

## Role of preemergence herbicides in Roundup Ready<sup>®</sup> crops. II. Reducing glyphosate selection pressure.

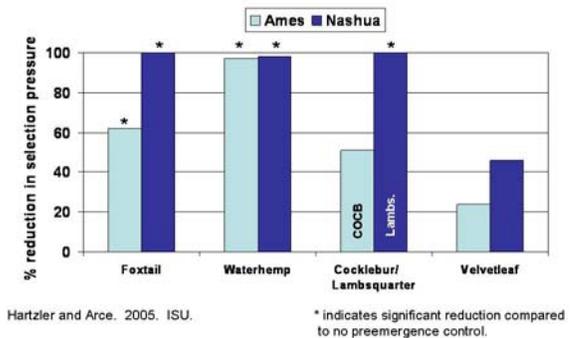
The number of acres planted to continuous Roundup Ready<sup>®</sup> crops in Iowa jumped dramatically in 2005, and is expected to continue to increase in 2006. In these systems the primary method of reducing glyphosate selection pressure on the weed community is to use alternative herbicides to supplement the activity of glyphosate (assuming that a farmer who pays the technology fee for the Roundup Ready<sup>®</sup> trait is unlikely not to use glyphosate as the keystone of the weed management program). This paper will report results of research evaluating the effectiveness of preemergence herbicides at reducing glyphosate selection pressure and the likelihood of selecting glyphosate resistant weeds.

Experiments were conducted at Ames, Nashua and Kanawha in conventional till corn and soybean. In corn, Harness Xtra<sup>®</sup> 6L was applied immediately after planting at 0, 0.6 or 1.2 qt/A, whereas in soybean INTRRO<sup>®</sup> (alachlor) was applied at 0, 1 or 2 qt/A. Glyphosate (29 oz Roundup WeatherMax<sup>®</sup> /A) was applied at either the V2, V4 or V6 stage of crop development. The number of weeds present at the time of glyphosate application was determined by counting weeds within four arbitrarily selected 1 ft<sup>2</sup> quadrats within each plot. The reduction in selection pressure by the pre treatment was determined by comparing the number of weeds in plots treated with a preemergence herbicide to that in the untreated control.

Harness Xtra<sup>®</sup> provided good to excellent control of foxtail, waterhemp and lambsquarter at all locations (Figure 1). Selection pressure on these weeds was reduced by at least 95%,

except for foxtail at Ames where selection pressure was reduced by 62%. The number of individuals of these species exposed to glyphosate was greatly reduced by Harness Xtra<sup>®</sup>, and therefore the probability of resistance being selected in these species would be low. As one would expect, the relatively low rate of Harness Xtra<sup>®</sup> provided poor control of the two large-seeded species, velvetleaf and cocklebur (Ames), and therefore selection pressure was not significantly reduced in these weeds.

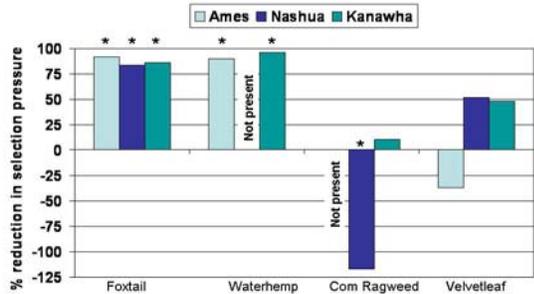
Figure 1. Reduction in glyphosate selection pressure from 1.2 qt Harness Xtra.



Results using INTRRO<sup>®</sup> in soybean were similar to that with Harness Xtra<sup>®</sup> in corn (Figure 2). Selection pressure for glyphosate resistance was reduced 80% or more in foxtail and waterhemp. However, INTRRO<sup>®</sup> failed to provide effective control of common ragweed and velvetleaf. The pre treatment actually increased selection pressure on common ragweed at Kanawha and velvetleaf at Ames by eliminating competition from the dominant foxtail.

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Figure 2. Reduction in glyphosate selection pressure from 2 qt INTRRO.



Hartzler and Arce. 2005. ISU.

\* Indicates significant reduction compared to no preemergence control.

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Sequential applications or tank mixes of alternative herbicides can reduce the potential for selection of glyphosate resistant weeds in Roundup Ready® crops by placing alternative selection pressures on weed communities. However, to be fully effective at reducing selection pressure, the alternative herbicides must provide redundant weed control – that is, the alternative herbicide must control weeds as effectively as glyphosate. Obviously economics prevent this approach – farmers will select alternative herbicides that either control species that glyphosate has failed to control in the past, or use a rate of a preemergence herbicide that provides greater flexibility in glyphosate application timing. In these studies, the large-seeded broadleaf weeds were not controlled effectively by the preemergence herbicides and thus the likelihood of resistance appearing in these weeds would be just as great as if no preemergence herbicide had been applied.

The role of preemergence herbicides in reducing early-season competition is discussed in another article:

<http://www.weeds.iastate.edu/mgmt/2006/rolepre1.pdf>

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Common chemical and trade names are used in this publication. The use of trade names is for clarity by the reader. Inclusion of a trade name does not imply endorsement of that particular brand of herbicide and exclusion does not imply nonapproval.