ENY-463

UF UNIVERSITY of FLORIDA
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Insect Management for Celery and Parsley[1]

S. E. Webb[2]

Celery and parsley (and carrots, treated in another chapter) are related crops in the family Apiaceae (Umbelliferae). Both fall in EPA Crop Group 4, Leafy vegetables. To a large degree they share insect pests and are thus treated together here. Most of the information presented refers only to celery, but pest biology and management options can, in most cases, be applied to parsley. Other related leafy vegetables, for which we do not have specific pesticide tables, include Florence fennel (finochio), and chervil. Key insect pests are described below with additional management options. Pesticides registered for use on celery and parsley are listed in two separate tables at the end of this chapter. Many other insects may occasionally attack these crops but seldom cause economic damage.

American Serpentine Leafminer (*Liriomyza trifolii*)

Description

The adult (Figure 1) is a tiny fly, less than 0.1 inches long, with yellow legs and transparent wings. The head is yellow with red eyes. The rest of the body is mostly gray and black. Eggs are tiny, and oval in shape. They are clear at first and then become creamy white. Eggs hatch into small maggots that feed inside the leaf.

Biology

The serpentine leafminer has historically been one of the most serious pests of celery in Florida. It also attacks parsley. Its host range is very broad, including many vegetable and floral crops and weeds.

Adult leafminers feed at flowers. In addition, adult females puncture leaves with their ovipositors (egg-laying organs) and feed on the plant juices that accumulate at the feeding puncture. Males, which only live a few days, cannot puncture the leaf, so they

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2. S. E. Webb, associate professor, Entomology and Nematology Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611-0640.

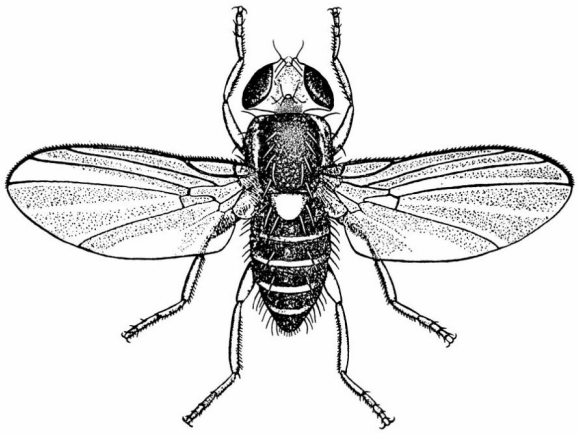

Figure 1. American serpentine leafminer adult (actual size less than 0.1 inches long).

feed after females have left. The female inserts an egg between the upper and lower epidermis (leaf surface), and the larva feeds within the leaf. As the larva feeds, it moves throughout the leaf from within, creating a mine in an irregular line (serpentine mine). The mine increases in diameter as the larva grows and consumes greater amounts of leaf tissue. When fully grown, the larva cuts through the upper leaf surface and leaves the leaf to pupate, falling between the petioles or onto the soil. The larva usually exits the leaf during the morning hours and becomes a pupa by mid-afternoon. After completing the pupal stage, the leafminer emerges from the soil or plant debris as an adult. Adult females can produce 200–-400 eggs in their lifetime on celery.

Although leafminers are more abundant during the middle and late part of the season, they can be a problem at any time. The time required for the leafminer to complete its development on celery in the laboratory has been shown to vary from 14 days at 95° F to 64 days at 59° F. Survival of pupae is very low at 95°, however, and reduced egg laying occurs at 59°. Optimum temperature for survival and egg production is 86° F. A complete life cycle is often completed in 21–-28 days. Temperatures in southern Florida, where celery is now produced exclusively, allow leafminers to develop throughout most of the year.

Damage

Leafminer damage on celery can result in early senescence of outer petioles, longer time to maturity, and a reduction in yield, although celery plants in southern Florida have been shown to withstand substantial leafminer damage without a reduction in growth or yield. Of greater concern to celery and parsley growers is the effect of leafminer feeding on cosmetic quality. Celery plants with insect damage on more than 2 petioles receive a lower grade, according to USDA standards. Protecting celery plants from leafminer damage during the last month of the growing season has been shown to be the key to preventing cosmetic damage to celery in southern Florida.

Table 1. Leafminers

Management Option	Recommendation
Scouting/ Thresholds	During the first two months after transplanting, leafminer populations below 60 pupae per 20 leaflets held for 7 days are acceptable. However, during the final month in the field, leafminer densities as low as 3 pupae per 20 leaflets can result in a significant loss in quality.
Notes	This insect has developed resistance to most commonly used insecticides. The effective insecticides, cyromazine and abamectin, should be strictly rotated according to the label to manage resistance development. Selective insecticides, such as SpinTor and Proclaim, which control armyworm and cabbage looper, also provides some control of leafminer populations and are soft on most beneficial insects.
Natural Enemies	Tiny wasp parasitoids attack the larvae and are quite effective at reducing leafminer populations unless they are eliminated by the use of broad-spectrum insecticides.

Table 1. Leafminers

Management Option	Recommendation
Cultural Controls	Disk fields to destroy and cover infested crop residues as soon as possible after harvest to reduce infestation of neighboring fields by emerging adults.

Beet Armyworm [*Spodoptera exigua* (Hubner)]

Description and Biology

The highly mobile adult moth has dark front wings with mottled lighter markings and hind wings thinly covered with whitish scales. Adults feed on nectar and other moisture sources. Each female can lay over 600 eggs, generally in masses of 80–100 on the undersides of leaves in the lower plant canopy. Egg masses are covered with fuzzy white scales. Larvae (Figure 2) emerge from egg masses in 3 to 4 days. Very young caterpillars, which are pale with dark heads, feed in groups and then disperse as they grow older (third instar). By the third instar, the dull green caterpillars have wavy, light-colored stripes lengthwise down the back and broader stripes on each side. After feeding from one to three weeks, they construct a cocoon from sand and bits of soil and pupate in the soil, emerging as adults about one week later. Beet armyworm is a tropical insect and survives the winter in southern Florida. It can complete many generations a year there. From southern Florida, adults migrate into northern Florida and other parts of the Southeast.

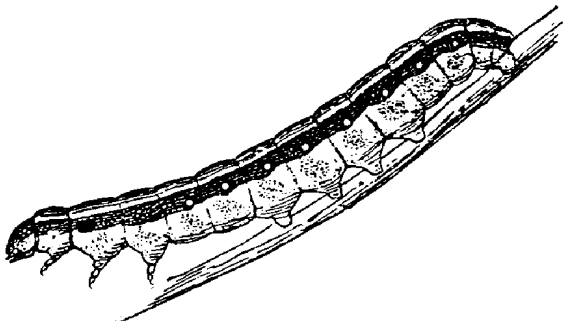

Figure 2. Beet armyworm larva.

Damage

Armyworms are the principal component of a worm complex that is one of the greatest insect problems of celery in the state. The worm complex, which also includes cutworms and occasionally cabbage loopers, among others, appears each year first in south Florida and then moves northward. The most important of the armyworms on celery and parsley is the beet armyworm, which also feeds on many cultivated and wild plants, including corn, pepper, tomato, potato, onion, pea, sunflower, citrus, soybean and tobacco, as well as plantain and lambsquarters.

Beet armyworm damages celery by feeding in and on the petioles and depositing fecal material throughout the plant, rendering it unmarketable. Older larvae feed closer to the base of the plant and are hard to reach with insecticides.

Beet armyworm populations in southern Florida are highest from late March through mid-June, with a smaller population rise from mid-August through October. The increase in the late summer and fall is thought to be related to beet armyworm activity on late summer weeds, while the population increase in the spring coincides with the leafy vegetable production season in southern Florida.

Table 2. Beet armyworm.

Management Option	Recommendation
Scouting/ Thresholds	Fields should be monitored at least weekly for damage by caterpillars feeding on leaves. Pheromone traps can be used to monitor occurrence of moths. Young plants are more susceptible to damage. Look for egg masses on the leaves. Look toward the base of leaves for damage and under outer leaves near the soil surface for larvae that may hide during the day away from their feeding site. Best time to treat for this pest is in early morning or early evening.

Table 2. Beet armyworm.

Management Option	Recommendation
Notes	Insecticides are most effective against the younger instars with higher rates and more frequent applications needed to try to control later instars. Coverage and penetration are important in treating for all of the moth species. Use of surfactants to increase surface coverage increases insecticidal control. Some *Bacillus thuringiensis* (Bt) products are effective against younger larvae and will help preserve natural enemies. Some of the newer products aimed mostly at caterpillar pests are also less harmful to beneficial insects.
Natural Enemies	Insect predators and parasitoids, as well as pathogens aid in control, but generally do not exert enough pressure to prevent yield loss.
Cultural Controls	Field disking and destruction of crop residues are important for control of all caterpillar pests to reduce their migration into nearby crops. Beet armyworms develop well on several weeds in the Amaranth (pigweed) group, so weed control on ditch banks surrounding fields can help reduce populations before they invade fields.

Granulate Cutworm, (*Feltia subterranea*) and Black Cutworm (*Agrotis ipsilon*)

Description

Granulate cutworm moths (Figure 3) have a wingspan of 1.2 to 1.7 inches. The front wings are often yellowish-brown and have distinct bean-shaped and round spots in the center. The hind wings are mostly white. Eggs are hemispherical and ridged. They are initially white and darken with age. Larvae (Figure 4) are grayish to reddish-brown. Each abdominal segment has a dull yellowish oblique mark. A weak gray line occurs along the length of the body with spots of white or yellow.

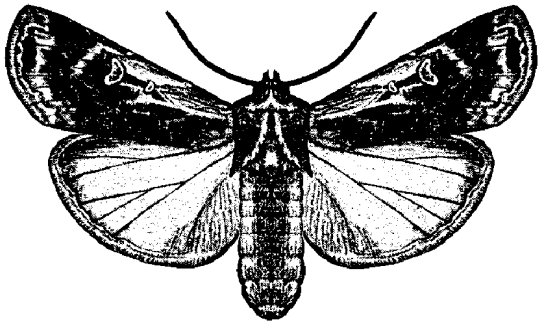

Figure 3. Granulate cutworm moth.

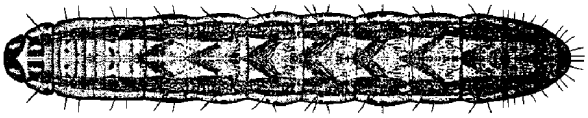

Figure 4. Granulate cutworm larva.

Black cutworm moths (Figure 5) are larger, with a wingspan of 1.5 to slightly over 2 inches. The forewings are dark brown with a lighter band near the end of each wing. The hind wings are whitish to gray. The ribbed eggs are first white, and then turn brown and are usually deposited in clusters. The larvae (Figure 6) are stout, gray caterpillars with a greasy appearance. Black cutworm larvae have numerous dark, coarse granules over most of their bodies.

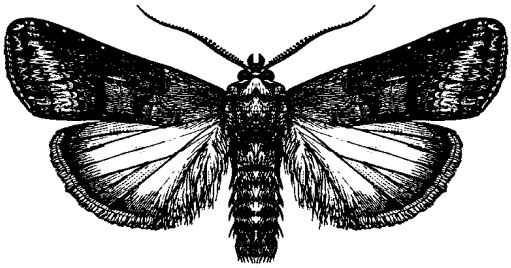

Figure 5. Black cutworm moths.

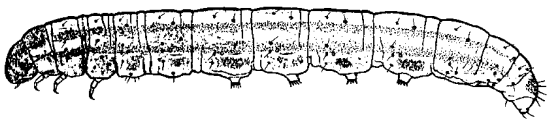

Figure 6. Black cutworm larva.

Biology

Although the black cutworm is one of the most destructive of the cutworms and attacks a wide range of plants, granulate cutworm is a greater problem on celery. Although cutworm larvae can migrate into a

field from adjacent areas, most migration occurs by adults flying into the field.

Cutworm moths feed on nectar and other moisture sources. Moths begin depositing eggs on field debris, stubble or leaves near the soil surface 7 to 10 days after emergence. Black cutworm eggs are deposited singly or in groups of up to 30, and granulate cutworms eggs are deposited singly or in small clusters. Larvae emerge from eggs in 3 to 6 days. Larvae tend to curl up into a ring when disturbed or handled. They may also bite and release a greenish-brown fluid. Larvae are active at night, feeding on leaves and stems of mostly young plants. During the day, they take refuge in the soil at the base of the plants. Larvae complete development in 20 to 40 days. Larvae pupate within a chamber in the soil. Adults emerge in 10 to 20 days. Generation time for cutworms is 35 to 70 days, depending on temperature.

Damage

Cutworms are another part of the worm complex that attacks celery every year in Florida. Although the black cutworm may be present, granulate cutworm is a greater problem in Florida. These cutworms attack many field and other vegetable crops, including beans, crucifers, cucurbits, corn, cowpea, lettuce, onion, pea, pepper, potato, spinach, sweet potato and tomato. Cutworm larvae become active in the spring. They can cut off plant stems near soil level, and they feed on the leaves, chewing into the developing petioles of celery. Older larvae (4th instar and later) can reach 2 inches in length and can cut plants off at their bases and drag them to their burrow in the soil.

Table 3. Cutworms.

Management Option	Recommendation
Scouting/ Thresholds	Seedling crops should be scouted as frequently as twice per week to detect cutworms or their damage, particularly in areas known for this pest. Young larvae may be found grouped together on foliage, but older larvae will usually be found in soil or beneath leaf trash during the day. Look for wilted foliage or plants with severed stems. Adults can be monitored with black light and pheromone traps.
Notes	Most of the insecticides available are foliar sprays. Carbaryl is available as a bait for both celery and parsley.
Natural Enemies	Natural enemies such as parasitic wasps, flies and predacious ground beetles can exert tremendous control pressure that may approach 80%. However, seedlings emerging in fields without resident natural enemy populations can experience significant stand loss from first generation cutworms. Larvae are also targets for attack by pathogenic fungi and viruses.
Cultural Controls	Weedy fields quickly rotated to leafy vegetables have higher potential for stand loss due to surviving older larvae cutting off the emerging plants. Therefore, prepare fallowed fields for production as soon as possible to allow time for surviving larvae to complete development before planting.

Cabbage Looper (*Trichoplusia ni*)

Description

Cabbage loopers feed on a variety of crops. The adults (Figure 7) are night-flying moths with brown, mottled fore wings marked in the center with a small, silver figure eight. Their eggs are small, ridged, round, and greenish-white. The eggs hatch into larvae (Figure 8) that are green with white stripes running the length of their bodies. The caterpillar has three

pairs of slender legs near its head and then three pairs of thick prolegs near the end of its body. It moves in a characteristic looping motion, alternately stretching forward and arching its back as it brings the back prolegs close to its front legs. The caterpillar is about 1.25 inches long when fully grown.

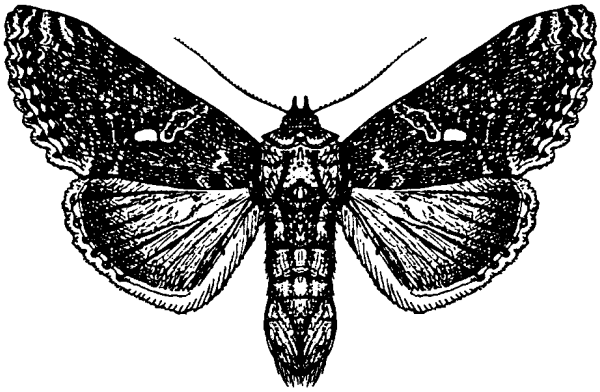

Figure 7. Cabbage looper adult male.

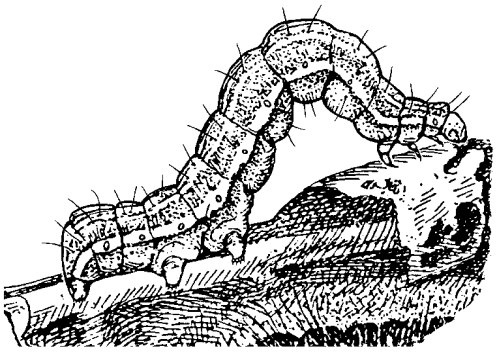

Figure 8. Cabbage looper larva.

Biology

Eggs are deposited singly or in small clusters on either leaf surface, although more are found on the lower leaf surface. Each female moth can produce 300 to 600 eggs during the approximately 10 to 12 days it is alive. Two to four weeks after hatching, the mature larva spins a thin cocoon on the lower leaf surface, or in plant debris or soil. The pupal stage lasts approximately two weeks. Total time required for development from egg to adult can be as little as 18 days at 21°C (69.8°F) and 25 days at 32°C (89.6°F).

Populations tend to be highest during the late spring and summer months, and in some years in the late fall. Cabbage looper does not enter diapause and cannot survive prolonged cold weather. The insect remains active and reproduces throughout the winter months only in the southern part of Florida (south of Orlando). In central Florida, cabbage looper populations peak during early fall and again during late spring.

Damage

The cabbage looper occasionally forms part of the worm complex on celery in Florida. It has a broad host range, including cabbage and related crucifers, lettuce, celery, parsley, tomato, potato, spinach, soybean and cotton. In southern Florida, pheromone trapping data shows adult populations to be highest during the late spring and summer months, and in some years, in the late fall.

Damage by cabbage looper larvae is similar to that caused by beet armyworm, but is not as severe. Older larvae are harder to control.

Table 4. Cabbage looper.

Management Option	Recommendation
Scouting/ Thresholds	Fields should be scouted weekly
Notes	Relying on Bts as the main insecticide and using some of the newer pesticides (spinosad, indoxacarb, tebufenozide) when needed, will help preserve natural enemies.
Natural Enemies	Parasitoid wasps and flies, and general predators help control cabbage looper. A *nucleopoly-hedrosis virus* also kills loopers.
Cultural Controls	Avoid the warmer months when pests are most abundant, destroy crop residues, and control weeds. Planting a nectar source for beneficial insects may be helpful—sweet alyssum has been tested in cabbage. For high-value, specialty crops, floating row covers put in place immediately after transplanting may eliminate damage.

Wireworms or Click Beetles (Elateridae)

Description

The adult stage (Figure 9) of this insect is a slender, somewhat flattened, medium to dark brown or gray beetle between 1/2 and 7/8 in. long. Their exoskeletons are smooth or with very short hairs and they have a large tooth-like projection between the rear legs that fits into a groove on the undersurface of the abdomen. These beetles feign death when disturbed and can then right themselves from their backs by quick flexion at the juncture of the thorax and abdomen. The larvae or wireworm (Figure 10) has a narrow, hardened, creamy yellow to orange-brown, tubular body. Characteristic hardened projections on the next to last abdominal segment can be used to identify them to species. They have three pairs of short true legs and no prolegs and can reach 1 1/4 in. long. Pupae are naked with legs, antennae and wing buds completely visible.

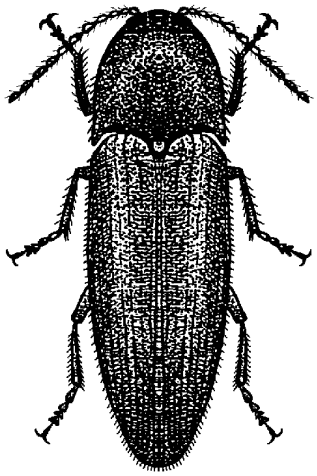

Figure 9. Click beetle (adult).

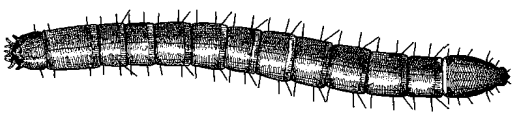

Figure 10. Corn wireworm larva.

Biology

Depending on species and soil temperature, wireworm larvae can take from 1 to 5 years to develop. Corn wireworm (*Melanotus communis*), common in Florida, may complete its development in 2 to 3 years in south Florida. Most flight activity occurs in May and June. Females lay eggs in cracks or crevices or burrow into the soil. Larvae tend to move deeper as soil temperatures become hotter and move closer to the soil surface when it is cooler. If temperatures drop further, larvae will again move deeper into the soil. Other wireworms found in Florida (*Conoderus* spp.) can complete their development in a year or less, resulting in up to three generations per year in south Florida. These species tend to stay close to the soil surface.

Damage

Larvae attack seeds, roots and crowns of plants below the soil surface. They chew into the base of plants and then hollow out the stem, eliminating the growing points. Young plants first exhibit severe wilting and desiccation of the youngest leaves. Plant death and stand loss quickly follow after plants begin to wilt.

Table 5. Wireworms.

Management Option	Recommendation
Scouting/ Thresholds	Soil within an area 8 inches in diameter around affected plants should be excavated in search of larvae in or near these plants. If infestation density is in question, then fields should be sampled for these pests to determine the best treatment strategy before crop is planted. Baits of oat, corn or potato buried in fields and recovered in 2 to 3 wk work well to monitor wireworms. Average counts >2 per bait are enough to recommend treatment.
Notes	Dichloropropene is the only insecticide (restricted use) labeled for wireworm control in celery and parsley and must be applied preplant. The best strategy is to sample for wireworms before planting and avoid fields that have an infestation.
Natural Enemies	Birds such as cattle egrets that follow farm equipment through the field can eat many wireworms exposed during field disking.

Table 5. Wireworms.

Management Option	Recommendation
Cultural Controls	Celery planted to weedy fields, or in rotation from pasture or sugarcane, is often exposed to very large wireworm populations. Summer flooding of fields is an effective cultural control, providing it is maintained for at least several weeks. Water temperature should be above 82° F for maximum control. Rotation through a cycle of rice has been shown to eliminate the need for wireworm treatment in the subsequent crop.

Aphids

Aphids are usually minor pests on celery in Florida, but they may be of concern because of their role as virus vectors. The most important aphids on celery are the green peach aphid (*Myzus persicae*) and the melon aphid (*Aphis gossypii*). Green peach aphid is the primary aphid attacking parsley. The green citrus aphid (*Aphis spiraecola*) may also colonize celery in Florida. An aphid pest newly introduced to Florida, *Hyadaphis coriandri*, may colonize celery and parsley. Primarily a pest of coriander and other umbelliferous herbs, it has the potential to become a serious pest if it becomes established in crop areas.

Description

Adults are soft-bodied, pear- or spindle-shaped insects with a posterior pair of tubes (cornicles or siphunculi), which project upward and backward from the upper surface of the abdomen and which are used for excreting a defensive fluid. Aphids have needle-like piercing-sucking mouthparts. Immature aphids or nymphs are smaller but otherwise similar in appearance to wingless adults. Green peach aphid adults (Figure 11) vary from 0.04 to 0.08 inches in length and are light green to yellow to pink and pear-shaped. The tubercles (bumps between antennae) point inward and are a distinguishing characteristic. Winged forms have a black patch on the back of the abdomen.

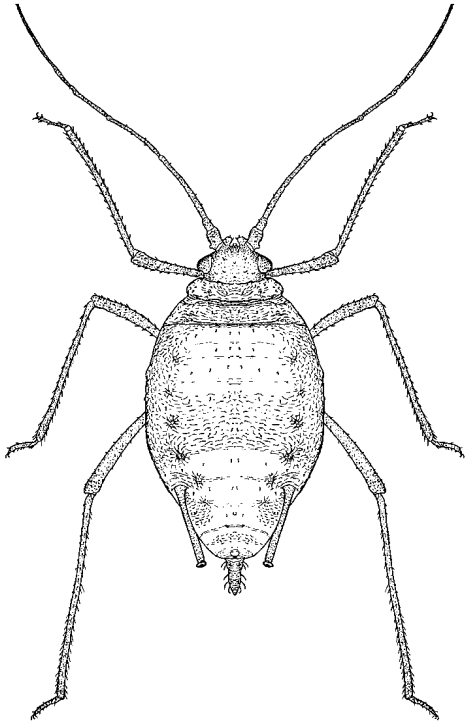

Figure 11. Green peach aphid.

Melon aphids (Figure 12) are almost egg-shaped when viewed from above. The largest ones are not much longer than one-sixteenth of an inch in length. Their color can vary from pale yellow to orange to dark green to almost black. The cornicles are dark and the cauda (a small tail-like structure) is pale or dusky.

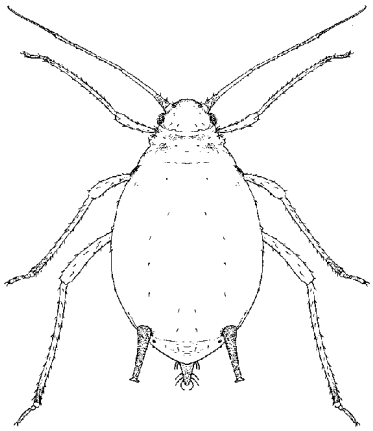

Figure 12. Melon aphid.

Biology

Aphids feed by inserting their needle-like mouthparts into plant tissue and sucking up plant juices. In addition to depleting the plant of nutrients, they can inject toxins that produce abnormal plant growth. While feeding, they also excrete large amounts of a sweet, sticky liquid called honeydew that ants are attracted to and feed on. Ants will defend aphids against predators. Sooty mold will grow on heavy deposits of honeydew.

Aphids reproduce rapidly, giving birth to nymphs rather than laying eggs. The newborn nymphs begin feeding immediately. The nymphs pass through several instars before molting into adults in 7 to 10 days. As a result of this rapid reproduction, aphid populations can increase dramatically. When aphids become crowded or if their host plant deteriorates, winged aphids develop and fly to new plants.

Damage

The green peach aphid (*Myzus persicae*), in addition to feeding on celery, also colonizes a wide range of plants, including cabbage and related crucifers, parsley, turnip, lettuce, chard, endive, tomato, potato, pepper, beets, spinach, and mustard greens. It is one of the most important aphid virus vectors and can transmit over 100 plant viruses, including those that affect celery in Florida (*cucumber mosaic virus* and *celery mosaic virus*). The green peach aphid has developed resistance to a great number of insecticides

The melon aphid (*Aphis gossypii*) is also a vector of both celery viruses in Florida. It has a broad host range as well and can colonize beans, cowpea, citrus, cucurbits, eggplant, peppers, potato, tomato, spinach, okra, beets, cotton, and many ornamental plants, as well as having many weed hosts. Many overlapping generations occur each year

In addition to depleting plant nutrients by their feeding, and transmitting plant viruses, aphids also contaminate plants. Contamination of fresh market celery with honeydew, cast skins, and aphids, both dead and alive, can lower the value of the crop.

Table 6. Aphids.

Management Option	Recommendation
Scouting/ Thresholds	No thresholds have been determined. Examine plants weekly, especially after petioles start to form. Intermediate age stalks are most likely to be infested. Check field edges carefully, especially if celery or parsley is being grown next to lettuce.
Notes	Chemicals with systemic or translaminar penetrating activity are effective for aphid control. Avoid broad-spectrum pesticides, if possible, to preserve natural enemies.
Natural Enemies	Many types of natural enemies may control these aphids under low insecticide input situations. However, these aphids reproduce quickly and move into protected areas of the plants, thereby greatly reducing the potential impact of their predators and parasitoids in older stage plants. Pathogens kill many winged adults before they begin producing nymphs.
Cultural Controls	Field disking and destruction of crop residues are important for control of all caterpillar, aphid and leafminer pests of leafy vegetables to reduce their migration into nearby crops.

Twospotted Spider Mite (*Tetranychus urticae*)

Description and Biology

Spider mites are nearly microscopic, but stippling on the upper surface of leaves and mites and webbing on the lower surface are good indicators of their presence. Eggs are whitish and spherical. The first instar is called a larva and has only 3 pairs of legs. Later stages are called nymphs and have 4 pairs of legs like the adults. Adults (Figure 13) have numerous long hairs on their legs, but only a few on their bodies. Often, the feeding female is greenish with two dark spots on her back, but color is not very reliable for identification.

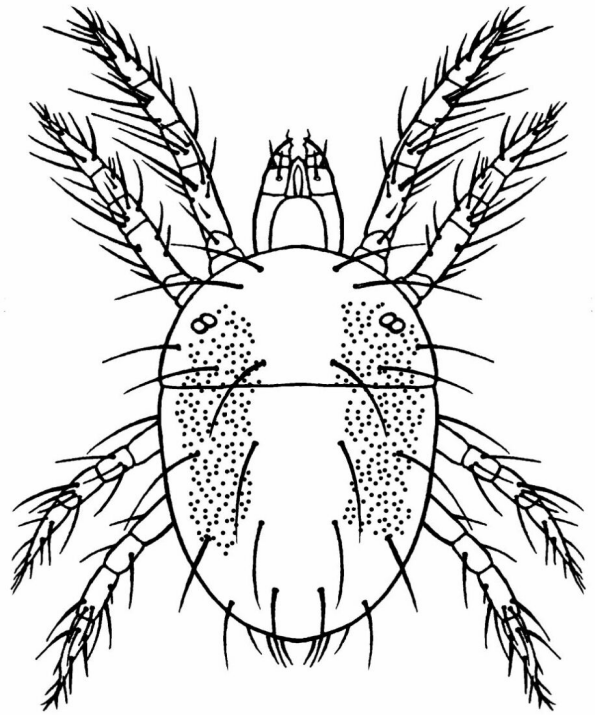

Figure 13. Twospotted spider mite (female).

Hot, dry weather speeds spider mite development, and populations may increase rapidly under optimum conditions. Each female may produce up to 19 eggs per day and a total of up to 100 eggs. The larvae hatch after 6 to 19 days and begin to feed, piercing the leaf surface (epidermis) with their long, slender mouthparts and withdrawing plant sap. Mites experience a resting period after the larval stage, then pass through two nymphal stages, with another resting period after each one. Maturity into adults may take as few as five days or as many as 20 days, depending on the temperature.

Damage

Twospotted spider mites are a minor and occasional pest of celery in Florida. They are more of a problem later in the season, when their presence on the harvested product is undesirable. Symptoms of spider mite damage begin with a bronzed appearance on leaves and include yellow and reddish-brown blotches on both leaf surfaces. Under severe infestations, paling and dropping of leaves may occur.

Table 7. Twospotted spider mite.

Management Option	Recommendation
Scouting/ Thresholds	Periodically check plants for symptoms of damage, especially when weather is warm and dry. No thresholds have been established for mites on celery and parsley.
Notes	The age structure of the population should be determined when considering the use of chemical controls. When many nymphs are present, the population is probably increasing, whereas if many adults are present, particularly males, it is probably declining. In addition, if a miticide is used, a second application is necessary between five and seven days after the first to kill mites that were in the egg stage at the first application. There are no effective miticides labeled for use on parsley. Consider using predatory mites and pirate bugs, available commercially.
Natural Enemies	Mites are attacked by many other insects and mites. Predatory mites and pirate bugs (*Orius* spp.) are particularly important. Some thrips attack mites. Mites are also susceptible to fungal disease.
Cultural Controls	Dry, dusty conditions favor spider mites and water-stressed plants are more susceptible. Overhead irrigation may help alleviate mite problems. Avoid excessive nitrogen.

Table 8. Insecticides approved for use on insects attacking celery.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Actara (thiamethoxam)	1.5-5.5 oz	12	7	aphids, flea beetles, leafhoppers, whiteflies	4A	Do not use if other 4A insecticides have been or will be used.
Admire Pro (imidacloprid)	4.4-10.5 fl oz	12	45	aphids, leafhoppers, whiteflies, foliage feeding thrips	4A	Do not apply more than 0.38 lb ai per acre per year.
Agree WG (*Bacillus thuringiensis* subspecies *aizawai*)	0.5-2.0 lb	4	0	lepitopteran larvae (caterpillar pests)	11	Apply when larvae are small for best control. OMRI-listed[2].
***Agri-Mek 0.15 EC** (abamectin)	8-16 fl oz	12	7	lepidopteran leafminers, spider mites	6	Do not make more than 2 sequential applications after transplanting.
***Ambush 25W** (permethrin)	6.4-12.8 oz	12	1	beet armyworm, cabbage looper, corn earworm, cutworms, fall armyworm, leafminers	3	Do not apply more than 128 oz/acre per season.
Assail 70WP (acetamiprid)	0.8-1.7 oz	12	7	aphids, whiteflies	4A	Begin applications for whiteflies when first adults are noticed. Do not apply more than 5 times per season or apply more often than every 7 days.
Assail 30 SG	2.0-4.0 oz					
Avaunt (indoxacarb)	2.5-6.0 oz	12	3	beet armyworm, cabbage looper	22	Do not apply more than 14 ounces of product per acre per crop.
Aza-Direct (azadirachtin)	1-2 pts, up to 3.5 pts	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, mites, stink bugs, thrips, weevils, whiteflies	un	Antifeedant, repellant, insect growth regulator. OMRI-listed[2].
Azatin XL (azadirachtin)	5-21 fl oz	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, weevils, whiteflies	un	Antifeedant, repellant, insect growth regulator.
***Baythroid XL** (beta-cyfluthrin)	0.8-3.2 fl oz	12	0	beet armyworm (1st and 2nd instars), cabbage looper, corn earworm, cutworms, flea beetles, grasshoppers, potato leafhopper, saltmarsh caterpillar, thrips, vegetable weevil, yellowstriped armyworm, suppression of adult whitefly	3	Maximum of 12.8 fl oz per acre per season.
Beleaf 50 SG (flonicamid)	2.0-2.8 oz	12	0	aphids, plant bugs	9C	Do not apply more than 8.4 oz/acre per season. Begin applications before pests reach damaging levels.

Table 8. Insecticides approved for use on insects attacking celery.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Biobit HP (*Bacillus thuringiensis* subspecies *kurstaki*)	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed[2].
BotaniGard 22 WP, ES (*Beauveria bassiana*)	**WP:** 0.5-2 lb/100 gal **ES:** 0.5-2 qts/100 gal	4	0	aphids, thrips, whiteflies	--	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank mix with fungicides.
Confirm 2F (tebufenozide)	6.0-8.0 fl oz	4	7	armyworms, cabbage looper, garden webworm	18	Do not exceed 56 ounces of product per acre per season.
Coragen (rynaxypyr)	3.5-7.5 fl oz	4	1	beet armyworm, cabbage looper, corn earworm, leafminers, suppression of whitefly nymphs	28	May be applied via drip chemigation in addition to foliar and various soil application methods.
Courier 40SC (buprofezin)	9.0-13.6 fl oz	12	7	leafhoppers, planthoppers, whiteflies	16	Do not make more than 2 applications per crop cycle. IGR targets immatures.
Crymax WDG (*Bacillus thuringiensis* subspecies *kurstaki*)	0.5-2.0 lb	4	0	caterpillars	11	Use high rate for armyworms. Treat when larvae are young.
Deliver (*Bacillus thuringiensis* subspecies *kurstaki*)	0.25-1.5 lb	4	0	caterpillars	11	Use higher rates for armyworms. OMRI-listed[2].
Dimethoate 4EC (dimethoate)	1 pt	48	7	leafminers, mites	1B	Use ground equipment. Florida only.
DiPel DF (*Bacillus thuringiensis* subspecies *kurstaki*)	0.5-2.0 lb	4	0	caterpillars	11	Treat when larvae are young. Good coverage is essential. OMRI-listed[2].
Durivo (thiamethoxam, chlorantraniliprole)	10.0-13.0 fl oz	12	30	aphids, beet armyworm, cabbage looper, corn earworm, fall armyworm, flea beetles, leafhoppers, whiteflies	4A, 28	Do not exceed more than 13 fl oz per acre per season.
Entrust (spinosad)	0.5-3 oz	4	1	armyworms, cabbage looper, leafminers, thrips	5	See label for resistance management recommendations. Apply no more than 9 oz per acre per year. OMRI-listed[2].

Table 8. Insecticides approved for use on insects attacking celery.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Extinguish ((S)-methoprene)	1-1.5 lb	4	0	fire ants	7A	Slow-acting IGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after three weeks and eliminated after 8 to 10 weeks. May be applied by ground equipment or aerially.
Fulfill (pymetrozine)	2.75 oz	12	7	aphids, suppression of whiteflies	9B	Apply when aphids first appear, before populations build to damaging levels. Two applications (maximum allowed) may be needed to control persistent aphid populations.
Intrepid 2F (methoxyfenozide)	4-10 fl oz	4	1	armyworms, cabbage looper, webworms	18	Do not apply more than 64 fl oz per acre per season.
Javelin WG (*Bacillus thuringiensis* subspecies *kurstaki*)	0.12-1.5 lb	4	0	most caterpillars, but not Spodoptera species (armyworms)	11	Treat when larvae are young. Thorough coverage is essential. OMRI-listed[2].
***Lannate LV, *SP** (methomyl)	**LV:** 0.75-3 pt **SP:** 0.25-1.0 lb	48	7	armyworms, aster leafhopper, beet armyworm, loopers, variegated cutworm	1A	Do not apply more than 24 pt of LV or 8 lb SP per acre per season.
***Larvin 3.2** (thiodicarb)	16-30 fl oz	48	14	armyworms, beet armyworm, cabbage looper, corn earworm, fall armyworm, southern armyworm	1A	Do not exceed 60 fluid ounces of Larvin per acre per season.
Lepinox WDG (*Bacillus thuringiensis* subspecies *kurstaki*)	1.0-2.0 lb	12	0	most caterpillars, including beet armyworm (see label)	11	Treat when larvae are small. Thorough coverage is essential.
Malathion 8F (malathion)	1-1.5 pt	12	7	aphids, mites	1B	
Movento (spirotetramat)	4.0-5.0 fl oz	24	3	aphids, whiteflies	23	Do not apply more than 10 fl oz/acre/crop.
M-Pede 49% EC (Soap, insecticidal)	1-2% V/V	12	0	whiteflies	--	OMRI-listed[2].

Table 8. Insecticides approved for use on insects attacking celery.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
***Mustang** (zeta-cypermethrin)	2.4-4.3 oz	12	1	corn earworm, cucumber beetles, cutworms, flea beetles, leafhoppers, saltmarsh caterpillar, tobacco budworm, aphids, whiteflies, armyworms, ground beetles, crickets, loopers, *Lygus* bugs, stink bugs, wireworm adults	3	A maximum of 0.3 lb ai/acre per season may be applied. Do not make applications less than 7 days apart.
Neemix 4.5 EC (azadirachtin)	4-16 fl oz	12	0	aphids, armyworms, cabbage looper, cutworms, leafminers, webworms, whiteflies	un	IGR and feeding repellant. OMRI-listed[2].
Orthene 75S, 97 (acephate)	**75S:** 0.67-1.33 lb **97:** 0.5-1.0 lb	24	21	cabbage looper, fall armyworm, green peach aphid	1B	Do not use more than 2 lb active ingredient per acre per season.
Platinum **Platinum 75SG** (thiamethoxam)	5.0-11.0 fl oz 1.66-3.67 oz	12	30	aphids, flea beetles, leafhoppers, leafminers (suppression), whiteflies	4A	Maximum = 11 oz/acre or 3.67 oz/acre (75SG) per season. Do not use in conjunction with other 4A insecticides.
***Pounce 25 WP** (permethrin)	3.2-12.8 oz	12	1	aphids, beet armyworm, cabbage looper, corn earworm, cutworms, fall armyworm, leafhoppers, leafminers, loopers, southern armyworm, tobacco budworm	3	Do not apply more than 1.0 lb active ingredient per acre per season.
***Proclaim** (emamectin benzoate)	2.4-4.8 oz	12	7	beet armyworm, corn earworm, fall armyworm, *Liriomyza* leafminers, loopers, tobacco budworm	6	Provides suppression of leafminers. Rotate with other products with different modes of action.
Pyrellin EC (pyrethrins + rotenone)	1-2 pt	12	12 hours	aphids, leafhoppers, leafminers, leaftiers, loopers, *Lygus* bug, mites, plant bugs, stink bugs, whiteflies	3, 21	
Pyronyl Crop Spray (pyrethrins + piperonyl butoxide)	1-12 fl oz	12	0	ants, aphids, armyworms, cabbage looper, corn earworm, flea beetles, leafhoppers, leaftiers, webworms, whiteflies	3	
Radiant (spinetoram)	5-10 fl oz	4	1	armyworms (not yellowstriped), cabbage looper, corn earworm, *Liriomyza* leafminer, thrips	5	Maximum of 6 applications, no more than 2 consecutive applications before rotating to another MOA.

Table 8. Insecticides approved for use on insects attacking celery.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Sevin XLR; 4F; 80S (carbaryl)	**XLR; 4F:** 0.5-2 qt **80S:** 0.03-2.5	12	14	armyworms, aster leafhopper, corn earworm, fall armyworm, flea beetles, leafhoppers, *Lygus* bug, spittlebugs, stink bugs, tarnished plant bug	1A	Repeat, as needed, up to 5 times, with at least 7 days between applications.
SpinTor 2SC (spinosad)	1.5-10 fl oz	4	1	armyworms, cabbage looper, leafminers (*Liriomyza* spp.), thrips	5	Control of leafminers and thrips may be improved by use of an adjuvant.
SunSpray 98.8%, JMS Stylet-Oil, Saf-T-side, others (Oils, insecticidal)	3-6 qt/100 gal (JMS) 1-2 gal/100 gal	4	0	aphids, beetle larvae, leafhoppers, leafminers, mites, thrips, whiteflies (pests controlled vary by product)	--	See label for cautions on tank mixes. Organic Stylet-Oil and Saf-T-Side are OMRI-listed[2].
Synapse WG (flubendiamide)	2.0-3.0 oz	12	1	armyworms, loopers	28	Do not apply more than 9.0 oz/acre per season.
***Telone C-35** (dichloropropene + chloropicrin)	See label	5 days-See label	preplant	symphylans, wireworms	--	See supplemental label for use restrictions in south or central Florida.
***Telone II** (dichloropropene)						
Thionex 3EC	0.66-1.33 qt	48	4 or 7	armyworms, cabbage looper, flea beetles, green peach aphid, leafhoppers, whiteflies	2	Do not exceed 1.33 qt per acre per season (EC). If two applications at lowest rate used against aphids, then PHI is 7 days.
Thionex 50W (endosulfan)	1-2 lb	96				
Trigard (cyromazine)	2.66 oz	12	7	leafminers	17	Do not make more than six applications per crop.
Trilogy (extract of neem oil)	0.5-2.0% V/V	4	0	aphids, mites, suppression of thrips and whiteflies	un	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed[2].
Venom Insecticide (dinotefuran)	**foliar:** 1-3 oz **soil:** 5-6 oz	12	7	leafhoppers, leafminers, whiteflies	4A	Do not apply more than 6 oz per acre per season (foliar) or 12 oz per acre per season (soil). Do not use both methods of application.
Vetica (flubendiamide and buprofezin)	12.0-17.0 fl oz	12	7	armyworms, cabbage looper, corn earworm, cutworms, green cloverworm, imported cabbageworm, suppression of leafhoppers, saltmarsh caterpillar, tobacco budworm, suppression of whitefly	28, 16	Do not apply more than three times per season or apply more than 38 fl oz per acre per season. Same active ingredients as Synapse, Coragen, and Courier.

Table 8. Insecticides approved for use on insects attacking celery.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Voliam Flexi (thiamethoxam, chlorantraniliprole)	4.0-7.0 oz	12	7	aphids, beet armyworm, cabbage looper, corn earworm, fall armyworm, flea beetles, leafhoppers, southern armyworm, tobacco budworm, whiteflies	4A, 28	Do not apply more than 14 oz per acre per growing season. An adjuvant may be used when applying to celery.
***Vydate L** (oxamyl)	2-4 pt	48	21	leafminers (except *Liriomyza trifolii*)	1A	

The pesticide information presented in this table was current with federal and state regulations at the time of revision. The user is responsible for determining the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label instructions.

[1]Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v. 6.1 August 2008.

1A. Acetyl cholinesterase inhibitors, Carbamates (nerve action)
1B. Acetyl cholinesterase inhibitors, Organophosphates (nerve action)
2A. GABA-gated chloride channel antagonists (nerve action)
3. Sodium channel modulators (nerve action)
4A. Nicotinic acetylcholine receptor agonists (nerve action)
5. Nicotinic acetylcholine receptor allosteric activators (nerve action)
6. Chloride channel activators (nerve and muscle action)
7A. Juvenile hormone mimics (growth regulation)
7C. Juvenile hormone mimics (growth regulation)
9B and 9C. Selective homopteran feeding blockers
10. Mite growth inhibitors (growth regulation)
11. Microbial disruptors of insect midgut membranes
12B. Inhibitors of mitochondrial ATP synthase (energy metabolism)
15. Inhibitors of chitin biosynthesis, type 0, lepidopteran (growth regulation)
16. Inhibitors of chitin biosynthesis, type 1, homopteran (growth regulation)
17. Molting disruptor, dipteran (growth regulation)
18. Ecdysone receptor agonists (growth regulation)
22. Voltage-dependent sodium channel blockers (nerve action)
23. Inhibitors of acetyl Co-A carboxylase (lipid synthesis, growth regulation)
28. Ryanodine receptor modulators (nerve and muscle action)
un. Compounds of unknown or uncertain mode of action

[2] OMRI-listed: Listed by the Organic Materials Review Institute for use in organic production.

*** Restricted Use Pesticide**

Table 9. Selected insecticides approved for use on insects attacking parsley.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Actara (thiamethoxam)	1.5-5.5 oz	12	7	aphids, flea beetles, leafhoppers, whiteflies	4A	Do not use if other 4A insecticides have been or will be used.
Admire Pro (imidacloprid)	4.4-10.5 fl oz	12	21	aphids, leafhoppers, thrips (foliage feeders), whiteflies	4A	Limited to 0.38 lb ai per acre per season.
Agree WG (*Bacillus thuringiensis* subspecies *aizawai*)	0.5-2.0 lb	4	0	lepidopteran larvae (caterpillar pests)	11	Apply when larvae are small for best control. OMRI-listed[2].
***Agri-Mek 0.15 EC** (abamectin)	8-16 fl oz	12	7	*Liriomyza* leafminers, spider mites	6	No more than 2 sequential applications. Maximum of 48 oz per acre per season.
***Ambush 25W** (permethrin)	6.4-12.8 oz	12	1	beet armyworm, cabbage looper, corn earworm, cutworms, fall armyworm, leafhoppers, vegetable leafminer	3	Do not apply more than 2 lb ai/acre per season.
Assail 70WP (acetamiprid) **Assail 30 SG**	0.8-1.7 oz 2.0-4.0 oz	12	7	aphids, whiteflies	4A	Begin applications for whiteflies when first adults are noticed. Do not apply more than 5 times per season or apply more often than every 7 days.
Avaunt (indoxacarb)	2.5-6.0 oz	12	3	beet armyworm, cabbage looper, corn earworm	22	Do not apply more than 24 ounces of product per acre per crop.
Aza-Direct (azadirachtin)	1-2 pts, to 3.5 pts if needed	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, mites, stink bugs, thrips, weevils, whiteflies	un	Antifeedant, repellent, insect growth regulator. OMRI-listed[2].
Azatin XL (azadirachtin)	5-21 fl oz	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, weevils, whiteflies	un	Antifeedant, repellent, insect growth regulator.
***Baythroid XL** (beta-cyfluthrin)	0.8-3.2 fl oz	12	0	beet armyworm (1st and 2nd instars), cabbage looper, corn earworm, cutworms, flea beetles, grasshoppers, potato leafhopper, saltmarsh caterpillar, thrips, vegetable weevil, yellowstriped armyworm, suppression of adult whitefly	3	Maximum of 12.8 fl oz per acre per season.

Table 9. Selected insecticides approved for use on insects attacking parsley.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Beleaf 50 SG (flonicamid)	2.0-2.8 oz	12	0	aphids, plant bugs	9C	Do not apply more than 8.4 oz/acre per season. Begin applications before pests reach damaging levels.
Biobit HP (*Bacillus thuringiensis* subspecies *kurstaki*)	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed[2].
BotaniGard 22 WP, ES (*Beauveria bassiana*)	**WP:** 0.5-2 lb/100 gal **ES:** 0.5-2 qts/100 gal	4	0	aphids, thrips, whiteflies	--	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank mix with fungicides.
Confirm 2F (tebufenozide)	6.0-8.0 fl oz	4	7	armyworms, cabbage looper, garden webworm	18	Do not exceed 56 ounces of product per acre per season.
Coragen (rynaxypyr)	3.5-7.5 fl oz	4	1	beet armyworm, cabbage looper, corn earworm, leafminers, suppression of whitefly nymphs	28	May be applied by drip chemigation, in addition to foliar and various soil application methods.
Courier 40SC (buprofezin)	9.0-13.6 fl oz	12	7	leafhoppers, planthoppers, whiteflies	16	Do not make more than 2 applications per crop cycle. IGR targets immatures.
Crymax WDG (*Bacillus thuringiensis* subspecies *kurstaki*)	0.5-2.0 lb	4	0	caterpillars	11	Use high rate for armyworms. Treat when larvae are young.
Deliver (*Bacillus thuringiensis* subspecies *kurstaki*)	0.25-1.5 lb	4	0	caterpillars	11	Use higher rates for armyworms. OMRI-listed[2].
DiPel DF (*Bacillus thuringiensis* subspecies *kurstaki*)	0.5-2.0 lb	4	0	caterpillars	11	Treat when larvae are young. Good coverage is essential.
Durivo (thiamethoxam, chlorantraniliprole)	10-13 oz	12	30	aphids, beet armyworm, cabbage looper, corn earworm, fall armyworm, flea beetles, imported cabbageworm, leafhoppers, whiteflies	4A, 28	May be applied by one of several soil application methods.
Entrust (spinosad)	0.5-3 oz	4	1	armyworms, cabbage looper, leafminers, thrips	5	Use no more than 9 oz per acre per crop. OMRI-listed[2].

Table 9. Selected insecticides approved for use on insects attacking parsley.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Extinguish ((S)-methoprene)	1.0-1.5 lb	4	0	fire ants	7A	SlowIGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after three weeks and eliminated after 8 to 10 weeks. May be applied by ground equipment or aerially.
Fulfill (pymetrozine)	2.75 oz	12	7	aphids, suppression of whiteflies	9B	Apply when aphids first appear, before populations build to damaging levels. Two applications (maximum allowed) may be needed to control persistent aphid populations.
Intrepid 2F (methoxyfenozide)	4-10 fl oz	4	1	armyworms, cabbage looper, webworms	18	Do not apply more than 64 fl oz per acre per season.
Javelin WG (*Bacillus thuringiensis* subspecies *kurstaki*)	0.12-1.5 lb	4	0	most caterpillars, but not *Spodoptera* species (armyworms)	11	Treat when larvae are young. Thorough coverage is essential. OMRI-listed[2].
***Lannate LV; *SP** (methomyl)	**LV:** 1.5-3.0 pts **SP:** 0.5-1.0 lb	48	10	beet armyworm, cabbage looper	1A	Do not use more than 4 lb of SP, or 12 pt of LV per acre/season.
***Larvin 3.2** (thiodicarb)	16-30 fl oz	48	14	armyworms, beet armyworm, cabbage looper, corn earworm, fall armyworm, southern armyworm	1A	Do not exceed 60 fl oz per acre per season.
Lepinox WDG (*Bacillus thuringiensis* subspecies *kurstaki*)	1.0-2.0 lb	12	0	for most caterpillars, including beet armyworm (see label)	11B2	Treat when larvae are small. Thorough coverage is essential.
Malathion 8 F (malathion)	1-2 pt	12	21	aphids	1B	
Movento (spirotetramat)	4.0-5.0 fl oz	24	3	aphids, whiteflies	23	Do not apply more than 10 fl oz/acre/crop.
M-Pede 49% EC Soap, insecticidal	1-2% V/V	12	0	aphids, leafhoppers, mites, plant bugs, whiteflies	--	OMRI-listed[2].

Table 9. Selected insecticides approved for use on insects attacking parsley.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
***Mustang** (zeta-cypermethrin)	2.4-4.3 oz	12	1	aphids, armyworms, corn earworm, crickets, cucumber beetles, cutworms, flea beetles, ground beetles, leafhoppers, loopers, *Lygus* bugs, saltmarsh caterpillar, stink bugs, tobacco budworm, whiteflies, wireworm adults	3	A maximum of 0.3 lb ai/acre per season may be applied. Do not make applications less than 7 days apart.
Neemix 4.5 (azadirachtin)	4-16 fl oz	12	0	aphids, armyworms, leafhoppers, leafminers, loopers, whiteflies	un	IGR and feeding repellant. OMRI-listed[2].
Oberon 2SC (spiromesifen)	7.0-8.5 fl oz	12	7	whiteflies	23	Maximum amount per crop: 25.5 fl oz/acre. No more than three applications.
Platinum **Platinum 75SG** (thiamethoxam)	5.0-11 fl oz 1.66-3.67 oz	12	30	aphids, flea beetles, leafhoppers, leafminers (suppression), whiteflies	4A	Maximum = 11 oz/acre or 3.67 oz/acre (75SG) per season. Do not use in conjunction with other 4A insecticides.
***Pounce 25 WP** (permethrin)	3.2-12.8 oz	12	1	aphids, armyworms, beet armyworm, cabbage looper, corn earworm, cutworms, fall armyworm, leafhoppers, loopers, southern armyworm, tobacco budworm, vegetable leafminer	3	Do not apply more than 1.0 lb ai/acre per season.
***Proclaim** (emamectin benzoate)	2.4-4.8 oz	12	7	beet armyworm, corn earworm, fall armyworm, loopers, tobacco budworm, suppression of leafminers	6	Do not apply more than 28.8 oz/A per season.
Provado 1.6 F (imidacloprid)	3.8 oz	12	7	aphids, flea beetles, leafhoppers, whiteflies	4A	Maximum of 19.0 fl oz per acre per season. Do not use with other 4A insecticides.
Pyrellin EC (pyrethrin + rotenone)	1-2 pt	12	0	aphids, cabbage looper, *Lygus* bug, mites, plant bugs, whiteflies	3, 21	
Radiant (spinetoram)	5-10 fl oz	4	1	armyworms (not yellowstriped), cabbage looper, corn earworm, *Liriomyza* leafminer, thrips	5	Maximum of 6 applications, no more than 2 consecutive applications before rotating to another MOA.

Table 9. Selected insecticides approved for use on insects attacking parsley.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Sevin 80S; XLR; 4F (carbaryl)	**80S:** 0.63-2.5 lb **XLR; 4F:** 0.5-2.0 qt	12	14	armyworms, aster leafhopper, corn earworm, fall armyworm, flea beetles, leafhoppers, *Lygus* bug, spittlebugs, stink bug, tarnished plant bug	1A	Do not apply more than a total of 7.5 lb or 6 qt per acre per crop.
SpinTor 2SC (spinosad)	1.5-10 fl oz	4	1	armyworms, cabbage looper, leafminers (*Liriomyza* spp.)	5	Do not apply more than 29 fl oz per acre per season.
Synapse WG (flubendiamide)	2.0-3.0 oz	12	1	armyworms, loopers	28	Do not apply more than 9.0 oz/acre per season.
***Telone C-35** (dichloropropene + chloropicrin) ***Telone II** (dichloropropene)	See label	5 days-See label	preplant	symphylans, wireworms	--	See supplemental label for use restrictions in south and central Florida.
Trigard (cyromazine)	2.66 oz	12	7	leafminers	17	No more than 5 applications per crop.
Trilogy (extract of neem oil)	0.5-2.0% V/V	4	0	aphids, mites, suppression of thrips and whiteflies	un	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed[2].
Venom Insecticide (dinotefuran)	**foliar:** 1-3 oz **soil:** 5-6 oz	12	foliar: 7 soil: 21	leafhoppers, leafminers, whiteflies	4A	Use only one application method (soil or foliar, not both). Do not apply more than 6 oz/acre (foliar) or 12 oz/acre (soil) per season.
Vetica (flubendiamide and buprofezin)	12.0-17.0 fl oz	12	7	armyworms, cabbage looper, corn earworm, cutworms, green cloverworm, imported cabbageworm, suppression of leafhoppers, saltmarsh caterpillar, tobacco budworm, suppression of whitefly	28, 16	No more than 3 applications per season or 38 fl oz per acre per season. Same active ingredients as Synapse, Coragen, and Courier.
Voliam Flexi (thiamethoxam, chlorantraniliprole)	4.0-7.0 oz	12	7	aphids, beet armyworm, cabbage looper, corn earworm, fall armyworm, flea beetles, leafhoppers, southern armyworm, tobacco budworm, whiteflies	4A, 28	Do not apply more than 14 oz per acre per growing season. Do not use an adjuvant.

Table 9. Selected insecticides approved for use on insects attacking parsley.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Xentari DF (*Bacillus thuringiensis* subspecies *aizawai*)	0.5-2 lb	4	0	caterpillars	11	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.

The pesticide information presented in this table was current with federal and state regulations at the time of revision. The user is responsible for determining the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label instructions.

[1]Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v. 6.1 August 2008.
1A. Acetyl cholinesterase inhibitors, Carbamates (nerve action)
1B. Acetyl cholinesterase inhibitors, Organophosphates (nerve action)
2A. GABA-gatedchloride channel antagonists (nerve action)
3. Sodium channel modulators (nerve action)
4A. Nicotinic acetylcholine receptor agonists (nerve action)
5. Nicotinic acetylcholine receptor allosteric activators (nerve action)
6. Chloride channel activators (nerve and muscle action)
7A. Juvenile hormone mimics (growth regulation)
7C. Juvenile hormone mimics (growth regulation)
9B and 9C. Selective homopteran feeding blockers
10. Mite growth inhibitors (growth regulation)
11. Microbial disruptors of insect midgut membranes
12B. Inhibitors of mitochondrial ATP synthase (energy metabolism)
15. Inhibitors of chitin biosynthesis, type 0, lepidopteran (growth regulation)
16. Inhibitors of chitin biosynthesis, type 1, homopteran (growth regulation)
17. Molting disruptor, dipteran (growth regulation)
18. Ecdysone receptor agonists (growth regulation)
22. Voltage-dependent sodium channel blockers (nerve action)
23. Inhibitors of acetyl Co-A carboxylase (lipid synthesis, growth regulation)
28. Ryanodine receptor modulators (nerve and muscle action)
un. Compounds of unknown or uncertain mode of action

[2] OMRI listed: Listed by the Organic Materials Review Institute for use in organic production.

*** Restricted Use Only.**