

AGRICULTURAL EXPERIMENT STATION of The Alabama Polytechnic Institute, Auburn, Ala.

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CHEMICAL WEED CONTROL IN COTTON

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Controlling weeds is one of the major costs in producing cotton in Alabama. The amount of hand labor required to produce an acre of cotton has changed very little since the beginning of cotton production. With the advent of chemical weed control it is possible to reduce the pre-harvest hand labor requirements in cotton production from 75 to 100 per cent.

Should You Use Chemicals for Weed Control?

Chemical weed control in cotton is a highly specialized operation which must not be done haphazardly if good results are to be expected. Cotton plants can be killed unless the chemicals are applied correctly. Farmers who are planning on using chemicals for the first time must familiarize themselves with all available information on chemicals, and equipment, and how to use them. It is recommended that the farmer treat only a small percentage of his total cotton acreage the first year so that experience may be gained before treating a large acreage.

Planning for Chemical Weed Control

Chemical weed control must begin with seedbed preparation and each operation from then on must be done properly if the best results are to be obtained. The land should be prepared far enough in advance of planting so that all the previous crop residue or cover crop will be completely turned under. It is desirable to have the cover crop decayed before planting.

Planting

Cotton should be planted on beds that are slightly above ground level so that excess water will drain away from the row. The top of the bed should be as flat as possible after planting and 16 to 18 inches wide. There should be no stones or clods on the surface of the bed. A good stand of cotton may be obtained by either strewing or hill-dropping 3 to 4 pecks of seed per acre, provided the germination is 80 per cent or better. This will usually result in emergence of about 35,000 to 45,000 plants per acre, which are normally adequate for maintaining a stand. The number of cotton plants can range from 8,000 to 40,000 per acre without affecting the yields as long as they are uniformly distributed.

Pre-emergence Treatment

A pre-emergence treatment is applied anytime after planting and before the young cotton plants break the surface of the soils. Normally, a pre-emergence treatment will keep the cotton row free of weeds for a period of 1 to 4 weeks, depending on weather conditions. The most economical application of a pre-emergence treatment is obtained by mounting the sprayer on a tractor and applying the chemical at the time of planting. Solid press wheels 12 inches wide, or a roller 12 inches wide following the regular press wheel should be used so that

a smooth surface will be made for applying the chemical. A fan-type nozzle should be mounted behind the roller and adjusted to treat a 12-inch band centered over the drill. Fan-type nozzle tips can be obtained with an angle from 65 to 110 degrees. The larger the angle, the closer to the soil a nozzle can be adjusted, which is desirable particularly on windy days.

Post-emergence Treatment

When a good job of pre-emergence is done, and if ideal weather conditions prevail, there may not be any weeds present for a period of 3 to 6 weeks. If weeds are present, a post-emergence treatment is necessary.

The first application can be made when the cotton plants are 2-1/2 to 3 inches high or when the plants are a week to 10 days old. Parallel action shoes or a shield may be used for applying post-emergence spray. Flat spray nozzles are mounted on each shoe or side of the shield so that an 8- to 10-inch band is sprayed, centered on the drill. The nozzles are adjusted so that the spray will strike the cotton plants just above the soil surface. Never allow the spray to be applied to the cotton leaves. Post-emergence sprays recommended for cotton will kill cotton plants if sprayed on the leaves. The middles can be cultivated at the time the post-emergence spray is being applied to the row. The sweeps should always be adjusted so as to leave the surface as flat as possible for the next application. Do not disturb or throw soil in the treated band until weeds begin to appear after the last post-emergence application.

Recommendations

The following recommendations are based on the results of experiments conducted by the Agricultural Experiment Station of the Alabama Polytechnic Institute during 1950 and 1951. The results of these 2-year tests, showing the degree of control obtained, are summarized in Table 1. It should be pointed out that the best weed control was obtained by a combination of pre- and post-emergence applications.

Apply "dinitro"* as a pre-emergence treatment at the rate of 1 to 1-1/2 pounds per acre, to a 12-inch band over the row on light sandy soil, and 2 to 2-1/2 pounds per acre on a heavy soil. Both oil-soluble and water-soluble dinitro may be applied in water, and the oil-soluble ~~and water-soluble~~ dinitro may be applied in diesel fuel. The total amount of solution needed per acre can range from 5 to 10 gallons. A more uniform coverage may be expected from the 10-gallon per acre rate.

Post-emergence herbicidal oil should be applied when needed. Herbicidal oil for cotton is a special oil made for killing weeds in cotton and no other oil should be used. There are two types of oil made for cotton. They are non-fortified and fortified. This Station recommends only the non-fortified. It should be applied at the rate of 5 gallons per acre, per application, to a 10-inch band in the drill. Never apply oil more frequently than five-day intervals,

*Dinitro is used in this report to refer to a group of dinitrophenols. See footnotes to Table 1 for specific compounds tested.

or more than 5 gallons per application, or more than 3 applications per season. Never apply oil after true bark begins to form at the base of the cotton plants. This can usually be determined by cracks appearing in the bark which normally occur when the cotton plants are about one month old. Oil is more effective on small weeds 1 to 1-1/2 inches high or less and should be applied when the weeds are dry.

Calibrating the Sprayer

These recommendations are based on 40-inch row widths. The rate of application per acre will vary as the row width varies. Remember that 8 ounces per 163 feet of row or 1 pint per 326 feet of row is equal to 5 gallons per acre in 40-inch rows or twice that amount for 10 gallons per acre. If a solution is mixed for 40-inch rows and applied at the rate mentioned above, the recommended rate for the drill will be applied regardless of row width. The amount that a sprayer will deliver can be changed by the speed of the machine, size of nozzles, and the pressure on the line. When checking the discharge rate of a sprayer, catch the solution in a container large enough to prevent spilling so that it can be measured accurately. Always calibrate a sprayer in the field with the same conditions under which it will be operated.

Research is being continued on the control of weeds in cotton with chemicals and these recommendations may be changed or added to as more information is obtained.

Precautions--Care and Selection of Equipment

1. Be sure to have a clean solution to prevent clogging the nozzles.
2. The dinitros are poisonous and should be handled according to the instructions of the manufacturer.
3. The sprayer should be equipped with high pressure neoprene hose.
4. The pump should have a capacity of 5 gallons per minute or more so that an adequate pressure can be maintained.
5. The sprayer should be equipped with at least one line strainer with a mesh size slightly smaller than the nozzle opening.
6. Nozzles should be cleaned and the calibration checked at the end of each half-day operation.
7. When using water solutions, calibrate the sprayer with water. Calibrate with oil when oil is to be used.
8. To check whether or not oil is being applied to the cotton leaves, treat two rows and wait 30 minutes to one hour, then observe cotton plants. Leaves to which oil is being applied will turn a dark color. Readjust nozzles and repeat the above procedure until you are certain the oil is not being applied to the cotton leaves.

9. Never change the speed of the machine without recalibrating the sprayer.
10. Wash sprayer thoroughly after use.

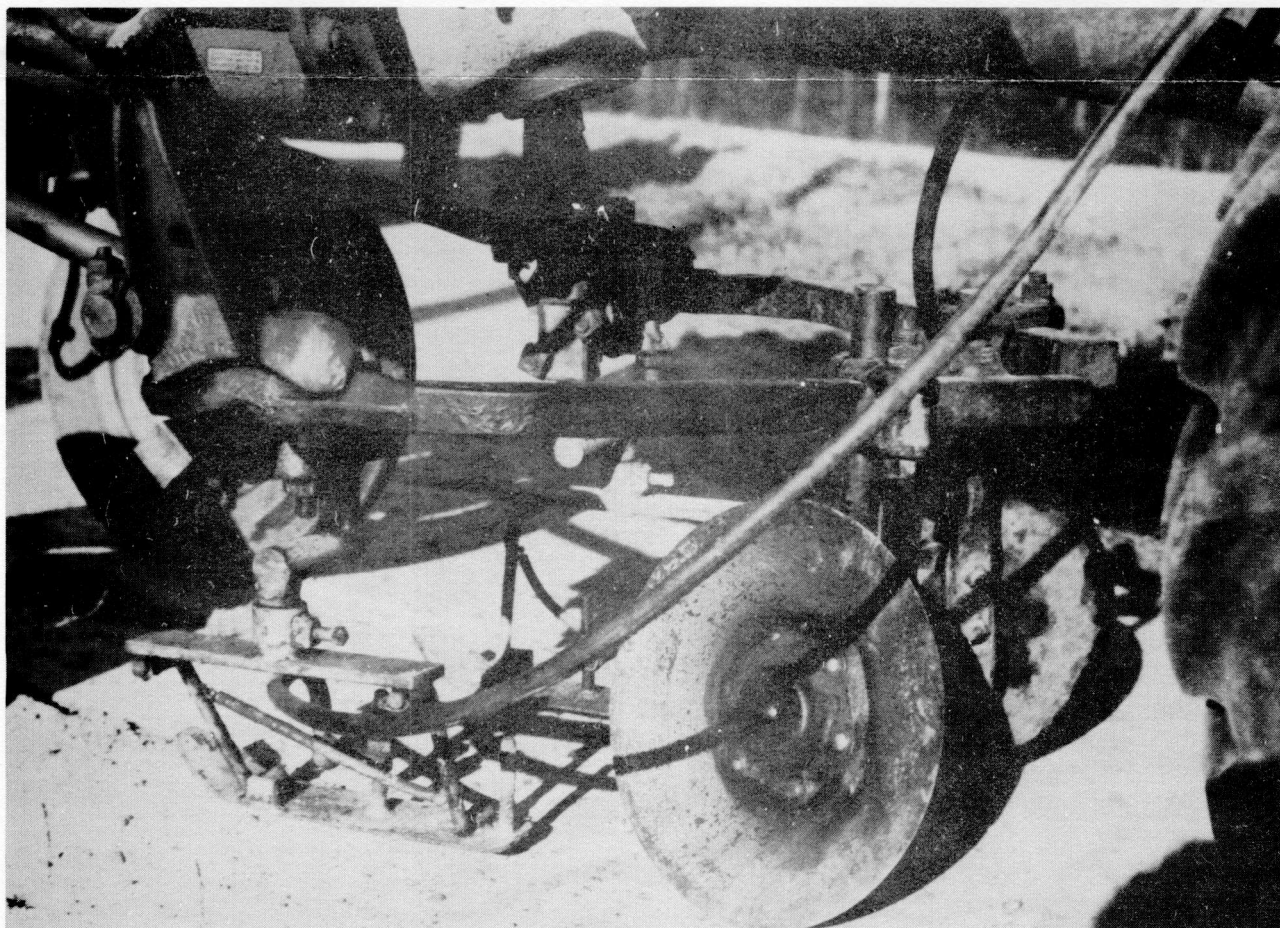
Table I. Results of Chemical Weed Control Treatments on Cotton.
Tallasse, Alabama. Average 1950-1951

Pre-emergence Treatments per acre ^{1/}	: Post emergence oil ^{2/}	: Av. no. weeds per ft. of row ^{3/}		
		Total weeds	Crab- grass	Pusley
OSDN 1 lb. ^{4/}	No	1.84	1.22	0.06
OSDN 1 lb.	Yes	0.23	0.01	0.00
OSDN 2 lbs.	No	1.88	0.69	0.00
OSDN 2 lbs.	Yes	0.74	0.01	0.00
WSDN 1 lb. ^{5/}	No	4.71	3.78	0.07
WSDN 1 lb.	Yes	0.75	0.18	0.00
WSDN 2 lbs.	No	1.87	1.17	0.00
WSDN 2 lbs.	Yes	0.84	0.84	0.00
Check (No treatment)	No	11.97	9.80	1.41
Check (No treatment)	Yes	1.53	0.67	0.15
Conventional method	No	--	--	--
LSD .05		5.35	4.90	0.12
LSD .01		7.68	7.04	0.18

- ^{1/} Pre-emergence treatments were applied to an 8-inch band over the row in 1950 and a 10-inch band in 1951. All treatments were replicated four times each year.
- ^{2/} The post-emergence oil was LHH-1 (herbicidal oil) applied to the same width band as the pre-emergence treatments. The oil was applied at 5 gallons per acre per application with a total of three applications. The first application was made when the cotton was about 1 week old, and at weekly intervals thereafter.
- ^{3/} Weed counts were made on an area 6 inches wide over the row.
- ^{4/} OSDN is an oil-soluble dinitro which was applied in diesel fuel. Active ingredient: dinitro-o-sec-butylphenol.
- ^{5/} WSDN is a water-soluble dinitro. Active ingredient: alkanolamine salts of dinitro-o-sec-butylphenol.



The cotton on the left received 1 pound of water-soluble dinitro per acre to a 10-inch band over the row as a pre-emergence treatment and three applications of a non-fortified herbicidal oil at 5 gallons per acre per application. First application of oil was made when the cotton was 1 week old. Second and third applications were made at weekly intervals. Cotton at right was not treated. No hoeing or chopping was done in either case. The cotton was 1 month old when these photos were taken.



Side view of one type of post-emergence applicator.

RESULTS of 1952 CHEMICAL WEED CONTROL EXPERIMENTS in COTTON^{1/}

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Results of experiments conducted by the A.P.I. Agricultural Experiment Station during 1952 with chemical weed control in cotton warrant an addition to the recommendations. CIPC^{2/} has been tested by the A.P.I. Agricultural Experiment Station for 2 years. Based on results of this Station and unpublished results from other experiment stations, CIPC is recommended, as well as the dinitros, as a pre-emergence chemical treatment for cotton. CIPC was tested by most states in the cotton belt during 1952 and found to be satisfactory. The rate per acre and method of applying CIPC should be the same as is recommended for the dinitros on page 2 of Progress Report Series No. 51, published April 1952.

The results from tests conducted at three locations are given in the table. Treatments were varied from location to location because of space available and soil differences. These data show that the best weed control was obtained with a combination of pre-emergence and post-emergence treatments. Where only the pre-emergence treatment was used, CIPC gave better weed control than the dinitros at Auburn and at the Sand Mountain Substation. The dinitros and CIPC gave about equal control at the Tennessee Valley Substation. This can be explained by the difference in the amount of rain falling soon after applying the chemical. The dinitros leach more readily than CIPC. Leaching is more likely to occur on light soils than on heavy soils.

1/ Issued January 1953.

2/ CIPC is an abbreviation for Isopropyl-N-(3-Chlorophenyl) Carbamate.

Results of Chemical Weed Control Treatments on Cotton, 1952

Pre-emergence treatments per acre ^{1/}	Av. no. weeds per ft. of row ^{2/}		
	Auburn ^{3/}	Sand Mountain	Tennessee Valley
WSDN 1.0 lb. ^{4/}	6.61	4.60	-
WSDN 1.5 lb. plus post-emergence oil ^{5/}	0.31	0.16	-
WSDN 2.0 lb.	6.69	4.92	1.17
WSDN 2.5 lb. plus post-emergence oil	-	-	0.19
WSDN 3.0 lb.	3.30	-	0.43
OSDN 1.0 lb. ^{6/}	6.94	-	-
OSDN 2.0 lb.	6.83	-	-
OSDN 3.0 lb.	5.21	-	-
OSDN 2.0 lb. (in oil)	6.32	-	-
CIPC 1.0 lb. ^{7/}	2.48	1.78	-
CIPC 2.0 lb.	0.92	0.45	0.92
CIPC 3.0 lb.	0.80	0.65	0.48
CIPC 4.0 lb.	-	-	0.32
None-plus post-emergence oil	1.00	0.86	0.55
Check (no treatment)	6.41	4.02	6.66
Conventional method	0.00	0.00	0.00
L. S. D. .05	2.78	2.96	0.99

- ^{1/} Pre-emergence treatments were applied to a 12-inch band over the row in a total volume of 10 gallons of water per acre, unless otherwise specified. All treatments were replicated four times except at the Sand Mountain Substation where three replications were used.
- ^{2/} Weed counts were made on an area 6 inches wide over the row 7 weeks after treatment at the Tennessee Valley and Sand Mountain Substations and 9 weeks after treatment at Auburn.
- ^{3/} Crabgrass made up 88.5 per cent of the total weeds at Auburn, 99.0 per cent at the Sand Mountain Substation, and 67.0 per cent at the Tennessee Valley Substation.
- ^{4/} WSDN is a water-soluble dinitro. Active ingredient: Alkanolamine salts of dinitro-o-sec-butylphenol.
- ^{5/} The post-emergence oil was a non-fortified herbicidal oil applied as previously recommended. Three applications were required at Auburn, while at the Tennessee Valley and Sand Mountain Substations, only two applications were required where a pre-emergence treatment was used.
- ^{6/} OSDN is an oil-soluble dinitro: Active ingredient: dinitro-o-sec-butylphenol. It may be applied in oil or water.
- ^{7/} CIPC is an abbreviation for Isopropyl-N-(3-Chlorophenyl) Carbamate.