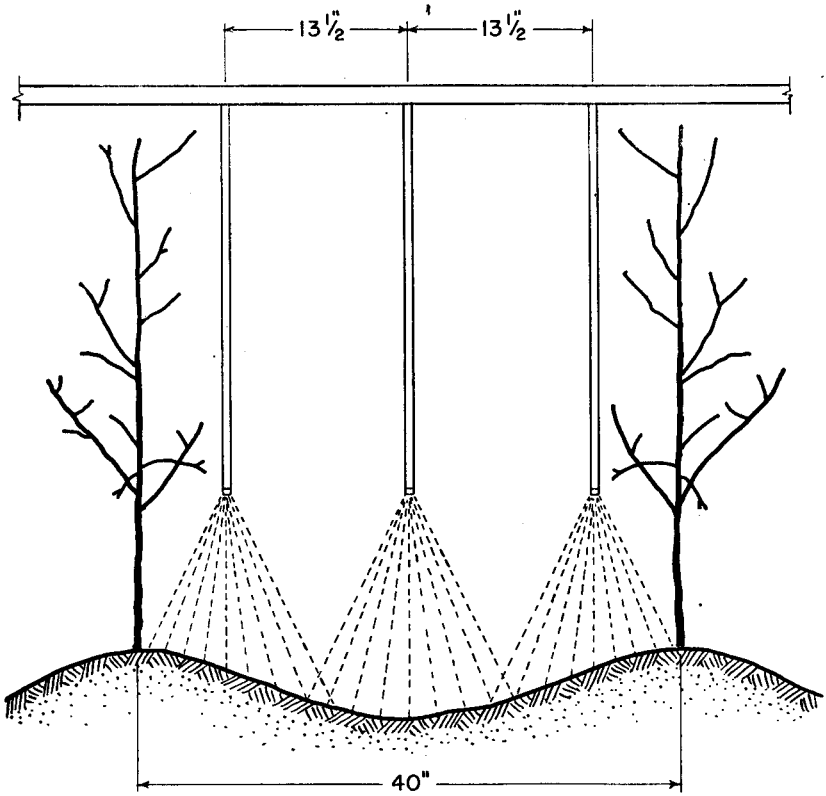
Chemical Control of Annual Morning Glory and Annual Grasses



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Chemical Control of Annual Morning Glory and Annual Grasses in Cotton

by H. Fred Arle[1] and E. H. Everson[2]

Sound farming practices are the key to weed control. Chemicals which control or eradicate weeds should be used in conjunction with good farming methods rather than in place of them. Annual morning glory and annual summer grasses in cotton can now be controlled by good farming practices and a timely application of a chemical called CMU [3-(*p*-chlorophenyl)-1, 1-dimethylurea].

During the early part of the growing season, annual weeds can usually be controlled by cultivation. However, many cotton fields in Arizona become infested with annual broadleaved weeds and grasses after "lay-by" time when the cotton plants are so large that they would be damaged by further cultivation. These weeds materially reduce lint quality and the net return to the grower.

In earlier years, grasses were of little concern since hand-picked cotton contained very little foreign matter. With the advent of the mechanical pickers, however, these late growing grasses have become a serious problem. The mechanical picker gathers a considerable quantity of the dried weed residues which become imbedded in the lint. This material is difficult to remove with standard lint cleaning equipment during processing, and frequently appears in the final product.

Annual morning glory presents a different problem to the farmer. The weed twines around the cotton plants and ties them together. This tangled condition reduces yield, hinders both hand and machine picking and thus lowers the margin of profit.

Cultural Practices

A vigorous and uniform stand of cotton that thoroughly shades the soil surface will usually suppress the growth of late season weeds. An ideal stand of cotton is 2 to 4 plants per foot of row. These spacings generally give the highest yields and tend to reduce the weed problem in the row. Sound fertilizer and irrigation programs aid cotton plants in competition with weeds. During the early part of the growing season, fields should be cultivated as necessary to maintain control of weeds.

Flame cultivation, when used properly, may be an effective means of controlling annual morning glory and grasses until "lay-by" time.

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Other important weed control measures include the use of certified seed to minimize the number of weed seeds planted, and a program to prevent the maturation of additional weed seeds in the field.

Chemical Control of Weeds

The early control of weeds by cultivation and flaming may be supplemented at "lay-by" time by an application of a new herbicide known as CMU [3-(p-chlorophenyl)-1, 1-dimethylurea]. This chemical herbicide effectively controls the growth of annual weeds without causing injury to cotton when applied at the proper time and rate.

CMU is used as a soil sterilant and enters plants through the roots. It is slightly soluble in water and is not considered a contact spray. However, cotton foliage when wet by the spray becomes yellow within a few days.

Effect of Soil Type

CMU is readily absorbed on the surface of fine-textured soils such as a clay loam type. On sandy soils the chemical is more readily leached below the surface and may enter the root zone of the cotton plant, causing injury.

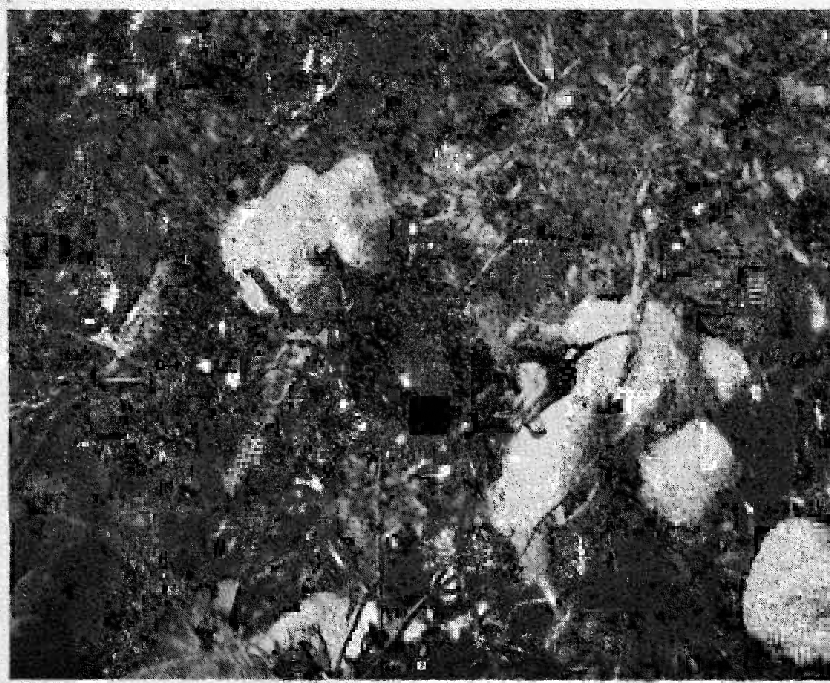

Figure 1. Annual morning glory covers cotton plants where infestations are serious.

Figure 2. Annual grasses grow between the cotton rows in untreated areas.

Rate of Application

The recommended rate of application ranges from ¾ to 1¼ pounds per acre depending upon soil type. The lower rate is suggested for use on sandy soils; higher rates should be used on clay or clay loam soils for heavy infestations of annual morning glory. CMU may cause yield reductions, even on heavier soil types, at rates in excess of 1¼ pounds per acre.

Importance of Residual Effect of CMU

CMU is rather persistent in soils and the residual effect of this chemical on following crops must be considered. *Severe injury has been noted on barley and wheat planted immediately following the late December harvest of cotton which was sprayed in early July.* Applications of 1.0 pound per acre in cotton have seriously reduced the stand of barley or wheat that followed.

Cotton and grain sorghum appear to tolerate more CMU in the soil than do barley or wheat. Applications of 4.0 pounds of CMU per acre have had no apparent effect on cotton or grain sorghum the year after treatment.

Since relatively little is known about the residual poisoning effect (toxicity) of CMU, the following precautions are suggested.

Figure 3. No annual grasses or weeds are present in the rows treated with CMU.

1. Use CMU only where you have a serious annual summer grass or annual morning glory problem.
2. Cotton fields which have been sprayed with CMU should not be cropped the winter immediately following the cotton harvest. This land may be used for cotton or grain sorghum the following year.

When to Apply CMU

On irrigated land the weeds should be controlled by cultivation as long as possible, and **CMU should be applied at "lay-by" time just before the last cultivation.** Earlier applications should not be made. An irrigation must follow the application of CMU to cause an effect on weeds.

Because of its low solubility in water and slow rate of leaching in most soils, the selective killing action of CMU is largely the result of different locations of root systems of the weeds and cotton plants. The root system of young cotton plants is close to the surface. When CMU is used on young cotton stands, the chemical is taken up by the cotton plant and serious injury may result. It is for this reason that CMU should be applied as late as possible, permitting development of a good root system well below the soil surface.

When CMU is sprayed on the soil surface just prior to the last cultivation, it remains near the surface where the annual weeds germinate. The shallow-rooted weeds are killed and the deeply-rooted cotton plants remain uninjured.

Methods of Application

CMU must be sprayed directly on the soil using 30 to 40 gallons of water per acre as the carrier. This application will require the use of equipment similar to that used in bottom defoliation of cotton. Three 80-degree, fan-type nozzles spaced 13⅓ inches apart between adjacent 40-inch cotton rows have been efficiently used in experimental applications (36-inch cotton rows would require 12-inch nozzle spacing).

Nozzles must be spaced to obtain complete coverage of the soil. That portion of the spray adhering to the leaves is wasted unless it is washed to the soil by rain. Therefore, the nozzles should be set as close to the soil surface as possible and still give good coverage.

Because of the low solubility of CMU, **vigorous agitation** in the sprayer tank is required to keep the chemical in suspension. If agitation is not provided, the chemical will gradually settle to the bottom of the tank and result in uneven application. **Mechanical agitation is the most positive** and therefore preferred over the "bypass" methods of agitation.

CMU also has a tendency to clog line and nozzle screens. Screens should never be finer than 50 mesh. In some cases it may be necessary to remove line strainers and nozzle screens to avoid clogging.

Notes of Caution

The effect of CMU on cotton is dependent on soil types. It is strongly recommended that farmers limit their first use of CMU to small areas. If possible, include several rates of application between ¾ and 1¼ pounds per acre.

Small-scale trials are especially urged for farmers operating spray equipment with which they are not completely familiar. The application of CMU in excessive quantities can and probably will be injurious to cotton plants. The performance of spray equipment must be completely understood.

CMU, at rates recommended for selective weed control in cotton, will not kill Johnson grass or other perennial weeds.

How to Calibrate a Sprayer

1. Select an area comparable with that to be sprayed.
2. Select the speed desired. This should be a speed that can be kept constant and allows uniform application of the spray.

3. Fill the sprayer tank to a predetermined level with water. This may be a full tank or to a height on a measuring stick.
4. Spray the selected area at the predetermined constant speed and at the pressure recommended for most efficient use of nozzles.
5. Drive the sprayer for exactly ¼ mile (1320 feet).
6. To determine the gallons applied, refill the tank to the predetermined mark by adding water from a measuring container.
7. Compute the gallons applied per acre by:
   A. Multiply the gallons required to refill the tank (Step 6) by 33.
   B. Divide the figure obtained in (A) by the width of the spray pattern in feet. This will give the gallons of solution applied per acre.
   C. The desired per acre rate of CMU is then mixed with the quantity of water as determined in Step 7B.

OTHER PUBLICATIONS OF INTEREST TO COTTON GROWERS

These are published by, and are free on request to Agricultural Experiment Station, College of Agriculture, University of Arizona, Tucson. Also available at the county offices of the Agricultural Extension Service.

GENERAL BULLETINS

Number

209 Fertilizer Handbook for Arizona Farmers. (1947) (Revised 1951)

210 The Irrigation of SxP Cotton on Clay Loam Soils in the Salt River Valley. (1947)

238 American-Egyptian Cotton: An Analysis of Some Economic Factors Affecting Production and Marketing. (1951)

240 Soil Organic Matter. (1951)

247 Fertilization of Field Crops in Arizona. (1953)

257 Tillage Practices for Irrigated Soils. (1954)

REPORTS

Number

106 Suggested Construction Methods and Specifications for Concrete-lined Farm Irrigation Ditches. (1951)

117 (Quite technical). Nutrient Requirements of Arizona Cotton. (1955)