

Chemical Control of Weeds in Cotton

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The use of machinery and chemicals to destroy weeds and grass in cotton offers a major opportunity to reduce hand labor and thereby cut the cost of production. Remarkable progress in using machinery for this purpose has been made in the past few years, and chemicals show promise of providing additional help.

Pre-emergence sprays for weed control in cotton have been tested by the Oklahoma Agricultural Experiment Station during the past three seasons in the vicinity of Stillwater and at the Cotton Research Station near Chickasha. Equipment for applying these sprays is being designed and tested.

This bulletin presents recommendations and suggestions based on results of the Oklahoma Station's research to date. It also summarizes information on post-emergence sprays as developed by research at other state agricultural experiment stations.* The work is being continued, and further reports will be published as additional information is developed.

Pre-Emergence Sprays

Pre-emergence sprays for weed control are applied on the soil in bands 12 to 14 inches wide, over the newly planted seed (See drawing on page 4). Band spraying reduces the cost of chemicals as compared to spraying the entire soil surface. Weeds in the middle between the rows can be killed by the usual types of cultivation.

The chemicals kill small weeds and grass, which germinate near the surface of the soil. The cotton seeds, being larger and planted deeper, are not affected if the chemicals are properly applied.

* Research projects are shared among the state agricultural experiment stations and the U. S. Department of Agriculture. This is to avoid unnecessary duplication and make the best of staff and facilities. The resulting information is shared equally by all states.

GENERAL SUGGESTIONS

Chemical control of weeds in cotton has been used by farmers only on a small scale and in a few states; therefore much remains to be learned from actual field experience. Tryouts on a small acreage are advisable before using the method on an entire farm planting.

These suggestions, based on Station tests, may be helpful:

(a) Do not attempt pre-emergence applications when soil is dry. Chemicals are not effective in dry soils, and there is danger of injuring the cotton if it rains after chemicals have been applied while the soil is dry.

(b) Cotton on sandy soils is more likely to be injured by the chemical than is cotton on heavy soils.

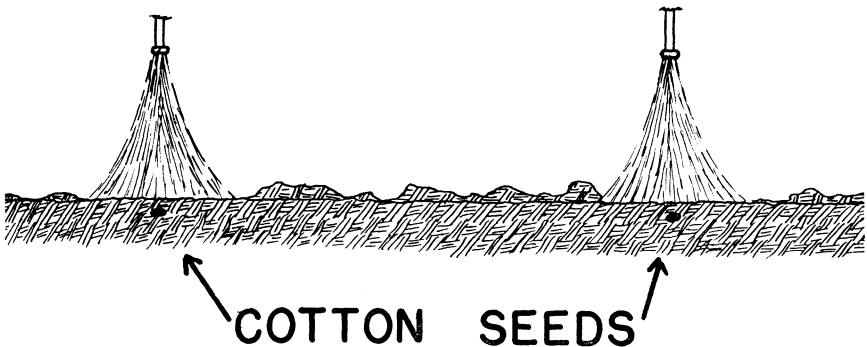
(c) Plant cottonseed as deep as possible without reducing the stand.

(d) Apply chemicals at planting time, or at least before the cotton seedlings break the surface of the soil.

(e) Have the seedbed firm, smooth, and preferably level. When seed is planted in furrows or on rough seedbeds, there is opportunity for untreated soil to wash on top of the treated area. The weed seeds in the untreated soil will sprout, thus nullifying the chemical effect.

(f) To save chemical, apply only in bands 12 to 14 inches wide, centered over the seed row. Any weeds in the middles can be killed by the usual types of cultivation.

(g) Do not disturb the treated area or plow untreated soil over it until all the weeds can be kept under control by cultivation (about four weeks after cotton plants emerge.)



A cross section of two rows of newly-planted cottonseed showing the area treated with pre-emergence sprays. The spray is usually applied with an attachment mounted on the planter.

(h) Use 10 to 15 gallons of water per acre as carrier for the chemical when treating bands 12 to 14 inches wide.

(i) Adjust sprayer carefully to apply the correct amount of material. Accurately weigh or measure the chemical. (See page 8 for method of calibrating sprayer, and page 9 for description of kind of machinery used in spraying.)

(j) If the cotton must be replanted, the pre-emergence spray which was applied to the first planting will not be effective on the second.

(k) Have spray equipment clean when starting work, and thoroughly drain and clean it before storing.

THE CHEMICALS USED

Three chemicals show promise for use in pre-emergence sprays on cotton. They are:

Chloro-IPC (CIPC), a liquid usually containing four pounds of active ingredient per gallon. The chemical name is isopropyl-N-(3-chlorophenyl) carbamate.

CMU, a wettable white crystalline compound containing 80 percent by weight of the active ingredient. Sprays made with this material must be agitated in the sprayer tank to secure uniform

The comparative yields of cotton when grass was allowed to grow in an untreated row (left) and when the grass was removed by a pre-emergence chemical spray (right). The non-hoed row yielded only 501 pounds seed cotton per acre, while the sprayed row yielded 816 pounds.



spread of the active ingredient. The chemical name is 3-p-chloro-phenyl-1-1-dimethylurea.

Dinitro (DNOSBP), a liquid usually containing three pounds of active ingredient per gallon. This chemical has been used on a small scale on farms in some states during the past few years. The chemical name is dinitro-ortho-secondary butyphenol.

Results of Station Tests

Results of a test at the Station's Perkins Farm in 1952, as shown in Table 1, are representative of what may be expected when chemicals are properly used under favorable conditions. In this test, the chemicals were applied immediately after planting the cotton, using 15 gallons of spray in bands 14 inches wide. The soil is a sandy loam. It was moist when the chemicals were applied, and a one-inch rain fell 24 hours after treatment.

Two plots were left untreated. One of these was hoed by hand to keep grass and weeds under control. The other was neither

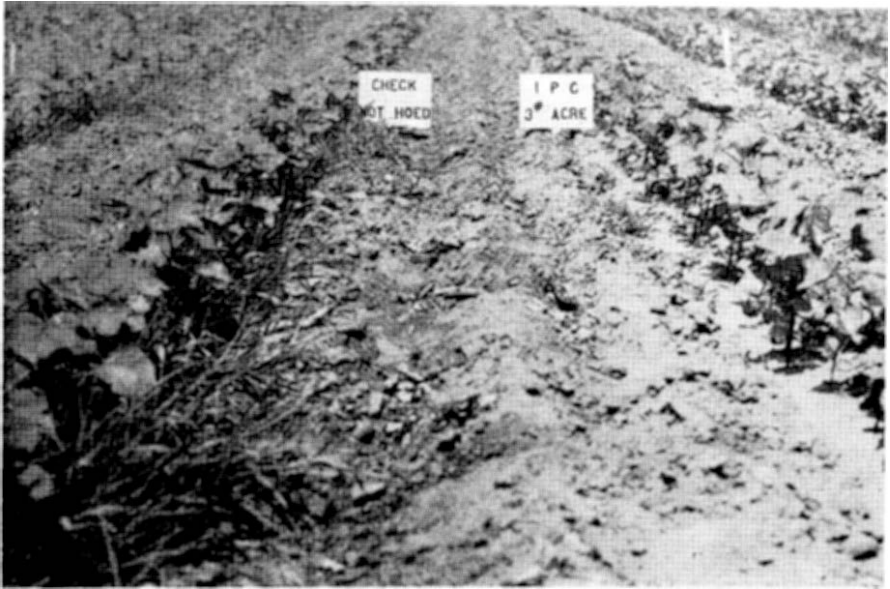
**Table I.—Results of a Test of Weed-killing Chemicals
As a Pre-emergence Spray on Cotton
(Perkins Farm, 1952)***

TREATMENT	Rate of application (Pounds of active ingredient per acre)	Yield of seed cotton (pounds per acre)**
None	501
Hand hoed	812
Chemicals		
Average ‡	829
Dinitro (DNOSBP)	1 2/3	832
	3 1/3	807
	5	842
	6 2/3	821
Dinitro (DNOSBP)	1	825
	2	865
	4	858
	6	849
CMU	1/6	707
	1/3	816
	2/3	767
	1 1/3	448

* Results of this test are presented as representative of what may be expected when pre-emergence chemicals are properly used under favorable conditions. These data are supported by other data obtained in tests in 1950, 1951, and 1952.

** Average of four replications.

‡ Average of yields at rates of chemicals recommended in Table II.



Neither of these two cotton rows was hoed. The row on the right was sprayed with a chemical weed killer at time of planting. Weeds were allowed to grow at will in the row on the left. The chemically-treated row remained weed-free, while the other row became infested with crabgrass.

treated nor hoed. All plots were given regular cultivation and sprayed for insect control.

There was a heavy growth of crabgrass in the check plot, and the yield of seed cotton was only 501 pounds per acre. Yield in the hand-hoed plot was 812 pounds. The three plots treated at approximately the recommended rates for each of the three chemicals yielded an average of 829 pounds.

CMU gave an excellent kill of grass and weeds when used at the rate of $1/3$ pound per acre, but did not control the grass when applied at $1/6$ pound per acre. The $1/3$ pound rate caused some parts of the young cotton leaves to turn yellow, but the plants soon recovered. CMU at the rate of $1\ 1/3$ pounds per acre killed much of the cotton when small.

CIPC affected cotton less than the other chemicals. It killed crabgrass but allowed a few other weeds to survive. The four and six-pound rates affected young cotton plants.

DNOSBP applied at five and $6\ 2/3$ pounds per acre affected the young cotton relatively little in this test. However, when it was applied under dry conditions in 1952, considerable injury to the cotton was evident after the first rain in plots where the $3\ 1/3$ -pound rate was used.

Suggested Rates of Application

On the basis of Oklahoma Station tests through the 1952 season, the following rates of application are suggested for spraying a 12-inch band above cotton planted in rows 3 1/2 feet (42 inches) apart:

CMU: 1/3 to 1/2 pound active ingredient per acre. .

CIPC: 1 1/2 to 2 or 3 pounds active ingredient per acre.

Dinitro (DNOSBP): 2 or 3 or 4 pounds active ingredient per acre.

Table II shows the amounts of commercial chemical of the usual strength needed to prepare 100 gallons of spray for two rates of spray application—10 gallons per acre and 15 gallons per acre.

ADJUSTING SPRAYER FOR CORRECT RATE

The sprayer can be adjusted to apply either 10 or 15 gallons per acre by the following method:

Attach a bucket or other container to catch the spray from each nozzle. Make a test run on an area similar to that to be sprayed, keeping both the tractor speed and the pump pressure **uniform and steady**. Where the rows are 42 inches apart and a 12-inch band is sprayed:

For 10 gallons per acre: From each nozzle, one quart will be discharged in a distance of 311 feet.

For 15 gallons per acre: From each nozzle, one quart will be discharged in a distance of 207 feet.

Table II.—Amount of Chemical Used for Recommended Spray Rates (Spraying 12-inch bands on rows spaced 42 inches apart)

TYPE OF MATERIAL	Lbs. active ingredient to be applied per acre	Amount added to 100 gallons water when spray is to be applied at rate of:	
		10 gallons per acre	15 gallons per acre
		Gallons	
Liquid; 4 lbs. active material per gallon	1 1/2	3 3/4	1 1/2
	2	5	3 1/3
	3	7 1/2	5
Liquid; 3 lbs. active material per gallon	2	6 2/3	4 1/2
	3	10	6 2/3
	4	13 1/3	8 7/8
		Pounds	
Powder; 80 percent active material	1/3	4 lbs., 3 oz.	2 lbs., 13 oz.
	1/2	6 lbs., 4 oz.	4 lbs., 2 oz.

Adjustments to get the desired rate of discharge can be made by: (a) Changing speed of tractor; (b) changing pressure of sprayer; or (c) changing size of opening in the nozzle.

EQUIPMENT FOR PRE-EMERGENCE SPRAYING

Spray equipment for applying pre-emergence chemicals need not be elaborate. It can be mounted on the planter frame if the spray is put on at the same time the cotton is planted.

Pump

A pump driven by the tractor power-take-off generally is satisfactory. It **must** develop **at least** 60-pounds pressure. If the chemical used is especially corrosive, the pump may need to be made of a special alloy.

Tank and Connections

The tank may be mounted on the planter frame. It should be clean, and big enough so that it does not require frequent refilling. The discharge side of the pump should have a hose, with a valve attached, connected to the tank. This hose is used to recirculate material which passes through the pump but is not discharged by the nozzles.

The suction hose from the tank to the pump should have a screen filter on the end in the tank. There should also be a filter screen between the pump and the nozzles. The mesh in this screen should be no larger than the mesh of the screens in the nozzles.

A valve should be placed between the pump and the nozzles for positive cut-off.

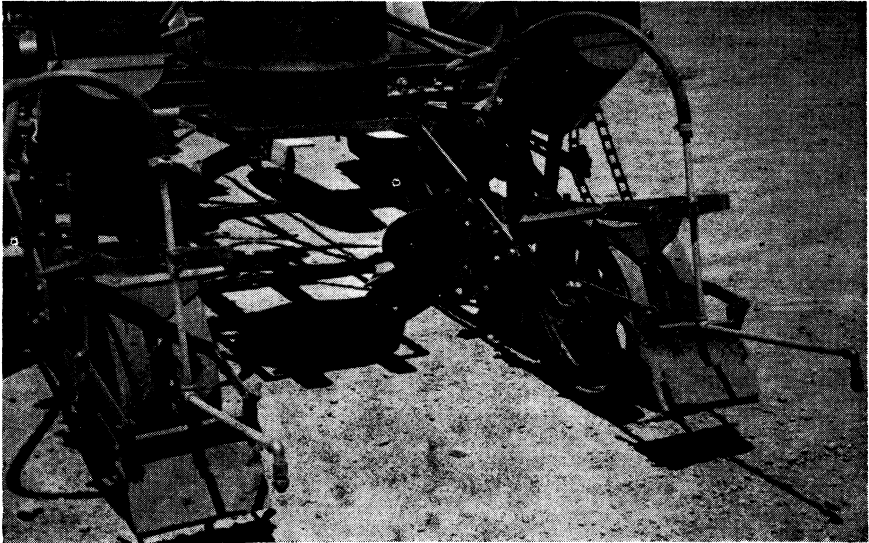
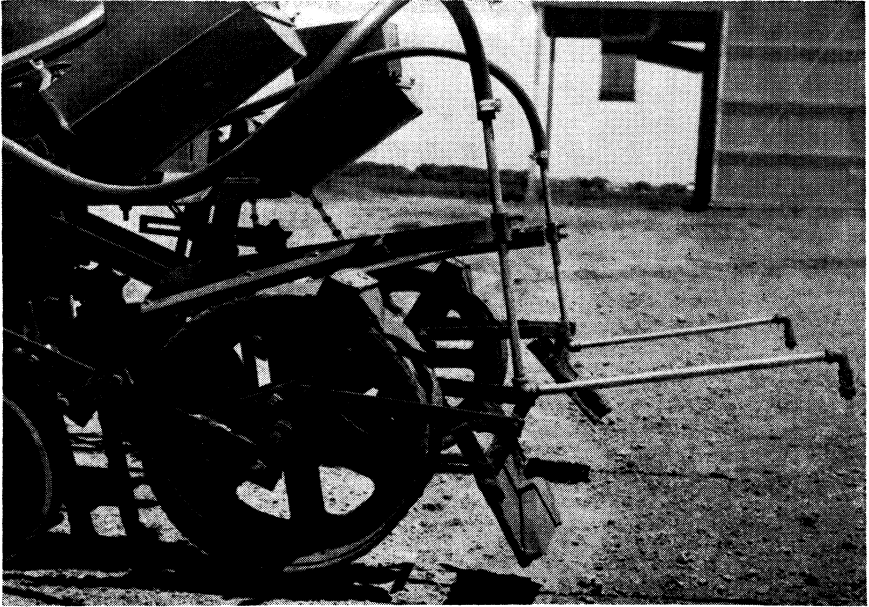
Nozzles

The type and kind of nozzle used will depend on how the chemical is to be applied. The flat-cone type nozzle which produces a fan-shaped spray has been satisfactory in Station trials.

Nozzles vary in the width of fan. Generally, the wider the fan angle, the closer the nozzle may be placed to the ground. This is desirable, especially in windy weather.

One nozzle over each row is usually enough. The spray should cover a width of six inches on each side of the seed row; that is, a total width of 12 inches. This may be achieved by adjusting the height of the nozzle according to the width of the spray fan it produces.

Nozzles should be calibrated at the pressure to be used in the field in order to insure the correct rate of application.



These two pictures show the correct position of spray nozzles behind the press wheels for applying pre-emergence chemicals at time of cotton planting. The drags in back of the press wheels can be dropped down to smooth the surface of the planted row which aids in giving complete spray coverage.

Soil Leveler

A smooth surface over the planted row is desirable for complete coverage by the spray. This may be obtained by a suitable drag or float behind the press wheel, or by a type of press wheel leaving a smooth soil surface.

Post-Emergence Sprays*

Post-emergence sprays for weed control may have some possibilities on bottomlands in eastern Oklahoma where weeds may be a problem for a long period during the growing season.

In most of Oklahoma's cotton area, there is little need for post-emergence treatment if weeds are held in check for three or four weeks after cotton emerges. After the pre-emergence spray has ceased to be effective, regular cultivation will take care of the weeds.

Post-emergence sprays for killing weeds must always be made by a directional method which puts the chemical at the base of the cotton stem and keeps it off the leaves. Any chemical now available which will kill weeds will also injure the cotton leaves, but the cotton stems are more resistant. Special oils have been used primarily for this type of weed control.

Post-emergence sprays must not be used until after the cotton has made some growth, usually at least 10 to 12 days.

The chemical is applied by attaching shoes to the cultivator beam and bolting spray nozzles on the shoes. Nozzles must be protected from dirt. The type of nozzle producing a fan-type spray pattern must be used.

Two nozzles are used per row, placed about 10 or 12 inches apart and an inch above the ground surface. The nozzles should be staggered, and not directly opposite each other. Each nozzle is set so the spray fan is horizontal and is directed into the cotton row but away from the cotton leaves.

The directional spray method may be used more than once early in the growing season, but the weeds and grass must be small for a satisfactory kill.

* Post-emergence sprays are not being tested by the Oklahoma Agricultural Experiment Station, since inter-station cooperation provides for their being tested in other states. The information given herein is based on results of this cooperative work at other state experiment stations.