

You  
**CAN** Control  
Johnsongrass

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# You CAN

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Johnsongrass may grow as tall as corn. It can reduce corn yields greatly and interfere with harvesting.

*This bulletin is a report on Department of Field Crops Project 156, "Weed Control."*

# Control

# Johnsongrass

**J**OHNSONGRASS is one of the most competitive weeds. About 500,000 acres of Missouri's best farm land are infested with it. Almost half of that is in the southeast Missouri delta region, and most of the remainder is in creek and river bottoms in the southern part of the state. In the north, the weed occurs as more widely scattered infestations in bottomlands. On uplands it is scattered and not as hard to eradicate.

It is not unusual for Johnsongrass to reduce the yield of corn from 80 or 100 bushels per acre down

to 20 bushels, and sometimes to a complete crop failure. It interferes with harvesting equipment so that crops sometimes have to be abandoned. Like its relatives, the grain sorghums, sweet sorghums and sudangrass, it may contain toxic quantities of prussic acid.

Once established, Johnsongrass is difficult to get rid of. It is an increasing problem in Missouri. Infestations are breaking out in new areas and old infestations are spreading and thickening.

## Eradication or Control?

Eradicating Johnsongrass is expensive. If heavily infested fields that are subject to reinfestation from flood waters can be used for hay or pasture, control may be more practical than eradication. At least moderate control measures should be applied to all infestations.

Eradication is the practical solution on small

areas and is the practical long-time objective on large areas where you do not expect frequent reinfestation. The cost of eradication can be distributed over several years by initiating a control program to keep the infestation within bounds and reduce the vigor of the Johnsongrass. Later, you can apply more effective measures.

# Identifying Johnsongrass

To destroy Johnsongrass you must know what it looks like. It often grows ten feet high, but it averages about six feet. The stems are about the size of a lead pencil and the leaves are from  $\frac{1}{2}$  to  $1\frac{1}{2}$  inches wide with a light green midrib. It looks much like sudangrass.

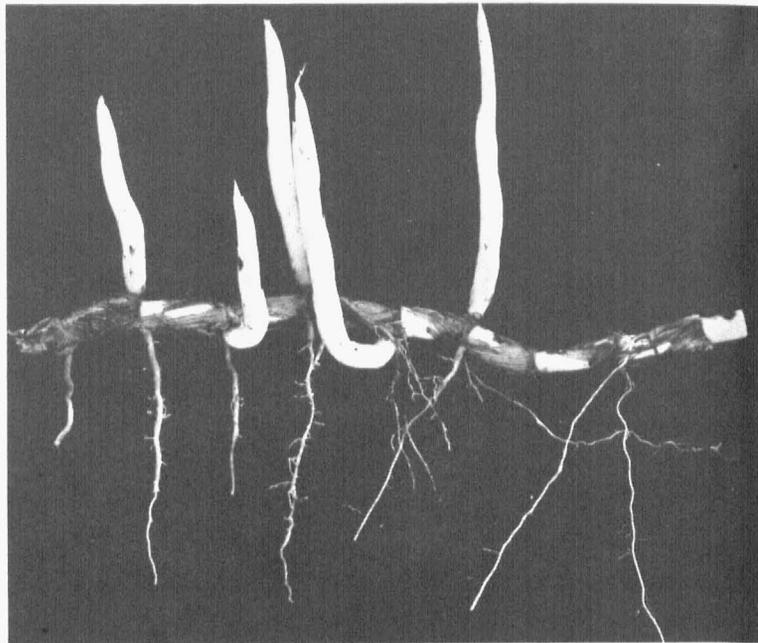
Seeds are borne in an open panicle which becomes reddish at maturity. There are usually several stems growing from a root crown, giving a bunch grass appearance. The top growth dies back after the first killing frost in the fall.

Johnsongrass spreads and thickens from both seeds and rhizomes (underground stems). The heavy rhizomes, which may be as much as  $\frac{1}{2}$  inch in diameter, are the distinguishing characteristic of an established Johnsongrass plant. These brown, scaly underground stems live over the winter and in the spring send out new, white, spurlike shoots. (Fig. 1) The rhizomes may grow four or five feet long, and may extend as deep as 30 inches into the soil in cultivated fields. When the plant is kept cut back closely the rhizomes grow in the upper four or five inches of the soil.

Johnsongrass seeds are about  $\frac{1}{8}$  inch long and narrowly oval. They vary in color from straw colored, through orange, to reddish-brown or dark mahogany.

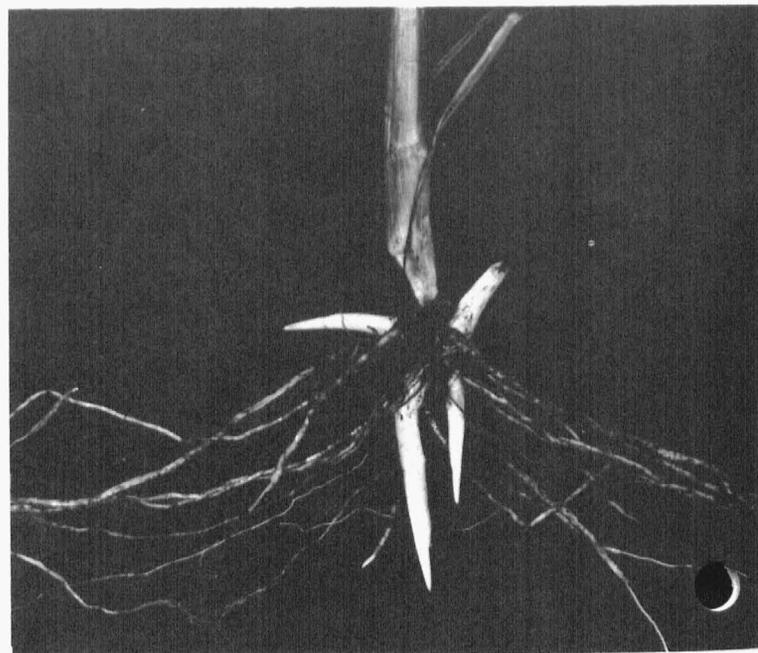
Johnsongrass seed looks much like sudangrass seed. You can usually tell the difference by its tendency to have a smooth scar at the base where it makes a clean break from the stem. Sudangrass lacks this distinct cleavage line between the seed and the stem so that the base of the seed shows an uneven break and may actually retain a short portion of the stem. (Fig. 3)

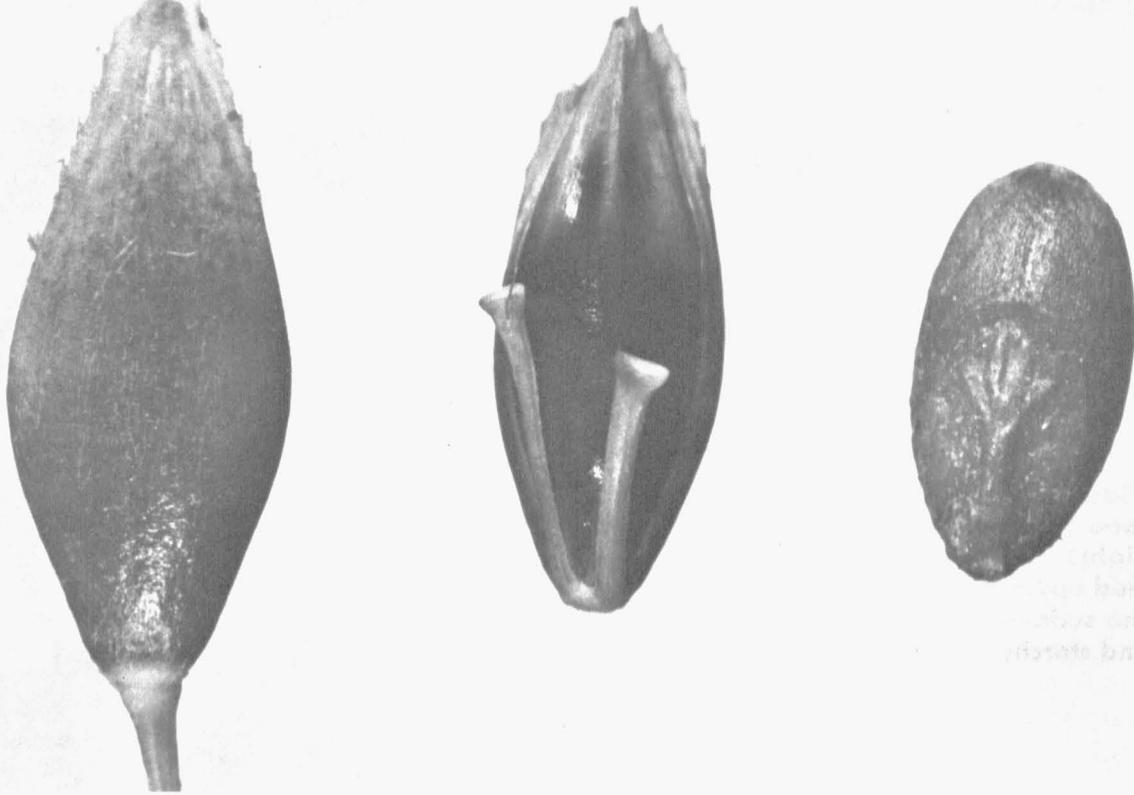
Young Johnsongrass seedlings look like sudangrass seedlings. The rhizomes of Johnsongrass grow underground from the root crown, starting three to six weeks after the seedlings emerge. (Fig. 2). Sudangrass does not have rhizomes. New growth from over-wintered rhizomes looks very much like a corn seedling. It is easy to tell the difference between Johnsongrass and corn by inspecting the underground portion of the plants, since the Johnsongrass shoot will be growing from a rhizome.



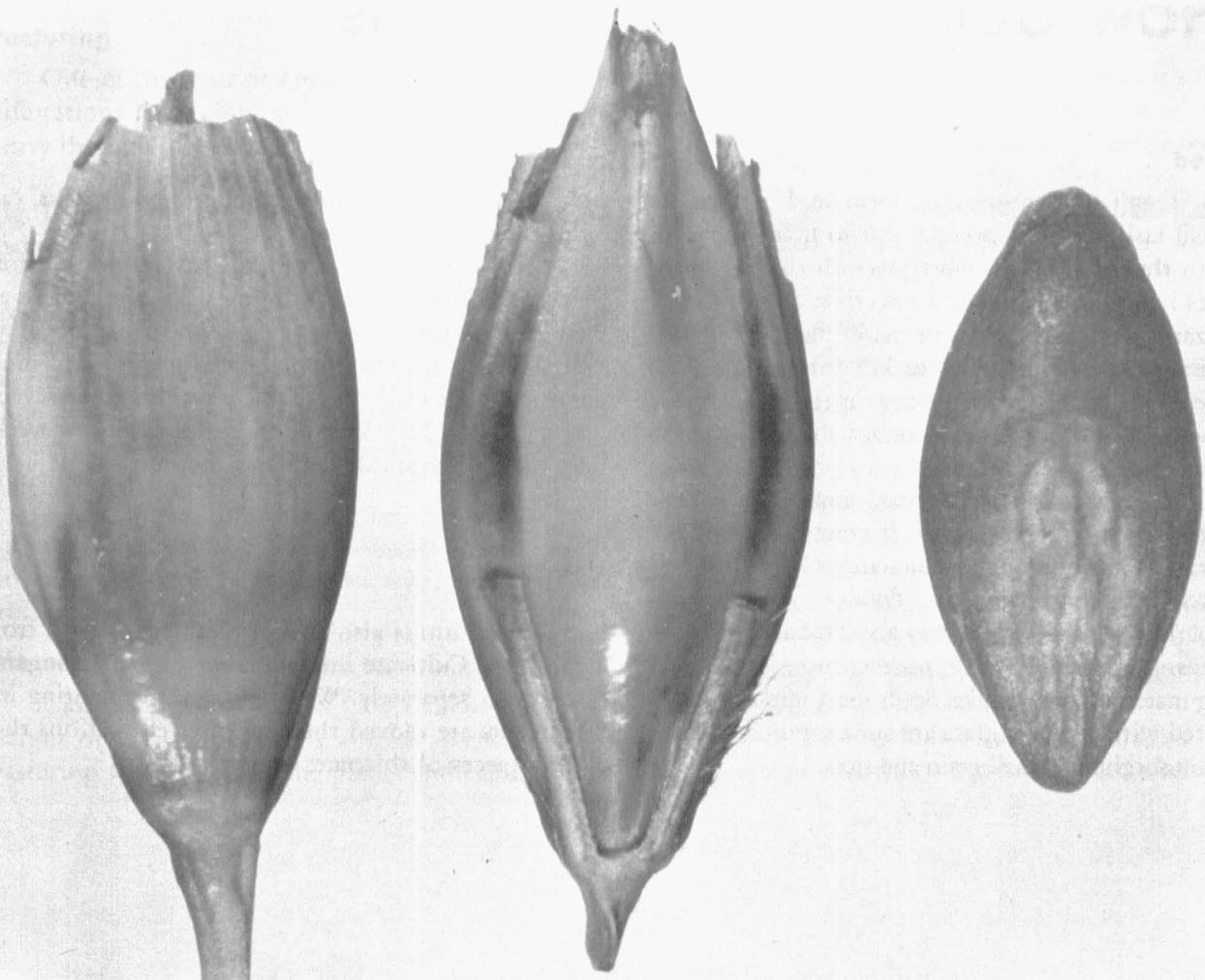
**Fig. 1—Old rhizomes produce new plants. Here the white shoots of new plants are shown growing from an old rhizome.**

**Fig. 2—Seedling Johnsongrass plants begin to develop rhizomes in three to six weeks after they come up. Note the white spurlike growth of new rhizomes on this 50-day-old seedling.**

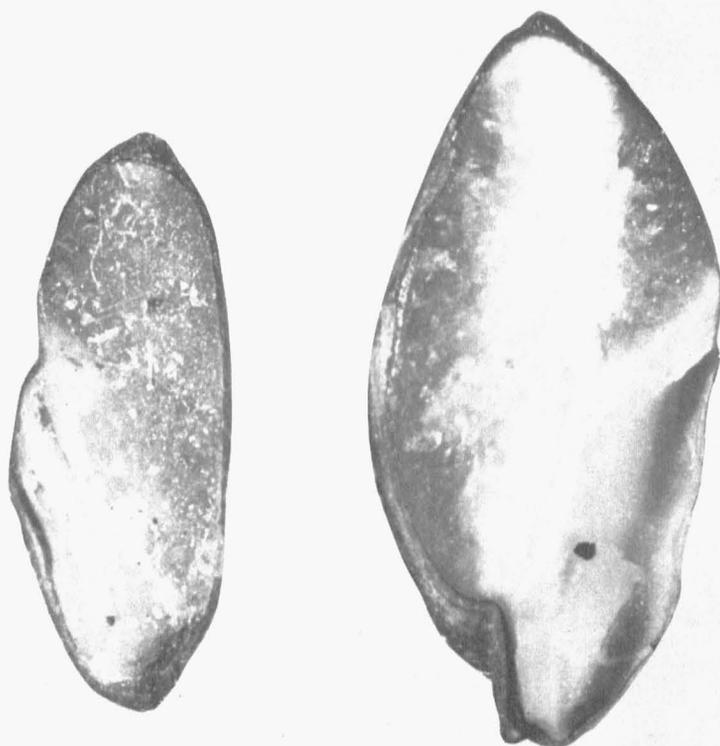




**Fig. 3—Johnsongrass seeds (top row) and sudangrass seeds (bottom row). On the left, back view of seeds, with part of stem attached. Note the line of cleavage between the seed and stem of the Johnsongrass. Front view of seeds is in the center. The Johnsongrass seed makes a clean break from the stem and the two appendages are bell-shaped on the end. The sudangrass seed does not make a clean break from the stem. Part of the stem is still attached to the seed. The appendages are not bell-shaped on the end. On the right are the hulled seeds. Johnsongrass seed tends to be smaller than sudangrass seed.**



**Fig. 4—Section through a Johnsongrass seed (left) and a sudangrass seed (right). Most of the Johnsongrass seed appears hard and glassy, while the sudangrass seed is mostly white and starchy.**



## How Johnsongrass Spreads

### Seed

Don't let Johnsongrass form seed. This is no small task, but it is essential just to hold your own with the weed. With most practical control measures less than 100 percent effective, and with the hazards of reinfestation in many places, you will benefit little from efforts to kill Johnsongrass on one hand while allowing it to propagate and spread seeds on the other. Use any means that destroys top growth before seeds form.

Flood waters probably spread more Johnsongrass seed than any other agency. If your land is downstream from Johnsongrass infestations, check for new patches of Johnsongrass after floods.

Johnsongrass seeds may also be carried in crop seeds, grain, hay, bedding, packing materials, mulching materials and the like. Seeds most often contaminated with Johnsongrass are sudangrass, forage or grain sorghums, small grain and rice.

Machinery, especially combines and trucks, carries the seed to new areas.

Some seeds live in the soil several years before they germinate. This can reinfest an area where all established Johnsongrass plants and rhizomes have been killed. An effective eradication program must include frequent checks for new seedlings for several years. They can be killed during their first few weeks by tillage, chemicals, or hand methods.

### Rhizomes

Infestations also spread through growth from rhizomes. Cultivate infested areas and Johnsongrass-free areas separately. When tillage and planting implements are moved through infested sections they carry pieces of rhizomes to new areas.

# Control Practices

Kill established plants. The best method to use depends on the size, location, and degree of the infestation; availability of livestock to utilize the Johnsongrass forage; funds available to invest in the control program; and the urgency of getting rid of the infestation.

Kill seedlings before they start to grow rhizomes. This will be three to six weeks after they emerge. Until then they can be killed by the same methods used against annual weed grasses. Once

rhizomes are formed, new growth can come from the rhizomes even if the tops of the plants are killed. Only when Johnsongrass is in the seedling stage is a single application of any practice likely to eradicate it completely. Established stands nearly always need follow-up treatments.

The following described control practices give a choice of practices for different types of infestations.

• • •

## To Weaken Johnsongrass On Large Areas of Crop Land

A practical program for a large infestation on crop land might start with lower-cost practices to give moderate control, then follow-up with higher-cost practices to give an excellent kill. Or the program can start with a practice to give a high degree of kill. In either case, you will need to kill seedlings for several years.

### Pasturing

One of the most practical ways to control large infestations is by close grazing. Pasturing must be heavy through the summer to keep down the growth. If you haven't enough stock, supplement with mowing. Do not allow the plants to grow more than six inches tall.

The carrying capacity of Johnsongrass will decrease considerably after the first year or two of grazing. You may seed small grain and lespedeza to increase pasture returns. After two or three years of close grazing, the Johnsongrass will be considerably weakened and most of the rhizomes will be concentrated in the top few inches of the soil.

Johnsongrass, like some other sorghums, may on rare occasions accumulate enough prussic acid poison to be toxic to cattle and sheep that eat the fresh grass.

### Mowing

Close mowing as often as Johnsongrass reaches a height of 8 to 10 inches is almost as effective as pasturing for weakening the plants and causing the

rhizomes to concentrate near the surface. Johnsongrass grows very rapidly with moisture and warm temperatures. Mowing may be necessary as often as once a week when growing conditions are good. The mowed grass may be used for feed. Prussic acid poisoning is not a problem with Johnsongrass hay or silage.

### Growing Alfalfa Hay

Much land infested with Johnsongrass is suitable for growing alfalfa. The competition of the alfalfa combined with mowing for hay weakens Johnsongrass and causes the rhizomes to grow near the surface. For greater effect mow the alfalfa-Johnsongrass mixture more often than you normally would mow alfalfa.

### Shallow Plowing

Johnsongrass that has previously been weakened and the rhizomes concentrated near the surface of the ground by continuous close cutting or grazing can be further weakened and thinned by shallow plowing in November. Plow just deep enough to turn out the rhizomes and to avoid as much as possible covering them again. Exposed to winter temperatures, they will generally be killed. The kill by freezing will be more effective if the shallow plowing is followed by spring tooth harrowing to pull the rhizomes out on top of the ground.

Shallow plowing in late summer, if followed by a long period of dry, hot weather is often effective,

but there is always the hazard of rain re-establishing contact between the rhizomes and the soil.

Confining hogs to the plowed field to consume the rhizomes will help some. Where it is practical to confine hogs on small infestations, they can completely eradicate established plants.

## **To Give a High Degree of Kill of Thick Stands on Large Areas of Cropland**

### **Clean Cultivation**

Clean cultivation is one of the most efficient ways to reduce extensive infestations to a few scattered plants. Heavy pasturing, frequent mowing, or a combination of both for two to four years preceding clean cultivation shortens the period that clean cultivation will be necessary.

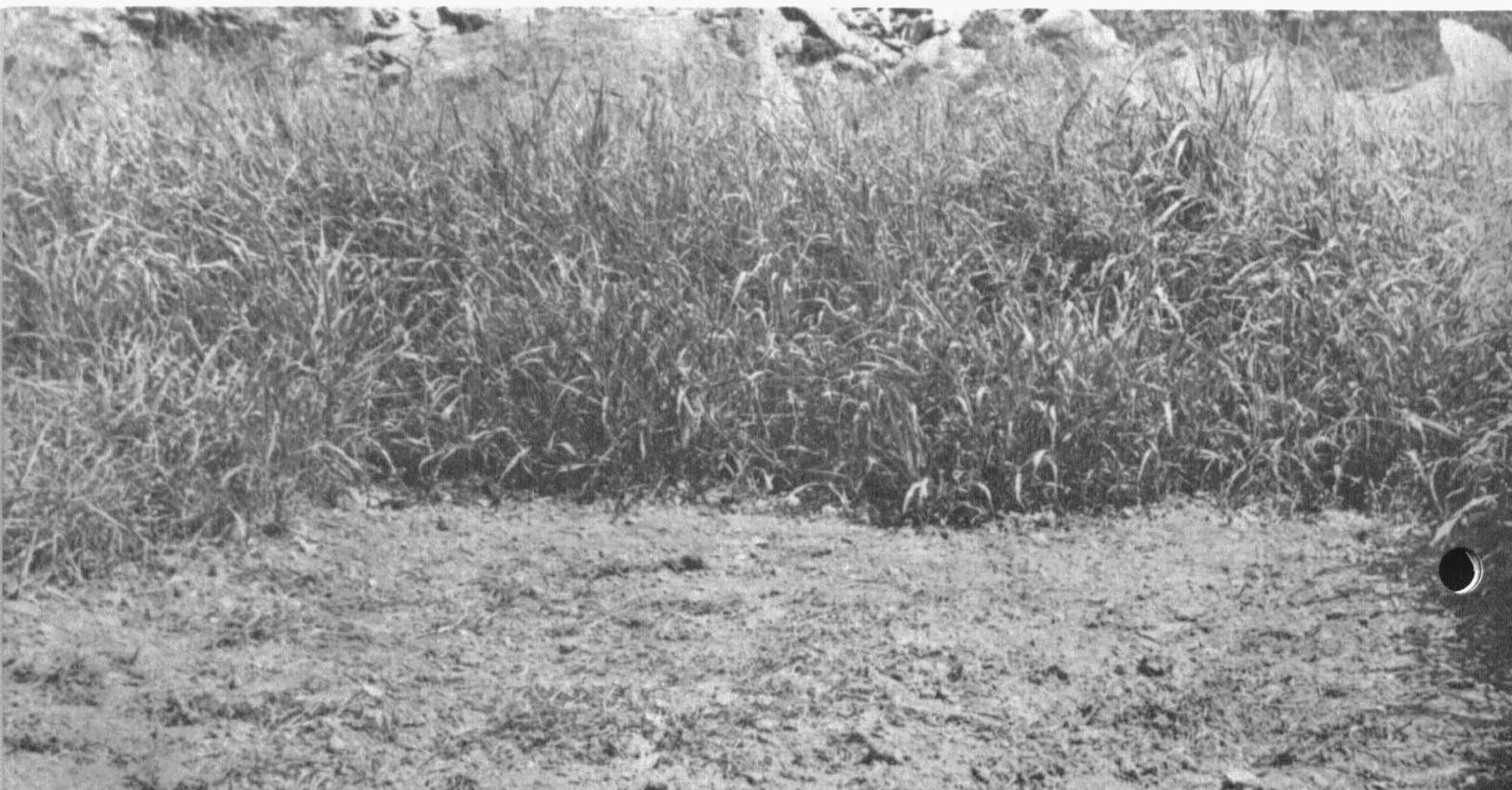
Plow the land about 4 to 6 inches deep in June. Till thoroughly to bury the tops or to sever them from the underground portions of the plant as often as regrowth reaches a height of about 6 inches. (Fig. 5) A good tool is one with overlapping sweeps set to run just below the surface of the ground. A disk can also be used. After the first year, tillage should begin in the spring when the Johnsongrass is about 6 inches tall. Each year it should continue until

growth is stopped by cold weather. A high degree of kill can be obtained in one to three years of this clean cultivation.

Small grain can be produced on the land. Plow and use clean cultivation from harvest time until cold weather stops growth or until time to plant small grain in the fall. If the small grain is harvested for grain, plowing is delayed longer than is ideal for killing the Johnsongrass, but the return from the crop may more than offset this disadvantage. Two to four years of clean cultivation between small grain crops give an excellent kill.

Another possible practice is to grow corn, skipping every other pair of rows. This would give alternating middle widths of 40 inches and 120 inches when planted with a 40-inch two-row planter. Cultivate the corn as well as possible and clean cultivate the wide middles. The next year, plant the corn in the area that was clean cultivated and leave the wide middle where the corn rows were the year before. If you start with a thick stand of Johnsongrass, the corn yield may be low the first year, but after that you can expect good yields of corn. Very limited observations indicate that by planting the corn 20 to 25 percent thicker than normal, yields should be from 65 to 75 percent as much as with normal row spacing.

**Fig. 5—Experimental plot which received deep tillage in early summer and shallow tillage every two weeks for the rest of the season. This treatment almost completely eradicated the Johnsongrass in one year.**



## Dalapon Broadcast Spray

Spray Johnsongrass foliage with 20 to 40 pounds per acre of acid equivalent of Dalapon (sold as "Dowpon"). The label on the container will tell you the percent acid equivalent. If, for example, the label says 74 percent acid equivalent and you want to apply 20 pounds per acre, you can figure the amount of dalapon to apply this way:

$$\frac{20 \text{ lbs. acid equivalent per acre}}{.74} = 27 \text{ lbs. of dalapon per acre}$$

This treatment is most effective applied to foliage 12 to 18 inches high, when the Johnsongrass is growing rapidly. (Fig. 6) This may be the first spring growth or regrowth after mowing. You can get reasonably good results by spraying foliage as short as 8 inches or up until heading time.

If you are going to spray very short or very tall Johnsongrass, or if growing conditions are not good, you should use nearer to 40 pounds per acre of acid equivalent of dalapon.

The dalapon broadcast spray treatment is somewhat more effective if the total amount to be applied is divided into two or three applications sprayed at weekly intervals. For a 30-pound-per-acre treatment, you can make two 15-pound-per-acre sprayings or three of 10 pounds per acre.

This treatment usually kills about 95 percent of the Johnsongrass. It is not a selective spray. At these rates it will kill any crop. The dalapon remains in the soil to prevent crop production for 6 to 12 weeks. The breakdown of dalapon in the soil is hastened by rainfall, warm weather and tillage. You should not till for two or three weeks or longer after spraying. The dalapon will be more effective if a good rain falls before any tilling is done.

Dalapon is a general grass-killing chemical. It will kill nearly all grasses growing in the sprayed area. Most of the broadleaved weeds will be affected, but they are likely to predominate as the effect of the dalapon begins to wear off. (Fig. 7) These probably will be accompanied by a considerable stand of Johnsongrass seedlings. You should kill those seedlings by tilling or spraying before they form rhizomes.

While spraying, be careful to prevent spray particles from drifting onto desirable plants. This

**Fig. 6—Dalapon broadcast spray treated experimental plot. The brown treated area in the foreground contrasts with the green growth of the Johnsongrass in the background. The following year only very widely scattered plants of Johnsongrass appeared in the treated area. The treatment resulted in a complete kill of top growth and a 97 percent kill of underground plant parts.**





**Fig. 7—Broadleaved weeds will normally come in where dalapon has been used to kill Johnsongrass. This picture was taken the next year after a dalapon broadcast spray treatment.**

chemical does not present the problem of vapors blowing from the sprayed field to sensitive crops as may occur with some forms of 2,4-D. Dalapon is somewhat corrosive to metals. The spray equipment should be thoroughly washed with water and detergent and rinsed after use. This will remove the dalapon so that the sprayer will be safe for other uses.

#### **Light Rates of Dalapon Plus Plowing**

This practice is still in the experimental stage. Results have been promising, but further research is needed to determine its effectiveness and the effects of the dalapon on the following crops and possibly to refine the technique. It is suggested here for those who would like to try it.

After harvesting small grain, allow the Johnsongrass to grow for about two weeks. Chop with a rotary mower or other suitable implement. Spray with 8 to 10 pounds per acre of dalapon when the regrowth reaches 12 to 18 inches. Fall plow three to four weeks after treatment. This practice is probably

as effective as clean cultivation between crops of small grain.

A variation of the above practice has looked encouraging when applied before planting corn or soybeans. Since it is in the experimental stage, changes may need to be made in the procedure outlined below.

If you try this treatment, omit spring tillage, spray with 10 pounds per acre of dalapon when Johnsongrass is 10 to 12 inches tall. Plow about one week after spraying. A good rain between spraying and plowing increases the effectiveness of the spray treatment. Corn may be planted two and one-half to three weeks after plowing. Wait three weeks if the soil is sandy or if it has been unusually dry or cool. Soybeans can be planted three to three and one-half weeks after plowing. From the standpoint of crop injury, corn is safer than soybeans to use with this treatment.

This practice delays planting about a month. That is not serious in the southern part of the state, but it leaves a rather short time to mature a crop in the northern part of the Johnsongrass area. Take

care to choose a variety that will mature in the time available.

In the northern two-thirds of the state, it may be desirable to spray in the spring when the Johnsongrass is 8 inches tall. This may reduce the effectiveness of the spray on the Johnsongrass, but it will allow you to plant corn or soybeans a little earlier.

## TO KILL SCATTERED PLANTS ON LARGE AREAS

Frequently a new infestation will appear as a few widely-scattered plants over a considerable area. This condition also is usual after a thick stand is treated. If these plants are allowed to produce seed and to extend their rhizomes, the area will soon be infested with a thick stand. Scattered plants call for attention to each individual clump.

### Dalapon Spot Treatment

Although dalapon strong enough to kill established Johnsongrass injures crops, it can be used to treat individual scattered plants. Spray to wet the foliage with a solution containing 1/5 pound of dalapon per gallon of water when the Johnsongrass is 12 to 18 inches tall. Repeat when the regrowth is about 12 inches tall. Spray all regrowth, foliage that was not completely killed by the previous spraying, and seedlings. A total of two to four sprayings during the season is usually necessary.

Dalapon spot treatments should be repeated each year as long as Johnsongrass continues to appear in the field.

Be careful to get as little as possible of the dalapon spray on crop plants. Those plants that are sprayed will be injured or killed. The loss is not serious in moderate Johnsongrass infestations, however. The crop loss from dalapon injury is usually offset by the benefit from removing the Johnsongrass competition. An ordinary three-gallon compressed air sprayer is commonly used for dalapon spot treatment. Knapsack sprayers are also satisfactory. An ordinary farm sprayer equipped with handguns is practical for large-scale operations. A better job can be done if the handgun operators walk, but seats for them can be mounted on the front of the tractor.

Spraying with low pressures of 25 to 40 pounds per square inch will give less crop injury than high-

er pressures by causing less "fog" and drift of the spray material. Most operators prefer nozzle tips that produce a fan-type spray over those that produce a cone-shaped spray because the fan can be aimed more accurately. A nozzle tip with a rather large opening allows more rapid movement of the wand, thus more rapid spraying, but an excessive rate of delivery causes a waste of spray materials and excessive crop damage. A nozzle tip that delivers a rather narrow-angle spray pattern conserves materials and reduces crop damage. A 40-degree nozzle tip rated to deliver about 0.2 gallon per minute at 40 pounds pressure is satisfactory. Some individuals will prefer some variation from this.

At this writing, the only crop for which the use of the dalapon spot treatment is cleared under the provisions of Public Law 518 is cotton. From the standpoint of performance the treatment is satisfactory in most crops, but it can be used in other crops only as approval is granted. No clearance is necessary for use on noncrop land.

### Soil Sterilants

Where the Johnsongrass is so widely scattered that sterilization of the soil around each clump of the weed is of little consequence, you can use one of the soil sterilants. Sterilants are especially good for scattered plants on noncrop land. (Fig. 8) These materials can be applied either dry or as a spray. The following chart indicates which method of application is more practical for most small or moderate sized jobs.



**Fig. 8—Experimental plot showing the effect of a soil sterilant treatment.**

TABLE 1--STERILANTS TO USE TO KILL SCATTERED PLANTS OF JOHNSONGRASS

Chemical	Rate		Method of Application	Remarks
	(lb/A)	(lb/sq. rod)		
Sodium chlorate	480-800	3-5	dry	Note caution below (1)
Sodium chlorate + fire retardants (2)	960-1600	6-10	dry	
TCA	60-100	3/8-5/8*	spray	Short-time soil sterilization-- watch for seedlings
Monuron (3)	40-80	1/4-1/2**	spray	On noncrop land only
Erbon (4)	80	1/2***	spray	On noncrop land only

- (1) **CAUTION:** Sodium chlorate in contact with any flammable material is a fire hazard. Pure sodium chlorate will not burn, but clothing, dry vegetation, wood, or any other flammable material can produce a flash fire when mixed with sodium chlorate. Prevent, as nearly as possible, contamination of clothing, floors of buildings, wagon boxes, etc. As soon as you've finished a spraying job, thoroughly wash contaminated clothing or equipment. Do not use on vegetation near buildings. Do not walk or drive over freshly treated areas. Sodium chlorate is probably no more poisonous to livestock than ordinary salt, but they can get too much. Keep livestock away from treated areas until there has been a rain following treatment. Keeping the livestock well supplied with salt reduces the hazard of the animals consuming the sodium chlorate.
- (2) Several brands of materials containing sodium chlorate are on the market. Most of these contain a fire retarding material such as borates or calcium chloride. These materials are more expensive than sodium chlorate, but they are safer to use. They are effective if you increase the rate to allow for the dilution of the sodium chlorate. Some materials on the market contain additives which include chemicals to give a quicker kill or longer-lasting sterilization. These latter mentioned additives have little advantage for killing Johnsongrass.
- (3) Sold as "Telvar."
- (4) Sold as "Baron."

\*This rate refers to pounds per square rod of *acid equivalent*. The label on the container will tell you the *percent* of acid equivalent in the chemical you buy. For instance, if you want to apply one-half pound of acid equivalent of TCA per square rod, and the material you buy contains 80 percent of acid equivalent, here's how you figure the amount of TCA to use:

$$\frac{\frac{1}{2} \text{ lb. acid equivalent per sq. rod}}{.80} = \frac{5}{8} \text{ lb. per sq. rod of TCA}$$

\*\*This rate is based on *active ingredient*. The label will tell you the *percent* of active ingredient in the chemical you buy. Figure your rate in the same way as above.

\*\*\*This rate is based on *active ingredient*. The label on the container will tell you the *pounds* of active ingredient per gallon of the chemical. If the chemical you buy contains 4 pounds of erbon per gallon, you can figure the amount to use this way:

$$\frac{\frac{1}{2} \text{ lb. per sq. rod}}{4 \text{ lb. per gal.}} = \frac{1}{8} \text{ gal (1 pint) per sq. rod}$$

The rhizomes of a clump of Johnsongrass may extend a considerable distance beyond the above-ground stems. The sterilant should therefore be applied to an area extending 4 to 6 feet beyond the top growth.

Soil sterilants are taken into plants through the roots. Be careful not to apply them to an area above roots of desirable plants or where they may wash to an area near desirable plants.

## Basal oiling

Basal oiling involves applying a small amount of a mixture of equal parts naphtha and diesel oil to the base of each Johnsongrass crown. About a tablespoonful of the material should be squirted on the basal  $\frac{1}{4}$  to  $\frac{1}{2}$  inch of the stems as often as the grass grows to about 6 inches. The regrowth will be more rapid than following the dalapon spot treatment but less rapid than following hoeing. Four to six oilings will be required during the season.

It appears that equal or better results can be obtained using, instead of the equal parts naphtha and diesel oil, diesel oil containing one of the following materials in the amount indicated:

- HCA—10 gal. per 100 gal. diesel oil
- C-56 (hexachlorocyclopentadine)— $\frac{1}{2}$  gal. per  
100 gal. diesel oil
- DNBP (phenol form—not amine salt)—  
 $\frac{1}{4}$  gal. per 100 gal. diesel oil

This practice requires more labor than the dalapon spot treatment, but the crop injury is normally less.

## Hoeing

Persistent hoeing to remove the tops of Johnsongrass at or just below the surface of the ground as often as it reaches a height of about 6 inches will kill out scattered plants. Hoeing will need to be done six to ten times during the season. Remove seedlings as well as the tops of established plants. This is an expensive, laborious practice.

## To Kill Small Patches

Extensive acreages of Johnsongrass often start from isolated small patches. You should learn to recognize Johnsongrass. As soon as you find a new patch, kill it. Watch for seedlings in and around the area for several years to catch new growth from rhizomes or from dormant seed.

## Soil sterilants

Use the soil sterilants discussed on page 11. Apply the chemical to an area extending at least six feet beyond the Johnsongrass top growth. Since only a small area is involved, use the materials at the upper limit of the range of rates given in Table 1.

## Dalapon

Thoroughly wet the foliage with spray containing  $\frac{1}{5}$  pound of dalapon per gallon of water. Spray both established plants and seedlings. Respray every

three weeks if any of the old growth is still green or if any new seedlings have emerged.

## Smothering

Small patches can be killed by smothering. This practice is especially well suited where the infestation occurs near valuable plants that may be susceptible to injury from chemicals.

Completely cover the infestation with material such as roofing to keep out the light and most of the air. You can use black plastic material for this purpose. It should be at least 4 mils (0.004 inches) thick. Weight the cover down with dirt or other material, especially around the edges.

## Clean hoeing

Small patches can be killed by cutting the tops at or just below the top of the ground to prevent the plants from reaching a height above 6 inches. This would require 10 or 12 hoeings during the season.

## To Kill Johnsongrass on Non-Crop Land

Fence rows, field margins, lots, roadsides, railroad right-of-ways, areas along drainage and irrigation ditches, and many other non-crop sites present some special problems in killing Johnsongrass. The same principles apply here as in crop land areas, but the most practical eradication methods may be different. It is not practical to clean cultivate much of the non-crop land. Without the concern for crop loss, soil sterilants can be used more freely.

Do not allow Johnsongrass to produce seed. It may require some time to obtain herbicides and equipment and to initiate a Johnsongrass control or eradication program on a large area. If this is the case, get a head start by at least preventing seed production. Mowing or any other practical method of destroying the tops before seed matures will help.

One method is the dalapon broadcast spray with sufficient follow-up sprays to kill plants that escape the earlier sprays and to kill seedlings. After you reduce the stand to scattered plants, you can use soil sterilants or the dalapon spot treatment.

Where sterilization of the soil is not objectionable, one of the soil sterilants can be used from the beginning. This requires less frequent retreatment but a higher cost for materials than the dalapon broadcast spray. Watch the area carefully for established plants that escape treatment, and for

seedlings. TCA normally will not keep down seedlings an entire season. The longer lasting sterilants will generally prevent seedling growth for a full season or more except where there is uneven application, extreme leaching, or erosion.

## To Kill Seedlings

Regardless of the method you use to kill established Johnsongrass plants, you will need to watch for seedlings. Do not allow them to produce rhizomes. Before rhizomes develop, they are as easy to kill as annual grasses such as crabgrass or foxtail. The main problem is to kill *all* of them. A few escapees can completely reinfest an area the first year.

Disking or field cultivating is effective for controlling seedlings when there is no crop on the land.

On cropland thorough cultivation is essential to control Johnsongrass seedlings. Checking and cross cultivating corn will help remove and cover up seedling plants.

Although it is time consuming, hand pulling or hoeing seedlings that escape cultivation in the crop row may be worthwhile in the long run.

When the dalapon spot treatment (Page 11) is used, the spray should be directed on seedlings as well as established plants. If only seedlings are involved, a dalapon broadcast spray at a rate as low as 4 to 6 pounds of dalapon per acre is effective.

A new chemical, EPTC, sold under the trade name "Eptam," is showing promise for controlling Johnsongrass seedlings in corn. The use of this chemical is still in the experimental stage. Suggestions given here may be changed. They are given for those who would like to use the chemical on a trial basis: Plant corn fully 2 inches deep. Spray EPTC on the surface at the rate of 3 pounds per acre. To prevent loss of EPTC vapors, incorporate the chemical into the top 1 to 1½ inches of soil. You can cut the cost of the treatment by spraying the EPTC in bands about 12 inches wide over the row. The common tillage implements leave much to be desired as tools to put EPTC into the soil. A disk set to run almost straight, or a rotary hoe can be used.

## Other Practices

### Burning

Plant residues of Johnsongrass can be burned every year with little effect on the stand. The removal of the dead top growth may be helpful in getting chemicals into the soil rather than having them intercepted by the litter, and it may facilitate tillage by reducing the clogging of tillage equipment. A few, but by no means all, of the seeds may be destroyed.

### Flaming

Using gas or oil burning flaming devices can be effective for repeated defoliation of Johnsongrass. The Johnsongrass should be flamed as often as it reaches a height of about 6 inches. Control fires where there is litter on the ground. There is some danger of setting fire to wooden fence posts or other wooden structures and flame may harm galvanized fencing.

### Hand Digging

Occasionally the attempt is made to dig up small clumps of established Johnsongrass. For one or two very small clumps where the rhizomes are near the surface, this may be as practical as some practice requiring considerable preparation, materials, and equipment. Usually, however, the job turns out to be a considerably more laborious undertaking than expected. For a complete kill, every node of the rhizomes must be removed.

### Grazing with geese

Geese are often used to control weed grasses, including Johnsongrass, in cotton fields. The grazed area needs to be fenced to enclose the geese. Grazing should begin as soon as grassy vegetation is about one inch high. The stocking or supplemental feed should be adjusted to keep the grasses from getting ahead of the geese. Heavy Johnsongrass infestations require three or four geese per acre. Supplemental feed should be quite limited so that the geese will graze the field closely. Uniform grazing over the entire field can be encouraged by placing the supplemental feed, water, and shade at widely-separated points. These can be moved to more light-

ly grazed sites from time to time.  
Very careful management is required for satis-

factory results with geese. Poor management will result in poor Johnsongrass control and a high cost.

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## **To Control Johnsongrass You CAN . . .**

- **Learn to recognize it when you see it if you don't already know.**
- **Prevent the spread of seed and rhizomes.**
- **Decide on the best plan of attack for your particular problem.**
- **Follow recommendations in this bulletin to get the best results.**