

## WEED INFESTATION IMPACT ON NUTRIENT AVAILABILITY IN CORN

Weeds are major constraints to agricultural production. Weeds primarily impact crop yield potential by competing for limited resources such as sunlight, water and nutrients.<sup>1</sup> In addition to reducing yield potential, weeds can impact crop production by interfering with harvest efficiency, contributing to the weed seed bank, potentially serve as alternate hosts for pests, and detract from field appearance.<sup>2</sup> (Figure 1).

The likelihood of yield losses is greater if the weeds compete with the corn during establishment. The extent of crop yield loss will depend on many factors such as weed density, time of weed emergence in respect to crop growth stage and weed species present.<sup>1</sup>

Understanding interactions among corn, applied nitrogen (N), and weeds is important in developing management strategies. Adequate fertility combined with effective weed management is important in maximizing corn yield potential. Corn uptake of N is dependent upon many factors such as weed species, weed density and the rate and formulation of applied N fertilizer.<sup>3</sup>



*Figure 1. Weedy Corn field*

### Relationship Between Fertilization and Weeds

Numerous studies have investigated how changing nutrient availability via fertilization can influence the competitive relationship between weeds and a crop. Fertilizer use can influence weed emergence, persistence, dormancy, dynamics, growth and weed dispersion attributes. The rate, timing, type and method of fertilizer application can all impact biological trends of weeds.<sup>4</sup> In some situations, fertilization favors crop growth over weeds and therefore reduces yield loss, whereas in others weed growth is benefited more than crop growth.

A study at the University of Wisconsin suggested that the utilization of N by weeds reduces N availability to corn, therefore requiring higher N rates for optimum yields. Although the N used by weeds will eventually be mineralized and become available for plant use, this N did not become available quickly enough following control of weeds with glyphosate application to satisfy the immediate needs of the corn crop.<sup>2</sup>

Additionally, a study conducted in eastern Nebraska also found the effects of N fertilization on early-season crop growth provided a competitive advantage for corn relative to weeds.<sup>5</sup>

### Critical Period of Weed Control

The critical period of weed control (CPWC) is the time during which weeds that emerge with the crop must be controlled to prevent yield losses. The critical period is the length of time following corn planting that weeds can grow with the crop before yields are impacted.<sup>7</sup> This is basically how long you can wait before controlling the weeds without compromising corn yield. The critical period is influenced by the weeds present and their density, emergence timing and duration of emergence, environmental conditions, and cultural practices. Since the critical period can vary widely depending on the conditions, there are no simple guidelines to accurately

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predict for all situations. Research at the University of Nebraska has documented that each crop has a CPWC during which weeds must be controlled to maintain maximum yields.<sup>6</sup> The length of the critical period is influenced by cropping practices, including the nitrogen level in corn.<sup>1</sup>

Early-season weed competition causing corn yield loss can begin soon after planting. Testing conducted in glyphosate-tolerant corn over two years across multiple sites and states suggested that the optimum timing for initial glyphosate application to avoid yield loss was when weeds were less than 4 inches tall, no more than 23 days after planting, and before the V4 stage of corn growth.<sup>8</sup> Remember these are only guidelines, and it is important to understand that timely early-season weed control is critical to protect corn yield potential. Research at the University of Nebraska has documented that each crop has a CPWC during which weeds must be controlled to maintain maximum yields. The length of the critical period is influenced by cropping practices, including the nitrogen level in corn.<sup>1</sup>

## Management

Control of weeds with tillage prior to planting is another method to reduce weed density. Annual weed control can be greatly enhanced if primary tillage is used in combination with delayed planting, which allows the annual species to germinate prior to the tillage operation.<sup>9</sup> However, if tillage is delayed to the point where weeds become larger, the effectiveness of tillage as a control tactic can be reduced. Weeds that are not killed by tillage can be more difficult to control with herbicides later in the season.<sup>9</sup>

Control of existing vegetation with a burndown herbicide application before or at the time of planting is one of the options in a no-till system. If burndown applications are made in combination with residual (preemergence) herbicides, they reduce competition from existing vegetation long enough for corn to get established and to allow for rainfall activation of the residual herbicides. If residual herbicides are not used, burndown treatments provide a window for total postemergence weed control programs to be applied.

## Sources

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<sup>7</sup> Gower, S.A. et al. 2013. Effect of postemergence glyphosate application timing on weed control and grain yield in glyphosate-resistant corn: results of a 2-yr multistate study. Weed Technology 17:821-828.

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## Legal Statement

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