EFFECTIVE MANAGEMENT OF WEEDS IN NO-TILL

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No-tillage conditions result in greater diversity in the weed species and weed life cycles that occur in corn and soybean production, compared with conventional and minimum tillage systems. This diversity can be challenging to manage, especially when growers attempt to oversimplify herbicide programs in hopes of cutting costs. Successfully managing weeds in no-till can be accomplished with relatively minor changes in herbicide programs, or it can require a substantial change in strategy, depending upon the nature of the weed population. Failure to use the appropriate strategy, or to adapt new strategies in response to weed population shifts, can result in poor weed control and further increases in populations. For example, some Roundup Ready soybean growers in Ohio have omitted preplant burndown treatments from their weed management programs, which have resulted in increased populations of winter annual weeds and dandelions, and problems with control of early-emerging summer annual weeds such as lambsquarters and giant ragweed. This approach has also contributed to over-reliance on glyphosate, and has been a primary cause of glyphosate resistance in horseweed (marestail).

Glyphosate and Roundup Ready crops are extremely effective tools for management of weeds in no-till, but poor management of these tools by growers can reduce their utility. The ability of glyphosate to control a broad spectrum of weeds, even large weeds when necessary, does not change the need for the following components in no-till soybean weed management programs: (1) either a fall or spring preplant burndown treatment to control winter weeds, and early-emerging summer annuals; (2) an early postemergence glyphosate application when weeds are 4 to 8 inches tall; and (3) a second postemergence application as necessary to control late-emerging weeds or those not completely controlled with the first application. Producers who integrate glyphosate with other herbicides, as in the inclusion of 2,4-D ester and residual herbicides in fall or preplant treatments, may improve control of certain weeds, reduce the need for a second postemergence application, and reduce selection for glyphosate resistance. The remainder of this article discusses strategies for management of the various weed life cycles that occur in no-till production, and serves to reinforce these principles.

Winter Annual Weeds

Winter annual weeds, such as common chickweed, purple deadnettle, and cressleaf groundsel, emerge primarily in late summer through fall, although some winter annual species can emerge in the spring also. The over-wintering winter annual populations are most problematic in crop production, since they develop the dense growth in spring that interferes with crop establishment. Dense stands of winter annual weeds can prevent soil

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from drying out and warming up, harbor insect populations, increase soybean cyst nematode populations, and interfere with crop planting and early-season crop growth. Most winter annuals flower and go to seed in late spring, so their major impact on crops occurs early in the growing season. The life cycle of one winter annual, horseweed (marestail), persists long enough for it to interfere with crop growth well into the growing season. The seed of winter annual weeds generally lacks dormancy, and allowing a dense stand of winter annual weeds to go to seed in spring can result in an immediate increase in populations the following fall.

The major goal of winter annual weed management should be to control them prior to crop planting and early enough in spring to prevent seed production and minimize their impact on soil drying and crop establishment. This can be accomplished by application of herbicides in the fall or spring. Fall herbicide treatments are overall more effective for winter annual weed control. Cold weather and dense populations in spring can result in difficulty obtaining adequate control and dessication of plants soon enough before planting.

Biennial Weeds

Biennial weeds have a 2-year life cycle, and well-established second-year plants are the major problem in no-till crop production. Weed species with this life cycle include wild carrot, poison hemlock, and burdock. Unlike winter annuals, which end their life cycle in late spring, second-year biennials do not end their life cycle until late summer or fall. Second-year plants can therefore interfere with crop establishment and growth throughout much of the growing season. Biennials are most easily controlled by herbicide application in the fall of the first year of growth, when they are small. Plants that have over-wintered are much more robust, growing from a well-established taproot, and are generally less sensitive to herbicides. When necessary, spring herbicide treatments should be applied early when plants are small, and should include several herbicides to ensure control. Growers who choose to omit preplant herbicide treatments from their no-till programs tend to have problems controlling biennial weeds.

Cool-season Perennial Weeds

Cool-season perennial weeds, such as Canada thistle, quackgrass, and dandelion, are not extremely difficult to manage in no-till systems where Roundup Ready crops are used. When not managed appropriately, however, they can greatly affect crop establishment, and interfere with crop growth well into the growing season. Cool-season perennials can emerge prior to planting in Ohio, interfere with crops until late spring or early summer, when they flower and go to seed, and then senesce. Growth resumes in late summer or fall and continues until a hard freeze in late fall. The adoption of Roundup Ready crops has resulted in an overall decrease in the number and density of infestations of Canada thistle and quackgrass in Ohio. Both weeds are often effectively controlled by sequential applications of glyphosate, even when growers omit preplant herbicide treatments in no-till.

Dandelion has become extremely problematic in no-till crop production in Ohio, even though growers have effective tools to manage it. Fall herbicide treatments are by far the most effective tool for management of dandelion, especially for very dense populations. Dandelion is not easily controlled in the spring, but continuous use of effective preplant burndown treatments can keep it under control, especially when combined with residual herbicides, and followed with an effective postemergence treatment. Dandelion becomes more difficult to manage when any of these are omitted, and growers who omit the preplant treatment and try to get by with multiple postemergence glyphosate applications have observed the greatest increase in dandelion populations. Dandelions flower and senesce relatively early in the spring in Ohio, and applying herbicides after this has occurred results in greatly reduced control. In addition, dandelion seeds lack dormancy, and seed produced in spring are the source of seedling dandelions later that same spring. Including residual herbicides in the preplant burndown treatment can provide control of seedling dandelions, as can postemergence treatments. Effective postemergence treatments can also help control plants that regrow following preplant burndown treatments, but usually do not provide adequate control where the preplant treatment was omitted or was largely ineffective. Where herbicides are applied in the fall for dandelion control, it is possible to omit the preplant burndown treatment the following spring and rely on postemergence glyphosate treatments for control.

Warm-season Perennial Weeds

Warm-season perennial weeds, such as pokeweed, hemp dogbane, and horsenettle, are well-adapted to no-till systems. These weeds emerge in late-spring or early summer, typically after crop emergence, and persist until late summer or early fall. Postemergence herbicides are really the only option for control of warm-season perennials. Postemergence use of glyphosate in Roundup Ready soybeans has reduced populations of many warm-season perennials. Glyphosate is most effective for reducing populations of perennials when applied at high rates and in two postemergence applications instead of just one. In spite of its apparent effectiveness on pokeweed in university studies, populations of this weed have been on the increase in corn and soybeans in the eastern cornbelt. Growers may be expecting to obtain adequate control with lower labeled rates of glyphosate, and with just one postemergence application. Where growers omit a preplant burndown treatment, and they are forced to make the first postemergence glyphosate application soon after planting, it is possible that pokeweed has not emerged or is too small to be effectively controlled. Inadequate spray coverage on larger pokeweed plants may also be one reason for poor control.

Summer Annual Weeds

Summer annual weeds, such as ragweeds, velvetleaf, foxtails, and common lambsquarters, are present in all tillage systems, but some are better adapted to no-till than others. There is a tendency for populations of large-seeded broadleaf weeds to decrease under no-till conditions, but this does not necessarily mean that control of these weeds can be deemphasized. For example, giant ragweed populations can decrease under no-till conditions, but the extended duration of emergence of this weed and its extreme

competitiveness with the crop demand an aggressive management strategy regardless of the population density. No-till conditions and the presence of surface residue can promote a more extended duration of emergence of foxtails and other small-seeded weeds, which increase the need for multiple postemergence applications or a combination of preemergence and postemergence herbicides to control late-emerging weeds. Aside from this, the major difference between no-till and tilled systems is the method of controlling summer annual weeds that emerge before planting – herbicides vs. tillage. A combination of 2,4-D ester plus either glyphosate or Gramaxone is usually effective for control of emerged summer annuals prior to planting, and it is possible to accomplish this without the 2,4-D ester if absolutely necessary. Many growers have decided that a preplant burndown treatment is not essential, however, and they expect postemergence glyphosate treatments to control large, aged weeds that have been growing since early in spring. This approach has been a major source of poor control in Roundup Ready soybean fields, and has contributed to the development of glyphosate resistance. While early-emergers such as giant ragweed, lambsquarters, and marestail can be easily controlled with preplant burndown treatments of glyphosate plus 2,4-D ester, they can be extremely difficult to completely control with postemergence glyphosate applications in the absence of a preplant burndown. Research conducted by OSU and Purdue University has shown that it is impossible to obtain adequate control of glyphosate-resistant giant ragweed, unless the weed management program starts with a preplant herbicide treatment that includes 2,4-D ester.