THE POSSIBILITY OF REDUCING BOLL WEEVIL DAMAGE BY AUTUMN SPRAYING OF COTTON FIELDS TO DESTROY THE FOLIAGE AND SQUARES

By WILMON NEWELL and T. C. PAULSEN, *Baton Rouge, La.*

The most important step in insuring a good crop of cotton in the boll weevil infested region of the South is the early fall destruction of the cotton plants in order to kill the immature stages of the weevil contained in the squares and bolls, to destroy the food supply of weevils already adult and to lengthen the period through which the insects must survive until the appearance of the following year's crop. So completely has this been demonstrated by the experiments of the Bureau of Entomology in Texas, and more recently by Prof. W. D. Hunter in an enormous field experiment in southern Texas, that discussion of this point is entirely unnecessary.

The great objection upon the part of planters to fall destruction of the cotton plants is that the cotton crop cannot be picked out early enough so that the plants can be uprooted and burned at the time necessary to insure destruction of the greatest number of weevils, for the labor problem in Texas and Louisiana is at present second in importance only to the boll weevil problem itself.

A method of practice which would destroy the weevils and their food supply (leaves, squares and green bolls) early in autumn and at the same time permit greater leisure for gathering the crop, has long been recognized as a desideratum. The possibility of spraying to destroy all green portions of the cotton plant, without affecting thereby the lint in bolls still unopened, was discussed at length as much as two years ago by Prof. W. D. Hunter and the senior author. At that time we saw no possibility of the plan being practical.

During the past summer the subject was again brought up by Dr. T. J. Perkins, an extensive planter of Redfish, La. Doctor Perkins had had experience in destroying the water hyacinth with sprays, and being also a practical cotton planter, he believed that the same plan could be made applicable in the warfare against the weevil.

The writers accordingly decided to make a few experiments in a small way to determine what could be accomplished along this line. We first experimented with substances which we knew to be destructive to plant life, such as common salt, white arsenic, copper sulphate, etc.

Through the courtesy of Capt. J. F. McIndoe, Corps of Engineers, U. S. A., we were furnished with directions for preparing the mixture of white arsenic and sodium carbonate used so successfully by

the army engineers in destroying the water hyacinth in the bayous and navigable streams of the southern states. The cost of the ingredients, and particularly of the arsenic, showed that the use of this preparation, even though it might meet all requirements, would involve an outlay too great to make its use profitable in the cotton fields.

It was also thought that the cotton plants might be killed by "girdling" the base of each with a flame from a gasoline blow torch, and this was accordingly tried. With cambium layer and bark entirely burned off, the plants died immediately and the green bolls afterwards opened fairly satisfactorily. However, a much more severe burning was necessary to kill the plant than was anticipated, from five to ten minutes' application of the flame to the base of each plant being necessary to insure death. On account of the labor involved this method was put aside as impracticable.

Spraying solutions were next tested, most of the experiments being made during the month of September. Several healthy plants were sprayed by hand with each solution tested, with the general results indicated below.

A 5% solution of common salt burned the foliage rather severely and caused some of it to shed, but the plant continued to grow and put on foliage and squares. The application of the salt solution to the larger unopened bolls caused them to open suddenly, without the lint maturing properly.

A 5% solution of bicarbonate of soda produced little effect, except that some leaves and squares were wilted. In six days after spraying the plants had practically recovered and were growing rapidly.

A 5% solution of ordinary lye severely burned the foliage and caused many leaves and squares to fall. It also seemed to scar the unopened bolls severely and the plants almost immediately started to put on a new growth. The caustic nature of the solution was also objectionable.

A 2% solution of hydrochloric acid burned some leaves and caused about 40% of the foliage to drop, but in two days' time an abundance of new foliage and fruitage was being put forth.

A 3% solution of white arsenic in water, dissolved by long continued boiling, killed the cotton plants outright and no "second growth" appeared at any time after spraying. The larger bolls were however forced open almost at once, with the result that the lint and seed had no opportunity to mature.

A solution containing 5% of white arsenic and 3% of carbonate of soda did not produce effects materially different from those produced by the 3% arsenic solution. All the foliage was killed, the larger

bolls opened and furnished fair lint, with improperly filled seed, while the smaller bolls either dropped off or decayed after opening slightly.

Copper sulphate used at the rate of 5 lbs. to 50 gallons of water scorched the foliage slightly and induced gradual shedding of leaves. This shedding, however, was accompanied by a constantly increasing rejuvenescence of the plants.

A 10% solution of iron sulphate killed leaves, squares and the smaller bolls.

A 5% solution of iron sulphate was next tried. The action of this solution was more gradual than that of the 10%. In 24 hours after application some leaves were burned. Three days after the application blossoms and forms were dead and on the fourth day the shedding of leaves, squares and forms was well under way. By the fifth day there was practically nothing upon the plants that could serve as food for the weevils. This slow killing of the foliage also gave the large bolls, not open at time of spraying, an opportunity to mature, for on the fifth day also the first of these opened. For several days afterwards these bolls opened rapidly and from those that were three-fourths grown or over at the time of spraying, fair lint was secured. Lint in bolls which were *open* at time of spraying was slightly discolored. Later a very few green shoots were put out by these plants. We have given the results of this experiment thus in detail for iron sulphate meets the requirements better than any other substance tried and it is also the cheapest.

The iron sulphate and salt solutions having separately proved the most promising, they were tried in combination. A solution containing 5% of each did not show any advantage over the 5% solution of iron sulphate used alone, and the plants sprayed with the former took on new growth to a marked extent.

Combinations of iron sulphate and white arsenic were tried, but gave no indication of being better than iron sulphate alone.

A 1% solution of iron sulphate was not found to be strong enough. A 3% solution of the same material was practically as effective as the 5% solution, except that the plant recovered to a certain extent and in a couple of weeks put out more new foliage than was desirable.

Taking a comprehensive view of these experiments, we see that arsenic solutions proved effective in killing the plants, but are too expensive, while iron sulphate solutions meet the requirement of killing the plants slowly, while at the same time permitting the larger bolls to mature and open. The latter—nearly grown bolls—it may be remarked, are the ones which are lost when the plants are uprooted and burned; smaller bolls would not figure in the production, as in

ordinary seasons they would be killed by frost, even were the plants not destroyed. Copperas, or iron sulphate, may be purchased in quantity at from 1 to 1½ cents per pound, hence weak solutions of it are not expensive.

We have made no attempt to experiment with these solutions on the scale of field operations, as time did not permit. There still remains the problem of applying this copperas, or other solution, to the cotton plants with a mechanical sprayer, making the application thorough enough to be effective in destroying the weevil's food supply and at a labor cost sufficiently low to make the method practicable. In this connection, however, it should be borne in mind that the lint contained in the grown and nearly grown bolls at the time fall destruction of the plants must be practised, constitutes a considerable part of the crop in weevil-infested sections, and by the amount of lint secured from such bolls, if the spraying prove otherwise successful, must we compute the loss or gain from such an operation.

From the foregoing it will be noted that destruction of the foliage, squares and blooms on the plants sprayed with the various solutions was usually followed in a week or ten days by new shoots and leaves being put out by the plant. Our experiments were made during the early part of September, just after the period of intense summer heat and just prior to the time when the second growth normally appears in all cotton fields. Should spraying to destroy the foliage be found efficient such spraying would be done, not in September, but between October 15 and November 1, at a time when little if any second growth would ordinarily be induced. We do not think therefore that the factor of rejuvenescence in the plants following the spraying would, under field conditions, militate against the success of the method.

The discoloration of lint in bolls open at the time of spraying would not be a difficulty hard to overcome, as it would only be necessary to have the spraying machine follow the pickers, thus spraying the cotton when no bolls are open.

THE FIRST AND LAST ESSENTIAL STEP IN COMBATTING THE COTTON BOLL WEEVIL

By W. E. Hinds, *Auburn, Ala.*

(Withdrawn for publication elsewhere.)

Mr. Sanderson remarked that these papers bring out in detail the fact which he had previously demonstrated, that the cotton stalks must be destroyed in the fall.