

TOBACCO PLANT-BED MANAGEMENT

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Soybeans growing on permanent plant-bed sites add fertility, improve soil structure, and help control weeds, and diseases.



Plan for a surplus of strong, vigorous plants.

CAUTION: Permanent plant-bed sites are not recommended in areas where black shank is prevalent. In black shank areas, new bed sites should be selected each year, because there is too great a chance for beds to become contaminated with the black shank fungus and the fungus being carried on young plants to clean fields. Also, where dark tobacco is being grown it is not advisable to use permanent plant-beds, unless they are steamed or treated with methyl bromide, because satisfactory black root rot-resistant varieties have not been introduced. On those farms, however, a suitable plant-bed site may be seeded to a summer legume, then plowed in late summer or early fall, and the site treated in the same manner as where permanent plant-beds are recommended.

CONTENTS

	Page
Choose a Fertile, Well-Drained Site	5
Use Disease-Resistant Varieties	5
Plan for a Surplus of Plants	6
Kill Weed Seed in the Plant-bed Area	6
Fertilize for Vigorous Growth of Plants	9
Sow the Seed as Soon as Weather Permits	11
Box the Plant-bed	11
If Heavy Freezes Occur	13
Control Wildfire and Angular Leafspot	13
Control Mosaic	15
Control Blue Mold	16
Danger of Blackleg in Wet Seasons	16
Pull Weeds No More than Necessary	17
2,4-D Injury	18
Water the Plants in Dry Weather	19
Control Insects	20
Summer Management of Permanent Plant-beds	23

Tobacco Plant-Bed Management

By Russell A. Hunt, Ira E. Massie, and George A. Everette

Plenty of healthy, vigorous, stocky plants should be ready for early transplanting if high-quality tobacco is to be produced. Enough plant-bed area should be prepared to provide, at two pullings, the plants needed for the entire crop. The first plants pulled from beds are usually free of mosaic, but at each successive pulling there are likely to be more mosaic plants in the field if a susceptible variety is grown. Vigorous, stocky plants are essential in getting a good stand.

Choose a Fertile, Well-Drained Site

Select fertile, well-drained land high in organic matter for the bed, preferably with a slight southern or eastern slope, free from shade, especially in the forenoon. An ideal place for growing plants is in an open field.

In the past it was recommended that a new plant-bed site be used each year, but with the advent of root rot-resistant varieties and because blue mold does not occur often, it is recommended that a permanent plant-bed site be used in areas where there is no black shank. Although there are no satisfactory black root rot-resistant dark tobaccos available, steaming and methyl bromide treatment will destroy the black root rot organism. A permanent bed site may be used for dark tobaccos if one of these treatments is used.

Immediately after setting, disk or plow the old plant-bed and seed it to cowpeas or soybeans, using 12 to 15 pounds of seed in a bed 9 x 100 feet. In late August, or early September, plow or disk the legume crop and treat the plant bed for weed control. This practice destroys all live roots in the soil so the wildfire bacteria have no place to live over winter. If the beds are ditched to keep water from the surrounding area from overflowing them, and are treated at the proper time with bluestone-lime in the spring, there should be no trouble from wildfire.

Use Disease-Resistant Varieties

Insofar as possible, use disease-resistant varieties. Choose a burley variety resistant to black root rot. The varieties are Ky 16,

Ky 26, Ky 35, Ky 41A, Ky 57, and Ky 58. Ky 57, and Ky 58 are highly resistant to black root rot. Ky 26 is more resistant than the moderately resistant Ky 16 and Ky 41A. On land infested with fusarium wilt use Ky 35. If fusarium wilt injures Ky 35, try Burley 11A or 11B. Where mosaic is a problem, use Ky 57, Ky 58, or Ky 35. Burley 21 and Ky 61 are resistant to black root rot, mosaic, and wildfire.

The table below gives the comparative disease resistance of many of the common varieties of burley tobacco now generally grown.

RELATIVE DISEASE RESISTANCE OF BURLEY VARIETIES

Dashes signify no appreciable resistance to the disease

Variety	Black Root Rot	Mosaic	Fusarium Wilt	Wildfire	Black Shank	Brown Root Rot
Ky 16	Medium	-----	-----	-----	-----	-----
Ky 41A	Medium	-----	-----	-----	-----	Medium-High
Ky 35	Medium-High	High	Medium	Slight	-----	-----
Ky 26	High	-----	-----	-----	-----	-----
Ky 57	High	High	-----	-----	-----	Medium
Burley 11A	Medium	-----	High	-----	Medium	-----
Ky 58	High	High	-----	-----	-----	-----
Burley 11B	Medium	-----	High	-----	Medium	-----
Burley 21	Medium	High	-----	High	-----	Medium-High
Ky 61	High	High	-----	High	-----	-----

Plan for a Surplus of Plants

It is desirable to prepare enough plant-bed area to have a surplus of strong, vigorous plants. Provide 100 feet of bed, 9 feet wide, or 75 feet of bed, 12 feet wide, for each acre of burley to be set. For dark tobacco, prepare 50 feet of bed, 9 feet wide, or the equivalent, for each acre to be grown.

Kill Weed Seed in the Plant-Bed Area

Tobacco plants are so small when they first emerge they cannot stand the competition of a heavy growth of weeds. Weeding the bed is a slow, tedious, and laborious job and it is likely to injure the young tobacco plants. Wildfire and mosaic often occur following weeding.

The best way to prevent weeds in the plant-bed is to employ some method of killing the seed in the plant-bed site, prior to the sowing of the tobacco seed.

Don't attempt to destroy weed seed in plant-bed sites when the soil is wet, regardless of the method used. Neither chemicals nor heat penetrates wet soil; consequently, if the soil is wet, poor re-



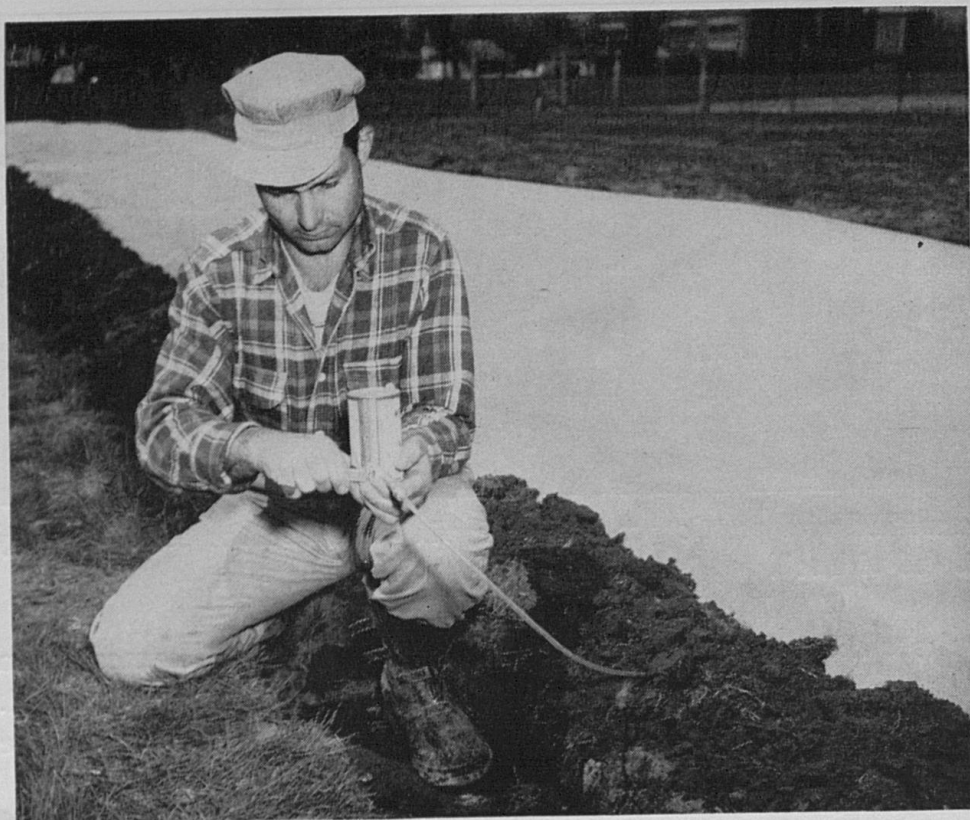
Plant-bed with plastic gas-proof cover in place and the edges properly sealed with soil.

sults will be obtained. In addition, soils burned or steamed when wet may become so hard that the tobacco plants can't grow well. For wildfire control, fall treatment is superior to treating in the spring.

Before trying to kill weed seed in the soil, plow the soil and work it thoroughly so that only a very light raking will be necessary before seeding. Deep stirring after preparation will likely result in a weedy plant-bed.

Beds may be prepared by steaming, burning, methyl bromide, calcium cyanamid, or by drenching with Vapam or allyl alcohol. Except for calcium cyanamid, any of these soil treatments may be used either in the fall or in the spring. Calcium cyanamid for bed treatment should be used only in late summer or fall. Usually fall treatments result in slightly poorer weed control than do similar treatments made in the spring, but the prevalence of suitable weather, better soil working conditions, and higher soil temperatures in the fall are factors which usually more than offset that disadvantage.

When burning, have the soil thoroughly prepared and dry enough for good tillage. Use enough wood to heat the soil to a depth of 3 to 4 inches. Usually 30 minutes burning with fairly large wood will provide enough heat to kill weed seed near the surface. Burning with a small amount of brush for 10 to 15 minutes is worthless. Burned beds may be seeded after the soil cools. Too heavy burning results in areas in the bed with few or no plants.



Releasing methyl bromide beneath gas-proof cover, using special application equipment.

Steaming is one of the most effective methods of treating plant beds to kill weed seed and to control leafspot diseases. When using steam, prepare the site thoroughly and at each "set" leave the pan in position for approximately 25 minutes, with the steam pressure in the boiler at 100 to 125 pounds. Steaming may be done in fall or spring whenever the soil is dry enough for working. Seeding may be done any time after the soil dries enough for raking.

When using methyl bromide, have the soil thoroughly pulverized and just about as moist as it can be safely worked. The soil temperature should be 50°F or warmer. Cover the bed with gas-proof covering and seal the edges with soil, then release 1 pound of methyl bromide gas for 100 square feet, into shallow pans or troughs, using a specially designed applicator. Beds treated in the spring may be seeded as soon as the cover is removed. Methyl bromide is poisonous. Follow precautions mentioned on the label carefully. (For more complete instructions, see Kentucky Extension Circular 500).

When using Vapam in plant-bed preparation, the ground should be broken and thoroughly disked about one week prior to the time of treatment. Soil temperatures should be 50°F or warmer, at the time of treatment. In extreme dry weather, when the ground is dusty, a light application of water to the bed area a few days prior to treatment, followed by a light raking or disking, is helpful to obtain penetration of the solution. All clods should be either broken up or raked off the bed site.

Use 2 gallons of Vapam in 175 to 200 gallons of water. Stir and sprinkle over 100 square yards of bed area. Applications may be made with power pump or sprinkling can. There should be enough of the solution to penetrate the soil 2½ to 3 inches deep. Vapam undergoes a chemical reaction in the soil, releasing a toxic gas which kills weed seed.

Vapam may be used in plant-bed preparation in the fall or in the spring. Fall applications are not quite so effective in controlling weeds as spring applications, but the advantage of having bet-



Drenches for weed control may be applied with a hand sprinkler or by power equipment.

ter weather in the fall, coupled with a better physical condition of the soil, more than offsets the slightly better weed-kill in the spring. Fall-prepared beds may be seeded as soon as weather permits in the spring. When using spring-prepared beds, wait 3 weeks or longer after Vapam is applied before seeding. Since Vapam is retained in some soils for a considerable period, it is desirable to rake the plant bed area *LIGHTLY* to break the crust one week before seeding. Vapam is poisonous. Users of Vapam should carefully observe the safety precautions printed on the label.

When using allyl alcohol, or materials containing it, work the bed until the soil is thoroughly pulverized. The soil moisture should be high and the surface moist before treatment. If soil is dry, water the bed lightly the day before treating to make sure the surface of the seedbed is damp. The soil temperature should be 50°F or warmer. Apply 6 to 8 quarts of allyl alcohol in 175 to 200 gallons of water to each 100 square yards. Plant beds may be seeded in 18 to 20 days after application. Do not harrow or disk the soil before seeding. **Allyl alcohol is poisonous** and should be handled with extreme care. It should not be allowed to come in contact with the skin and fumes from the concentrate should not be breathed. Observe carefully the safety precautions printed on the label.

Use calcium cyanamid only on soil that drains quickly. Have the soil thoroughly pulverized, with enough moisture for good tillage. Apply $\frac{3}{4}$ pound of calcium cyanamid and 2 pounds of 20-percent superphosphate to the square yard and mix with 3 inches of soil. Rake the surface smooth. Apply $\frac{3}{4}$ pound more of calcium cyanamid to the square yard and rake lightly. Water the bed, using 300 to 500 gallons for a bed 100 feet long. At seeding time prepare the surface with a hand rake, but don't stir soil deeper than 1 inch. Recommended dates for using calcium cyanamid are August 10-October 15. Beds treated with calcium cyanamid should be seeded March 20 to April 1. In case the plants begin to turn yellow they should be heavily watered.

Fertilize for Vigorous Growth of Plants

Fertilize beds which have been steamed or treated with methyl bromide, Vapam, or allyl alcohol with a complete fertilizer, such as 8-8-8, or 4-12-8, at the rate of 25 to 35 pounds for a bed 9 by 100 feet, and rake in lightly. For a burned bed, use 25 to 30 pounds of

20-percent superphosphate and 10 to 12 pounds of nitrate of soda, or 30 to 40 pounds of a mixed fertilizer, such as a 4-12-0, or similar analysis. Normally a cyanamid-treated bed will not need nitrogen fertilizer. If phosphate was applied in the fall, no additional phosphate will be needed in the spring. Potassium needs may be supplied with an application of 4 to 5 pounds of sulfate of potash. CAUTION: Don't use too much fertilizer. If you use much more than the amounts above, soluble salts may rise to the top of the soil in dry weather and may cause the plants to yellow and die. Heavy watering will help correct this condition.

Where plants are well rooted and show no injury to the crown but grow slowly and are a uniform yellow, treat the bed with nitrate. Dissolve 10 pounds of nitrate of soda in a 50-gallon barrel of water. Remove the cotton and sprinkle the nitrate solution evenly over the bed, with a sprinkling can, at the rate of 5 gallons to 18 running feet of bed 12 feet wide, or 24 running feet where the width is 9 feet. Follow at once with an equal amount of clear water to rinse the solution off the leaves to prevent burning.

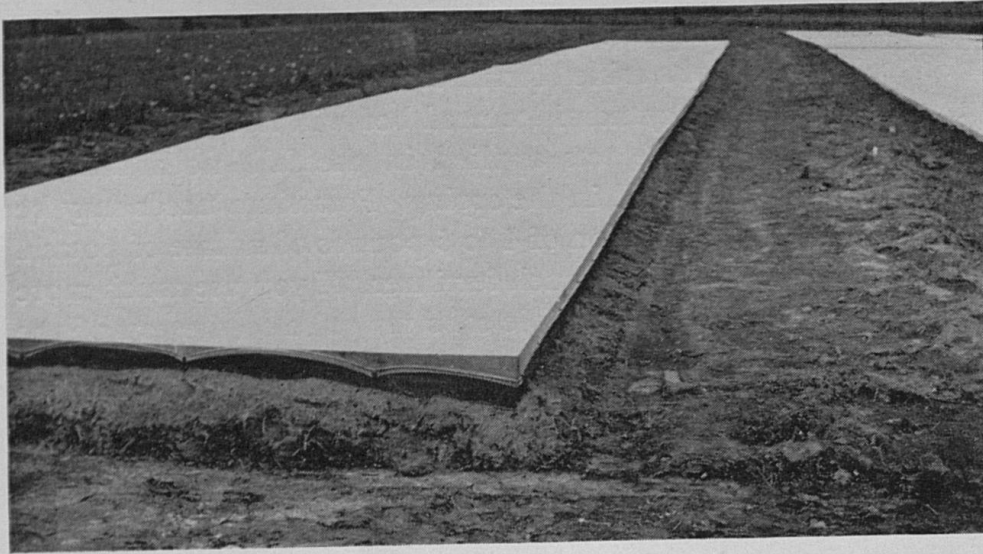
Sow the Seed as Soon as Weather Permits

Sow 2 level teaspoons of cleaned and tested seed to each 100 feet of bed 9 feet wide, or $2\frac{1}{2}$ level teaspoons of seed for each 100 feet of bed 12 feet wide. Seeding may be done as soon as weather permits, which is usually the last half of February or in March. Seeding should be completed by April 10.

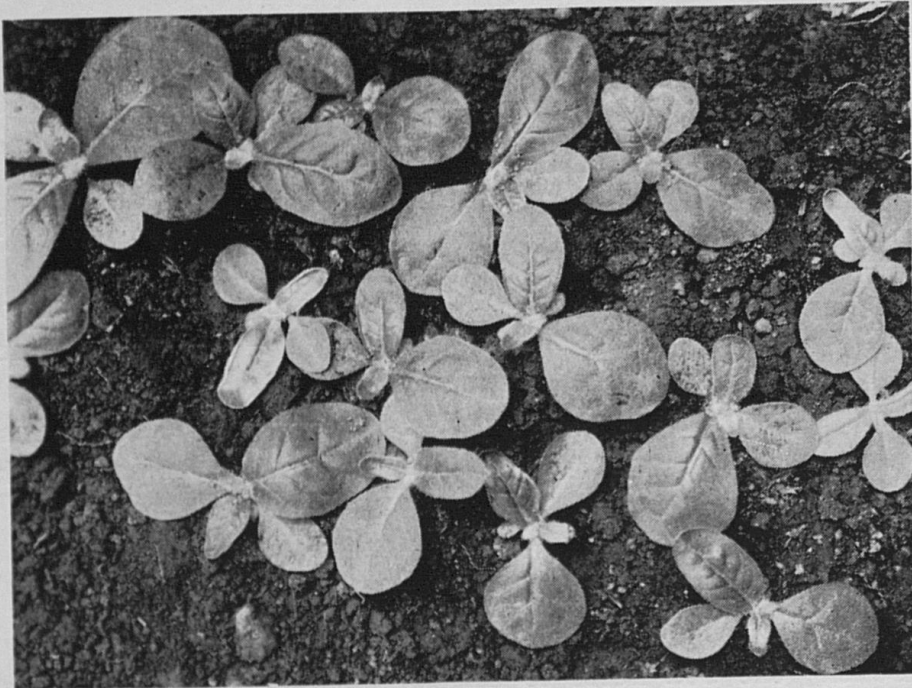
To distribute the seed evenly, use a tobacco seed distributor, or mix the seed with commercial fertilizer, fine sand, or screened wood ashes. Where a seed distributor is used the seed are sown without mixing with other materials. Going over the bed at least three times helps to get even distribution if you are sowing the seed by hand.

Box the Plant-bed

Boxing the bed helps to control cutworms and fleabeetles. Use 1" by 6" material and stretch a good grade of tobacco cotton over the top of the boards and fasten to the side. If boards are not available, uniform logs are satisfactory. Tall bottles turned upside down and stuck in the soil, will keep the cotton off the ground and prolong its life.



Bed properly boxed and ditched



Cold injury to tobacco plants in the plant-bed.

If Heavy Freezes Occur

Small tobacco plants, while injured by cold weather, are rarely killed unless the soil freezes enough to be honeycombed. Then the plants may be lifted or heaved out of the soil and die. If heavy freezes occur, remove the canvas as soon as the soil thaws, tramp or roll the soil, disregarding the plants, and then water the bed thoroughly.

Following cold, windy weather most of the plants in the bed may be affected with cold injury. As they develop, the bud leaves of such injured plants are white, and the partially developed leaves are smaller than normal and white. With warmer weather the affected plants recover quickly and grow normally, except that the affected leaves appear mottled, with somewhat the appearance of mild mosaic.

Control Wildfire and Angular Leafspot

Plowing under a legume in late summer, treating for weeds in the fall, ditching the bed to keep surface water from flowing over it, plus the use of bluestone-lime, will effectively control wildfire and angular leafspot in the plant bed. In the spring as soon as the tobacco plants can be seen they should be treated with bluestone-lime, and again 7 to 8 days later. If weeding is necessary, bluestone-lime should be applied immediately after, on the same day, that weeding is done. Bluestone-lime should be used after each weeding.



Tobacco plants ready for the first bluestone-lime treatment.

In using bluestone-lime, treat the bed and at least 3 feet beyond the sides and end of the bed. Most of the failures with bluestone-lime are due to its being used too late. The first application should be made as soon as the plants come through the soil.

To Prepare Bluestone-Lime Mixture: (1) Fill a clean 50-gallon barrel or oil drum $\frac{3}{4}$ full of water strained through a cloth. (2) In one container thoroughly mix 4 pounds of fresh com-

Sprinkle sides and end of plant bed with bluestone-lime to help control wild-fire.



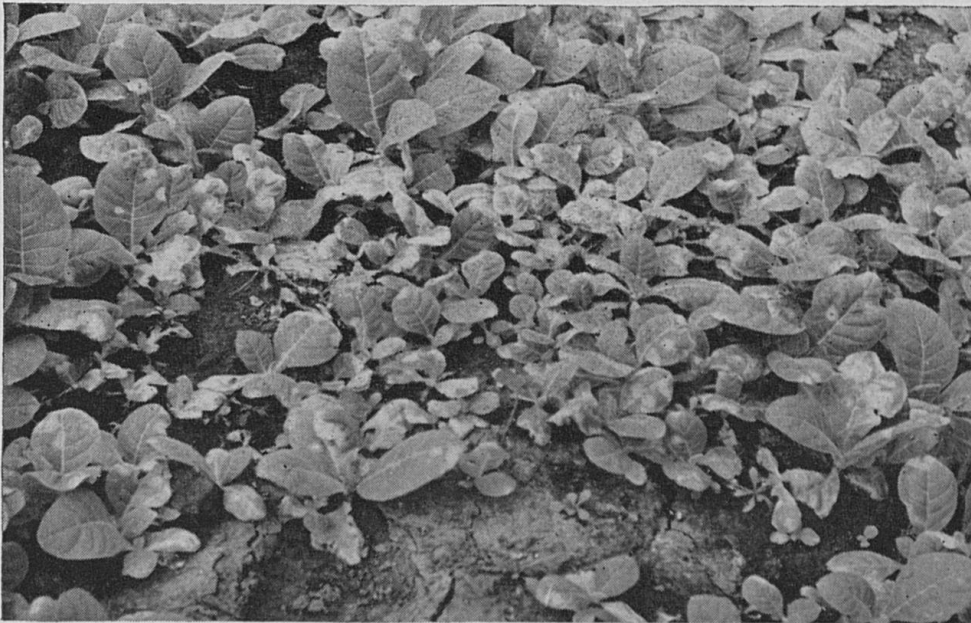
mercial hydrated lime in 3 or 4 gallons of strained water. (3) In another container dissolve 3 pounds of powdered bluestone in about 4 gallons of water. (4) Pour the lime paste into the barrel of water and stir vigorously. While stirring, add the bluestone solution slowly. (5) Add water to make 50 gallons. Add $\frac{1}{2}$ pound of 50-percent wettable DDT to control cutworms and flea-beetles.

Apply without removing the cotton cover, with an ordinary sprinkling can. Stir each time the sprinkling can is filled. Use 1 quart per square yard. Fifty gallons will treat 140 running feet of bed 9 feet wide, or 100 running feet of bed 12 feet wide, and

provide enough material for the plowed area on each side and ends of bed for a distance of 2 to 3 feet.

Control Mosaic

Mosaic is a serious tobacco disease for many farmers. It may be prevented by growing mosaic-resistant varieties as mentioned in Section 2 above, or by seeing that workers do not use home-spun or barn-cured tobacco while working in plant-beds. If the



Wildfire in the plant-bed though mild may cause heavy losses in the field. The light spots on the leaves (actually yellow) are wildfire.

workers chew, make up twists from a mosaic-resistant variety like Ky 58 or Ky 35. To prevent mosaic, the pockets of the workers should be brushed clean and the hands thoroughly scrubbed before going to the plant bed, and the workers should not smoke or chew home-cured tobacco when weeding plant beds or pulling and setting plants. Manufactured plug, twist, cigarettes, or pipe tobacco is relatively safe to use if one must use tobacco, but cigarettes should not be made from granulated tobacco.

Dipping the hands in a strong solution of trisodium phosphate, from time to time while weeding or pulling plants, will prevent mosaic infection nearly completely, even when barn-cured tobacco is used by workmen. Washing powders marked T.S.P. are made of trisodium phosphate.



Wildfire often destroys plants in the bed.

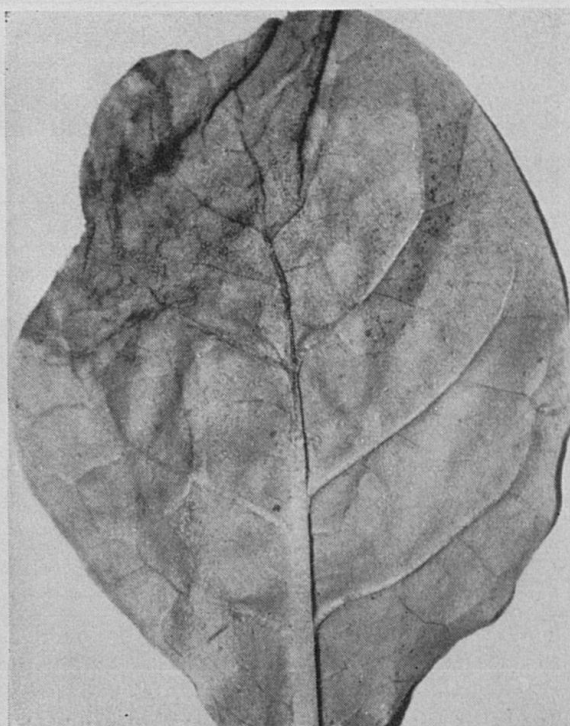
Control Blue Mold

Blue mold does not occur regularly in Kentucky. If blue mold appears early in your neighborhood, treat the bed with ferbam or zineb either as a spray or dust, twice a week, and after each rain, from the time the disease is first reported spreading in the neighborhood until the plants are set. Use 3 tablespoons of ferbam or 2 of zineb to 1 gallon of water, and apply 4 to 6 gallons, or 2 to 3 pounds of properly diluted dust to a bed 9 x 100 feet. Beds severely injured with the blue mold should be nitrated to hasten recovery. Removing the cover during the day is helpful.

Danger of Blackleg in Wet Seasons

Blackleg occurs in the plant-bed during wet periods when the plants are about ready to be set. It is a bacterial soft rot attacking leaves that touch the ground and spreading from them into the soft, tender stalk. The stalk may rot off completely, or the disease may spread up one side, splitting it open. The rotted areas usually turn black. Frequently the plants in an area up to 3 feet in

Blue mold showing spore masses on the under side of a leaf. These spores, when blown about, cause new outbreaks in the same bed and in beds at a distance.



diameter are damaged. Slightly affected plants when set in the field grow normally if set in rather dry soil, but if the setting season is wet it is not advisable to use plants from an affected bed.

Pull Weeds No More than Necessary

Most plant beds must be weeded once and unless they were properly treated to kill weed seeds may require weeding two or more times.

Repeated weedings result in mosaic if workers use homespun tobacco, and wildfire if weeds are pulled out of the bed. *Use a sharp knife and cut weeds at the surface of the soil rather than pulling them out.* Pulling weeds disturbs the surface of the soil and permits wildfire to attack young plants even when the blue-stone-lime mixture was used at the proper time. Always follow weeding with an application of bluestone-lime to prevent wildfire. The application should be made immediately after weeding, not two or three days later.



Blackleg of tobacco occurs in the plant bed as a soft rot, when the plants are about ready to set.

2,4-D Injury

2,4-D injury to tobacco is common in plant beds. It usually results from the use of a pressure sprayer that has been used in the past for 2,4-D. Occasional injury is caused by spray drifting across the plant bed or from the ester form volatilizing and drifting onto the bed. 2,4-D fumes have been known to drift from one half to three quarters of a mile.

When small plants are sprayed with extremely small amounts of 2,4-D, the young leaves may grow together, giving a vase or cup-like effect, older plants may develop thick leaves, with prominent midribs, as illustrated. If the injury to the older plants is relatively slight they will usually grow out normally when set.

It is sometimes possible to remove 2,4-D from sprayers, if all parts are washed *thoroughly* in strong ammonia water. The sprayer should be filled with water and allowed to stand overnight and then emptied, before filling with the spray material. When spraying tobacco beds however, it is safer to use equipment that has *never* had 2,4-D in it.



Typical 2, 4-D injury on leaves of burley tobacco.

Water the Plants in Dry Weather

Rapidly growing plants evaporate much water from the soil, and in dry weather beds must be watered or growth will be checked and the plants injured. Watering is a laborious operation, but necessary in many seasons if strong, thrifty plants are to be produced. It is better to give the plant-bed a thorough watering once every 6 to 7 days than to water lightly every few days. A barrel of water for every 100 square feet of bed is enough. It is the equivalent of about $\frac{3}{4}$ inch of rain. Seldom are there seasons when watering will not be a help in producing strong, early plants.

If weather is dry in late April and early May, small tobacco plants $\frac{1}{4}$ to 2 inches across may turn yellow and die or, when touched, break off at the surface of the ground. Usually the area in the bed where this occurs has a white coating over the surface



Weeding is a laborious job. It is much cheaper to prevent weeds.

soil particles made up of salts carried to the surface by evaporating water. These salts injure the small roots of the plants and prevent growth of new roots from the crown. Such a condition is usually brought about by applying too much fertilizer to the surface of the bed before sowing. If the season is wet continuously no harm will result, but if the season is dry, even for short periods, plants in large areas of the bed may die. Similar injury sometimes follows the use of calcium cyanamid for weed control.

If too much fertilizer has been used, or if the bed has been treated with calcium cyanamid, and the plants are yellowing in a dry period, water the bed heavily to dilute the salts and carry them into the soil.

Control Insects

Fleabeetles, cutworms, and grubworms (Green June beetle larvae) are the most important insect pests of the tobacco plant-bed. Slugs may destroy a stand of seedlings in beds that have not been treated with bluestone lime.

Fleabeetles and most kinds of cutworms may be controlled by the use of DDT, applied either as a dust or spray. If dusts are



Dusting to control insects.

preferred, use a 10 percent DDT formulation applied at the rate of 1 pound per 100 square yards of plant-bed. However, if a spray is desired use $\frac{1}{2}$ pound of a 50 percent wettable DDT powder in at least 5 gallons of water, or in the standard bluestone-lime mixture, and applied over the surface of the bed (based on a standard 9' x 100' bed, or 100 square yards of surface area). A 1 to $1\frac{1}{2}$ percent endrin or dieldrin dust may also be used for cutworms and fleabeetles and should be applied at the rate of 1 pound per 100 square yards.



Cut worms may move into plant-beds from adjacent stubble.

Grubworms, or green June beetle larvae are commonly found in plant-beds located near livestock barns, or in areas where stable manure or rotting straw has been spread. Parathion, which is highly toxic to man and other warm-blooded animals, is the only insecticide known at this time that will quickly (within 1 to 2 days) and effectively control this pest. Two pounds of a 1 percent parathion dust (per 100 square yards) applied when needed through the dry cotton bed cover will control this pest.

In a permanent plant-bed green June beetle larvae, as well as other harmful soil insects may be controlled by a fall or early spring application of dieldrin. This material is slow in action and should be applied at least 60 days prior to seeding the bed. It is, however, very persistent and one application should control these pests for at least 2 to 3 years. Dieldrin can be applied to the bed in either the spray, dust, or granular form. The dosage should be such that at least 1½ ounces of actual dieldrin are applied per 100 square yards of bed surface.

For a further description of insects infesting tobacco plants see Kentucky Extension Circular EC-525, "Controlling Tobacco Insects," and for current recommendations on insect control see Kentucky Extension Miscellaneous Publication M-37, "Tobacco



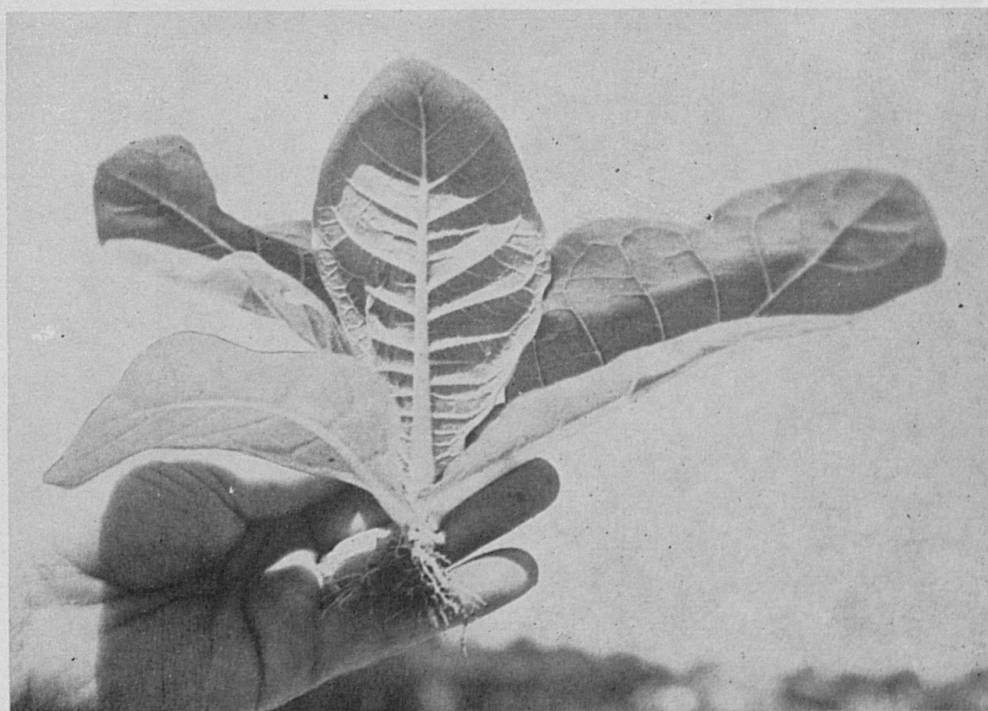
Green June beetle larvae often destroy plants in the bed. They may be controlled by applying dieldrin or parathion. The insects crawl out of the soil after the poison is used. The dark spots are holes from which the worms emerged.

Insect Control." Copies may be obtained from your county extension office or by sending a request to the Bulletin Office, Agricultural Experiment Station, University of Kentucky, Lexington.

Summer Management of Permanent Plant-beds

When setting is completed, the plant-beds should be plowed to destroy the remaining plants. The soil should be thoroughly prepared to provide a good seedbed, and seeded to cowpeas, soybeans, or some other broadleaf legume to provide a dense covering during the summer. Fertilizing the legume ahead of seeding with a mixed fertilizer, containing phosphate and potash, coupled with inoculation of the legume seed provides for maximum growth of the crop and reduces the need for using chemical fertilizers on the plant bed in the spring. This program provides for highly fertile soils for growing the plants and prevents fertilizer injury to the young plants. Spring-plowed beds are almost certain to be contaminated by the wildfire bacteria unless they are thoroughly steamed, or where methyl bromide is used.

Permanent plant-beds with a heavy growth of summer legume are helpful in controlling weeds, keeping the soil fertile and in good tilth, and in preventing wildfire in the plant-bed and in the field.



A sturdy plant ready for transplanting

U.S. DEPARTMENT OF JUSTICE
FEDERAL BUREAU OF INVESTIGATION
WASHINGTON, D. C.

TO : SAC, [illegible]
FROM : SAC, [illegible]
SUBJECT: [illegible]

[illegible text]