

Spittlebug Control

in legumes



By
T. H. Parks
and
C. R. Weaver

Young or nymphs of spittlebugs with spittle removed. They constantly secrete this frothy material and feed beneath the mass.

Agricultural Extension Service,
The Ohio State University
and
Ohio Agricultural Experiment Station,
Cooperating

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Spittlebug Control in Legumes

By T. H. Parks¹ and C. R. Weaver²

Failure to obtain satisfactory yields of red clover and the first crop of alfalfa hay in June has brought many requests for help to the Ohio State University and the Ohio Agricultural Experiment Station. Much of this crop yield failure has been caused by outbreaks of spittlebugs, which have appeared in legume fields during the past 5 years. The insect responsible is the species, *Philaenus leucophthalmus* Linn., commonly known as the meadow spittlebug.

Habits of the Insect and the Resulting Problem

Visible damage attributed to this insect is caused by the orange-colored young. These nymphs are present during the spring on growing plants and live within masses of spittle-like secretion. From one to several nymphs may live within the same spittle-mass, which is attached to stems and leaves of clover and alfalfa during early season plant development. Spittlebugs also attack strawberry plants and many weeds.

Masses of spittle are present from the third week of April to the middle of June. Nymphs develop rapidly during May and transform into adults during the 10 days preceding the harvest of the first crop of alfalfa or clover. The presence of the *young* bugs or nymphs, feeding in the spittle-masses, has a definite stunting effect on the plant they attack. Spittlebugs also may cause damage in their adult stage, at which time they do *not* secrete spittle.

Resemble Robust Leafhoppers

Adults are winged and resemble robust, over-grown leafhoppers. They can fly or jump for several feet when disturbed. They fly or jump in great numbers in front of the mower when hay is being cut. These adults leave the cut hay before it is taken up from the swath and fly away to border areas where they assemble on other crops or on weeds. Many of them migrate back to the hay field after the new growth gets started, since the second growth is attractive to them.

During the summer, the adults feed upon foliage, which they share with varying numbers of leafhoppers and plant bugs that also migrate into legume fields. With such a mixed insect population during July and August, it is difficult to determine how much of the sizable loss in hay or seed yield is caused by spittlebugs and how much by other pests.

Adult spittlebugs remain in or around clover and alfalfa, or in weed areas, until autumn. Then they again migrate. Many fly to the new seedling crop of legumes in grain stubble and lay their eggs on stubble and trash nearby. Sometimes they lay their eggs near weed hosts such as dandelion, whitetop, wild parsnip, and plantain.

This insect winters in the egg-state, closely spaced in a row in old stems or stubble. In central Ohio, hatching begins in mid-April and continues for 3 or 4 weeks. By the second week in May, most of the eggs have hatched: the spittle-masses are much in evidence and damage is well underway.

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Fig. 1. Masses of spittle on alfalfa stems.

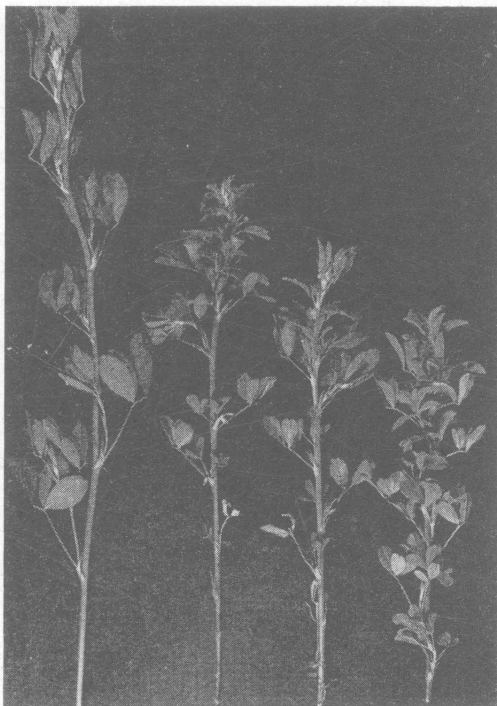


Fig. 2. Three on right—plants stunted by attacks of spittlebugs. Left—plant grown free from spittlebug attack.

Experimental Work Points to Solution

Enough research work has now been carried on in Ohio and neighboring states, together with insecticidal usage in Ohio, to arrive at a practical course of procedure for control. This is the application of either BENZENE HEXACHLORIDE or TOXAPHENE against the *very young nymphs* in the spittle-masses. Tests made by Ohio entomologists, with ground and air spraying and dusting equipment, showed clearly that it is economical and practical to apply insecticidal treatment with remarkably low dosages per acre for control.

Based on a 3-year test in Ohio, an application of benzene hexachloride late in April or the first week in May can increase the clover hay yield from 25 to 55 percent. In the spring of 1950, farmers treated approximately 85,000 acres of legumes. Average estimated increase in yield was 27.6 percent. Much of this acreage was treated too late in May, however, to obtain maximum benefit.

It is important to apply the insecticide early and before damage has progressed too far to obtain greatest returns. This requires examination of the young clover or alfalfa growth frequently during April and the first week of May. One or two small spittle-masses per plant on or between the expanding leaves should prompt action. At this time, new growth probably is under 5 inches, and there will be no trouble about contaminating the hay crop with spray residue, because

the harvesting date is still a month or more away. *The field should not be pastured during the 3 weeks following treatment.*

Important Facts About Insecticides

Benzene hexachloride: The gamma isomer found in benzene hexachloride gives it insecticidal value. The other isomers carried give it a disagreeable, musty, or pungent odor. Commercial BHC varies in gamma isomer content from 1 percent in the dilute powder sold for general dusting to 25 percent found in the high gamma or purified form of the wettable powder. The 25 percent—so-called high gamma—powder has most of the objectionable odor removed. The musty odor of unrefined benzene hexachloride has limited its use on food plants. There is no objection to this odor if the insecticide is applied to hay crops *early* in the season.

Most economical form of benzene hexachloride is a water miscible concentrate carrying 10 to 11 percent gamma isomer, or the wettable powder carrying 6 to 12 percent gamma isomer. Examine the "*fine print*" on the package to determine the gamma isomer content of the material.

The liquid form, or water miscible concentrate, is suited for all types of sprayers, but it is the only form satisfactory for use in low volume weed sprayers and in liquid sprays applied by airplane. (See Table 1 for dilutions of this soluble type.)

Dilution Rates for Different Forms of Insecticides

Table 1. Benzene hexachloride water miscible concentrate.
(Carrying 10% gamma isomer)

Intended rate of spray application per acre*	Amount of liquid concentrate to make 50 gallons of spray
2½ gallons.....	20 quarts
5 "	10 "
7½ "	6⅔ "
10 "	5 "
12½ "	4 "
15 "	3⅓ "

* The higher rates of application are desirable when plants are more than 6 inches high. Very low gallonage per acre is recommended only when growth is small.

Table 2. Benzene hexachloride wettable powder.
(Of different gamma isomer content)

Intended rate of spray application per acre	Pounds of BHC powder to use per 100 gallons of water		
	Gamma isomer content of powder		
	6%	10%	12%
75 gallons	4.5	2.7	2.3
100 "	3.4	2.0	1.7
150 "	2.3	1.4	1.2

Table 3. Toxaphene

Intended rate of spray application per acre in gallons*	Amount of 60% liquid concentrate needed to make 50 gals. of spray	Lbs. of 40% wettable powder to use in 100 gallons water
2½	6¼ gallons	Not recommended in low pressure sprayers
5	3⅛ "	
7½	2 "	
10	1½ "	
12½	5 quarts	
15	4 "	7½ pounds 3¾ " 2½ "
25	1½ "	
50	2½ pints	
100	1¼ "	
150	0.83 pint	

(Concentrates or powders of varying toxaphene strength should be adjusted to above table in proportion to degree of variation.)

The wettable powder is adaptable only for high volume sprayers using pressures more than 100 pounds. (See Table 2.) The wettable powder also may be formulated into a dust for application by airplane or by power-driven ground dusters.

Toxaphene: This is a rather new organic insecticide that has wide usage in the control of grasshoppers and armyworms. Demonstrations in Ohio and Indiana show it is quite effective against young spittlebugs in the frothy spittle-masses. At applications of 1.5 pounds per acre it is equal to 0.2 pound gamma benzene hexachloride in effectiveness. However, it may be more objectionable than benzene hexachloride in possible residue hazards, if applied too late in May. It does not have the pungent odor of BHC.

Toxaphene is marketed as a liquid concentrate carrying 60 percent of the toxicant or as a wettable powder carrying 40 percent. Regardless of which form is used, the material should be applied at the rate of 1½ pounds of actual toxaphene per acre. (See Table 3.)

Chlordane: Chlordane is *not* recommended for spittlebug control because of its inferior performance in Ohio tests and because of higher toxicity of chlordane residue to warm-blooded animals.

Rate of Application

Amount of benzene hexachloride required per acre is approximately 0.2 pound of gamma isomer, which is the toxic material in that product. For toxaphene, the recommended dosage is 1½ pounds of actual toxaphene per acre.

Amount of dilute spray used will depend on the stage of plant growth and denseness of foliage.

The larger amounts suggested are necessary when there has been some delay in application and the growth is tall and dense. Applications of less than 5 gallons per acre are less effective progressively after the new growth is more than 6 inches tall. Airplane spraying with low gallonage per acre is effective only when the plants are small.

* See note under Table 1.

Low pressure weed-type sprayers are most efficient when adjusted to apply 5 or more gallons per acre with the higher gallonage applications being necessary where new growth is tall. Pressures of more than 50 or 60 pounds are not necessary or desirable with low volume applications.

High pressure, high gallonage per acre sprayers are effective in any stage of growth if the spray is *driven with force* throughout the foliage. It is not necessary to break the spray into a fine mist.

Dust Applications

Benzene hexachloride is available in dilute powder mixed ready to be applied as a dust instead of a liquid spray. This powder carries 1 percent of the gamma isomer and is suitable for application by airplane or ground duster. Apply from 25 to 30 pounds per acre evenly over the young growth. Good coverage is best accomplished at night or in the morning and evening when there is little or no air movement. It is not necessary for the foliage to be wet with dew when applying this dust.

If the legume growth is heavy, control by dust application may not be satisfactory near the ground. Subsequent rains which wash the dust down are helpful. Dusting is most satisfactory under good weather conditions and before the growth is too far advanced.

Expected Performance and Limitations of Equipment

Low pressure or "weed control" sprayers are satisfactory to use with the soluble or water miscible type of material. Such sprayers

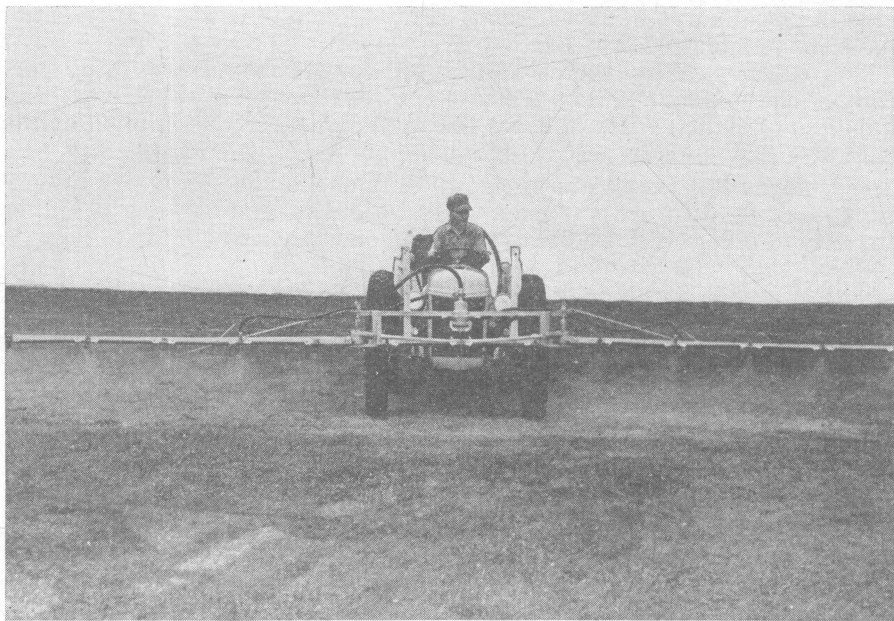


Fig. 3. Low volume sprayer satisfactory for spittlebug control.



—(Courtesy Paul Bailey, Crop Dusting Service.)

Fig. 4. Dusting by airplane for spittlebug control.

cannot be expected to handle the wettable powder in the high concentration required for low gallonage applications. Trouble from nozzle-clogging can then be expected. If the sprayer has been used for weed control, it is essential to clean this equipment thoroughly so the cover or alfalfa will *not* be injured by traces of 2,4-D remaining in the equipment. Those who attempt to use these weed sprayers should **CLEAN THEM THOROUGHLY WITH HOUSEHOLD AMMONIA**—1 gallon in 100 gallons of water—**BEFORE** using for legumes. The drum used for the 2,4-D preferably should *not* be used for spraying legumes.

Controlling spittlebugs with concentrate spray applied by airplane is satisfactory but has its limitations. Coverage is likely to be too light and lack sufficient distribution on the lower parts of the plants unless the plants are small. Airplane spraying is recommended only during the early period, say 10 days to 2 weeks of spittlebug development, following their first appearance.

High volume power sprayers, capable of delivering 100 to 300 pounds pressure and carrying a boom that distributes the spray evenly, are effective for all situations encountered. They are heavy to pull through a meadow where soil conditions and the weight of a large quantity of water contribute to mechanical damage.

Airplane or ground dusting is successful when the application is well-timed and the hay has *not* attained too much growth.

Airplane dusting or spraying can be done when the ground is soft; therefore, without mechanical damage to the field or hay. If the application is made before the plants are more than 6 inches high, the

dust will give fairly good control immediately. If dust is not applied until the growth is tall and dense, it will take a rain to wash the dust down into the spittle-masses low on the stems to kill the insects located near the ground. Dust applications are limited to periods when weather conditions are favorable and should never be undertaken in a strong wind.

Treatment Protects Only the First Crop

Spraying or dusting for the *immature* insects in the masses of spittle will control only the insects in the first crop of hay. During mid-summer, the *adults* from other fields and from weed areas will migrate into the treated field when the second growth has become attractive to them. Benzene hexachloride does NOT give satisfactory control of the *adult* spittlebugs. No insecticide can be recommended at the present time for use on second crop hay to be fed dairy cattle.

Cost of Treating

Based on current prices of insecticides, the cost of treating an acre of meadow used for hay is not prohibitive. Per acre cost of the insecticide varies with the formula used. At the foregoing rates, the cost of benzene hexachloride powder will be between \$1 and \$1.50 per acre. If the 10 percent unrefined water miscible type is used, the cost still will be economical and comparable with that of powder. Cost of treatment with toxaphene will average slightly more but should not exceed \$2 per acre.

Custom operators charge from \$1.25 to \$1.75 per acre for applications. Sizes of fields and other jobs available in the community enter into the cost of airplane treatments. These costs should vary little, if any, from that charged for ground treatment.

Complete cost of treatment will range somewhere between \$2.25 and \$4 per acre and will be highly worthwhile if the stand of hay is good and spittlebugs threaten to damage it.

Controlling Adult Spittlebugs

If the second crop is to be grown for SEED, the field may be dusted with 5 percent DDT powder at about 30 pounds per acre. This will control *adult* spittlebugs, leafhoppers, alfalfa bugs, plant bugs, and *young* grasshoppers. It will not kill clover root borers nor full-grown grasshoppers. If grasshoppers are a problem, toxaphene can be mixed with the DDT. This should be applied when the clover or alfalfa is in the BUD STAGE and BEFORE more than 10 percent of the heads are opening into bloom. This will benefit greatly the seed crop and promote outstanding yield increases.

Airplane applications have a distinct advantage at this stage of growth of the crop, and dusting takes precedence over spraying, because better distribution is obtained and less likelihood of a serious residue problem results. Such treated fields should NOT be pastured, and the chaff or straw coming from the combine or thresher should NOT be fed to dairy cows in milk production.