

Crop Profile for Tobacco in West Virginia

Prepared: March 14, 1999

General Production Information



- West Virginia ranked 15th in United States tobacco production in 1996 (1)
- West Virginia contributed 0.18% to total U.S. tobacco production in 1996 (2)
- Burley tobacco area harvested a total of 17,000 acres with yields averaging 1,200 pounds per acre and production totaling 2.04 million pounds in 1996 (1)
- Tobacco production value was \$3,923,000 in 1996 (1)

Production Regions

West Virginia's tobacco crop is mainly concentrated in the southwestern region of the state. Mason County is the leading tobacco producing county with 560,000 pounds, followed by Putnam (460,000), Lincoln (440,000), Cabell (290,000), and Jackson counties (110,000). Tobacco production of the aforementioned counties accounted for over 91 percent of the state total in 1996 (1).

Cultural Practices

A good source of transplants is required to produce a satisfactory tobacco crop. Proper site selection is essential in producing transplants available for field planting when suitable conditions exist (3 and 4). Common characteristics of a good plant bed include:

- A deep, fertile, and well drained soil high in organic matter

- Soil with a slight (5%) southern or western slope
- Exposure to sunshine from 9 a.m. to 3 p.m
- A clean water supply for irrigation
- Being located away from tobacco barns and tobacco trash
- Being located away from tobacco fields to minimize the spread of common pests

General Plant Bed Management

- Apply no more than 50 pounds of 12-6-6 tobacco plant bed fertilizer per 100 square yards before fumigation
- Fumigate with methyl bromide when soil moisture is suitable for cultivation and the soil temperature is at least 50 degrees
- Seed bed 70 to 75 days before the normal transplanting date using 0.17 ounce of seed per 100 square yard

General Field Management

Tobacco field sites should be level to gently rolling with good internal soil drainage. A soil pH of 6.4 to 6.6 is ideal for good tobacco production; a soil test can be used to determine the need for lime and fertilizers. When lime is applied in the spring before transplanting, half of the lime should be applied before plowing and the other half disked in after plowing. Nitrogen fertilization rates depend on the previous field history. On well-drained soils, nitrogen can be broadcast applied and incorporated into the soil up to two weeks before transplanting. On sandy soils or poorly-drained soils, nitrogen applications should be split, with one-third applied before transplanting and the remainder applied two to three weeks after transplanting. Recommended rates of P and K are based on soil test results (3 and 4).

Insect Pests

Plant Bed Insects

The most common insect pests in tobacco plant beds are tobacco flea beetles, black and variegated cutworms, green peach aphids, vegetable weevils, green June beetles, and slugs (5 and 6).

Tobacco Flea Beetle (*Epitrix hirtipennis* [Melsheimer])

- **Damage:** Adult beetles attack plants as they emerge from the ground, chewing holes, reducing plant vigor and value, and ruining entire plant beds (6, 7, 8, and 9).
- **Life cycle:** The larvae or white grubs burrow into the soil and feed on the roots. The adult beetles feed on the leaves and stalks (6, 7, 8, and 9).
- **Chemical control (9):**
 - ***Disulfoton (Di-System) 15G:** Broadcast the granular insecticide after plants emerged (0.5-1 inch in diameter) at 9.0 oz./100 sq. yd.
 - **Acephate (Orthene 75 SP):** Applied as a spray at 1.0 lb./acre
 - **Carbaryl (Sevin XLR plus):** Applied as a spray at 11 tbs./50-100 gallons of water
- *** Restricted use**
- **Cultural control practices:** Sterilize or fumigate the bed's top soil before planting (6). Clear the surrounding area of weedy vegetation and excess organic debris (9). Old plant beds should be plowed/cleaned after transplanting to prevent beetles from invading the surrounding fields (6).

Cutworms, black (*Agrotis ipsilon*) and variegated (*Peridroma saucia*)

- **Damage:** Cutworms cause damage by night feeding on leaves and cutting off plants; the variegated cutworms feed in the buds and cause a serious problem in mid-season (6, 7, 8, and 9).
- **Life cycle:** Larvae feed for four to five weeks at night and can be found in the soil around cut plants during the day; they pass the winter in the pupal stage (6, 7, 8, and 9).
- **Chemical control:** Recommended insecticides for plant bed treatments of cutworms, aphids, and vegetable weevils (9)
 - **Acephate (Orthene 75 SP):** Applied as a spray at 1.0 lb./acre
 - **Carbaryl (Sevin XLR plus):** Applied as a spray at 11 tbs./50-100 gallons of water

- Cultural control practices: Plow fields in early spring to reduce cutworm populations. Also, keep the surrounding area weed-free and debris-free.

Aphids, green peach (*Myzus persicae* [Sulzer])

- Damage: Mass feeding results in thin, lightweight, and poor quality leaves that may ripen prematurely.
- Life cycle: Several generations are produced during the growing season, particularly in mid-season.
- Chemical control: See cutworms
- Cultural control practices: Early-planted tobacco suffers less aphid damage. Early topping gives some reduction in aphid populations (9). The surrounding area should be kept clear of weeds and other organic debris.

Vegetable weevil (*listroderes costirostris obliquus* [Klug])

- Damage: The insect feeds at night, destroys the bud, and eats holes in the leaves.
- Life cycle: During early spring, larvae and adults feed on plant beds, forming a V-shaped spot on leaves (6, 7, 8, and 9).
- Chemical control: See cutworms
- Cultural control practices: See flea beetles

Green June Beetle (*Cotinis nitida* [Linnaeus])

- Damage: Larvae cause damage by feeding on young tender plant roots. They also cause serious damage to the soil, loosening and uprooting plants with their continual burrowing and tunneling.
- Life cycle: Eggs are laid during the summer; larvae hatch, grow to two inches long, and overwinter as larvae deep in the soil to complete their development the following spring. In the spring, larvae tunnel near the soil surface for feeding, pupate in June, and emerge as adults in

July and August (one generation/year).

- Chemical control: In general, no chemical treatment is required, but in large infested areas, insecticides (i.e., Sevin, Malathion) may be used to discourage feeding.

Slugs (*Limax spp.*)

- Damage: Slugs damage plant beds by feeding at night and tearing ragged holes in the leaves, especially during cool, rainy springs. Also, slugs leave a mucous secretion that may attract other pests.
- Chemical control:
 - **Hydrated or air-slaked lime** Metaldehyde bait: Applied as a dust in a band three to four inches wide along the edges of the bed at 4.0 lb./acre. Apply to the soil surface in alleys in late afternoon. Do not apply directly on the foliage (9).

Transplant/Field Tobacco Insects

In addition to the plant bed insects, wireworms, budworms, and hornworms attack transplanted tobacco in the field. Other insects include armyworms, cabbage loopers, thrips, stink bugs, grasshoppers, and stalk borers (5 and 9).

Wireworms (various species)

- Damage: Larvae cut off underground stems and roots, bore into larger stems and roots, and cause plants to stunt, wilt, and die within days (6, 7, 8, and 9).
- Life cycle: Worms hatch in the summer, feed on newly transplanted tobacco, and spend the winter in the soil. It takes about one to three years to complete the life cycle (6, 7, 8, and 9).
- Chemical control (9):
 - **Ethoprop (Mocap EC)**: Broadcast application, at least 14 days before transplanting, at 0.5 gal./acre
 - **Ethoprop (Mocap 10G)**: Broadcast application, at least 14 days before transplanting, at 20.0 lb./acre

- **Chlorpyrifos (Lorsban 15G):** Broadcast application, at least 14 days before transplanting, at 13.5-20.0 lb./acre
- **Chlorpyrifos (Lorsban 4E):** Broadcast application, at least 14 days before transplanting, at 2.0-3.0 qt./acre
- Cultural control practices: Plowing fields in early spring will help reduce wireworm populations. Proper soil drainage will minimize or prevent the damage caused by certain wireworm species
- (6). Healthy and thick-stemmed transplants are less susceptible to wireworms.

Budworms (*Heliothis virescens* [Fabricius])

- Damage: Budworm is one of the most destructive tobacco pests. Larvae damage the bud or growing tips, which then produce ragged and distorted leaves. They also may chew small holes in the leaves (6, 7, 8, and 9).
- Life cycle: Eggs are laid on tobacco leaves, hatch, and develop into 1.5 inch long larvae when fully grown. They may appear anytime during the growing season.
- Chemical control (9):
 - **Acephate (Orthene 75 SP):** Applied as a spray at 1.0 lb./acre
 - ***Bacillus thuringiensis* (Dipel 2X):** Applied as a spray at 0.25-0.5 lb./acre and as bait by mixing 1.0 lb. of Dipel 2X with 99 lb. of cornmeal
 - ***Bacillus thuringiensis* (Dipel 4L):** Applied as a spray a 1.0 pt./acre
 - ***Bacillus thuringiensis* (Biobit EC):** Applied as a spray at 3.5 pt./acre
 - ***Bacillus thuringiensis* (Biobit WP):** Applied as a spray at 2.0 pt./acre
 - **Carbaryl (Sevin 80WP):** Applied as a spray to established plants at 1.25-2.5 lb./acre
 - **Carbaryl (Sevin 50WP):** Applied as a spray to established plants at 2-4 lb./acre
 - **Carbaryl (Sevimol 4F):** Applied as a spray to established plants at 1-2 qt./acre
 - **Endosulfan (Thiodan):** Applied as a spray at 0.67-1.34 qt./acre

- ***Methomyl (Lannate 90SP)**: Applied as a spray at 0.25-0.5 lb./acre
- ***Methomyl (Lannate LV 2.4EC)**: Applied as a spray at 1-1.5 pt./acre

* Restricted use

- Cultural control practices: Control should be initiated anytime prior to tobacco buttoning when there are five or more budworms per 50 plants. After the button stage, budworms rarely cause economic damage to tobacco (9). Fall and winter deep plowing will expose the insect to natural enemies and harsh weather conditions. Budworm-tolerant varieties can be used to minimize the damage. Excessive nitrogen fertilization should be avoided (6).
- Biological control: A parasitic wasp (*Campoletis sonorensis*) provides good natural control (9). The tachinid flies (*Zygostrumia spp*) and (*Winthemia spp*) are important parasitic flies. The stiltbug (*Jalysus wickkhami*) also feeds on budworm eggs (6).

Hornworms, tobacco (*Manduca sexta* [Linnaeus])

- Damage: Hornworm is the most destructive tobacco pest. Larvae chew irregular holes in leaves and consume considerable amounts of tobacco leaves. Damage occurs during June, August, and September (6, 7, 8, and 9).
- Chemical control (9):
 - **Acephate (Orthene 75 SP)**: Applied as a spray at 0.67 lb./acre
 - ***Bacillus thuringiensis* (Dipel 2X)**: Applied as a spray at 0.25-0.34 lb./acre
 - ***Bacillus thuringiensis* (Dipel 4L)**: Applied as a spray a 0.5-1.0 pt./acre
 - ***Bacillus thuringiensis* (Biobit EC)**: Applied as a spray at 1.0 pt./acre
 - ***Bacillus thuringiensis* (Biobit WP)**: Applied as a spray at 0.5 pt./acre
 - **Carbaryl (Sevin 80WP)**: Applied as a spray to established plants at 1.25 lb./acre
 - **Carbaryl (Sevimol 4F)**: Applied as a spray to established plants at 1-2 qt./acre
 - **Endosulfan (Thiodan)**: Applied as a spray at 0.67-1.34 qt./acre

- ***Methomyl (Lannate 90SP)**: Applied as a spray at 0.25-0.5 lb./acre
- ***Methomyl (Lannate LV 2.4EC)**: Applied as a spray at 0.75-1.5 pt./acre

* Restricted use

- Cultural control practices: Hand picking and destroying the worms when possible. Early topping, early transplanting, and effective sucker control reduce late-season infestations. Stalk cutting and root destruction soon after harvest reduce overwintering populations (9). Fall and winter plowing will destroy the pupae and reduces the hornworm population the following season (6).
- Biological control: Parasitic wasps (*Cotesia congregata*), (*Apanteles congregatus*), and the paper wasp (*Polistes spp*) help reduce hornworm populations (9). In addition, tachinid flies prey on hornworm larvae, and the spined stiltbug (*Jalysus spinosus*) preys on eggs (6).

Aphids, green peach

- Chemical control: Foliar treatments (9):
 - **Acephate (Orthene 75 SP)**: Applied as a spray at 0.67-1.0 lb./acre
 - **Endosulfan (Thiodan)**: Applied as a spray at 0.67-1.34 qt./acre
 - **Imidacloprid (Provado 1.6F)**: Applied as a spray at 2-4 fl. oz./acre
 - ***Methomyl (Lannate 90SP)**: Applied as a spray at 0.5 lb./acre
 - ***Methomyl (Lannate LV 2.4EC)**: Applied as a spray at 1.5 pt./acre

* Restricted use

Tobacco Flea Beetles

- Chemical control: Foliar treatments (9):
 - **Acephate (Orthene 75 SP)**: Applied as a spray at 0.67 lb./acre
 - **Carbaryl (Sevin 80WP)**: Applied as a spray to established plants at 1.25 lb./acre
 - **Carbaryl (Sevimol 4F)**: Applied as a spray to established plants at 1.0 qt./acre

- **Endosulfan (Thiodan)**: Applied as a spray at 0.67-1.34 qt./acre
- ***Methomyl (Lannate 90SP)**: Applied as a spray at 0.25-0.5 lb./acre
- ***Methomyl (Lannate LV 2.4EC)**: Applied as a spray at 0.75-1.5 pt./acre

* Restricted use

- Cultural control practices: Stalk cutting and root destruction soon after harvest and harvesting at the normal time are the most effective cultural practices for reducing tobacco flea beetle damage in the field (9).

Critically Needed Insecticides

The following insecticides were reported as critically needed for tobacco pest control in West Virginia. These insecticides include:

- Acephate (Orthene 75 SP): Widely used by tobacco growers in the state (95% of the tobacco growers in Putnam County, West Virginia), and also necessary to enhance tobacco production in the region
- Endosulfan (Thiodan): Used by tobacco growers for green peach aphid and tobacco flea beetle control
- Chlorpyrifos (Lorsban 15 G and 4E): Used by tobacco growers for wireworm control in the field
- Carbaryl (Sevin XLR plus) is used for tobacco flea beetle control in the plant bed
- *Bacillus thuringiensis* (Dipel 2X), carbaryl (Sevin 80 WP, 50 WP, and 4F), and endosulfan (Thiodan) are used for tobacco budworms and hornworms control

Alternative Chemical Insect Control

An insecticide, imidacloprid (Admire), was labeled for tobacco in 1997, after the printing of the 1998 pest management recommendations manual. Admire controls sucking insects such as aphids, thrips, whiteflies, turf insects, soil insects, and some beetle species. Admire is not a restricted pesticide and is effective and easy to apply, but rather costly.

Diseases

Plant Bed Diseases

The most common plant bed diseases include blue mold, anthracnose, angular leaf spot, and wild fire. Damping off is another disease that damages plant beds (9 and 10).

Blue Mold: Caused by the fungus (*Peronospora tabacina*, also called *P. hyoscyami*)

- **Damage:** The fungus can be devastating to bed plants. Affected leaves become deformed and twisted. In larger plants, the disease can appear as leaf blighting and severe leaf loss.

Blue mold may occur on the plant anytime from seeding to harvest (9 and 10).

- **Chemical control (9):**
 - **Metalaxyl (Ridomil 2E):** Applied as a spray at 4 tsp./1gal.
 - **(Dithane DF):** Applied as a spray at 1 tsp./1gal.
- **Cultural control practices:** Selection of resistant cultivars, healthy transplants, rotation of bed sites, sanitation, and plant bed irrigation management (9).

Anthracnose: Caused by the fungus (*Colletotrichum spp.*)

- **Damage:** The fungus develops cankers on midribs and veins of leaves and causes stunting and/or death of transplants. It is most common in plant beds that are weedy and/or deficient in nitrogen (9 and 10).
- **Chemical control (9):**
 - **Ferbam (Carbamate WDG):** Applied at 1.5 lb./50gal.
 - **Metalaxyl (Dithane DF):** Applied at 0.25 lb./50gal.
- **Cultural control practices:** See blue mold.

Angular leaf spot, and wildfire: Caused by the bacterial strain (*Pseudomonas syringae pv. tabaci*)

- Damage: The bacterium can cause severe spotting and defoliation in plant beds. The disease agent can overwinter on tobacco debris, weeds, and other crop plants.
- Chemical control (9):
 - **Streptomycin sulfate (Agri-strep):** Applied as a foliar spray at 0.25-0.5 lb./50gal.
 - **Copper sulfate +Lime (Bordeaux):** Applied as a spray at 4.0 lb. + 4.0 lb./50gal.
- Cultural control practices: See blue mold.

Field Plant Diseases

The most common diseases affecting plants in the field include black shank, root-knot, and blue mold. Other disease pests are brown spot, ragged leaf spot, frog-eye, angular leaf spot, wildfire, black root-rot, fusarium wilt, and a number of plant viruses (9 and 10).

Black Shank: Caused by the fungus (*Phytophthora parasitica , sp. nicotianae*)

- Damage: The fungus affects the roots and causes stunting and permanent wilting of leaves.
- Chemical control (9):
 - **Metalaxyl (Ridomil 2E):** Applied at 2-4 qt./acre
 - **Mefenoxam (Ridomil Gold EC):** Applied at 1-1.5 qt./acre
- Cultural control practices: Use resistant varieties and avoid rotating with tomatoes and peppers (9).

Root-knot: Caused by nematodes (*Meloidogyne spp.*)

- Damage: The nematode forms knots or galls on the roots. Infected plants wilt rapidly and may die.

- **Chemical control:** Also, recommended for other nematodes. Incorporate into top two to four inches of soil (9):
 - ***Oxamyl (Vydate L):** Applied at 1 gal./12,000 row ft.
 - ***Fenamiphos (Nemacur 3):** Applied at 1 gal./acre
 - ***Ethoprop (Mocap EC):** Applied at 1 gal./acre
- * Restricted Use
- **Cultural control practices:** Plow out tobacco roots for exposure to the sun immediately after harvest. Small grains, horseweeds, and ragweeds are useful in rotational plannings since they are resistant to root-knot nematodes. Use of nematodes-resistant varieties (9).

Blue Mold: Highly unpredictable and possibly devastating. Also, see plant bed.

- **Chemical control (9):**
 - **Metalaxyl (Ridomil 2E):** Applied at 1-2 qt./acre
 - **Mefenoxam (Ridomil Gold EC):** Applied at 1 pt./acre
- **Cultural control practices:** Sanitation practices, plant debris removal, cleaning farm equipment, and maintaining weed-free surroundings in the field and greenhouse.

Critically Needed Fungicides

- Metalaxyl (Ridomil 2E) is reported as an important fungicide in controlling tobacco blue mold and black shank diseases.
- Streptomycin sulfate (Agri-strep) is reported as an important fungicide in controlling tobacco angular leaf spot and wildfire diseases.

Alternative Chemical Disease Control

The fungicide Acrobat has been suggested as a potential fungicide for tobacco disease control. This

fungicide is not yet registered for tobacco pest control. It has only been permitted for use under section 18.

Weeds

Weeds grown in tobacco beds and fields compete for nutrients and space, causing noticeable crop damage that leads to yield reduction and poor quality crops. Several weed species, including annual grasses and broadleaf, have been observed in tobacco beds and fields. This list includes barnyardgrass, crabgrass, foxtail (giant and green), jimsonweed, lambsquarters, fall panicum, purslane, ragweed, pigweed, goosegrass, shattercane, sida (prickly), velvetleaf, mustard, morningglory, cocklebur, and spurred anoda (9).

- Chemical control:

- **Plant Beds Only**

- **Napropamide (Devrinol 10G):** Applied to the soil in the fall through spring prior to weed emergence at 1.36 lb./acre. Good for white clover control
- **Sethoxydim + crop oil concentrate (Poast+crop oil):** Applied to actively growing grasses with 10 to 20 gallon of water/acre, at 1.0 pt. of poast+2.0 oil /acre

- **Field Tobacco:** Incorporate herbicide two to four inches deep after spraying to dry soil

- **Clomazone (Command 3ME):** Applied prior to transplanting in a single broadcast application at 0.75-1.0 a.i./acre with 20 gallon of water
- **Clomazone (Command 4EC):** Applied at 0.75-1.0 lb. a.i./acre
- **Napropamide (Devrinol 50DF):** Applied at 1.0-1.5 lb. a.i./acre. Incorporated at 1-2 inches deep
- **Pendimethalin (Prowl 3.33EC):** Applied at 0.5-1.0 lb. a.i./acre. Incorporated at 1-2 inches deep. Provides good control of purslane
- **Sulfentrazone (Spartan 75DF):** Surface applied prior to transplanting at 0.25-0.375 lb. a.i./acre

- **Pebulate (Tillam 6E):** Applied at 3-4 lb. a.i./acre
- Cultural control practices: Practice crop rotations, land preparation, fertilizer/fungicide incorporation, and select healthy transplants.

Critically Needed Herbicides

The following herbicides were reported as critically needed for tobacco weed control:

- Clomazone (Command 3ME and 4EC)
- Pendimethalin (Prowl 3.33EC)
- Sulfentrazone (Spartan 75DF)

Vertebrate Pests

Deer feeding in tobacco fields was reported by farmers as the most common mammal problem in West Virginia (5).

Contacts

John F. Baniecki, Ph.D.

State Liaison Representative (Coordinator),
National Agricultural Pesticide Impact
Assessment Program (NAPIAP);
Extension Specialist, Entomology/Plant Pathology
West Virginia University
414 Brooks Hall
Morgantown, WV 26506
Ph.# (304)293-3911
Fax (304)293-2872
E-mail: jbanieck@wvu.edu

M. Essam Dabaan, Ph.D.

Program Specialist,
National Agricultural Pesticide Impact
Assessment Program (NAPIAP)
West Virginia University
414 Brooks Hall
Morgantown, WV 26506
Ph.# (304)293-3911
Fax (304)293-2872
E-mail: mdabaan@wvu.edu

References

1. Abbe, D., and S.R. Edwards. 1997. West Virginia Agricultural Statistics, Bulletin #28. National Agricultural Statistics Service.
2. USDA-NASS. 1998. Agricultural Statistics. National Agricultural Statistics Service.
3. Smith D. 1998. Transplant Production. North Carolina Burley Tobacco Production Guide. North Carolina State University.
4. Palmer, G., B. Maksymowicz, and J.R. Calvert. 1998. Tobacco in Kentucky: Transplant Production. University of Kentucky.
5. Baniecki, J., and M.P Culik. 1997. Usage of Newer Pesticides by Apples, Alfalfa, and Tobacco Growers. Extension Service, West Virginia University.
6. Townsend, L. 1998. Tobacco in Kentucky: Tobacco Insect Pests. University of Kentucky.
7. Yepsen, R.B. Jr. 1984. The Encyclopedia of Natural Insects & Disease Control. Rodale Press, Emmaus, Pa.
8. Borror, D.J., and D.M. DeLong. 1964. An Introduction to The Study of Insects. Holt, Rinehart and Winston, Inc.
9. Bulletin #237. 1998. Pest Management Recommendations for Field Crops. University of Maryland, Delaware, Pennsylvania, Rutgers, Virginia Polytechnic Institute, and West Virginia Cooperative Extension Services.

10. Nesmith, W. 1998. Tobacco in Kentucky: Controlling Plant Diseases in Tobacco. University of Kentucky.
11. Reich, R. 1986. Burley Tobacco Field Manual. Reynolds Tobacco Company Winston-Salem, N. C.

This profile was sent to Extension personnel for review and special thanks are extended to:

Wallbrown, R., Extension Agent, Mason County, West Virginia

Bennett, W., Extension Agent, Putnam County, West Virginia

Dr. Townsend, L., Extension Entomologist, University of Kentucky, Lexington, Kentucky

Database and web development by the [NSF Center for Integrated Pest Management](#) located at North Carolina State University. All materials may be used freely with credit to the USDA.