

C  
I  
R  
C  
U  
L  
A  
R  
  
1  
7  
9



DECEMBER, 1950

*Control*  
of  
*Tobacco Insects*

by Neely Turner



THE CONNECTICUT AGRICULTURAL  
EXPERIMENT STATION  
NEW HAVEN, CONNECTICUT

## CONTENTS

	PAGE
INSECTICIDES .....	3
FLEA BEETLES .....	5
APHIDS .....	6
CUTWORMS .....	8
WIREWORMS .....	9
HORNWORMS AND GRASSHOPPERS .....	10
JAPANESE BEETLE .....	11
TOBACCO BUDWORM .....	12
TARNISHED PLANT BUG .....	12
THRIPS .....	13
GARDEN SPRINGTAIL .....	13
SEED CORN MAGGOT .....	13
KEY TO DAMAGE BY INSECTS ON TOBACCO .....	15

## CONTROL OF TOBACCO INSECTS

Neely Turner<sup>1</sup>

The Connecticut Agricultural Experiment Station has been conducting research on tobacco insects for many years. This circular has been written from the experiences of this experimental work. The aim is to provide up-to-date information on the control of insects attacking growing tobacco in the Connecticut Valley.

A key to the damage caused by various insect pests of tobacco and a description of the insects appears on page 17. By referring to this key, one can determine what insect he has found and can then turn to the pages where it is discussed.

Growers seeking more information on life histories and habits of the pests may find the information in Station Bulletin 379, "Insect Pests of Growing Tobacco," by Donald S. LaCroix.

### INSECTICIDES

Many new organic insecticides have been introduced in the last five years, and several more will be offered to farmers in the near future. In many instances these newer materials have replaced older and less effective insecticides. These new materials have excellent killing power for insects, and some of them are also highly poisonous to man. Many differ so much from arsenate of lead and rotenone in their ability to penetrate human skin that special precautions must be taken in handling them. The old and new materials most useful in controlling insect pests of tobacco are as follows.

#### Rotenone

The rotenone preparations in common use have been prepared from the roots of tropical shrubs which contain rotenone. At the present time the most important source of wild plants of this type is South America. Cultivated derris, another source of rotenone, may be available again from the Southwest Pacific area.

The principal use of rotenone on tobacco is in dust form to control flea beetles. A 1 per cent dust with sterilized tobacco filler has been preferred.

Rotenone in the form used is relatively non-poisonous to man.

<sup>1</sup> Entomology Department.

### DDT

This organic chemical, dichloro diphenyl trichloroethane, was discovered and developed in Switzerland. It is relatively toxic to many insects, which pick it up on the legs and mouthparts. It is not highly toxic to man but must be used with some care to prevent excessive residues on the plant or excessive exposure of operators applying it.

At present the chief use of DDT is as a 10 per cent dust mixed with sterilized tobacco filler for flea beetles and for aphid control early in the season. It is also effective against the Japanese beetle, tarnished plant bug, tobacco budworm and thrips.

### Chlordane

Chlordane is a chlorinated hydrocarbon, effective in controlling several pests of tobacco. It is manufactured as a heavy, oily material which can be mixed with carriers to make wettable powders and dusts. It is somewhat more toxic to man than DDT.

The chief use of chlordane on tobacco has been in controlling wireworms. It may be sprayed over the soil and worked in, or added to the setting water.

Chlordane dust applied to the surface of the soil and left undisturbed is a promising control for cutworms.

### Toxaphene

Toxaphene is a chlorinated camphene compound of about the same toxicity to man as chlordane. It has been used to control hornworms and grasshoppers. It is also highly effective in controlling cutworms when dusted on the soil and left undisturbed.

### Parathion

Parathion is an organic phosphate compound originally developed in Germany. It is highly toxic to aphids, thrips and many other pests. It is equally poisonous to man. Residues of parathion on plants usually disappear within a week after application has been made. The principal hazard in its use is the danger that the person operating a duster or sprayer may absorb too much of it. Parathion penetrates the skin readily, and is easily absorbed by the eyes and in the lungs. *Every precaution suggested by the manufacturer should be followed carefully to prevent serious illness or death of those handling parathion.*

### Tetraethyl Pyrophosphate

Tetraethyl pyrophosphate is another organic phosphate. It, too, is a violent poison to man, but it breaks down so quickly in the presence of moisture that its use is less hazardous. In spray form it has produced serious chemical injury on tobacco. As a dust it is an excellent material for controlling aphids. *The manufacturer's precautions regarding protection of operators during application should be followed.*

### Lindane

Lindane is the name given the pure gamma isomer of benzene hexachloride. This material is of about the same toxicity as DDT and chlordane. It has been used in dust form to control aphids and is very effective in killing Japanese beetles.

### Poisoned Bait

Cutworm bait has been made of 50 pounds wheat bran and 1 pound of Paris green with enough water to moisten the bran. Toxaphene may be substituted for Paris green, following the directions on the package. Use of molasses, oranges and lemons is unnecessary.



Potato flea beetle injury to tobacco leaf.

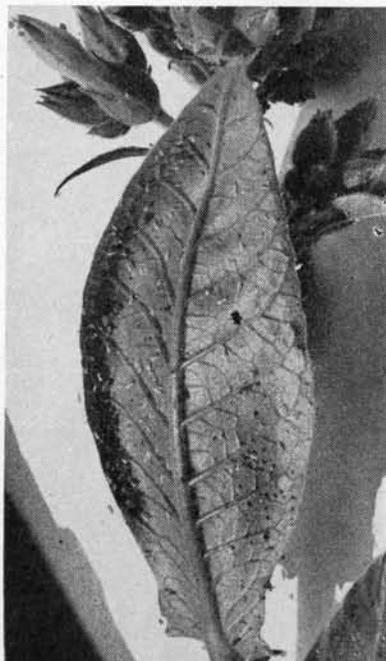
### FLEA BEETLES

The potato flea beetle is one of the most serious pests of tobacco in Connecticut. The adults are small shining black beetles about 1/16 inch long. They jump when disturbed, hence their common name. They feed on the undersides of the leaves, cutting out small round holes.

Although there is only one generation of flea beetles a year, there are two distinct feeding periods. Early in the spring beetles that have hibernated over the winter may attack plants in beds, and later the newly set plants in the field. Apparently the beetles do not breed in tobacco fields, but usually lay their eggs in potato fields. The larvae develop by feeding on the potato roots. Adults begin to emerge about the second week in July, and damage to tobacco increases until early in August.

#### Control Measures

For many years 1 per cent rotenone dust was the standard remedy for this pest. This material is still highly effective. DDT dust is also very effective, and is preferred by many growers because it also helps to control aphids. The usual schedule is two applications of 10 per cent DDT dust or 1 per cent rotenone dust (with sterilized tobacco filler) at the rate of 10 to 15 pounds per acre about July 10 and 20, or as needed.



**A colony of aphids on the under surface of a tobacco leaf. The white cast skins adhere to the sticky leaf.**

#### APHIDS

The green peach aphid (*Myzus persicae* S.) has occurred on tobacco in small numbers for many years. In 1946, this aphid became a major pest and by 1948 was by far the worst pest of shade tobacco. The infestation declined in 1949 and 1950, but aphids remain a serious problem. Just why

these insects changed their feeding habits is unknown. The infestation on tobacco started the same year potato growers started using DDT on potatoes. The aphid has always been present on potatoes, and it seems possible that DDT sprays on potatoes may have contributed to the change.

The damage caused by aphids on tobacco is most evident on the cured leaf. The presence of "honey-dew" makes the leaves sticky and off-color. The white cast skins adhering to the leaf reduce the grade drastically.

This aphid may pass the winter out of doors in southern climates. It is also a pest of greenhouse plants, and infestations can be carried over in this way. In the normal life cycle of the aphid in temperate climates, the winter is passed in the egg stage on peach trees. Spring migrants then fly back to summer hosts.

The exact source of the infestation on tobacco in Connecticut is not known. At least a few of the serious infestations could be traced to infested plants in the seedbed. Plants are infested in the field by winged aphids migrating from weeds or cultivated vegetables growing in the vicinity.

#### Control Measures

Several insecticides are very effective in killing aphids, and can be used to control severe infestations. However, less damage to the tobacco results if large populations of aphids are prevented. For this reason, control measures are usually started in the plant bed and carried out in the field before the plants are heavily infested.

#### Plant Beds

At least one application of parathion spray or dust should be made on plants in the bed. This treatment should be at least 10 days before the first plants are to be removed. For a spray,  $\frac{1}{2}$  to 1 pound 15 per cent parathion wettable powder in 100 gallons of water is required. It may be mixed at the same rate with Fermate or Dithane sprays if these are needed at the same time. If dusting is preferred, a 1 per cent parathion dust may be used.

#### Field Treatment

It has been shown conclusively that DDT dusts will kill many aphids and that dusted plants are not infested again for some time. The young plants may be dusted with 10 per cent DDT dust (mixed with sterilized tobacco dust) at the rate of 10 pounds to the acre. This also controls flea beetles and repeated dustings should keep the plants free of aphids until the plants grow too large for treatment with row-crop dusters.

Aphid control on large plants requires treatment by means of mist blowers or aircraft. The use of about .2 pound of parathion per acre in the form of wettable powder has given good results. This may be applied in from 3 to 5 gallons of water by aircraft or 10 to 15 gallons of water by mist blower. Usually only one or two such applications are required. The final application should be made at least a week before the first priming.

If isolated spots of infested plants are found during priming, hand treatment with tetraethyl pyrophosphate dust may be made.

**CAUTION.** Parathion and tetraethyl pyrophosphate are highly poisonous to humans. They can be absorbed through the skin very easily. Therefore, every precaution should be taken in handling and applying the materials to prevent inhalation or contact with the skin. In weighing the concentrated materials, an approved respirator should be worn. Adequate clothing should be used to keep spray particles from the skin. Each package of spray material contains a list of precautionary measures which should be followed carefully.

### CUTWORMS

Several species of cutworms may damage tobacco. Infestation may occur in seed beds; newly set plants may be cut off just above the ground or established plants may be damaged by cutworms feeding on the bud or leaves. Most cutworms normally inhabit grassland. Their damage is not very noticeable, but when the grass is plowed under and tobacco is set they cause serious damage. The larvae that infest tobacco in the spring have hatched from eggs laid late in the preceding fall and have lived through the winter as partly-grown caterpillars. Most of the cutworms feed only at night, and spend the day hiding just under the surface of the soil, usually near a tobacco plant.

#### Control Measures

Cutworms are most easily controlled *before* plants are set in the field.

#### Plant Beds

Steam sterilization should kill all cutworms but some may migrate into the beds after steaming. Beds not sterilized may be infested by cutworms. Usually the young plants are partly grown before damage becomes apparent. Application of 10 per cent DDT dust should stop the attack. Toxaphene dust is highly effective but may cause stunting of young tobacco plants. Poisoned bait is not very practical because it injures plants severely.

#### Field Control

**Bait.** Poisoned bait made of 50 pounds wheat bran, and 1 pound of Paris green mixed dry and then moistened is very effective. The bait should be broadcast late in the evening at the rate of about 25 pounds to the acre before the plants are set. Heavy rain falling before the cutworms have had a chance to feed destroys the value of the bait.

**Surface Treatment with Sprays and Dusts.** Experiments were carried out in 1949 using sprays and dusts on the surface of the soil for control of cutworms. Thirty pounds of 10 per cent toxaphene or chlordane dust to the acre, applied a week before setting, gave good control. Toxaphene emulsion sprayed on the soil at the rate of 3 pounds of toxaphene per acre was also effective. Apparently the cutworms were killed when they crawled over the surface of the soil during the night. Heavy rainfall did not destroy the value of the treatment.

Although both toxaphene and chlordane were effective, it is suggested that toxaphene be used because it does not accumulate in the soil. Chlor-

dane leaves a residue that persists for some time, and repeated treatments with it might be undesirable.

Toxaphene was also tested in combination with fertilizer and applied at the rate of 3 pounds to the acre. Control was good but the field was not heavily infested with cutworms.

DDT dust as used for control of flea beetles should control cutworms on established plants.

### WIREWORMS

Wireworms are hard, shiny, yellow or brown larvae that feed on the roots and stems of plants. Their most serious damage is in killing or stunting newly-set plants. Wireworms are larvae of the click beetles seen so commonly around tobacco fields in May and June. Eggs which are laid in the soil hatch into very small larvae. Two to four years may be required for these to complete their growth. Therefore, fields infested one season may also be infested one or two years afterwards.



Wireworm injury to young tobacco plants.

#### Control Measures

There are two practical methods of control for wireworms: (1) fumigation of the soil, and (2) soil treatment with insecticides.

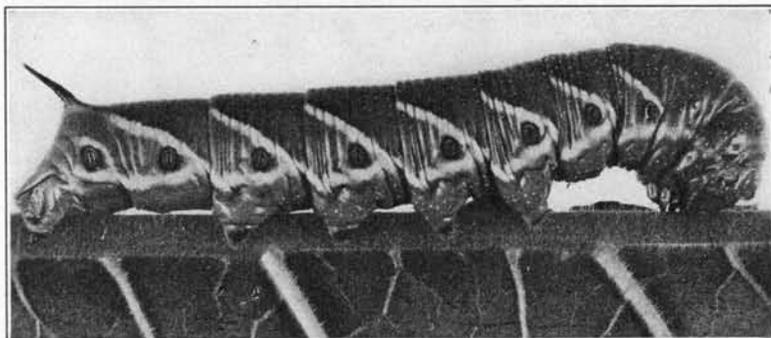
Fumigation is usually used when control of nematodes is required. Either ethylene dibromide or D-D mixture may be used as for nematode control. Occasionally fumigation is not effective on wireworms because it is done late in the fall or early in the spring when the wireworms are too deep in the soil to be reached by the fumigant.

Soil treatment with insecticides may be made while the land is being prepared for planting. Four pounds of chlordane per acre may be applied to the surface of the soil in either dust or spray form and disced in immediately. In terms of the usual formulation, 8 pounds of 50 per cent chlordane wettable powder or 40 pounds of 10 per cent dust are required per acre. Results are usually better if the material is applied at least two weeks before setting the plants. One treatment should be effective for at least three years.

Good protection from wireworm damage can be obtained by addition of chlordane to the setting water. The suggested rate is 4 ounces of 50 per cent wettable powder to 50 gallons of water. Agitation is necessary to keep the powder from settling. This method may not be effective in succeeding years, but is especially useful in re-setting fields.

### HORNWORMS AND GRASSHOPPERS

Hornworms may be serious pests on outdoor tobacco in some seasons. The northern hornworm has V-shaped greenish-white stripes and a black horn. The southern hornworm has oblique stripes and a red horn. The northern species is usually the more abundant in Connecticut.



Northern tobacco hornworm, slightly larger than natural size.

#### Control

The northern hornworm is easier to kill than the southern with most insecticides. DDT, for instance, is very toxic to the northern species, but is much less effective on the southern form. The closely related DDD (*Rhothane*) is somewhat more effective than DDT on the southern species. Toxaphene and parathion are very effective in controlling both species. One application of 10 per cent toxaphene dust at from 10 to 20 pounds per acre is usually sufficient to control hornworms. A second treatment 10 days later may be required in some seasons.

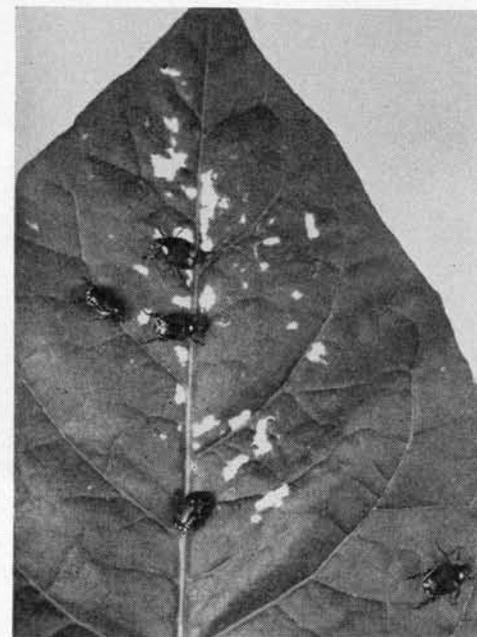
There is still some question as to whether or not toxaphene residues affect the flavor of cured tobacco. Growers preferring not to risk off-flavor may use 1 per cent parathion dust, or 10 per cent DDT or DDD (*Rhothane*) dust.

Grasshoppers may be controlled by toxaphene dust applied at the rate given above, if they become a pest.

### JAPANESE BEETLE

The Japanese beetle is about half an inch long, bright green in color, with copper-colored wing covers. Two white spots on the tip of the upper abdomen show beyond the ends of the wing-covers. These beetles feed on a variety of plants, including fruit trees and ornamental plants. Tobacco is not one of the preferred hosts. However, Japanese beetles emerging from land which was in grass the preceding season may damage tobacco. Beetles may also migrate into tobacco from grassland nearby.

Japanese beetles emerge in July and most of their damage is done then. They breed in turf, where the larvae spend the winter.



Japanese beetles feeding on tobacco leaf.

#### Control

Japanese beetles are killed readily by DDT, parathion or lindane dusts or sprays. If the infestation occurs at the time flea beetles are present, DDT will control both pests. If treatment is needed for aphids, parathion should work. If special applications are needed, either 10 per cent DDT, 1 per cent parathion or 1½ per cent lindane dust may be used.

### TOBACCO BUDWORM

This is a brown caterpillar which turns green as it grows, with lighter stripes running the length of the body. It develops from an egg deposited on the underside of the leaves by a velvety green moth. Feeding is confined to the growing tip, or bud.

The budworm has not been a major pest as yet in Connecticut. The standard control in southern areas has been a corn meal-lead arsenate bait applied to the bud. DDT dust (10 per cent) used regularly should control this pest if treatment is necessary.



**Injury of the tobacco budworm.**

### TARNISHED PLANT BUG

This bug is about  $\frac{1}{4}$  inch long, flattened and oval in outline. It is brown in color with irregular areas of white and yellow. It occasionally feeds on tobacco by sucking the sap from the plant. So far as is known, this bug does not breed on tobacco.

The damage results from feeding punctures. The bugs introduce some poisonous substance into the plant, and the result is a small dead area or a mal-formed leaf.

DDT dust should be very effective in controlling these plant bugs if control is necessary.

### THRIPS

Tobacco thrips have been very destructive, especially in dry seasons. These tiny dark brown or black insects feed along the veins on the undersides of the leaves. The injury is sometimes known as "white-vein".

Thrips have not been very abundant for the past four or five years. It is possible that the use of DDT dust control for flea beetles and of parathion for aphids has kept thrips under control. If infestations do develop, either of these insecticides should be effective.



**Thrips injury on a cured tobacco leaf.**

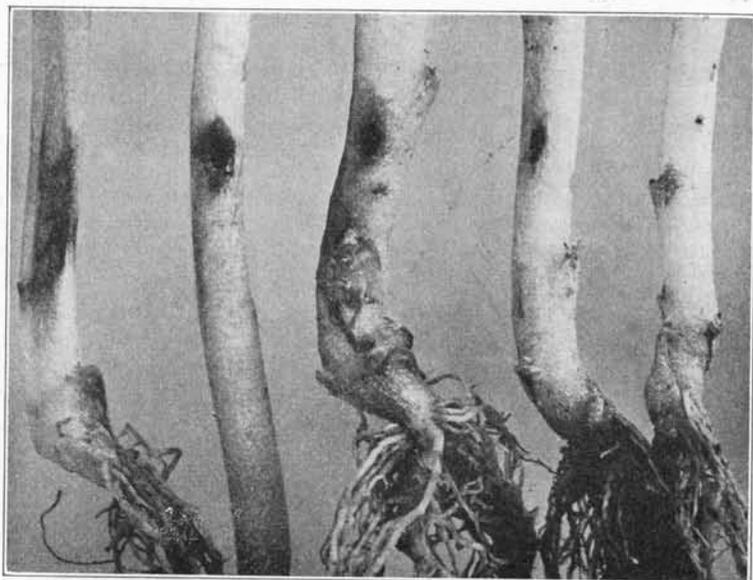
### GARDEN SPRINGTAIL

This very small, dark colored insect sometimes feeds on young plants in the seedbed. The damage is usually limited to a few notches eaten in the edge of the leaves. Occasionally defoliation may be severe. The insect jumps quickly when disturbed and is therefore difficult to catch.

Nicotine sulfate sprays (1 pint in 100 gallons of water) will control this pest.

### SEED CORN MAGGOT

This pest appears in newly set fields without warning, destroys many plants and disappears suddenly. Infested plants may wilt and fail to grow properly. The young maggots, white and about  $\frac{1}{4}$  inch long, are found feeding in the stalk of the infested plant.



**Work of the seed corn maggot on young tobacco plants.**

This insect is apparently attracted to soil rich in organic matter under certain unknown conditions. Eggs are laid, the maggots hatch quickly and feed for a few days. Plants set a week before the infestation or two or three days after may escape injury entirely.

Since there is no practical way to forecast an outbreak of this pest, it is difficult to apply any preventive measures. At present the only remedy is to reset the infested field, using 4 ounces of 50 per cent chlordane wettable powder in 50 gallons of setting water to try to prevent reinfestation.

## KEY TO DAMAGE BY INSECTS ON TOBACCO<sup>1</sup>

### I. Insects Causing Injury to Plants in Seedbeds:

1. Very small seedlings in two- or four-leaf stage, defoliated. Tiny, purple, jumping insects, just visible to the naked eye.  
*Garden Springtail*
2. Large holes eaten in the leaves, or whole seedlings devoured or cut off at soil surface. Large dark-colored worms which feed at night and curl up under the surface of the soil or at the sides of beds during the day.  
*Cutworms*
3. Foliage of larger plants (middle to late May) has numerous "shot holes" eaten by small, black, active, jumping beetles, 1/16 inch long.  
*Potato Flea Beetle*
4. Small green insects on the undersides of leaves. No damage to plant apparent.  
*Aphids*

### II. Insects Causing Injury to Young Plants in the Field:

1. Inside of root or base of stem tunneled out, causing plants to wilt and die, usually within a few days after transplanting. Hard, yellowish-brown, shiny, slender worms, 1/2 to 1 inch long, in stalks or in soil near plants.  
*Wireworms*
2. Injury similar to that mentioned above, but soft-bodied white maggots 1/4 inch long present.  
*Seed Corn Maggot*
3. Young plants cut off at soil surface. Fat, dark-colored worms curled up in soil nearby.  
*Cutworms*

### III. Insects Causing Injury to Larger, More Mature Plants in Field in July or August:

1. Growing point or buds attacked before leaves unfold
  - (a) Unfolding leaves distorted and curly but with no large holes. Brown mottled bug, 1/4 inch long, flying away when disturbed.  
*Tarnished Plant Bug*
  - (b) Unfolding leaves ragged and misshapen with irregular, large holes. Small, rusty brown worms, when young; or green, slender worms with paler stripes lengthwise on sides, up to 1 1/2 inches long, when mature.  
*Tobacco Budworm*

<sup>1</sup> Modified from Anderson's "Key to Insect Injuries," Tobacco Culture in Connecticut, Conn. Agr. Expt. Sta. Bul. 364:785-786, 1934.

2. Mature leaves damaged

- (a) Main veins silvery above and peppered with minute black specks. Brown, slender, sucking insects, 1/25 inch long.

*Tobacco Thrips*

- (b) Numerous little "shot holes" eaten by small, black, active, jumping beetles, 1/16 of an inch long.

*Potato Flea Beetle*

- (c) Large round holes between veins eaten by large, variously colored (never black) hoppers with prominent hind-legs.

*Grasshoppers*

- (d) Holes much as above, or all of leaf tissue except larger veins eaten by dirty gray or brown, fat "worms".

*Cutworms*

- (e) Large holes, or extensive areas without regard to veins, eaten away by large green caterpillars up to four inches long, with prominent horn-like appendage at posterior end.

*Hornworms*

3. "Honeydew" on leaves, white cast skins of small insects present. Small green insects on the under surfaces of leaves.

*Aphids*

4. Seed pods bored and entered by pale green, slender worms with lighter lengthwise stripes, up to 1½ inches in length.

*Tobacco Budworm*