

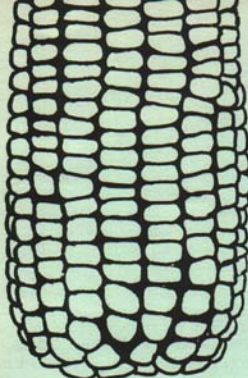
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Michigan Corn Production Weed Control
Michigan State University Extension Service
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Michigan Corn Production

WEED CONTROL

COOPERATIVE EXTENSION SERVICE
MICHIGAN STATE UNIVERSITY

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CONTROLLING WEEDS in the corn field is essential to a high yielding crop. Few farmers are able to avoid some loss in yield from weed competition. Weeds (1) compete with corn for light, water, and nutrients, (2) interfere with and delay harvest, and (3) sometimes harbor insects and diseases.

The most troublesome weeds in corn vary from farm to farm but most of the problems are associated with those listed in Table 1 on page 2.

Once a field is contaminated, a weed problem will continue for many years because most weed seeds live in the soil for a long time. It takes only a few weed plants to contaminate a field. One plant may produce the following number of seeds: rough pigweed—117,000; green foxtail—34,000; and lambsquarter—72,000.

Yield losses can be substantial with only a few weeds in the corn field. In addition, weed growth early in the season can reduce the yield significantly even though they are present for only a limited time. Some test results are shown in Tables 2 and 3 on page 3.

Somewhat similar results occurred with giant foxtail.

Ways to Control Weeds

No one method of control is the best under all conditions. Cultural control is very effective at times, whereas the use of herbicides (chemical weed killers) is more practical at other times. A combination of the two may be the best solution. It is necessary to consider both the control obtained and the cost.

Cultural Control

Minimum tillage methods of seedbed preparation can help to control weeds. The loose soil surface left

between corn rows provides a dry surface layer in which weed seeds are slow to germinate and develop.

Studies with corn in Michigan have shown that it is seldom necessary to cultivate except for weed control. On the heavy-textured soils which crust and seal-over after a rain, it is occasionally profitable to cultivate to break a crust and allow air and water penetration.

Cultivation should be shallow and when the weeds are small. The shovels should be adjusted so that weeds in the row will be covered with soil. Many corn roots are just below (1 to 2 inches) the soil surface. The rotary hoe, spiketooth harrow, and weeder are effective tools for controlling annual weed seedlings. These implements should be used when seedlings are just coming through the soil surface.

Chemical Control

Several herbicides are available for controlling weeds in corn. They vary in controlling specific weeds and in the length of time they are effective. Some create a residue problem which may be harmful when other crops are to follow corn in a rotation. Some herbicides are for use only as pre-emergence herbicides (applied before the corn plant emerges) while others may be used both pre-emergence and post-emergence (after the corn has emerged).

Studies have shown that pre-emergence application is effective on more weeds, and it also provides early protection when the soil may be too wet for cultivation. It reduces work competition between making hay and cultivating corn. On the other hand, pre-emergence herbicides are not very effective if the soil is dry, but this problem does not occur often at corn planting time in Michigan.

Effective herbicidal action is dependent on moisture to move the herbicide just below the soil surface into the zone where weed seeds germinate.

Post-emergence applications are usually effective because the herbicide is applied directly to the weed plants. However, some damage may have already been done by weeds and post-emergence application cannot undo that damage. Also, well-established weeds are more difficult to kill than seedlings, and post-emergence application increases the possibility of damaging the corn with the herbicide. For example, 2,4-D ester applied post-emergence when the corn plants are above 8 to 10 inches may cause malformation of the plants. Occasionally the plants may be twisted, and frequently the brace roots do not develop as a result of the chemical treatment. This damage makes the plant more subject to lodging.

Recommendations

Refer to Table 4 for recommended herbicides to use with corn. The rates expressed are in pounds of active ingredients per acre for the area actually covered with the herbicide. *All agricultural chemicals should be applied according to regulations of the Federal Insecticide, Fungicide, and Rodenticide Act as to rates and timing.* The recommendations in Table 4 conform to these regulations.

Special Considerations

1. *With band application*, measure the band accurately so that you obtain the correct application rate per acre.

2. *With atrazine and other herbicides formulated as wettable powders*, apply a minimum of 20 to 25 gallons of water per acre and provide for continuous and vigorous agitation in the sprayer tank. Usually herbicides formulated as liquids can be applied satisfactorily in 10 gallons of water per acre.

3. *Atrazine breaks down slowly in the soil* and usually lasts for the entire corn growing season. When more than two pounds per acre are applied there may be a soil residue problem. Corn plants will tolerate large amounts of atrazine without damage but most other crops will not. At 2 pounds per acre any of the common field crops, except sugar beets, may be safely planted the following year. When corn is grown continuously for at least two years and atrazine is applied at two pounds per acre each year, the last year of corn, prior to changing to another crop, should receive 2,4-D or CDAAC-TCBC (Radox T) instead of atrazine.

4. *If the soil is dry* and pre-emergence herbicides do not seem to be working, cultivation is called for. If the soil remains dry for two weeks from planting time, you may assume that 2,4-D and CDAAC-TCBC are

Table 1—Major Weeds in Michigan Corn Fields

Name	Life duration	Type of weed	Longevity of seed in the soil	Remarks
Barnyardgrass	annual	grassy	probably more than 10 years	
Bindweed, Field	perennial	broad-leaf	over 20 years	spreads mainly by creeping roots
Foxtail, Green	annual	grassy	over 16 years	seed dormancy a problem
Foxtail, Yellow	annual	grassy	about 10 years	
Lady's Thumb (Smart Weed)	annual	broad-leaf	over 16 years	
Lambsquarter	annual	broad-leaf	over 16 years	
Pigweed, Rough (red root)	annual	broad-leaf	over 10 years	
Quackgrass	perennial	grassy	1 to 2 years	spreads mainly by creeping rhizomes
Ragweed, Common	annual	broad-leaf	over 20 years	
Velvet leaf	annual	broad-leaf	over 20 years	seeds usually dormant for several years



Fig. 1—Quackgrass control with amitrole. Left: No Treatment; Right: 2 lbs. amitrole-T pre-plow plus 2 lbs. Atrazine pre-emergence.

not going to work. Then you will have to cultivate the remainder of the season. If atrazine was applied, and a two-week dry period followed, the atrazine might still be effective after one cultivation.

Control of Special Weeds

Quackgrass before corn is planted

1. Apply amitrole-T at 2 pounds per acre in a minimum of 25 gallons of water in the spring when the quackgrass is 4 to 8 inches tall. Plow 7 to 10 days later. Plant corn immediately and apply atrazine pre-emergence at 2 pounds per acre. Amitrole-T may also be applied in the fall, followed by plowing as above, and planting corn in the spring followed by atrazine pre-emergence.

2. Apply atrazine at 4 pounds per acre in at least 25 gallons of water when the quackgrass is 4 to 8 inches tall. Plow 10 to 14 days later and plant immediately. If the quackgrass stand is heavy, apply in the fall instead of the spring. This application may be split to 2 pounds per acre on the growing quackgrass and the remaining 2 pounds applied pre-emergence. In using the 4-pound rate, corn must be grown for two consecutive years.

Studies in Michigan have shown that these treatments may give about 90 to 95% control of quackgrass the year of application, 85 to 90% control in the second year, and 80 to 85% control in the third year. In calculating the cost per acre of this operation, it is quite apparent that the cost should not be charged to a single corn crop. A more accurate figure would be three crop years.

Quackgrass control after the corn has emerged

Because of adverse weather and moisture conditions, quackgrass sometimes becomes a serious problem after corn has emerged. In this emergency, when it is apparent that failure to control will result in substantial crop yield reduction, it is possible to use a herbicide for reasonably good control. Apply atrazine at 4 pounds per acre in at least 25 gallons of water to the growing quackgrass in the corn, when the quackgrass is at least 4 inches tall. Cultivate shallow in 10 to 14 days. This treatment will not damage the corn. It will be necessary to plant corn in the field again next

year because of residue problems which would be harmful to any other crop. Application must be made within 3 weeks from the time of planting.

This method will not give as good or lasting control of quackgrass as the pre-plant measures listed above. Therefore, it should be considered an emergency measure only.

Yellow Nutgrass (nut sedge)

Apply 3 pounds per acre of atrazine early post-emergence. The nutgrass should not be over 1½ inches tall when application is made and this usually is 8 to 10 days after planting corn. The treatment should give good control of nutgrass during the year of application and will prevent the formation of additional nuts on the roots that year. However, it will not damage the ungerminated nuts in the soil. Additional nuts may germinate the following year. When the 3-pound rate is used, it will be necessary to plant corn a second year in that field, because of the atrazine residue in the soil.

Table 2—Effect of Pigweed in the Row on the Yield per Acre of Corn (Middles of the row kept weed-free)*

Amount of pigweed	% reduction in yield
None	None
1 per 40 inches	7 to 8
1 per 20 inches	14 to 15
1 per 5 inches	23 to 24
1 per 1 inch	26

*Adapted from data from a three-year study, University of Illinois.

Table 3—Effect of Early Weed Growth on the Yield of Corn*

Treatment	% reduction in yield
Plots kept weed-free	none
Weeds allowed to grow for two weeks, then plots kept weed-free remainder of season	10
Weeds allowed to grow for four weeks, then plots kept weed-free remainder of season	25

*Adapted from unpublished data—Ph.D. thesis, Rutgers University, 1960.

**Table 4—General Weed Control Recommendations for Field Corn
ON MINERAL SOILS**

Chemical	Rate & Time of Application	Weeds Controlled	Remarks
Atrazine	2 lbs., pre-emergence (if wheat follows corn use 1½ lbs.)	Annual grasses and broad-leaved weeds. Usually season-long control	If dry weather persists for two weeks after application, cultivate shallow. May apply within 10 days after planting to control small weeds. Do not plant sugar beets or vegetable crops the year following application. Band application will reduce cost.
2,4-D Low Volatile Ester OR 2,4-D Oil soluble amine	1½ lbs., pre-emergence	Most annuals except smartweed. Sometimes ineffective on annual grasses. Usually good control for 4 to 6 weeks	Do not use on sandy soils because of leaching. Do not cultivate until weeds emerge. Use oil-soluble amine where susceptible crops are nearby (grapes, etc.)
CDAAs + TCBC (Randox-T)	4½ quarts-pre-emergence	Annual grasses and annual broad-leaved weeds. Usually obtain good control for 4 to 6 weeks	Avoid cultivation as long as possible. Do not plant field beans, sugar beets, or vegetables the year after application. Band application will reduce the cost.
2,4-D amine	½ lb., post emergence Corn up to 6 to 8 inches tall	Broad-leaved annuals only	Use drop nozzles on corn taller than 6 to 8 inches and up to 18 inches. Esters of 2,4-D not suggested for post-emergence use because of greater possible damage to corn and other crops.

ON ORGANIC SOILS

Atrazine	3 lbs., early post-emergence, about 8 to 10 days after planting; weeds less than 1 inch tall	Annual grasses and annual broad-leaved weeds	Do not plant sugar beets or vegetable crops the year after application. Band application will reduce cost.
CDAAs + TCBC (Randox-T)	4½ quarts, pre-emergence	Annual grasses and annual broad-leaved weeds. Usually in good control for 4 to 6 weeks	Avoid cultivation as long as possible. Do not plant field beans, sugar beets, or vegetables the year after application. Band spraying will reduce cost.
2,4-D Low Volatile Ester OR 2,4-D Oil soluble amine	2 lbs., pre-emergence	Most annuals except smartweed. Sometimes ineffective on annual grasses.	Avoid cultivation as long as possible. Generally less effective than Atrazine or Randox-T. Use oil-soluble amine where susceptible crops are nearby (grapes, etc.)
2,4-D amine	½ lb., post-emergence. Corn up to 6 to 8 inches tall	Broad-leaved annuals only	Use drop nozzles on corn taller than 6 to 8 inches and up to 18 inches. Esters of 2,4-D not suggested for post-emergence because of greater possible damage to corn and other crops.
CDAAs and 2,4-D amine	4 lbs., pre-emergence ½ lb. post-emergence	CDAAs for annual grasses —2,4-D for broad-leaved weeds	Apply 2,4-D when weeds are small. May have to repeat 2,4-D application when more weeds appear. Use drop nozzles on corn taller than 6 to 8 inches.

Precautions

1. Read the label on the herbicide container and follow directions closely.
2. Note restriction on label as to time, rate, and method of application and special restrictions.

Additional Detail on Weed Control

For additional details on herbicides refer to Extension Bulletin No. 434, Weed Control in Field Crops. For detailed information on equipment and its calibration refer to MSU Misc. Series Circular CE-24, Equipment for Chemical Weed Control.

Other publications dealing with corn production are: Bull. 436, Corn Hybrid Selection and Cultural Practices; Bull. 437, Fertilization; Bull. 439, Insect Control; Bull. 440, Disease Control; and Bull. 441, Harvesting and Storing.