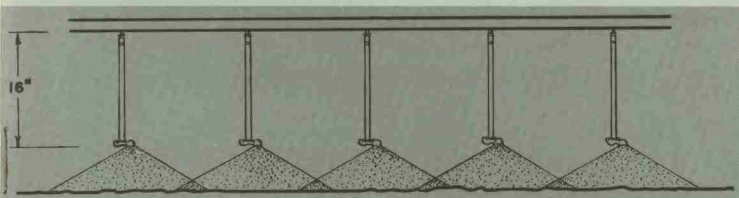


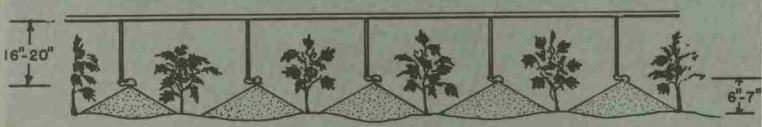
CHEMICAL

WEED

L. 143



CONTROL IN COTTON



The Value of Weed Control

Increasing emphasis on growing high quality cotton as economically as possible has made chemical weed control an important factor in cotton production. Weeds have always caused great losses to the cotton farmer. Early weeds compete with cotton for moisture, light, and nutrients. Yield is lowered. Late weeds in cotton interfere with defoliation, reduce efficiency of mechanical and hand pickers, contribute to next year's weed crop and lower the grade of cotton.

As use of mechanical cotton pickers increases rapidly in North Carolina, preventing late grass is a more and more important factor. Farmers in North Carolina lose as much as 6 to 8 hundred thousand dollars a year just because of lowered grades caused by grass. It is estimated that total costs and losses due to weeds in cotton are often as high as \$50 per acre each year.

If North Carolina farmers want to increase their profits on cotton and compete with cotton growers in other parts of the country, sound, economical weed control practices must be used. These practices include the best combinations of cultural, biological, and chemical methods. Chemical weed killers should be a part of, rather than replace, good farming practices.



Weed-free cotton is a must for economical production

Cultural Weed Control Practices

Plan for weed control. Long term plans covering weed control programs for several years are advisable. Successful cotton weed control on your farm depends on total farm weed control and other proper production practices. These production practices help cotton get off to a good start so it can compete with weeds. Use all recommended methods which favor a good stand and rapid crop growth.

Good uniform stands of cotton shade the soil surface sooner than poor stands. This helps suppress weeds after midsummer. Ideal cotton stands have 4 to 6 plants per foot of row. These spacings generally give greatest yields and help reduce weed problems. Use high quality seed, fertilize the cotton properly, and control diseases and insects.

Have a good crop rotation for fields where you grow cotton. When cotton is grown for several years on the same field, mechanical cultivation may not control certain weeds. These weeds will become more and more troublesome. Furthermore, some weeds are also resistant to herbicides used in cotton. You need to rotate crops which let you get maximum use of chemical aids in weed control. For example, cocklebur is hard to control in cotton. It is easy to control in corn with chemicals. Several years of cocklebur-free corn will greatly lessen the cocklebur problem in cotton when cotton is planted in the field.

If you have tough perennial weeds in fields where you plan to grow cotton, get rid of them *before* attempting to grow cotton. Early elimination, especially of small infestations, will save you considerable



Cotton to right had a preplant herbicide application. Cotton on left had no herbicide, but has been cultivated three times and hoed twice, and is still weedy.

money over a long term period. Consistent yearly efforts are usually necessary to clean up final remnants of a weed population. Make sure the field is not re-infested from weeds and plants in close-by weedy areas. Keep field edges, ditch banks, and fence rows clean.

One or two shallow mechanical cultivations early in the season and flame cultivations later in the season are good supplements to chemical weed control.

Chemical Weed Control Practices

In planning a weed control program in cotton, consider the weed problem on your farm. Then select the best herbicide or combination of herbicides and cultural practices that will handle the problem economically in your production program.

PREPLANT INCORPORATED TREATMENTS

These treatments are made before the crop is planted. These herbicides are applied to the soil and thoroughly mixed with the soil by mechanical means. See individual herbicide label for incorporation instructions. The preplant incorporated herbicides are arranged alphabetically.

Planavin (Nitralin)

Planavin is sold as Planavin 75 wettable powder and Planavin WDL liquid formulations. The liquid formulation contains 4 pounds active ingredient per gallon. This would be 1 pound active ingredient per quart.

Applications Rates

Soil type	Lbs. Active Ingredient Broadcast	Lbs. Planavin 75 WP.A Broadcast	Pint Planavin WDL/A Broadcast
Light Sandy Loam	.6	.75	1.0
Intermediate Loam	.75	1.0	1.5
Heavy Clay Loam	1.2	1.5	2.0

Weeds Controlled

Normal Control	Weeds
Good	Many annual grasses such as crabgrass, foxtails, goosegrass and many annual broadleaved weeds such as pigweed, lambsquarter, purslane, knotweed.
Fair	Pigweed, smartweed, prickly sida.
Poor to None	Ragweed, cocklebur, morningglory, nutsedge, horsenettle, sicklepod, Johnsongrass, Bermuda-grass, Jimsonweed, nightshade.

Rates of $\frac{1}{2}$ to $\frac{3}{4}$ pound per acre are usually sufficient for the Coastal Plain. In the Piedmont $\frac{3}{4}$ to 1 pound per acre may be required, especially for pigweed and smartweed control.

Planavin should be applied in 15 to 20 gallons of water per acre on soil that is in good condition for planting. Planavin should be incorporated within 3 to 4 hours after application. Incorporate 1 to $1\frac{1}{2}$ inches deep with a disc, bed conditioner, rotary hoe or roto tiller. In light soil that is in good working condition, two trips over with a ground-driven rotary hoe can give good results. Drive tractor fast enough (6 to 8 m.p.h.) to get good soil mixing action. Regardless of which piece of equipment you use, make sure you provide the same thorough incorporation as with double disking.

Planavin can be applied and incorporated immediately after planting. Incorporate 1 to $1\frac{1}{2}$ inches deep with a power-driven rotary cultivator or hoe that has the teeth separated over the row as for cultivation. When incorporating after planting, care should be taken not to disturb the cotton seeds or cover seed too deeply.

Cotton can be replanted directly in the treated soil or after the field

Treflan (trifluralin)

Available as a liquid containing 4 lbs. active ingredient per gallon. This would be 1 lb. active ingredient per quart.

Application Rates

Soil Type	Lbs. Active Ingredient Broadcast	Pints Treflan Broadcast
Sandy or Sandy loam (light, less than 2% O.M.)	$\frac{1}{2}$	1
Loam (medium, 2 to 5% O.M.)	$\frac{3}{4}$	$1\frac{1}{2}$
Silt and Clay (heavy)	1	2

Weeds Controlled

Normal Control	Weeds
Good	Crabgrass, barnyardgrass, foxtails, Johnsongrass (from seed), goosegrass, lambsquarter, Florida pussley, carpetweed, fall panicum.
Fair	Smartweed, pigweed
Poor to None	Cocklebur, ragweed, prickly sida, horsenettle, Jimsonweed, nightshade, nutsedge, Bermuda-grass, Johnsongrass (root stocks), sicklepod, morning glory.

Rates of $\frac{1}{2}$ to $\frac{3}{4}$ lb. per acre are sufficient for the Coastal Plain. In the Piedmont $\frac{3}{4}$ to 1 lb. may be required especially for pigweed control.

has been disced before replanting. A light cultivation with sweeps can be made at lay-by time as cultivation does not reduce effectiveness of this treatment.

Treflan *must be incorporated into the soil immediately after application*. This prevents loss of the chemical through evaporation (volatility). Treflan may be incorporated before planting the cotton or after planting. Application before planting is the most common method used in North Carolina.

Use machinery to incorporate the chemical that will break up large clods and mix the chemical thoroughly with the soil. The power-driven rotary cultivator is an excellent tool for this use. Set the implement to operate 2 to 3 inches deep in the soil. Have the rotors close enough together to thoroughly mix the soil across entire width of swath. Spray and incorporate in the same operation if possible.

Good results can also be obtained with other implements already on most cotton farms. Use a tandem disc followed by a spike tooth drag harrow. Disc twice. In the second discing, go in cross direction (at right angles) to the first operation. The second discing may be done immediately or it may be delayed several weeks if more convenient. Set discs to go 3 to 6 inches deep. Spray and incorporate in the same operation if possible.

With any soil incorporation method, satisfactory results will not be obtained if soil is so wet or rough that good soil movement and mixing action is not obtained.

The preplanting method of using Treflan fits best in North Carolina. However, the chemical can also be used immediately after planting if necessary. Incorporate with a power-driven rotary cultivator. Set to a depth of 1 to 2 inches. Set rotors to skip the planted row as in cultivation. Be sure that cotton seeds are not covered too deeply.

If replanting becomes necessary, cotton may be planted directly in the treated soil or the field may be disced before replanting. Retreatment with chemical is unnecessary.

One to three cultivations are suggested following use of treflan. Need for cultivation will be more important where resistant weeds are present. Cultivate shallow (1-1½ in. deep) to avoid cotton root pruning and bringing untreated soil to the surface.

In North Carolina Treflan has given control of susceptible weeds throughout most of the season. In many instances control of susceptible species lasts all season. Treflan is less dependent on rainfall for activation since it is mixed into the soil at application.

The chemical may be applied and mixed into the soil from 2 to 3 weeks before planting or immediately before planting. Length of control will be somewhat less the earlier the chemical is applied before planting. If the incorporation is done immediately before planting and drought follows, too much soil moisture may be lost. Probably the better time to apply and incorporate is about 1 to 2 weeks before planting. This will allow the soil to become firmed before planting.

Stunting of cotton seedlings sometimes occurs when Treflan is used. In all instances so far, the cotton has grown out of this temporary stunting and yields have not been reduced. Also, inhibition of the upper lateral roots of the cotton plant often occurs. This does not always cause stunting and does not seem to be of any real importance at this time.

If properly applied, no injury to fall or spring seeded crops has occurred following use of Treflan.

Summary For Preplant Incorporated Herbicides

Treflan and Planavin are the herbicides currently suggested for use in North Carolina. Check with your county agricultural agent or farm chemicals dealer for changes in suggested herbicides.

Treflan and Planavin have provided a significant step forward in

The power-driven rotary cultivator is a good tool for soil incorporation of cotton herbicides. Here herbicide is applied and incorporated in one operation.



The disk harrow is the most widely used herbicide soil-incorporation tool in North Carolina.



Herbicide application and incorporation can easily be done in the same operation. A second disking can be made later.

(a) Boom attached to harrow

(b) Boom attached underneath tractor with harrow behind



weed control in cotton. They have filled a real need of the cotton grower in terms of season-long annual grass control. Both materials are weak, however, in control of certain broadleaved weeds. Because of these factors cotton growers should not rely on one chemical alone for full weed control.

PREEMERGENCE TREATMENTS

These treatments are applied to the soil after planting but before the cotton and weeds come up. See individual herbicide label for application instructions. The preemergence herbicides are arranged alphabetically.

Caparol (prometryne)

Sold as "Caparol 80W". Available as an 80% wettable powder.

Application Rates

Soil Type	Lbs. Active Ingredient Per Acre		Lbs. Caparol 80W/A	
	Broadcast	Band*	Broadcast	Band*
Medium sandy loam				
and fine sandy loam	2.4	.8	3	1.1
Silt loam and clay loam	3	1.1	3.75	1.3

* Band treatment based on 14 inch band on 40 inch r.o.w.

Weeds Controlled

Normal Control	Weeds
Good	Most annual grasses, such as crabgrass, goosegrass, and many annual broadleaved weeds such as pigweed, ragweed, smartweed, Florida pussley, prickly sida, lambsquarters.
Fair	Morningglory, (variable)
Little or None	Perennials such as Johnsongrass, Bermudagrass, nutsedge, horsenettle, cocklebur.

Caparol is a member of the triazine herbicide family. It is generally safe for use preemergence to cotton. It works on the same principle as many other preemergence cotton herbicides and should be applied at planting or immediately after. Rainfall within a few days after application is necessary to move the herbicide into the soil for best results.

Susceptible weed species should be controlled for 4 to 6 weeks. When applied according to directions a preemergence treatment should not cause residue problems to crops planted in the fall or next spring. However, the label does carry a warning statement that fall-seeded crops should not be planted following use of Caparol.

Cotoran (fluometuron)

Sold as Cotoran 80 wettable powder.

Application Rates

Soil Type	Lbs. Active Ingredient		Lbs. Cotoran 80WP/A	
	Broadcast	Band*	Broadcast	Band*
Light Sandy Loam	1	.35	1.25	.44
Intermediate Loam	1.5	.52	1.87	.65
Heavy Clay Loam	2	.70	2.5	.88

* Band treatment based on 14 inch band on 40 inch row.

Weeds Controlled

Normal Control	Weeds
Good	Most annual grasses such as crabgrass, goosegrass, foxtails, barnyardgrass, crowfootgrass, Fall panicum and many annual broadleaved weeds such as pigweed, ragweed, smartweed, Florida pusley, lambsquarter, sicklepod.
Fair	Cocklebur, morningglory.
Poor to None	Bermudagrass, Johnsongrass (rootstocks), nutsedge, horsenettle.

Cotoran should be applied to the soil surface after planting in 25 to 40 gallons of water per acre. Normal rainfall is adequate to activate Cotoran and if drought occurs, cultivate lightly using rotary hoes or sweeps. If stand failure occurs, replant only to cotton. *Do not* replant Cotoran treated fields within the same year to crops other than cotton. *Do not* retreat fields before replanting.

Susceptible weed species should be controlled for 4 to 8 weeks. Cotoran is more effective on broadleaved weeds, especially cocklebur and morningglory, than any of the other preemergence or preplant chemicals. When applied according to directions, a preemergence treatment of Cotoran should not cause residue problems to small grain crops planted in the fall or other crops planted the next spring. However, the label does carry a warning statement that other crops should not be planted in the same year following use of Cotoran.

Dacthal (DCPA)

Sold as "Dacthal". Available as a wettable powder herbicide containing 50% active ingredient.

Application Rates

Soil Type	Lbs. Active Ingredient Per Acre		Lbs. Dacthal 50W/Acre	
	Broadcast	Band*	Broadcast 50%	Band 50%
Light Sandy Soils	4.5	1.6	9	3
Intermediate Soils	6.75	2.4	13.5	4.75
Heavy Soils	9	3.2	18	6.3

* Based on treating a 14 inch band on 40 inch row.

Weeds Controlled

Normal Control	Weeds
Good	Crabgrass, foxtail
Fair	Florida pussley, purslane, lambsquarter, Johnsongrass (seedling), barnyard grass, goosegrass, panicum species.
Poor to None	Pigweed, spurge, ragweed, smartweed, sicklepod, Johnsongrass, Bermudagrass, nutsedge, trumpet creeper, horsenettle, other perennials.

Apply Dacthal in the same operation with planting or immediately after. Control of susceptible species usually lasts 6 to 8 weeks. Rainfall is required to activate the herbicide (to move it into the zone of weed seed germination).

In general, Dacthal gives poor broadleaved weed control. For this reason and cost of the material, usage in North Carolina has not grown appreciably. Cotton is very tolerant to the herbicide. No soil residual problems are expected when using Dacthal.

Read entire label before using chemical. Follow all precautions listed.

Karmex (diuron)

Sold as "Karmex DL" diuron weed killer and "Karmex" diuron weed killer, wettable powder. The "DL" formulation is a thick liquid suspension. It contains 2.8 lbs. active ingredient per gallon. The wettable powder formulation contains 80% active ingredient.

The liquid formulation is recommended for preemergence application for cotton because it is easier to apply uniformly than the wettable powder.

Application Rates

Soil Type	Lbs. Active Ingredient Per Acre		Pints Karmex DL Per Acre	
	Broadcast	Band*	Broadcast	Band*
Loam sand	0.5	0.18	1.6	0.56
Sandy loam, loam silt loam, and silt	0.8	0.28	2.3	0.81
Sandy clay, loam, clay loam, silty clay loam, and sandy clay	1.0	0.35	3.1	1.0
Silty clay and clay	1.6	0.56	4.8	1.68

* Band treatment based on 14 inch band on 40 inch row.

Weeds Controlled

Normal Control	Weeds
Good	Crabgrass, goosegrass, foxtail, pigweed, poorjoe, lambsquarters, ragweed, purslane
Fair	Smartweed, horseweed, prickly sida, knotweed, sandbur, Florida pussley, cocklebur
Poor to None	Morningglory, sickle pod, Bermudagrass Johnsongrass, nutsedge, trumpet creeper, horse nettle, and other perennials

Apply Karmex in the same operation with planting or immediately (within 3 days) after. Control of susceptible species usually lasts 4 to 7 weeks. Rainfall is required to activate the herbicide. Do not apply to very light, sandy soils (less than 0.5% organic matter).

Certain rates and applications of Karmex may result in chemical soil residues which may injure succeeding crops. Read the following carefully.

There should be no residue danger to fall or spring planted crops when you follow these practices:

1. Make a broadcast preemergence treatment of Karmex, using rates within the suggested amounts and applying it properly.
2. Make a preemergence band treatment of Karmex and follow with *one* early post emergence band application.

If you (1) make a broadcast preemergence application and one band postemergence application, or (2) two band postemergence applications, or (3) a lay-by application alone, *observe the following precautions:*

1. Do not plant a fall seeded crop.
2. Plant only cotton, corn, or grain sorghum (not sorghos or forage sorghums, or grass sorghums) in the spring of the year following treatment.
3. Do not plant any other crop within one year of last Karmex application as crop injury may result.

You can replant cotton in Karmex treated soils if weather conditions make replanting necessary. Wherever possible, plant directly in the original treated soil. Place seed at least 1 inch deep. Do not disturb the originally treated soil. If you need to rework soil before replanting use shallow disking. Do not re-list or move soil on top of originally treated band. Do not retreat the field with a second preemergence application.

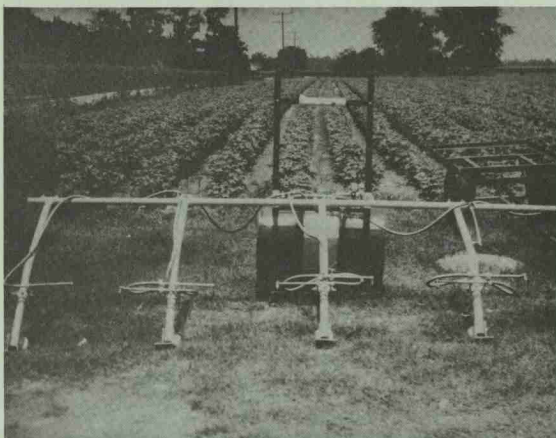
Summary For Preemergence Herbicides

Caparol, Cotoran, Dacthal and Karmex are the preemergence herbicides currently suggested for use in North Carolina. Check with your county agricultural agent or farm chemicals dealer for changes in suggested herbicides.

Research in North Carolina indicates that Caparol, Cotoran or Karmex, at their lowest recommended rates, can be applied as a pre-emergence band treatment immediately after planting cotton following the use of either Treflan or Planavin earlier as a preplant incorporated treatment. When used in this manner, these preemergence herbicides usually insure a wider spectrum of broadleaved weed control and generally increase the length of broadleaved weed control, over Treflan or Planavin used alone, for several weeks during the growing season.

POSTEMERGENCE TREATMENTS

Postemergence treatments are made after the emergence of the cotton and the weeds. For convenience, the postemergence herbicides are suggested either for early and mid-season treatments or as late treatments.



Spray equipment that can direct herbicidal application under young cotton is needed for early postemergence treatments.

A sound weed control program for any cotton farmer should begin with a preplant or preemergence herbicide. Supplemental practices such as postemergence chemicals, cultivation, and flaming will be needed in most fields. You can use postemergence chemicals to save time and labor to control weeds resistant to the preemergence chemical. Postemergence applications also come in handy when the effects of the preemergence chemical give out.

However, there are important factors to consider in order to make postemergence chemical weed control successful. (1) The cotton must come up to a uniform stand and grow rapidly. The cotton must be larger than the weeds at the time of postemergence application. (2) Postemergence chemicals have to be sprayed under the cotton and on the small weeds. Foliage of cotton must not be sprayed with the chemical. Cotton is severely injured when many of the postemergence chemicals come in contact with the leaves. Illegal chemical residues in cottonseed may also result from improper postemergence application. (3) You need a wide, flat seedbed. It should be free from rocks, clods, and crop residues. You cannot apply postemergence chemicals on very uneven land or where cotton is planted in a deep furrow. (4) You need special or modified equipment to make the directed spray application.

EARLY AND MID-SEASON POSTEMERGENCE TREATMENTS

These treatments are normally applied after the cotton is 3 inches tall and before the weeds are over 2 inches tall. If needed, a second application can be made up until first bloom.

DSMA + Surfactant

DSMA is available under various trade names, usually as a 63% active ingredient water-soluble powder. (Terms on the label usually state hexahydrate-100%. This is equivalent to 62.5% anhydrous DSMA.)

Broadcast 2 to 3 lbs. active ingredient per acre. Band treatment may be used to reduce cost of chemical. An example of how to mix the chemical for a broadcast treatment is as follows: Mix 3½ to 4½ lbs. commercial powder plus 1½ to 2 quarts of suitable surfactant in about 40 gal. of water. Apply as a directed spray (under cotton) to cover one acre.

For a band treatment, mix 3½ to 4½ lbs. material plus 1½ to 2 quarts suitable surfactant in about 55 gal. water. Apply approximately 14 gal. spray per acre on a 14 inch band as a directed spray. The 55 gal. mix should treat approximately 4 acres.

Do not apply to cotton under 3 inches in height. Do not apply after first bloom. Keep spray off cotton leaves. Read and follow label instructions.

A second application may be required during humid growing conditions. Time of a second application if needed, should follow about 1 to 3 weeks after the first application.

Slight burning and a reddish discoloration of the cotton leaf may occur sometimes after treatment. This does not injure the cotton plant, and it will develop normally.

MSMA + Surfactant

MSMA is the term for monosodium methanearsonate. Sometimes you may see the chemical called monosodium methylarsonate. It is available as a water soluble liquid under various trade names. The active ingredient content is usually 50.6% (6.6 lbs. active ingredient per gallon) or 34.39% (3.96 lbs. active ingredient per gallon).

MSMA is used in the same manner as DSMA plus surfactant. Weed control results will be about the same. It should be used at the rate of 2 lbs. active ingredient per acre as a directed spray.

For example, mix 2 qts. of 34.3% commercial product or 2½ to 3 pts. of 50.6% product in about 40 gallons of water. Add surfactant at the rate of 1½ to 2 qts. per acre. Apply broadcast to one acre.

Note: Some formulations of MSMA may already have *surfactant mixed*. Read label carefully and follow all instructions.

For band application, apply at a rate of one gallon of the above mix for each 1 inch of band width to be treated. This is based on cotton grown in a 40-inch row.

Same remarks and precautions apply to MSMA plus surfactant as for DSMA plus surfactant. *Do not apply after first bloom. Keep spray off cotton leaves.*

Herbicidal Oils

Herbicidal oils are another possible early post emergence treatment for weed control in cotton. Due to lack of availability and farming operations in North Carolina, oils have been used very little. The following is given as information on the treatment.

Apply oil at rates of 5 to 6 gallons per acre on a 13 to 14 inch band. Make a *directed spray*. *Leaves and buds of cotton plants hit by spray will be killed.*

Oil is applied from nozzles attached low to the ground on a sliding shoe. You need flat, smooth fields with enough of a shoulder on either side of the row for the oiling shoes to operate properly.

Oil may be applied after cotton plants are 3-4 inches tall. Apply once a week if necessary, but not more often than 5 days apart. *Oil must not be applied after bark begins to form on the stem.* This usually occurs about 4 to 5 weeks after planting. Bark begins to form when the cotton stems are about the size of a pencil and when small cracks appear on the stem. This means that there is only about a three week period during the growing season when oil can be used.

Herbicidal oil is a contact weed killer. Broadleaved or grassy weeds beyond the two leaf stage will not be killed. The oils leave no chemical residue in the soil.

Caparol + Surfactant

Caparol, discussed under preemergence treatments, is also labeled for postemergence and lay-by treatments. Research and experience in North Carolina is limited. The following is given as information.

Apply caparol before weeds are two inches high and after cotton plants are at least 6 in. tall. Spray 0.6 to 0.8 lbs. of the commercial material per acre. Add 1½ pts. surfactant per acre.

Direct spray so as not to contact cotton leaves. Leaves sprayed will be injured. Repeat treatments may be made.

A fall-seeded crop should not be planted following postemergence use of caparol.

Cotoran + Surfactant

Cotoran, discussed under preemergence treatments, is also labeled for early postemergence and lay-by treatments in cotton. Apply Cotoran as a directed, semi-directed or over-the-top spray using 25 to 40 gallons of water per acre. Cotoran may be applied to cotton plants at any stage of growth from 3 inches high to lay-by. Use 1¼ to 2½ pounds of the commercial material per acre and add surfactant according to manufacturer's directions. Use the higher rate when applying postemergence to weeds and before weeds are 2 inches tall.

Research in North Carolina indicates that Cotoran kills most rapidly growing annual weeds that are less than 2 inches high. Annual broadleaved weeds including cocklebur and morningglory are controlled. Weed control usually lasts from 4 to 12 weeks.

Cotton is very tolerant to Cotoran. Occasionally, Cotoran may cause cotton leaves to be chlorotic, but chlorosis is usually of short duration. Soil type has had little effect on the tolerance of cotton to Cotoran applied postemergence.

Karmex + Surfactant

Use "Karmex DL", the same herbicide as available for preemergence weed control. Apply 0.2 to 0.4 lbs. active ingredient per acre on a broadcast basis. However, to avoid soil residue problems, apply as a band treatment only. This means that you should apply 9 to 18 fl. ounces of "Karmex DL" per acre on a 13 to 14 inch band.

Apply after cotton is at least 6 in. tall. Add surfactant recommended by manufacturer at the rate of 1 pint for each 25 gal. of spray mixture. Direct spray to cover weed foliage. *Avoid contact with cotton leaves.* DO NOT SPRAY OVER TOP OF COTTON.

You usually get good kill of rapidly growing annual weeds that are under 2 inches tall. Most annual grassy weeds are controlled, including crabgrass and goosegrass. Annual broadleaved weeds including morningglory and cocklebur are controlled. There should be a slight amount of residual control on susceptible weed species. If weeds and grasses are under drought stress or over 2 in. tall control will not be good.

The treatment does not control seedling Johnsongrass, nutsedge, Bermudagrass, or other perennial weeds.

Soil residue considerations—If you use *one* band postemergence treatment on land where a *band* preemergence treatment was used, there should be no soil residues of chemical to injure fall or spring planted crops.

Where you use (1) a broadcast preemergence treatment and a band post emergence treatment or (2) two band post emergence treatments or (3) a lay-by treatment with karmex, *observe the following precautions:*

- (1) Plant only cotton, corn, or grain sorghum (not sorgos of forage sorghum, or grass sorghum) in the spring of the year following treatment.
- (2) Do not replant to any other crop within one year after last application as crop injury may result.

Herban (norea) + DSMA or MSMA + Surfactant

A tank mix of Herban + DSMA or MSMA + surfactant can be used as an early postemergence treatment for broad spectrum weed control in cotton. "Herban 62", Herban and DSMA premixed, will be available for use in 1968. Apply 1 to 1½ pounds of Herban (commercial material) in a mixture with either 1.5 to 2.0 pounds of DSMA (active ingredient) or 1.0 to 1.75 pounds of MSMA (active ingredient) plus .5% (by volume) surfactant in 30 to 40 gallons of water per acre. Apply as a directed spray when cotton is at least 3 inches tall but before weeds are over 3 inches high. Nozzles should be arranged for maximum coverage of weeds and grasses but avoid contact with cotton leaves. **DO NOT SPRAY OVER TOP OF COTTON.**

Herban + DSMA or MSMA + surfactant will control many annual grasses and many annual broadleaved weeds such as Florida pussley, pigweed, purslane, lambsquarter and cocklebur. For more complete kill of weeds, a second application at the same rate may be needed 7 to 10 days after the first application.

Treflan

"Treflan", the preplant or preemergence chemical, also has clearance for postemergence applications. It may be applied any time after cotton has emerged until up to 120 days of harvest. Use same rates as preemergence, ½ to 1 lb. active ingredient per acre. Treflan will not seriously injure cotton foliage, but it should be applied as a directed spray.

Fields must be clean cultivated before application since the chemical will not kill weeds already up. Treflan must be incorporated into the soil immediately after application. In young cotton this could be done with power driven rotary cultivators or ground-driven rotary hoes.

Postemergence treatment would be most useful where the chemical

was not applied preplant or preemergence. If Treflan or other chemical was used earlier, postemergence application of Treflan should not be needed.

If Treflan is used postemergence on cotton, there should be no soil residues to injure any spring planted crop. There is a possibility of injury to fall seeded small grains, although research and experience is lacking on this particular question.

Summary For Early and Mid-Season Postemergence Treatments

DSMA + surfactant, MSMA + surfactant, herbicidal oils, Caparol + surfactant, Cotoran + surfactant, Karmex + surfactant, Herban + DSMA or MSMA + surfactant and Treflan are currently suggested for use in North Carolina. Check with your county agricultural agent or farm chemicals dealer for changes as they occur.

LATE POSTEMERGENCE (LAY-BY) TREATMENTS

Season-long control of weeds is a must for successful cotton production. Crabgrass germinating in late June, if left in the field, can reduce the grade of harvested cotton. One large crabgrass plant in 20 ft. of row is enough to reduce the quality of mechanically harvested cotton by one grade. Good thick stands of cotton lessen the probability of late weed problems.

In some situations a lay-by herbicide application can fit into a grower's cotton weed control program. *However, use of some chemicals this late in the season can lead to soil residue problems for following crops. Emerged weeds are not controlled with some lay-by chemicals. Be sure you read all instructions and are aware of the limitations of these chemicals.*

Lay-by chemicals in cotton have not been used much in North Carolina. The following is given for information only.

Caparol + Surfactant

"Caparol 80-W" is effective as a lay-by spray when applied to weeds that are no more than 2 inches high. Spray 0.8 to 1.6 lbs. active ingredient (1 to 2 lbs. Caparol 80-W) per acre. Add surfactant at the rate of 1 pt. per 25 gal. spray mixture. Apply in about 25 gal. water per acre. Direct spray under cotton to cover small weeds. Keep spray off cotton foliage.

Do not plant a fall seeded crop on fields where Caparol was used.

Cotoran + Surfactant

Cotoran + surfactant, discussed under early postemergence treatments, can be used in cotton at lay-by time when applied to weeds before they reach a height of 2 inches. Spray 1.0 to 2.0 pounds (active ingredient) per acre as a directed or semi-directed spray to the base of the cotton plants. Direct spray under cotton to cover small weeds. Add surfactant according to manufacturer's directions.

Karmex + Surfactant

"Karmex"—Use 1 lb. active ingredient per acre diuron ($1\frac{1}{4}$ lbs. "Karmex" wettable powder herbicide) after last cultivation. Do not use a lay-by treatment on sand or on soils very low in organic matter, as injury to cotton may result. This treatment will not kill existing weeds.

If some weed growth is present after last cultivation, add a suitable wetting agent as 1 pint per 25 gallons of spray mixture. This will give contact kill of actively growing weeds less than 4 in. in height. Control of weeds under drought stress or over 4 inches high is usually impractical with this spray.

Spray should be *directed* under cotton. Avoid contact of cotton foliage with spray or drift. Do NOT SPRAY OVER TOP OF COTTON.

If Karmex is used as a lay-by application, band or broadcast, *do not plant fall seeded crops after cotton harvest. The following spring plant only cotton, corn, soybeans, or grain sorghum.*

Lorox (linuron) + Surfactant

"Lorox"—Use 1.0 to 1.5 lbs. active ingredient (2 to 3 lbs. "Lorox") in 25 to 40 gal. water per acre as a directed spray. Cotton should be at least 20 in. tall before treatment with Lorox. Direct the spray to contact a minimum of cotton foliage as leaves sprayed directly will be burned.

Lorox used alone should be applied immediately after last cultivation. If weeds are emerged at time of application, add surfactant (1 pint per 25 gal. spray). Apply before annual weeds are over 4 in. in height. If rainfall occurs after application the chemical will be moved into the soil and give additional residual control of germinating annual broadleaved and grassy weeds.

Do not apply within 60 days of harvest. *Read and follow all label instructions before using the chemical.*

Lorox persists for a relatively short period of time in the soil, but do not plant any crop within 4 months of a lay-by application of lorox.

When Karmex is used on the field prior to lay-by with Lorox, observe the following precautions as to planting following crops:

Application of Karmex Prior to Layby

Pre-emergence only, band treatment

Pre-emergence only, broadcast treatment

Early post-emergence only, band treatment only

Pre-emergence (band) plus early post-emergence (band)

Pre-emergence (broadcast) plus early post-emergence (band)

Crops That May Follow Layby Treatment With Lorox

Fall grains; or cotton, corn, grain sorghum, or soybeans the following spring.

Cotton, corn, or grain sorghum the following spring.

Cotton, corn, grain sorghum, or soybeans the following spring.

Cotton, corn, grain sorghum, or soybeans the following spring.

Cotton, corn, or grain sorghum the following spring.

Until further information is known on residues of Lorox, it would be safer not to plant tobacco or peanuts the spring following lay-by with Lorox.

Herban + Surfactant

Herban can be applied as a lay-by treatment in cotton immediately after the last cultivation. If weeds are absent, apply 1.66 to 2.0 pounds of Herban (commercial material) in 30 to 40 gallons of water per acre. Keep spray low by directing under cotton to minimize contact with the cotton plants.

If a layby cultivation cannot be made and weeds are present and actively growing (but less than 3 inches tall) apply 1.66 to 2.0 pounds of Herban (commercial material) + surfactant in 30 to 40 gallons of water per acre. Add 4 pints of surfactant to each 100 gallons of spray mixture. Be sure the sprayer boom is high enough so that the best possible coverage of weeds is obtained. However, do not raise the sprayer boom so that the spray pattern is disrupted by the lower branches of the cotton plant. **DO NOT SPRAY OVER TOP OF COTTON.**

Summary For Late Postemergence Treatments

Caparol + surfactant, Cotoran + surfactant, Herban + surfactant, Karmex + surfactant and Lorox + surfactant may be used for late postemergence or lay-by treatments for cotton in North Carolina. Check with your county agricultural agent or farm chemical dealer for changes in suggested herbicides.

These lay-by herbicide treatments, except cotoran + surfactant, are cleared only for directed applications. Keep the spray pattern low and try to minimize contact with the cotton foliage. **DO NOT SPRAY OVER TOP OF COTTON.**

Some lay-by herbicide treatments used late in the growing season could lead to soil residue problems for following crops under certain conditions. Be sure to read all instructions and be aware of the limitations of each herbicide treatment.

Controlling Johnson and Bermudagrass

Johnson and Bermudagrass can be controlled by spot treatment with dalapon where infestations are 10 per cent or less. Dalapon is sold as "Dowpon." To treat, dissolve 1 pound of "Dowpon" in 5 gallons of water. Spray young Johnson and Bermudagrass, wetting the plants thoroughly. "*Dowpon*" will injure or kill cotton plants which are sprayed. Place a light sheet metal or plastic shield between cotton plants and grass to help protect the cotton.

If cotton must be planted in land with heavy infestations of Johnsongrass or Bermudagrass, a *preplanting* treatment with dalapon will help. The treatment will reduce the perennial weedy grasses so a cotton crop can be grown, but will not give complete control.

Apply 5 to 7 lbs. of dalapon in the spring as soon as Bermudagrass has 3 to 4 inches of growth. Use 8 to 10 lbs. of dalapon when Johnsongrass is 6 to 8 inches tall. Plow or disk 3 to 5 days later. Disk once or twice more before planting cotton. Cotton may be planted 10 to 14 days after the spray application.

This preplanting treatment would cause a serious delay in cotton planting, thus probably it is of limited value in North Carolina.

Postemergence applications of DSMA and MSMA give considerable kill of topgrowth of Johnsongrass and retard regrowth. Five to 6 applications would be needed for complete control. Apply as discussed under the section on early postemergence treatments. Spot treatments may also be used. **READ AND FOLLOW LABEL DIRECTIONS.**

SPRAY EQUIPMENT FOR COTTON HERBICIDES

The low-gallonge farm sprayer, already a common tool on cotton farms, is satisfactory for most cotton herbicide applications. For special treatments it is usually easy to convert or adapt these sprayers, or parts of the sprayers, for the special applications. Basic parts and arrangement of the low-gallonge farm sprayer is shown in Figure 1.

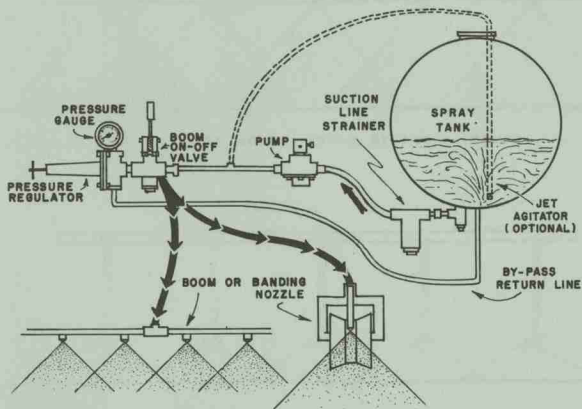
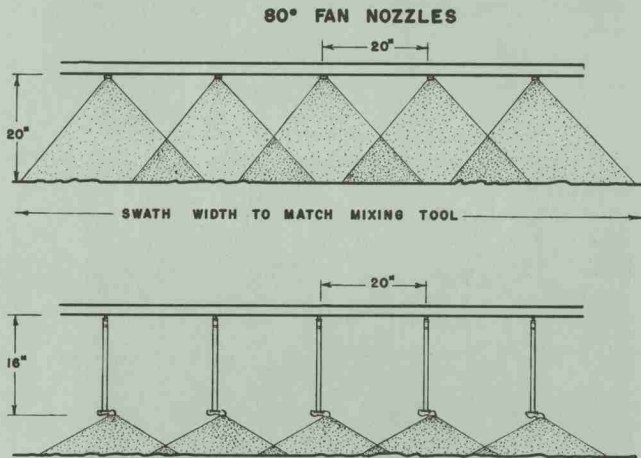


Figure 1. Basic sprayer parts and arrangement of low gallonage hydraulic farm sprayers.

Pumps—The pump is one of the most important parts of a sprayer, although all parts are necessary for proper operation. The pump must provide enough volume for the nozzles. When applying wettable powder herbicides, it must also supply liquid for adequate hydraulic agitation.

Conventional gear-type pumps are satisfactory for liquid emulsions but do not withstand the abrasive wettable powders or provide enough volume for agitation. "Internal" gear pumps withstand abrasive action somewhat better and have higher volume capacity. The most common pump on tractor mounted sprayers is the roller pump. An 8-roller Ni-resistant pump or the new high-capacity 7-roller pump is the best buy. These pumps have almost double the capacity of 6-roller pumps and maintain capacity longer. This also means that you could operate



120° WHIRL-CHAMBER HOLLOW CONE NOZZLES
Figure 2. Broadcast booms for preemergence applicator using either 80° fan tips or 120° whirl-chamber hollow cone nozzles.

the tractor engine at a lower speed (higher gear). If only wettable powders were to be used, rubber rollers would last longer. Nylon rollers are needed if oils or emulsions are to be sprayed.

Centrifugal pumps have very high capacity and resist wear. They are comparable in price to roller pumps. Recent designs for P.T.O. mounting are capable of adequate spray pressures.

Nozzles—The two most commonly used nozzle types for preemergence spraying are the flat fan and the whirl-chamber hollow cone nozzles. Flooding nozzles may also be used but they are more commonly used in late postemergence directed sprays. For early post-emergence sprays flat fan nozzles, turned horizontally, are usually used.

Select nozzles that will give desired gallonage at low pressure to avoid spray drift and equipment wear. Use stainless steel nozzle tips. Brass nozzle tips wear rapidly especially where wettable powders are used. Tests with brass nozzles on wettable powder indicate up to a 20% increase in flow after two day's use. Start the season with new nozzles. If using brass, recheck calibration every day or two to compensate for wear. The whirl-chamber nozzle wears much more slowly and tends to maintain the rate and spray pattern longer than other nozzle designs.

Sprayer Calibration—Accurate rate of herbicides applied is a must

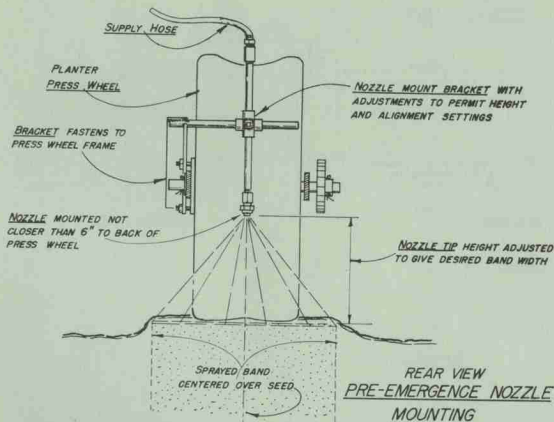


Figure 3. Single nozzle for band spraying of pre-emergence materials can be mounted directly behind the planter.

for effective results and to avoid crop injury. *Know how much your sprayer applies before you add any chemical.* To calibrate:

- (1) With sprayer properly operating, hold a jar or other container under each nozzle for one minute and measure output. If any nozzle output is far from average of all nozzles replace it.
- (2) Fill spray tank with water.
- (3) Drive over a measured acre in the field you will spray at the speed and pressure you wish to operate.
- (4) Refill sprayer to original level, measuring water as you refill.

The amount of water taken to refill sprayer is the amount your sprayer applies per acre at the speed and pressure you used.

If the amount of spray per acre is greatly different from what you wish, change speed or nozzle size. *In preemergence and post-emergence applications of herbicides (with the exception of herbicidal oils), the amount of water per acre is not a critical factor. The important factor is knowing how much the sprayer does apply per acre.* Then you can add the correct amount of herbicide to correspond to the number of acres a tank full will cover.

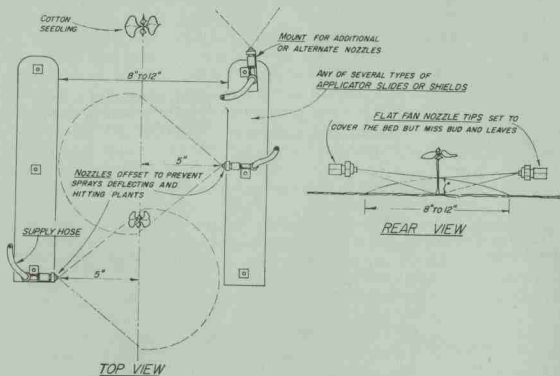


Figure 4. Nozzle arrangements for early postemergence directed herbicide sprays.

This method of calibration will work for preemergence band or broadcast spraying or for postemergence band or broadcast application.

Preemergence Equipment

For broadcast application, either of the nozzle types and boom arrangements below is suggested. Boom length can be set to suit 2 or 4 row widths or to suit width of an incorporating tool if herbicide is to be mixed in soil.

Booms for making applications of herbicides that must be incorporated can be mounted on the incorporating tool or under the tractor. This arrangement saves a trip over the field with two separate pieces of equipment.

For Band Application—Center an 80° even spray flat fan nozzles or an 80° hollow cone whirl chamber nozzle directly over the planted row. The preemergence band nozzle can be mounted directly on the planter frame or a simple clamp arrangement can be made. The flat-fan nozzle should spray straight down and the whirl-chamber nozzle should be tipped to spray slightly to the rear.

Postemergence Equipment

Postemergence applications of cotton herbicides must be directed

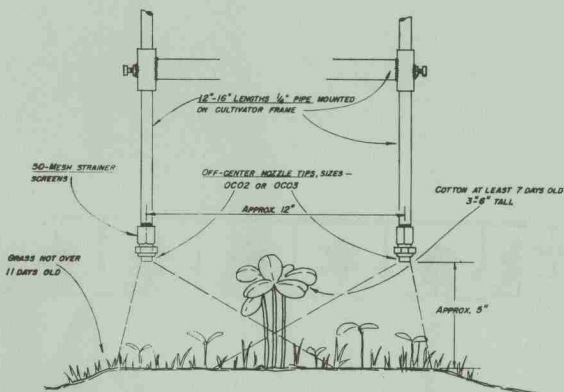


Figure 5. Cultivator-mounted post-emergence nozzle set for semi-directed sprays.

keeping all spray off cotton foliage, or semi-directed where the spray is directed generally toward the base of the cotton plant.

Three types of arrangements for early postemergence and late or lay-by spray are shown below.

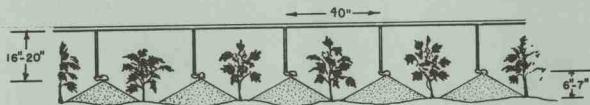


Figure 6. Boom with drop nozzles using type K flooding nozzles or 120° whirl-chamber nozzles, making directed lay-by sprays in cotton.

NOTES

Cotton herbicides are of low toxicity to man. However, they can be injurious if handled carelessly. Some of the herbicides can also be injurious to desirable plants, livestock, and fish if improperly used. Care should be exercised in the use of herbicides and the disposal of unused chemicals, spray mixtures, or empty containers to avoid injury of desirable plants and to avoid polluting streams and water supplies.

Precautions for handling and applying pesticides are printed on the container label. **READ AND FOLLOW ALL INSTRUCTIONS FOR USE AND OBSERVE PRECAUTIONS.**



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