerged weeds.	<b>Crops: All cucurbits</b> Use a nonionic surfactant or crop oil concentrate to enhance efficacy. Good coverage is critical for acceptable control. Avoid contact with crop canopy to prevent injury.
<b>glyphosate @ 0.5 to 1 lb/A</b>	Annual grasses and broadleaf weeds	<b>Glyphosate (4 lb/gal formulations)</b> 1 to 2 pt/A	Apply as a hooded sprayer to row middles, a shielded sprayer to row middles, a wiper application in row middles, or post-harvest.	<b>Crops: all cucurbits</b> To avoid severe crop injury, do not allow herbicide to contact crop foliage, green shoots, stems, exposed roots, or fruits of crop. Do not apply within 14 days of harvest.
CUCURBITS - HOMEOWNER PRODUCTS				
<b>Trifluralin</b> See label	Annual grasses and small-seeded broadleaf weeds	<b>Preen</b> See label for rates	Apply after crop seedlings have reached 2-3 inches tall.	<b>Crops: All cucurbits</b> This granular formulation can be spread by hand over emerged vegetable gardens. May also be applied after mulching beds.
<b>Sethoxydim</b> See label	Annual and perennial grasses only	<b>GrassGetter</b> See label for rates	Apply to emerged grass weeds. Smaller weeds will be easier to control	<b>Crops: All cucurbits</b> This product will be harmful if applied to grass species and turf near the vegetable garden. Be careful to only apply to the desired vegetable crops. Do not apply within 14 days of harvest..
<b>Glyphosate</b> See label	Annual grasses and broadleaf weeds	<b>Many trade names</b> See label for rates	Apply to emerged and actively growing weeds.	<b>Crops: All cucurbits</b> May be used to kill emerged weeds before planting or used to spot spray weeds within the garden. <b>NOTE:</b> avoid contact of this herbicide with crop foliage or severe crop injury may occur.



