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Critical periods of competition in corn

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Critical periods of competition in corn

Abstract

The critical period of competition defines how long weeds can compete with crops before affecting yields. Two critical periods are defined. The first involves weeds that emerge at the same time as the crop and compete until a postemergence strategy is applied. These weeds have the greatest potential to affect crop yields and are the focus of this article. The second critical period involves weeds that emerge after crop emergence. As the interval between crop and weed emergence increases there is less likelihood that the weeds will impact yields.

Keywords

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INTEGRATED CROP MANAGEMENT

Critical periods of competition in corn

The critical period of competition defines how long weeds can compete with crops before affecting yields. Two critical periods are defined. The first involves weeds that emerge at the same time as the crop and compete until a postemergence strategy is applied. These weeds have the greatest potential to affect crop yields and are the focus of this article. The second critical period involves weeds that emerge after crop emergence. As the interval between crop and weed emergence increases there is less likelihood that the weeds will impact yields.

Researchers in Canada investigated early-season competition from mixed weed infestations on corn yields in seven experiments (Table 1). Results were highly variable among locations, with early-season weed competition causing a 5 percent corn yield loss as soon as 2 weeks after planting or as long as 7 weeks after planting. Weed density was strongly correlated with the critical period, with sites with high weed populations generally having shorter critical periods than sites with low-to-moderate infestations. The shortest critical period occurred at the site having the highest weed population, 56 weeds per square foot.

Researchers in Michigan controlled weeds when they reached 2, 4, 6, or 8 inches in height. In 1992, yield losses were first observed when herbicide applications were delayed until weeds reached 6 inches, whereas in 1993 applications losses did not occur until the 8-inch weed height application (Table 2). The difference in weed densities between the 2 years was relatively small and inversely related to the critical period, thus it appeared that the difference in critical period was due to environmental factors rather than weed populations. Monsanto sponsored a multistate study investigating the critical period in Roundup Ready corn [Loux et al. (1998), *Determining the critical period of competition in Roundup Ready corn*, Proceedings of the North Central Weed Science Society 53:66-67]. Similar experiments were conducted at 22 sites in the North Central region during 1998. Roundup was applied at different foxtail heights, ranging from 2 to 15 inches. Late flushes were controlled with a second application of Roundup. The critical period ranged from 4- to 12-inch giant foxtail, with a 6-inch height being the most common stage where yield losses were first observed.

The results of these studies illustrate the complexity of crop-weed interactions. The time at which weeds begin to impact yields is influenced by many factors, but weed density probably has the greatest influence, followed by soil moisture availability early in the growing season. Based on the information provided here, a conservative recommendation would be that initial postemergence applications should be made before weeds reach 4 to 5 inches in height. In fields with low-to-moderate infestations, there should be little risk of yield loss following this recommendation. However, in fields with heavier infestations there could occasionally be situations where significant yield losses occur by delaying applications this long.

Table 1. Days after planting required for native weed populations to cause 5 percent

yield loss in corn at several sites in Ontario, Canada.

Location	Year	Days after planting to 5% corn yield loss	Corn leaf stage at 5% yield loss^a	Weeds/sq. ft^b
Kemptville	1988	50	12	3
Elora	1988	22	5	25
Woodstock	1988	24	8	4
Ridgetown	1988	40	10	9
Kemptville	1989	40	10	14
Elora	1989	52	12	14
Woodstock	1989	12	3	56

Modified from Hall et al. (1992). The critical period of weed control in corn. Weed Science 40:441-447.

^aNumber of emerged leaves, including those just emerging from the whorl.

^bMixed populations of weeds were present at all locations. Species present included redroot pigweed, common lambsquarters, green foxtail, wild mustard, and others.

Table 2. Effect of weed removal time on yield loss in corn (Michigan State University).

Weed height at application (inches)^a	Corn height at application (inches)	Corn leaf stage (collars)	Days after planting	Corn yield loss (%)
1992				
2	3	2	12	0
4	6	3	18	0
6	12	5	25	10
8	18	6	31	20
Full-season competition				68
1993				
2	4	2	9	0
4	6	3	15	0
6	12	4	20	0

8	18	4	23	8
Full-season competition				49

Source: Kells, J.J. (1999). Weed Competition in corn. 1999 Illinois Crop Protection Conference Proceedings, pp. 63-64.

^aMixed infestation of giant foxtail, common lambsquarters, redroot pigweed, common ragweed, and velvetleaf. Total weed density of approximately 55-80 plants/square foot.

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