Extension Service
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Weed Control Program Necessary to Improve Corn Yield

Rakesh Chandran, *WVU Extension Service Weed Specialist and IPM Coordinator*
Rodney W. Wallbrown, WVU Mason County Extension Agent Nov. 2004

Planting corn could be compared to beginning a walk to the river to collect a pail of water. Imagine that the pail is inevitably going to have leaks during the trip. The amount of water we bring back would depend on the location of the leak. The first thing we want to determine is that the pail does not have any inherent leaks to begin with. This would be comparable to choosing a good hybrid of corn that has built-in traits like high yield, disease resistance, and insect pest resistance (Bt corn). Testing the soil for pH, organic matter, and available nutrients and applying the appropriate amount of fertilizer and lime, if necessary, would be other practices that can prevent a few leaks right away. If the corn hybrid is not genetically modified to resist insect pests, like corn root borer, it may be necessary to apply an insecticide before planting corn. The path used to haul the water would also determine if any spills would occur on the way. Similarly, growing conditions during the season are going to influence crop yield. Average temperature and sunshine available during peak periods of crop growth, timing and amount of rainfall, and any unforeseen natural adversities that affect crop yield are factors beyond our control.

However, NOT having a proper weed control program would be similar to taking a break during our walk and drilling a hole somewhere in the bottom half of the pail! To prove this, we conducted a field trial in the summer of 2004 to evaluate different weed control programs on corn yields.

Roundup Ready® corn (Southern States RR-842) was planted along 30-inch rows in a 17-acre conventionally tilled field in Mason County, on May 17, 2004. Fertilizers and insecticides were applied as required. Eleven herbicide treatments (Table 1) were applied to individual 1.5-acre plots on May 18 and 19. Roundup was applied on June 30 when the corn was approximately 2 feet tall.

Weed counts by species were taken at three randomly selected plots from each treatment on July 8. Weed yield was recorded similarly on July 28. Corn was harvested on September 24. Weights of ear corn were recorded from three randomly selected plots in each treatment. Within each plot, two rows of 17.6 feet each were picked. Percent moisture was determined prior to determination of adjusted corn yield per acre. Length and girth of randomly collected corn ears (10 for each treatment) were also recorded.

The most prevalent weed species in the field were Johnsongrass, dandelion, and daisy-fleabane. Other weeds like yellow nutsedge, common lambsquarters, common pigweed, pokeweed, and common ragweed were present in fewer numbers. The following charts summarize the data collected during the season.

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Table 1. Herbicide treatments chosen for the corn weed control trial in Mason county, 2004.

Herbicide	Rate(per Acre)	Mode/s of Action	Cost ($/Acre)
Cinch ATZ	2.1 quart	Photosynthesis Inhibitor/Seedling Shoot Inhibitor	20.90
Harness Extra	2.5 quart	Photosynthesis Inhibitor/Seedling Shoot Inhibitor	21.81
Bicep Lite II Magnum	1.5 quart	Photosynthesis Inhibitor/Seedling Shoot Inhibitor	19.65
Lumax	2.5 quart	Pigment Inhibitor/ Photosynthesis Inhibitor/Seedling Shoot Inhibitor	27.32
Define 4SC	19 ounces	Seedling Shoot Inhibitor	17.91
Axiom	18 ounces	Photosynthesis Inhibitor/Seedling Shoot Inhibitor	19.93
Aatrex	1 quart	Photosynthesis Inhibitor	2.54
Keystone + Hornet	2.6 quart 3.0 ounces	Photosynthesis Inhibitor/Seedling Shoot Inhibitor/ALS Amino Acid Inhibitor/Growth Regulator	21.53 9.77
Aatrex + Prowl	1 quart 1 quart	Photosynthesis Inhibitor/Seedling Root Inhibitor	7.61
Fultime	3 quart	Photosynthesis Inhibitor/Seedling Shoot Inhibitor	20.88
Roundup Weather-Max	22 ounces	EPSP Amino Acid Inhibitor	9.77
Control	-	-	0.00

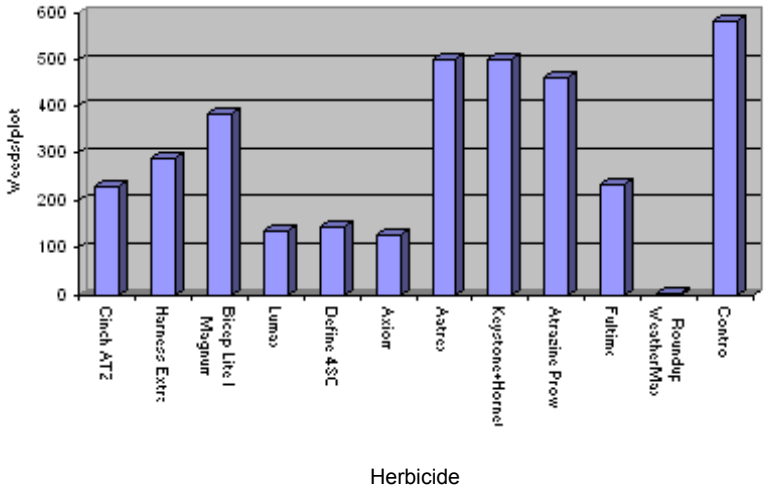

Fig. 1. Weed counts (total number/75 sq ft) as affected by various herbicide treatments.

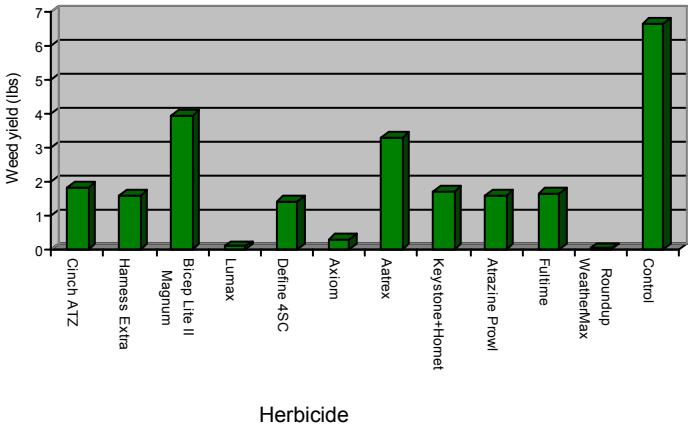

Fig. 2. Weed yield (lbs/75 sq ft) as affected by various herbicide treatments.

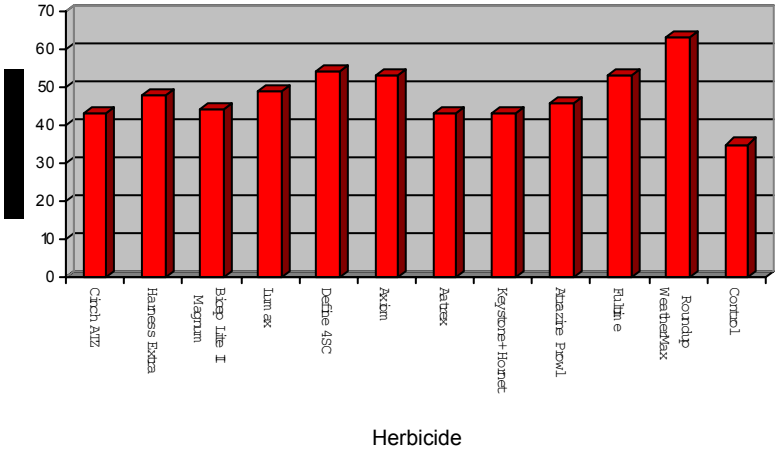

Fig. 3. Corn ear size (cubic inches) as affected by various herbicide treatments.

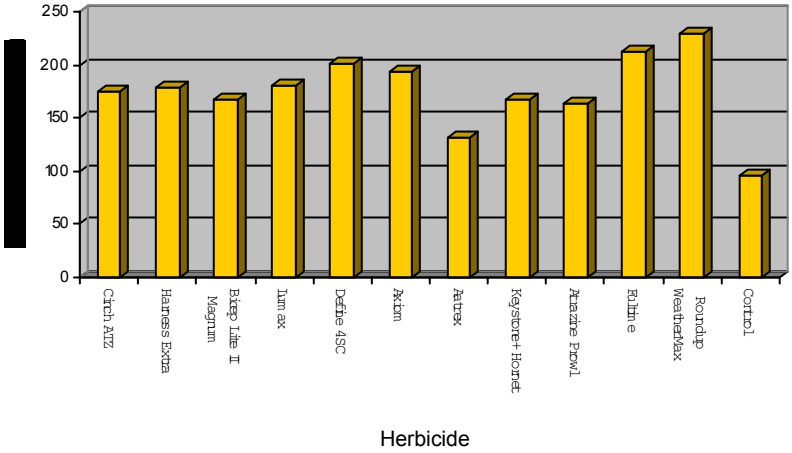

Fig. 4. Grain corn yield (bushels/acre) as affected by various herbicide treatments.

It is clear that weed control is critical to increase corn yield. Based on statistical analyses of the yield data, the treatments were broadly categorized into three groups. Herbicide treatments that resulted in high corn yields included Roundup, Fultime, Define, Axiom, Lumax, and Harness Extra; there were no significant yield differences but numerical differences were seen. The herbicides Cinch ATZ, Keystone+Hornet, Bicep Magnum, Aatrex+Prowl, and Aatrex fell into the next category. Obviously, the untreated plot resulted in the lowest corn yield. Applying Aatrex alone, the herbicide treatment with lowest yields, resulted in a 38% increase, compared to untreated plot (control). The best treatment in our study (Roundup) resulted in 141% yield increase, compared to control. On average, a 90% yield increase was obtained by applying a herbicide. There was a high degree of correlation (84%) between weeds per plot and yield loss. This study found that a pound of weeds in every 15 feet of row space, two months after planting corn, reduced ear corn yield by 60 bushels per acre.

The results of this study may not be generalized across all corn growing areas of the State. Depending on type of weeds, type of soil, and other environmental conditions in a given location, the results may vary. However, it is clear that even a low-cost herbicide program may result in considerable yield increases. It is also clear that the fields do not have to be completely weed-free to obtain optimum corn yields. From the weed count and yield data, it was evident that plots that received Roundup and Lumax were relatively weed-free. However, when yield data were analyzed, Define- and Fultime-treated plots that had more weeds resulted in similar yields. Roundup-treated plots had larger corn ears than those from other treatments.

Many other possible herbicide programs were not included in this study. However, some of the commonly used and newer classes of corn herbicides were included. Based on our experience, most of the competitive premergence herbicide programs provide a reasonable job of controlling most annual weeds. Unless there is a severe weed problem, the returns from application of a postemergence herbicide are marginal. In our trial, application of a postemergence herbicide like Accent+Banvel, Northstar, or Option would have brought up the yields of other treatments to levels seen in Roundup-treated plots. This would have made a difference for certain treatments like Aatrex alone or Aatrex + Prowl. With other broad-spectrum preemergence herbicides applied here, the returns would be less significant. Regardless, a postemergence herbicide will have to be applied if the preemergence herbicide fails (due to poor activation from lack of rainfall), or if there is a secondary infestation of certain obnoxious weeds like Johnsongrass, lambsquarters, velvetleaf, burcucumber etc.

Looking at the economics of this study, we can make a few conclusions. First, costs of a weed control program could be considered as a wise investment. A quick glance at our data may suggest that growing Roundup Ready® corn and using a labeled glyphosate product is the best solution. However, it may not be a prudent choice to depend on such a program year after year. Repeated use of the same herbicide or of herbicides belonging to the same class may result in the development of resistant weeds. Eventually, a given herbicide, an otherwise effective tool, will become useless with repeated use. Therefore it is important to rotate herbicide classes from year to year and to follow other recommended methods to manage herbicide-resistant weeds.

While we were finishing up harvest, our farmer cooperator joked that we created a problem for him. He ran out of room to store his corn since his trench was full after harvesting about two-thirds his acreage. In the past, the trench was seldom filled to capacity after harvesting his entire crop. A good problem to have indeed!