

Tobacco

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Tobacco Insect Management

Various species of insects cause serious damage to tobacco in the field, the greenhouse, and in storage. Insects damage the roots, destroy the leaves and bud, reduce leaf quality, and transmit several important plant viruses. Integrated pest management (IPM) combines the use of cultural, natural, and chemical controls to maintain insect pest populations below the levels that cause economic damage to the crop. IPM promotes using insecticides only when they are needed. It also emphasizes that a certain amount of insect damage does not reduce the crop value enough to pay for the cost of treatment. IPM helps to maximize profits while it reduces pesticide residues, the development of resistance to pesticides, and human exposure to pesticides.

Cultural Controls

Several cultural practices help reduce insect infestations and decrease the need for insecticide applications. They include:

1. **Early plowing**, at least 4 weeks before transplanting, reduces cutworm populations.
2. **Proper nitrogen fertilization reduces late-season hornworm and aphid infestations.** High rates of nitrogen on flue-cured tobacco favors hornworm infestations by delaying maturity so that the plants remain succulent longer and produce more suckers.
3. **Adjust transplanting dates.** The transplanting date influences tobacco susceptibility to some insect pests. Early-planted tobacco is usually less susceptible to aphids and hornworms, and more susceptible to budworms and flea beetles. Late-planted tobacco is highly susceptible to hornworm damage and may have lower yield and quality.
4. **Keep field margins clear of weeds and tall grasses that provide food and habitat for cutworms, grasshoppers, vegetable weevils, and other insect pests.** However, do not cut borders between tobacco fields and hay fields that are heavily infested with grasshoppers.
5. **Top tobacco in the late-button or early-flower stage and obtain effective sucker control.** This practice eliminates food sources for budworms and makes tobacco plants less desirable hosts for aphids and hornworms.
6. **Destroy stalks and plow up roots immediately after harvest to eliminate many feeding and overwintering sites for hornworms, budworms, and flea beetles** and to reduce populations of nematodes and other soil-borne pathogens.
7. **Rotate tobacco with crops that help reduce infestations of wireworms, cutworms, and whitefringed beetles.** Beware of cutworm and wireworm problems following established grass sods.

Natural Controls

Several beneficial organisms, including predators, parasites, and pathogens, provide valuable control of insect pests on tobacco. For instance, the grubs of parasitic wasps such as the **red-tailed wasp** and *Campoletis sonorensis* provide excellent control of the **tobacco budworm**, often killing over 80 percent of the budworms in a field. This control may be as good as that obtained with the most effective insecticides. The parasite *Cotesia congregata* attacks **hornworm** caterpillars. It feeds inside of hornworms and forms many white, egg-like cocoons on the backs of hornworms when it matures. It provides good supplemental control of hornworms, especially late in the growing season.

The slender, long-legged **stilt bug** is an important predator of hornworm and budworm eggs. It also feeds on aphids as well as on tobacco plant sap. **Tachinid flies** resemble large hairy houseflies. They attack mature hornworm larvae, feeding inside the larvae and pupae and killing the insect before it can reproduce.

Beneficials that control aphids include three species of **lady beetles**, **midge larvae**, **lacewings**, **syrphid fly larvae**, and a **fungal pathogen**. These beneficials provide some control of aphids, but they are not very effective against rapidly increasing aphid populations on tobacco in the rapid-growth stage. Although beneficial insects are usually abundant on aphid-infested tobacco, they usually do not provide enough control to prevent severe economic damage to the crop. However, beneficials are very important and should be promoted as much as practical. To preserve beneficial insects, scout fields and use economic thresholds to time insecticide applications and select insecticides with low impact on beneficials such as *Bacillus thuringiensis*

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(*Bi*), pymetrozine (Fulfill), emamectin benzoate (Denim), spinosad (Tracer), flubendiamide (Belt), and methomyl (Lannate). Transplant-water and tray-drench applications of imidacloprid (Admire Pro) and thiamethoxam (Platinum) have little direct impact on beneficials. However, Temik applied as a soil treatment is harmful to stilt bugs.

Weather can also affect insect pests. Late-season flea beetle and tobacco splitworm infestations are often associated with hot, dry weather. Although mild, wet weather favors severe aphid infestations, it also favors aphid pathogens that can quickly bring aphid infestations under control.

Chemical Control

Although many cultural and natural controls help reduce or prevent infestations by insect pests, it is almost impossible to grow a high-quality, high-yielding tobacco crop without using some insecticides. Remedial insect control with an insecticide is needed when field scouting indicates that insect pest populations have reached their economic thresholds (Table 4.62). The economic threshold is the pest population or injury level that requires control with an insecticide to prevent economic damage to the crop. Fields should be scouted at regular intervals (about once a week).

Pest Control on Transplants Produced in Greenhouses

Almost 100 percent of the tobacco transplants used in Virginia is produced in greenhouses. Although insects have not been major problems, several have the potential to cause serious injury to tobacco seedlings grown in greenhouses.

Ants remove seeds from trays and take them back to their nests. This can seriously reduce the number of seedlings in greenhouse trays. To reduce this damage, eliminate ant habitat through sanitation and apply a drench treatment of Orthene to anthills in and around the greenhouse before the float beds are set up and the trays are seeded.

Crickets feed on and destroy germinating seedlings after greenhouses are seeded in the spring. This damage reduces the number of transplants produced per tray. Control crickets by eliminating their overwintering sites in and around the greenhouse. A broadcast application of Orthene provides excellent control of crickets.

Adult vegetable weevils migrate into tobacco greenhouses from surrounding weedy areas. They feed on the leaves and stems and lay eggs at the base of young transplants. The emerging larvae feed on the buds and leaves of young transplants and reduce transplant quality. Keep the area around the greenhouse well manicured to eliminate weedy habitats and do not plant fall-winter gardens near greenhouses. Foliar applications of Orthene provide excellent control of vegetable weevils. Adults and larvae usually hide during the day and feed at night.

Green peach or tobacco aphids sometimes build up high populations on tobacco seedlings in greenhouses. They may reduce transplant quality and be taken to the field on transplants. Cultural practices include the elimination of other aphid hosts such as greens, turnips, collards, and related weedy host plants. Crops grown in the greenhouse during the fall and winter can also be hosts of aphids. Orthene provides excellent control of aphids in the greenhouse. The application of Admire or Platinum as tray drenches or transplant-water treatments just before or at transplanting also provides excellent control.

Cutworms and yellowstriped armyworms can occur in the greenhouse. Cutworms may move from weedy areas around the greenhouse or cutworm and yellowstriped armyworm moths may lay eggs on the plants in the greenhouse. Lights in the greenhouse may attract egg-laying moths at night. Use Orthene to control these pests.

Shore flies, which look like small house flies, frequently build up very high populations in tobacco greenhouses. Although shore flies are a nuisance, they do very little damage except when trays are seeded on more than one date in the same greenhouse. Shore fly larvae normally feed on algae in the float water and on the media in the trays. If seedlings from two seeding dates occur in the same greenhouse, the larvae may injure very young seedlings. Eliminate algae from the float water and the media to reduce food sources for shore flies.

Mice can devastate transplants by removing seeds and young seedlings from trays. Control mice by eliminating food and shelter in and around the greenhouse. Traps and poison baits also provide good control of mice.

Cultural controls

Sanitation is the most important practice in tobacco greenhouses. Keep the area in and around the greenhouse clean and free of weeds, decaying plant material, leaves, hay, plastic, rocks, wood, metal, and other protected sites for insects and other pests. Ants, crickets, cutworms, grasshoppers, slugs, vegetable weevils, and mice move into greenhouses from these sheltered areas.

Winged aphids can migrate into greenhouses from nearby weeds and establish colonies on tobacco seedlings. If greenhouses are used for the production of other crops, allow a fallow period between crops to reduce the chances that a pest on the other crop will carry over to the tobacco seedlings. Whiteflies or aphids could become problems if they move from an earlier crop to tobacco. Very cold or hot conditions during this fallow period can reduce potential pest problems. Immediately after transplanting has been completed, discard all unused plants. Clean the greenhouse again just before seeding plants for the next season.

Chemical control

Orthene is the only effective insecticide labeled for insect control on tobacco seedlings in the greenhouse (Table 4.57). It should be applied when insect infestations are observed. It provides good to excellent control of ants, cutworms, flea beetles, and aphids. Orthene should be applied as a foliar treatment and not in the float water. Control mice with traps and cultural practices in combination with poisonous baits.

Table 4.57 - Tobacco Transplants Grown in Greenhouses

Insect	Insecticide (Formulation)	Rate per 1000 sq ft	Restricted Entry Interval (Hours) ¹	Remarks and Precautions
Ants	acephate (Acephate AG) 75SP	1.0 oz/5.0 gal of water	24	Apply 1 gal of mix to each mound area by sprinkling the mound until it is wet and treat a 4-foot diameter circle around the mound. Treat only once during the season.
	(Acephate) 97UP	0.75 oz/5.0 gal of water		
	(Orthene) 97PE			
Aphids, cutworms, flea beetles	acephate (Acephate) AG 75SP	1.0 tbsp/3.0 gal of water (1 lb/A)	24	Apply evenly to insure thorough coverage. Overapplication and application to young plants may cause phytotoxicity. Do not apply in the float water or through an irrigation system.
	(Acephate) 97UP	0.75 tbsp/3.0 gal of water (0.75 lb/A)	24	
	(Orthene) 97PE	0.75 tbsp/3.0 gal of water (0.75 lb/A)	24	
Snails and slugs	metaldehyde (Deadline Bullets) 4% bait	0.5-2.0 lb	12	Apply to alleys, walkways and vacant areas in late afternoon. Do not apply to float water or on foliage.

¹Minimum time interval between application and worker re-entry into field without protective clothing

Insect Control on Newly Transplanted Tobacco

Wireworms

Wireworms are the whitish- to yellowish-brown larvae of click beetles that live in the soil and tunnel the roots and piths of young tobacco plants. This injury stunts plant growth, causes irregular stands, reduces yields, and allows soil-borne pathogens to enter the roots of both disease resistant and susceptible plants. Although wireworms feed throughout the growing season, the most serious damage occurs during the first month after transplanting. Wireworms take 1 to 5 years to complete their life cycle. The larvae emerge from eggs in the late summer and fall, feed on the roots of tobacco and other host plants, and overwinter into the following season. Wireworms are most serious in tobacco fields with a history of infestations and in those following corn, sod, weeds, or small grains. In these situations, apply an insecticide labeled as soil, transplant-water, or tray-drench treatments for wireworms (Tables 4.58, 4.59, 4.60, 4.61). Sturdy, healthy transplants are less susceptible to wireworm damage than tender transplants. There is no remedial control for wireworm damage. If the stand is seriously reduced, one option is to plow, disk, or rebed the field and replant it after treatment with a recommended preplant insecticide. A second option is to cultivate and irrigate the crop to help it overcome the wireworm damage. This approach often enables the crop to produce a normal yield.

Cutworms

Cutworms are active at night, feeding on leaves, stems, and roots and frequently cutting off entire plants. This injury can cause enough damage and stand loss to require replanting. However, tobacco can easily compensate for more than 5 percent stand reduc-

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tions so that there is no effect on yield. Cutworm infestations are fairly difficult to predict, but they are most likely to occur in weedy, low-lying fields that are plowed within a month before transplanting. Early plowing reduces cutworm populations by destroying crops and weeds that attract the egg-laying moths. Normally, preventive soil treatments are not needed because serious infestations are rare and remedial applications of a foliar insecticide are effective. To determine when a remedial foliar treatment is needed, scout fields for cutworm damage once or twice a week during the first month after transplanting. Apply a foliar insecticide for cutworm control during late afternoon or early evening when about 5 percent of the plants in a field have recent cutworm damage.

Whitefringed beetles

Whitefringed beetle grubs have become a serious problem in some flue-cured and burley tobacco fields. Outbreaks usually occur in fields that have been planted in clover, soybeans, or alfalfa in the previous year. Most legumes are excellent food plants for the whitefringed beetle. The grubs feed on the outer surface of the roots or tunnel into the pith of newly transplanted tobacco like wireworms. This injury can cause severe stunting, plant mortality, and yield reductions. All adult beetles are flightless female weevils. No insecticides are registered for whitefringed beetle control on tobacco. Tray drench applications of imidacloprid and thiamethoxam often reduce the injury caused by whitefringed beetles. The rotation of tobacco with good stands of grass containing few legumes or broadleaf weeds is the most effective cultural control.

Table 4.58 - Ratings of Soil And Transplant-water Treatments for Control of Insect Pests on Flue-Cured Tobacco¹

Insecticide	Application method ³	Leaf-feeding insects ¹		Soil insects ¹		Nematodes ^{1,2}	
		Aphids	Flea beetles	Cutworms	Wireworms	Root-knot and others	Tobacco cyst
acephate Acephate AG/ Acephate UP Orthene 75S, 97	TPW	1	3	3	0	0	0
imidacloprid Admire 2F Admire Pro 4.6SC	TPW, TD	5	2 TPW, 4 TD	0	3	0	0
bifenthrin Capture 2EC	TPW, TD, PPI	0	2 TPW, 3 TD	3	?	0	0
chlorpyrifos Lorsban 4E	PPI	0	1	3	4	0	0
ethoprop Mocap 6EC	PPI	0	1	3	4	0	0
thiamethoxam Platinum 2F T-MOXX	TPW, TD	5	3 TPW, 4 TD	0	3	0	0
aldicarb Temik 15G	PPI - Band	3	2	0	0	3	3

¹Ratings are based on a scale of 0 to 5 where 0 = not labeled, 1 = poor control, 2 = fair control, 3 = good control, 4 = very good control, and 5 = excellent control.

²Ratings for nematode control were made by Dr. Charles Johnson.

³TPW = Transplant Water; TD = Tray drench to seedlings before transplanting; PPI = Preplant soil incorporated.

Tobacco flea beetle

Adult tobacco flea beetles feed on the leaves and stalks of tobacco plants, while the slender grubs or larvae feed on the roots. Extensive feeding by both stages on newly set transplants may delay early-season growth, affect crop uniformity, and stunt scattered plants in the field, resulting in uneven stands. When checking tobacco plants for flea beetles, look for the characteristic 'shot-hole' feeding damage in the leaves, and then count the flea beetles on 20 plants (2 per field-sample location). **Treat for flea beetle control on newly set tobacco when there are 4 or more beetles per plant.** Larger plants can tolerate very high flea

beetle densities. After topping, densities may exceed 60 beetles per plant and the bases of the lower leaves may have a ragged, lacy appearance. However; most insecticides registered for use on tobacco at this growth stage do little to reduce flea beetle damage because they give limited residual control and adult beetles are continuously emerging from the soil around the tobacco plants. Harvesting at the normal time and stalk cutting and root destruction immediately after harvest are the most effective cultural practices for reducing flea beetle damage.

Managing thrips to control tomato spotted wilt virus

The tobacco thrips is the primary vector of tomato spotted wilt virus (TSWV) a serious disease of tobacco in the southeastern United States. In 2002, TSWV caused moderate losses in tobacco fields in the eastern part of the flue-cured production region in Virginia, but it has caused only minor losses since then. Foliar insecticide treatments for thrips control have not been effective or practical for managing TSWV. However, the use of tray drench or transplant water applications of Admire and Platinum suppresses TSWV in tobacco fields. Treatments to control TSWV are rarely needed in Virginia. See the “Diseases: Tobacco” section for more information on managing TSWV.

Soil-incorporated insecticides

Pretransplant soil applications of insecticides can provide effective control of wireworms, flea beetles, aphids, cutworms, and nematodes on tobacco (Table 4.59). However, foliar insecticides applied as needed at the economic thresholds usually give effective control of insects feeding on tobacco foliage at lower costs than soil-applied systemic insecticides.

Several things should be considered before selecting a soil insecticide.

- 1) What pests must be controlled with a soil treatment (Table 4.58)? Various soil treatments give effective control of aphids, flea beetles, cutworms, and wireworms.
- 2) Does the field have a history of wireworm, cutworm, or nematode infestations? Temik (flue-cured tobacco only) controls both insects and nematodes. If a tobacco field has been in sod, weeds, or small grains during the previous year or has a history of wireworm problems, an insecticide should be applied for wireworm control. Mocap and Lorsban are labeled as soil treatments for wireworms. Admire and Platinum applied as transplant water or transplant drench treatments for wireworms also control aphids and flea beetles.
- 3) A preventative insecticide application for cutworm control may be warranted if the field is plowed within 2 weeks of transplanting, otherwise a remedial foliar treatment is the best approach to cutworm control.
- 4) Temik, the most effective contact nematicide, is not effective against wireworms, so another chemical may be needed for wireworms.

Table 4.59 - Insects on Field Tobacco – Pretransplant Soil Treatments

Insect	Insecticide (Formulation)	Rate per acre	Restricted Entry Interval (Hours) ¹	Remarks and Precautions
Aphids (Early season suppression of flea beetles)	aldicarb (Temik) 15G (Flue-Cured Only)	10.0-14.0 lb	48 (See label for re-entry restrictions after rain or irrigation).	RESTRICTED USE. Apply granules in a 6- to 12-inch band and incorporate into soil or cover with soil to a depth of 2 to 6 inches when forming beds. Transplant into treated area. The 17 to 20 lb/A rate labeled for nematodes also provides good aphid control. Do not apply more than 1 week before transplanting. Transplants are often sensitive to Temik applied in narrow bands. Check the label for plant back restrictions on other hosts. Do not apply after transplanting. Temik is not effective against wireworms and cutworms.

¹Minimum time interval between application and worker re-entry into field without protective clothing

Table 4.59 - Insects on Field Tobacco – Pretransplant Soil Treatments (cont.)

Insect	Insecticide (Formulation)	Rate per acre	Restricted Entry Interval (Hours) ¹	Remarks and Precautions
Wireworms	ethoprop (Mocap) 6EC	1.33-4.0 qt	48	Make broadcast applications at least 2 weeks before transplanting. Band applications are usually less effective than broadcast treatments. Use a suitable device to incorporate into the top 3 inches of soil. These chemicals are RESTRICTED USE .
	ethoprop (Mocap) 10G	20.0 lb	48	
Wireworms, cutworms	chlorpyrifos (Lorsban) 15G	13.5-20.0 lb	24	
	chlorpyrifos (Lorsban) 4E	2.0-3.0 qt	24	

¹Minimum time interval between application and worker re-entry into field without protective clothing

Table 4.60 - Insects on Field Tobacco – Transplant Water Treatments

Insect	Insecticide	Rate per acre or 1000 plants	Restricted Entry Interval (Hours) ¹	Remarks and Precautions
Cutworms, flea beetles, thrips, suppression of aphids for up to 6 weeks	acephate (Acephate) AG 75S	1.0 lb/A	24	Provides control for 3 to 4 weeks after transplanting. Transplant water treatments should be applied in at least 100 gal of water/A. Calibrate transplanters and allow tanks to run low before refilling and adding additional acephate.
	(Acephate) 97UP	0.75 lb/A	24	
	(Orthene) 97PE	0.75 lb/A	24	
Aphids, flea beetles	imidacloprid (Alias) 2F, (Nuprid) 2F	1.0 fl oz/1,000 plants	12	Imidacloprid and thiamethoxam provide good control of aphids for 8 to 10 weeks after transplanting. Flea beetle control with transplant-water treatments is less effective than with tray-drench treatments that give excellent control of flea beetles for 3 to 4 weeks after transplanting. These treatments do not control flea beetles after topping.
	(Admire Pro) 4.6SC	0.6 fl oz/1,000 plants	12	
	thiamethoxam (Platinum) 2SC	0.5-1.3 fl oz/1,000 plants	12	
	(T-MOXX) 2SC	0.5-1.3 fl oz/1,000 plants	12	
Wireworms, thrips (suppression of thrips with Admire)	imidacloprid (Alias) 2F, (Nuprid) 2F	1.4-2.8 fl oz/1,000 plants	12	
	(Admire Pro) 4.6SC	0.8-1.2 fl oz/1,000 plants	12	
	thiamethoxam (Platinum) 2SC	1.3 fl oz/1,000 plants	12	
	(T-MOXX) 2SC	1.3 fl oz/1,000 plants	12	

¹ Minimum time interval between application and worker re-entry into field without protective clothing.

Table 4.61 - Insects on Field Tobacco – Drench Application to Greenhouse Transplants

Insect	Insecticide	Rate per acre or 1000 plants	Restricted Entry Interval (Hours) ¹	Remarks and Precautions
Aphids, flea beetles	imidacloprid (Alias) 2F, (Nuprid) 2F	1.0 fl oz/1,000 plants	12	Spray on seedlings in trays or flats prior to transplanting and water plants immediately after application using enough water to remove all residue from the foliage and to wash it into the potting media where it is taken up by the roots. Mix with water before application and keep agitated or mix regularly to avoid settling in tanks. Transplant into field within 7 days. Imidacloprid and thiamethoxam provide good control of aphids for 8 to 12 weeks after transplanting. The higher rates of imidacloprid also may reduce the incidence of tomato spotted wilt virus.
	(Admire Pro) 4.6SC	0.5 fl oz/1,000 plants	12	
	thiamethoxam (Platinum) 2SC	0.5-1.3 fl oz/1,000 plants (3.0-8.0 fl oz/A)	12	
	(T-MOXX Tobacco insecticide) 2SC	0.5-1.3 fl oz/1,000 plants (3.0-8.0 fl oz/A)	12	
Wireworms, thrips (suppression of thrips and tomato spotted wilt virus with Admire)	imidacloprid (Alias) 2F, (Nuprid) 2F	1.4-2.8 fl oz/1,000 plants	12	Use waterproof gloves when transplanting treated plants. Do not apply Actara, Assail, or Provado to tobacco already treated with Admire Pro or Platinum.
	(Admire Pro) 4.6SC	0.8-1.2 fl oz/1,000 plants	12	
	thiamethoxam (Platinum) 2SC	0.8-1.3 fl oz/1,000 plants (5-8 fl oz/A)	12	
	(T-MOXX Tobacco insecticide) 2SC	0.5-1.3 fl oz/1,000 plants (3-8 fl oz/A)	12	

¹ Minimum time interval between application and worker re-entry into field without protective clothing.

Insect Control on Larger Tobacco

Scouting tobacco fields for insects

Tobacco fields should be scouted at least once a week throughout the season to determine when insecticide applications are needed.

- 1) Sample for insect pests and their damage on at least 50 plants in a field (1-10 acres). Preselect plants so that you do not see them ahead of time. Take samples from all parts of the field. Make counts and record the data for 5 consecutive plants at 10 locations throughout the field. If a field is planted on two different dates or if there are great differences in plant size, divide the field into two or more sections and sample each section separately. Large fields (more than 10 acres) will require larger samples. Sample 10 additional plants for every 2 additional acres.
- 2) During the first 4 weeks after transplanting, check tobacco for feeding holes or missing, stunted, or cut plants. These plants may be damaged by wireworms, cutworms, flea beetles, and other insects.
- 3) After 3 to 4 weeks, hornworms, budworms, and aphids are the primary targets of an insect scouting program.
- 4) When a field is being scouted for insects that feed on tobacco foliage, individual plants should be examined as follows:
 - a. First, check the bud region for budworm damage.
 - b. If damage is present, look carefully for budworms and the white cocoons of the budworm parasite, *Camponotus caryocarpae*. If there is budworm damage, but no worm, do not count the plant as infested.
 - c. Check the entire plant for hornworm damage, locate and count the hornworms at least 1 inch long, and determine whether they are parasitized by *Cotesia congregata* (white egg-like cocoons on the backs of hornworms).

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- d. Examine the undersides of upper leaves for aphids and the upper surfaces of the middle and lower leaves for honeydew, flea beetles, flea beetle feeding holes, and mines of the tobacco splitworm.
 - e. If an unidentified insect is observed and it appears to be causing serious damage to the crop, collect samples of the insect and its damage and take them to a local Extension agent for identification. This is important because beneficial insects are often mistaken for pests. In addition, the misidentification of a pest may result in the selection of the wrong insecticide for its control.
- 5) Tobacco fields should be treated when one or more insect pests meet or exceed the threshold levels shown in Table 4.62.

Table 4.62 - Economic Thresholds for Various Insects on Tobacco

Insect	Economic threshold	Time when insect is a problem (weeks after transplanting)
Aphids	50 or more aphids on any upper leaf on 5 of 50 plants.	4 weeks after transplanting to final harvest
Budworms	10 plants infested with budworms per 50 plants until 1 week before topping.	3 weeks after transplanting to 1 week before topping
Cutworms	5 out of 50 plants with recent cutworm damage or 2 out of 50 cut plants.	0 to 4 weeks after transplanting
Flea beetles	4 beetles per plant on newly transplanted tobacco (less than 2 week-old), 8 to 10 beetles per plant on 2 to 4 week-old plants. Sample 50 plants, 5 plants in each of 10 locations.	0 to 4 weeks after transplanting and from topping to final harvest
Grasshoppers	10 grasshoppers per 50 plants.	4 weeks after transplanting to final harvest
Hornworms	5 larvae (worms) at least 1 inch long per 50 plants. Do not count worms with white egg-like parasite cocoons on their backs.	3 weeks after transplanting to final harvest. Can be a problem in the curing barn on air-cured tobacco
Wireworms	Not determined	1 to 4 weeks after transplanting

Budworms

Tobacco budworm larvae feed in the buds of young tobacco plants, causing many holes in the tiny developing leaves. As these leaves increase in size, the feeding holes increase at the same rate, giving the leaves a ragged, distorted appearance. This injury may look serious, but it usually has no effect on yield or quality. However, when budworms top tobacco plants (destroy the bud), the plant may be stunted, have earlier sucker growth, and the need for extra labor to remove the suckers. **Tobacco budworm control should be initiated anytime before buttoning when there are 10 or more living budworms per 50 plants.** After the button stage, budworms rarely cause economic damage to tobacco. Apply foliar sprays for budworm control with 1 or 3 solid-cone or hollow-cone nozzles over each row using 40 to 60 pounds pressure (psi) to deliver 20 to 40 gallons per acre of spray mixture. Orient the spray into the bud. Control with foliar sprays rarely exceeds 80 percent. When tobacco is checked for budworms, the cocoons of a small wasp (*Campoletis*) that parasitizes budworms are often observed on the leaves near the bud. They are about 1/4 inch long and white or grayish in color with two black bands. Living budworms are rarely found on plants with *Campoletis* cocoons. *Campoletis* provides good natural control of budworms in Virginia and should be conserved as much as possible.

Hornworms

Tobacco and tomato hornworms are large caterpillars (up to 4 inches long) that consume large amounts of tobacco leaf. Infestations may develop anytime from transplanting until harvest, but the most severe damage usually occurs during June, August, and September. **Control should be initiated when there are 5 hornworms an inch long or greater per 50 plants. Do not count parasitized hornworms.** Hornworms with white, egg-like cocoons of the parasitic wasp, *Cotesia congregata*, on their backs eat much less than healthy hornworms and provide a source of parasites that will help reduce the next generation of hornworms. In some cases, when large numbers (over 1 per plant) of hornworm larvae less than 1 inch long are found, an insecticide should be applied for their control. For optimum hornworm control, insecticide sprays should be directed to the upper two-thirds of the plant.

Hornworms on burley tobacco at harvest and in the curing barn

Hornworms on tobacco at harvest can seriously damage burley and dark-fired tobaccos in the curing barn. High populations of large hornworms may eat so much leaf that only the stalks and veins remain. Large numbers of small hornworms can also develop on the curing green leaf and cause extensive damage. Since there is no practical treatment for hornworms in the curing barn, it is important to control them before harvesting. Scout fields for hornworms within 7 days before harvest to determine whether treatment is necessary. Treat if there are two or more hornworms an inch long or longer per 50 plants or if there are 10 or more hornworms less than an inch long per 50 plants. Do not count the parasitized hornworms. Treat with *Bacillus thuringiensis* (Agree, Crymax, Dipel, Javelin, Lepinox, and Xentari) or another short residual insecticide within 7 days of harvest. *Bacillus thuringiensis* is recommended because it is effective and has a 0-day preharvest interval. If other insecticides are used, be sure to observe and follow the preharvest intervals to avoid undesirable pesticide residues.

Aphids

The tobacco or green peach aphid is a major insect pest of tobacco in Virginia. High aphid populations can reduce the yield of untreated tobacco by 5 to 25 percent. Aphids may infest tobacco seedlings in plant beds or greenhouses, but the most severe damage occurs on field tobacco from late June through mid-September. They can be introduced into a field on infested tobacco transplants, but the most important source of infestation is winged aphids that fly into the field and deposit young wingless nymphs on tobacco plants. Feeding aphids deposit honeydew, a sugary substance that gives the leaves a shiny appearance, and a dark, sooty mold often develops on the honeydew. This combination often interferes with curing and reduces quality. The presence of honeydew and sooty mold indicates that aphids have been a problem, but these materials often remain on leaves after aphids have been controlled.

Producers should watch for aphid infestations from early June to the end of August. Examine the undersides of leaves from the lower, middle, and upper portions of tobacco plants at regular intervals to determine the infestation levels. Be on the lookout for honeydew and sooty mold. **Remedial treatments should be initiated for aphid control when at least 5 of 50 plants are infested with 50 or more aphids on any one leaf.**

The following practices can be used to manage aphids on tobacco.

1. Cultural Control

Use cultural practices to reduce aphid populations. Most cultural practices do not keep aphid populations below the economic threshold, but they can improve the effectiveness of foliar insecticides and reduce the need for insecticide applications after topping. Useful cultural practices include:

- a. Avoid planting cole crops such as greens, cabbage, and turnips (winter hosts for aphids) near plant beds or greenhouses. Aphids can develop on these crops and then migrate to tobacco.
- b. Control aphids in greenhouses and destroy plant beds and greenhouse transplants immediately after transplanting is completed.
- c. Transplant early. Early planted tobacco becomes infested with aphids earlier but it matures earlier and the impact is usually not as great as it is on tobacco planted in the middle of the recommended planting period.
- d. Use recommended nitrogen rates on flue-cured tobacco. Excessive nitrogen keeps the leaves green for a longer period of time and promotes excessive sucker growth that favors aphid infestation.
- e. Top early and control suckers. Aphid populations often decline rapidly after topping, especially during hot, dry weather. However, populations may build back up to damaging levels that require insecticide treatment.
- f. Conservation tillage, including no tillage, and strip tillage, is usually less favorable for aphids than conventional tillage.

2. Preventive Control

- a. Apply a preventive insecticide before or at transplanting. Admire or Platinum applied as transplant-drench or transplant-water treatments and Temik applied in a band before transplanting (flue-cured tobacco only) usually provide excellent preventive control of aphids throughout the season. The Orthene (acephate) transplant water treatment provides some early-season control of aphids.

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3. Remedial Control

- a. Make remedial applications of a foliar insecticide at the economic threshold level before aphids become established and are more difficult to control. If aphids are controlled early, they are much easier to control for the rest of the season.
- b. Rotate insecticides. The continuous use of the same insecticide over the growing season and year after year increases the chances that insects will develop insecticide resistance. Rotating insecticides with different modes of action reduces the chances that resistance will develop. Orthene/Acephate, Fulfill, Actara, and Assail/Provado can be rotated for effective aphid control. Do not apply foliar treatments of neonicotinoids (Actara/Assail/Provado) to tobacco already treated with a neonicotinoid (Admire, Platinum, or T-MOXX) applied as tray-drench or transplant-water treatments.
- c. After applying an insecticide for aphid control, wait at least 3 to 4 days before assessing control because it takes 1 to 3 days for the aphids to die. If control is not adequate, review the weather conditions during and after applications. Also recheck the insecticide label, the sprayer, and its calibration to see if any of these factors may have affected the control.
- d. Most remedial insecticides used for aphid control must come in contact with the undersides of the leaves where most aphids are found. The use of higher gallonage, higher sprayer pressure, drop nozzles, and spreader-stickers will improve coverage.
- e. After obtaining satisfactory control, continue to watch the crop closely because aphid populations can build up rapidly and require additional insecticide applications.

Table 4.63 - Rating of Foliar Insecticides for Control of Insect Pests on Flue-cured Tobacco¹

Insecticide	Aphids	Budworms	Cutworms	Flea Beetles	Grasshoppers	Hornworms
thiamethoxam Actara	4	0	0	3	0	0
acetamiprid Assail	4	2	0	0	0	0
<i>Bacillus thuringiensis</i> , (Agree, Crymax, Dipel, Javelin, Lepinox, Xentari)	0	2	0	0	0	5
bifenthrin (Capture)	2	0	3	4	2	0
flubendiamide (Belt)	0	4	0	0	0	5
emamectin benzoate Denim	0	4	0	0	0	5
pymetrozine Fulfill	3	0	0	0	0	0
methomyl Lannate	2	3	0	3	0	5
acephate Orthene/Acephate AG/ Acephate UP	4	3	4	3	4	5
imidacloprid Provado/Pasada	4	0	0	3	0	0
carbaryl Sevin	0	2	3	3	2	4
spinosad Tracer	0	4	0	0	0	4
lambda-cyhalothrin Warrior	1	3	3	3	3	5

¹Rating is based on a scale of 0 to 5 where 0 = not labeled, 1 = poor control, 2 = fair control, 3 = good control, 4 = very good control, and 5 = excellent control.

Tobacco splitworm/potato tuberworm

The tobacco splitworm, or potato tuberworm, is a small leaf-mining caterpillar that is sometimes a late-season pest of tobacco. Splitworms feed inside mines that appear as grayish, translucent blotches on the tobacco leaves. They also feed along, inside the veins, and in the pith. Old mines turn brown and may destroy the entire leaf. Splitworm damage is often mistaken for leaf damage caused by leaf diseases such as target spot and brown spot. It is most common on the lower leaves, but can occur on any leaf. It may destroy entire leaves, increasing the amount of necrotic tissue that reduces leaf quality. Since splitworms feed inside the leaves, they are difficult to control with insecticides. Some insecticides, including Denim, Lannate, and Orthene, provide fair control when applied at high gallonage using drop nozzles. However, economic thresholds have not been established for this pest and none of the insecticides provide effective control. Therefore, it is important to avoid planting and storing potatoes near tobacco fields or curing structures since they are important sources of this pest in tobacco. If the feeding mines are observed on the lower leaves, the leaves should be harvested and cured as soon as possible. The larvae can continue to develop inside the leaves, veins, and stalks as burley tobacco is being cured in the barn, but splitworms are killed during the curing process for flue-cured tobacco. Removing infested leaves and dropping them on the ground does not reduce splitworm infestations.

Insecticide Application Methods

Foliar insecticides must be applied properly for optimum insect control. Thorough coverage of the entire plant provides the best control of aphids, flea beetles and hornworms, while the insecticide must be concentrated in the bud for optimum budworm control. On small tobacco, effective control can be obtained by using one solid-cone or hollow-cone nozzle per row directed to the bud. Operate spray equipment at 40 to 60 pounds pressure, do not exceed 5 miles per hour, and use at least 6 to 8 gallons of mixed spray per acre. After tobacco is 2 ft tall, use one or three cone nozzles per row. If three nozzles are used, the two side nozzles should be oriented at a 45° angle toward the upper one-third of the plant. Use 40 to 60 pounds pressure and 20 to 40 gallons of spray mixture per acre. Set the nozzles 8 to 12 inches above the tobacco. Drop nozzles oriented to the undersides of the leaves and used in combination with 1 to 3 nozzles over the row improve aphid, flea beetle, and tobacco splitworm control.

Table 4.64 - Foliar Treatments - Field Tobacco

Insect	Insecticide (Formulation)	Rate per acre	Time Limits		Remarks and Precautions
			Restricted Entry Interval (Hours) ¹	Days to Harvest	
Aphids	acephate				Apply as a spray. Use highest rate for heavy infestations. Good coverage is important for all products. If tobacco is large, use drop nozzles to orient spray to undersides of leaves. Prime before treating.
	(Acephate) AG 75S	0.67-1.0 lb	24	3	
	(Acephate) 97UP	0.5-0.75 lb	24	3	
	(Orthene) 97PE	0.5-0.75 lb	24	3	
	acetamiprid				Do not make more than 4 applications per season. Do not apply to tobacco treated with Admire or Platinum.
	(Assail) 70WP	0.6-1.7 oz	12	7	
	(Assail) 30SG	1.5-4.0 oz	12	7	
	bifenthrin	4.0-6.4 fl oz	12	Do not apply after layby	Apply in at least 10 gal/A.
	imidacloprid				Apply as a spray. Do not apply to tobacco treated with Admire or Platinum.
	(Provado) 1.6F	2.0-4.0 fl oz	12	14	
	(Pasada) 1.6F	2.0-4.0 fl oz	12	14	
	methomyl				RESTRICTED USE. Apply as a spray. Several applications may be necessary to control aphids. Aphid populations rebound quickly because methomyl gives short residual control.
(Lannate) 90S	0.5 lb	48	5 flue-cured 14 fire- and air-cured		
(Lannate) 2.4LV	1.5 pt	48			

¹Minimum time interval between application and worker re-entry into field without protective clothing.

Table 4.64 - Foliar Treatments - Field Tobacco (cont.)

Insect	Insecticide (Formulation)	Rate per acre	Time Limits		Remarks and Precautions
			Restricted Entry Interval (Hours) ¹	Days to Harvest	
Aphids (cont.)	pymetrozine (Fulfill) 50WG	2.75 oz	12	14	Apply when aphids first appear before populations build up to damaging levels. This material causes aphids to quit feeding immediately but they may remain alive on the plants for 2 to 4 days. Do not make more than two applications per year.
	thiamethoxam (Actara) 25WDG	2.0-3.0 fl oz	12	14	Do not make more than one application per season. To insure thorough coverage, use a minimum of 20 gal/A. Do not apply to tobacco treated with Admire or Platinum as tray drench or transplant water treatments.
Armyworms (beet, fall and yellowstriped)	<i>Bacillus thuringiensis</i> Xentari WDG	0.5-1.0 lb	4	0	Apply as a spray.
	bifenthrin (Capture) 2EC	4.0-6.4 fl oz	12	Do not apply after layby	Apply in at least 10 gal/A.
	emamectin benzoate (Denim) 0.16EC	6.0-12.0 fl oz	48	14	RESTRICTED USE. Apply in sufficient water for thorough coverage.
	lambda-cyhalothrin (Warrior) 1EC	1.9-3.8 fl oz	24	40	RESTRICTED USE. Apply as a spray.
Budworms	acephate (Acephate) AG 75S	1.0 lb	24	3	Apply as a spray.
	(Acephate) 97UP	0.75 lb	24	3	
	(Orthene) 97PE	0.75 lb	24	3	
	<i>Bacillus thuringiensis</i> (Agree) WG	1.0-2.0 lb	4	0	Apply as a spray. Do not allow diluted sprays to stand more than 12 hours.
	(Crymax) WG	0.5-1.5 lb	4	0	
	(Dipel) DF	0.5-1.0 lb	4	0	
	(Dipel) ES	1.0 pt	4	0	
	(Javelin) WG	1.0-2.0 lb	4	0	
	(Lepinox) WDG	1.0-2.0 lb	12	0	
	(Xentari) WDG	0.5-1.0 lb	4	0	
	carbaryl (Sevin) 80WP	1.25-2.5 lb	12	0	
	(Sevin) 4F	1.0-2.0 qt	12	0	
	(Sevin) XLR Plus	1.0-2.0 qt	12	0	
	emamectin benzoate (Denim) 0.16EC	8.0-12.0 fl oz	48	14	RESTRICTED USE. Apply in sufficient water for thorough coverage. Apply before damaging infestations occur.
	flubendiamide (Belt) 4SC	4.0-6.4 fl oz	12	14	Apply in at least 10 gal/A.
lambda-cyhalothrin (Warrior) 1EC	1.9-3.8 fl oz	24	40	RESTRICTED USE. Apply as a foliar spray at the threshold as indicated by field scouting.	

¹Minimum time interval between application and worker re-entry into field without protective clothing.

Table 4.64 - Foliar Treatments - Field Tobacco (cont.)

Insect	Insecticide (Formulation)	Rate per acre	Time Limits		Remarks and Precautions
			Restricted Entry Interval (Hours) ¹	Days to Harvest	
Budworms (cont.)	methomyl (Lannate) 90SP	0.5 lb	48	5 flue- cured,	RESTRICTED USE. Apply as a spray. Make applications as needed. Direct the spray into the buds before buttoning.
	(Lannate) 2.4 LV	1.5 pt	48	14 fire- and air-cured	
	spinosad (Tracer) 4F	1.4-2.9 fl oz	4	3	Apply as a spray when larvae are small. Use higher rates for large larvae or high populations. Use at least 20 gal of water/A.
Cabbage loopers	acephate (Acephate) AG 75S	1.0 lb	24	3	Apply as a spray in 10 to 50 gal of water.
	(Acephate) 97UP	0.75 lb	24	3	
	(Orthene) 97PE	0.75 lb	24	3	
	<i>Bacillus thuringiensis</i> (Agree) WG	1.0-2.0 lb	4	0	Apply as a spray. Do not allow prepared sprays to stand in tank more than 12 hours.
	(Crymax) WG	0.5-1.5 lb	4	0	
	(Dipel) DF	0.5-1.0 lb	4	0	
	(Dipel) ES	1.0 pt	4	0	
	(Javelin) WG	1.0-2.0 lb	4	0	
	(Lepinox) WDG	1.0-2.0 lb	12	0	
	(Xentari) WDG	0.5-1.0 lb	4	0	
	emamectin benzoate (Denim) 0.16EC	8.0-12.0 fl oz	48	14	RESTRICTED USE. Apply in sufficient water for thorough cov- erage. Apply before damaging infestations occur.
	lambda-cyhalothrin (Warrior) 1EC	1.9-3.8 fl oz	24	40	RESTRICTED USE. Apply as a spray.
	methomyl (Lannate) 90SP	0.5 lb	48	5 flue- cured,	
(Lannate) 2.4LV	1.5 pt	48	14 fire- and air-cured		
spinosad (Tracer) 4F	1.5-2.9 fl oz	4	3	Apply as a spray. Use higher rates for large larvae or high populations. Use at least 20 gal of water/A.	
Cutworms	acephate (Acephate) AG 75S	1.0 lb	24	3	During the late afternoon, apply as a spray ovetop of plants in affected areas when 5% of plants are injured by cutworms.
	(Acephate) 97UP	0.75 lb	24	3	
	(Orthene) 97PE	0.75 lb	24	3	
	bifenthrin (Capture) 2EC	4.0-6.4 fl oz	12	Do not apply after layby	Apply in at least 10 gal/A.
lambda-cyhalothrin (Warrior) 1EC	1.9-3.8 fl oz	24	40	RESTRICTED USE. Apply in the late afternoon when cut- worms are causing damage.	
Flea beetles	acephate (Acephate) AG 75S	0.75 lb	24	3	Apply as a spray.
	(Acephate) 97UP	0.5 lb	24	3	
	(Orthene) 97PE	0.5 lb	24	3	

¹Minimum time interval between application and worker re-entry into field without protective clothing.

Table 4.64 - Foliar Treatments - Field Tobacco (cont.)

Insect	Insecticide (Formulation)	Rate per acre	Time Limits		Remarks and Precautions
			Restricted Entry Interval (Hours) ¹	Days to Harvest	
Flea beetles (cont.)	bifenthrin (Capture) 2EC	4.0-6.4 fl oz	12	Do not apply after layby	Apply in at least 10 gal/A.
	carbaryl (Sevin) 80WP	1.25 lb	12	0	Do not apply until plants are established and growing. Aphids often become a problem following two or more applications of carbaryl.
	(Sevin) 4F	1.0-2.0 qt	12	0	
	(Sevin) XLR Plus	1.0-2.0 qt	12	0	
	imidacloprid (Provado) 1.6F	2.0-4.0 fl oz	12	14	Apply as a spray. Do not apply to tobacco treated with Admire or Platinum.
	(Pasada) 1.6F	2.0-4.0 fl oz	12	14	
	lambda-cyhalothrin (Warrior) 1EC	1.9-3.8 fl oz	24	40	RESTRICTED USE. Apply in sufficient water for coverage.
methomyl (Lannate) 90SP	0.25-0.5 lb	48	5 flue- cured, 14 fire- and air-cured	RESTRICTED USE. Apply as a spray.	
(Lannate) 2.4LV	0.75-1.5 pt	48			
	thiamethoxam (Actara) 25WDG	2.0-3.0 fl oz	12	14	Do not make more than one application per season. To insure thorough coverage, use a minimum of 20 gal/A. Do not apply Actara to tobacco treated with Admire or Platinum as tray drench or transparent water treatments.
Grasshoppers	acephate (Acephate) AG 75S	0.67 lb	24	3	Apply as a spray. Treat crop and a strip around field to reduce grasshopper immigration.
	(Acephate) 97UP	0.5 lb	24	3	
	(Orthene) 97PE	0.5 lb	24	3	
	bifenthrin (Capture) 2EC	4.0-6.4 fl oz	12	Do not apply after layby	Apply in at least 10 gal/A.
	carbaryl (Sevin) 80WP	0.67-1.88 lb	12	0	Apply as a spray. Treat crop and a strip around field to reduce grasshopper immigration.
	(Sevin) 4F	0.5-1.5 qt	12	0	
	(Sevin) XLR Plus	0.5-1.5 qt	12	0	
	lambda-cyhalothrin (Warrior) 1EC	1.9-3.8 fl oz	24	40	RESTRICTED USE. Apply as a spray.
Hornworms	acephate (Acephate) AG 75S	0.67 lb	24	3	Apply as a spray. Treat infested fields before worms are 1.5 inches long. Insecticides should be directed toward top six leaves of plants. Prime before treatment.
	(Acephate) 97UP	0.5 lb	24	3	
	(Orthene) 97PE	0.5 lb	24	3	
	<i>Bacillus thuringiensis</i> (Agree) WSP	1.0-2.0 lb	4	0	Apply as a spray. Do not allow dilute sprays to stand in tank more than 12 hr. Dipel can be tank mixed with maleic hydrazide (MH-30).
	(Crymax) WG	0.5-1.5 lb	4	0	
	(Dipel) DF	0.5 lb	4	0	
	(Dipel) ES	0.5-1.0 pt	4	0	
	(Javelin) WG	1.0-2.0 lb	4	0	
	(Lepinox) WDG	1.0-2.0 lb	12	0	
	(Xentari) WDG	0.5-1.0 lb	4	0	

¹Minimum time interval between application and worker re-entry into field without protective clothing.

Table 4.64 - Foliar Treatments - Field Tobacco (cont.)

Insect	Insecticide (Formulation)	Rate per acre	Time Limits		Remarks and Precautions
			Restricted Entry Interval (Hours) ¹	Days to Harvest	
Hornworms (cont.)	carbaryl (Sevin) 80WP	1.25 lb	12	0	Apply as a spray. May injure young plants.
	(Sevin) 4F	1.0-2.0 qt	12	0	
	(Sevin) XLR Plus	1.0-2.0 qt	12	0	
	emamectin benzoate (Denim) 0.16EC	8-12 fl oz	48	7	RESTRICTED USE. Apply in sufficient water for thorough coverage. Apply before damaging infestations occur.
	flubendiamide (Belt) 4SC	4.0-6.4 fl oz	12	14	Apply in at least 10 gal/A.
	lambda-cyhalothrin (Warrior) 1EC	1.9-3.8 fl oz	24	40	RESTRICTED USE. Apply as a spray.
	methomyl (Lannate) 90SP	0.25-0.5 lb	48	5 flue- cured, 14 fire- and air-cured	RESTRICTED USE. Apply as a spray.
	(Lannate) 2.4LV	0.75-1.5 pt	48		
	spinosad (Tracer) 4F	1.0-2.0 fl oz	4	3	Apply as a spray.
	Japanese beetles	acephate (Acephate) AG 75S	1.0 lb	24	3
(Acephate) 97UP		0.75 lb	24	3	
(Orthene) 97PE		0.75 lb	24	3	
bifenthrin (Capture) 2EC		4.0-6.4 fl oz	12	Do not apply after layby	Apply in at least 10 gal/A.
carbaryl (Sevin) 80WP		1.25 lb	12	0	Apply as a spray.
(Sevin) 4F		2.0 qt	12	0	
(Sevin) XLR Plus		1.0-2.0 qt	12	0	
imidacloprid (Provado) 1.6F		4.0 fl oz	12	14	Do not use Provado on tobacco treated with Admire or Platinum.
lambda-cyhalothrin (Warrior) 1EC		1.9-3.8 fl oz	24	40	RESTRICTED USE. Apply as a spray.
thiamethoxam (Actara) 25WG		2.0-3.0 oz	12	14	Apply as a spray. Make only one application per year.
Stink bugs	acephate (Acephate) AG 75S	0.67-1.0 lb	24	3	Apply as a spray.
	(Orthene) 97PE	0.5-0.75 lb	24	3	
	bifenthrin (Capture) 2EC	4.0-6.4 fl oz	12	Do not apply after layby	Apply in at least 10 gal/A.
	lambda-cyhalothrin (Warrior) 1EC	1.9-3.8 fl oz	24	40	RESTRICTED USE. Apply as a spray.

¹Minimum time interval between application and worker re-entry into field without protective clothing.

Table 4.64 - Foliar Treatments - Field Tobacco

Insect	Insecticide (Formulation)	Rate per acre	Time Limits		Remarks and Precautions
			Restricted Entry Interval (Hours) ¹	Days to Harvest	
Thrips	acephate (Orthene) 97PE	0.5 lb	24	7	Apply as spray. Early season applications may control thrips and help reduce the incidence of tomato spotted wilt virus. Foliar treatments for thrips control are rarely necessary.
	bifenthrin (Capture) 2EC	4.0-6.4 fl oz	12	Do not apply after layby	Apply in at least 10 gal/A.
	lambda-cyhalothrin (Warrior) 1EC	1.9-3.8 fl oz	24	40	Apply as spray. Early season applications may control thrips and help reduce the incidence of tomato spotted wilt virus. Foliar treatments for thrips control are rarely necessary.
Whitefringed beetles	No chemical controls				Cultural control: rotate tobacco with grass crops. Control legumes and broad-leaf weeds. Do not plant tobacco after legumes.

¹Minimum time interval between application and worker re-entry into field without protective clothing.