COMPARISON OF PREEMERGENCE AND POSTEMERGENCE HERBICIDE PROGRAMS UTILIZING BEST MANAGEMENT PRACTICE RATES OF ATRAZINE OR ATRAZINE REPLACEMENTS IN FIELD CORN AT ROCHESTER, MINNESOTA. Lisa M. Behnken*, Ryan P. Miller, Fritz R. Breitenbach, and Jeffery L. Gunsolus, Extension Professor, University of Minnesota, Rochester Regional Office, Rochester, MN 55904-4915, Assistant Extension Professor, University of Minnesota, Rochester Regional Office, Rochester, MN 55904-4915, Associate Extension Professor, University of Minnesota, Rochester Regional Office, Rochester, MN 55904-4915, and Professor, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN 55108-6026.

Field research was conducted at Rochester, MN in 2007, 2008, and 2009 to 1) evaluate weed control of herbicide programs with and without atrazine applied at BMP rates, 2) evaluate performance of herbicides used as replacements for atrazine and 3) evaluate crop safety of potential replacements in field corn in southeastern Minnesota. The research site was a Lawler loam series with a pH of 7.0, 6.7, and 6.8, soil test P of 16, 22, and 37 ppm and soil test K of 160, 126, and 115 ppm, respectively in 2007, 2008 and 2009. The corn hybrid, 'Pioneer 38H65', was planted on April 27, 2007, the hybrid, 'DeKalb DKC50-19', was planted on May 9, 2008, and the hybrid ' Pioneer 35F44' was planted on May 8, 2009. They were planted at a depth of 3.8 cm in 76-cm rows at 79,073 seeds ha^{-1}. A randomized complete block design with four replications was used. Preemergence and postemergence treatments were applied with a tractor-mounted sprayer delivering 187 l ha^{-1} at 221 kpa using 11002 flat fan nozzles. A one-half label use rate of s-metolachlor at 1.07 kg ai ha^{-1} was applied preemergence to the entire plot area.

In 2007, six postemergence treatments were evaluated, mesotrione at 0.105 kg ai ha^{-1}, mesotrione at 0.105 kg ai ha^{-1} + atrazine at 0.56 kg ai ha^{-1}, flumetsulam & clopyralid at 0.039 & 0.105 kg ai ha^{-1}, flumetsulam & clopyralid at 0.039 & 0.105 kg ai ha^{-1} + atrazine at 0.56 kg ai ha^{-1}, dicamba at 0.56 kg ai ha^{-1} and dicamba at 0.56 kg ai ha^{-1} + atrazine at 0.56 kg ai ha^{-1}. In 2008, four additional postemergence treatments were evaluated, mesotrione at 0.105 kg ai ha^{-1} + bromoxynil at 0.105 kg ai ha^{-1}, mesotrione at 0.105 kg ai ha^{-1} + dicamba at 0.14 kg ai ha^{-1}, flumetsulam & clopyralid at 0.039 & 0.105 kg ai ha^{-1} + mesotrione at 0.035 kg ai ha^{-1}, and dicamba at 0.56 kg ai ha^{-1} + mesotrione at 0.035 kg ai ha^{-1}. Weed control evaluations were conducted for giant ragweed, common lambsquarters and common waterhemp. Plots were also evaluated for corn injury and corn grain yield.

In 2009, thirteen treatements were evaluated. Four preemergence programs included s-metolachlor at 0.94 kg ai ha^{-1} + mesotrione at 0.092 kg ai ha^{-1} / nicosulfuron at 0.035 kg ai ha^{-1}, s-metolachlor at 0.94 kg ai ha^{-1} + mesotrione at 0.094 kg ai ha^{-1} + atrazine at 0.35 kg ai ha^{-1}/ nicosulfuron at 0.035 kg ai ha^{-1}, acetochlor at 0.92 kg ai ha^{-1} + flumetsulam at 0.29 kg ai ha^{-1} + clopyralid at 0.093 kg ai ha^{-1} and acetachlor at 0.92 kg ai ha^{-1}+ flumetsulam at 0.29 kg ai ha^{-1}+ clopyralid at 0.093 kg ai ha^{-1} + atrazine at 0.56 kg ai ha^{-1}. Nine postemergence programs included glufosinate at 0.47 kg ai ha^{-1}, glufosinate at 0.47 kg ai ha^{-1} + atrazine at 0.56 kg ai ha^{-1}, glufosinate at 0.47 kg ai ha^{-1} + bromoxynil at 0.105 kg ai ha^{-1}, thiencarbazone-methyl at 0.015 kg ai ha^{-1} + tembotrione at 0.076 kg ai ha^{-1}, thiencarbazone-methyl at 0.015 kg ai ha^{-1} + tembotrione at 0.076 kg ai ha^{-1} + atrazine at 0.56 kg ai ha^{-1}, thiencarbazone-methyl at 0.015 kg ai ha^{-1} + tembotrione at 0.076 kg ai ha^{-1} + bromoxynil at 0.105 kg ai ha^{-1}, s-metolachlor at 1.05 kg ai ha^{-1} + glyphosate at 1.05

kg ai ha^{-1} + mesotrione at 0.105 kg ai ha^{-1} , s-metolachlor at 1.05 kg ai ha^{-1} + glyphosate at 1.05 kg ai ha^{-1} + mesotrione at 0.105 kg ai ha^{-1}+ atrazine at 0.56 kg ai ha^{-1}, and s-metolachlor at 1.05 kg ai ha^{-1}+ glyphosate at 1.05 kg ai ha^{-1} + mesotrione at 0.105 kg ai ha^{-1} + bromoxynil at 0.105 kg ai ha^{-1}. Weeds evaluated in 2009 were common lambsquarters, common waterhemp, velvetleaf and woolly cupgrass. Plots were also evaluated for corn injury and corn grain yield.

In 2007 and 2008 giant ragweed control was improved when treatments included atrazine. In 2008, mesotrione + either bromoxynil or dicamba provided similar giant ragweed control as mesotrione + atrazine. However, mesotrione + bromoxynil resulted in 20% injury to corn. Flumetsulam & clopyralid + atrazine or mesotrione at a reduced rate, 0.035 kg ai ha^{-1}, provided significantly greater giant ragweed control than flumetsulam & clopyralid applied alone. Flumetsulam & clopyralid + mesotrione provided greater control than flumetsulam & clopyralid + atrazine. In 2008, dicamba + mesotrione provided weed control equivalent to dicamba + atrazine. In 2007 and 2008, common waterhemp and common lambsquarters control were similar for mesotrione and mesotrione + atrazine. Flumetsulam & clopyralid + atrazine and dicamba + atrazine provided greater control of common waterhemp and common lambsquarters control in 2007. In 2008, common waterhemp control was improved significantly with the addition of the BMP rate of atrazine or mesotrione to flumetsulam & clopyralid as compared to flumetsulam & clopyralid alone. Also, common waterhemp control with flumetsulam & clopyralid + mesotrione at 0.035 kg ai ha-1 was significantly greater than with atrazine. Corn grain yields were greater for both mesotrione + atrazine and flumetsulam & clopyralid + atrazine when compared to their non-atrazine partners in 2007. Due to plot variability in 2008, corn yields were not significantly different at the $P \leq 0.10$.

In 2009, weed control was similar for herbicide programs with and without atrazine or bromoxynil for common lamsquarters, common waterhemp, and velvetleaf. Woolly cupgrass control was reduced when either atrazine or bromoxynil was added to thiencarbazone-ethyl + tembotrione. With this group of herbicide comparisons, corn yield with and without the BMP rate of atrazine was similar. Corn yield for all comparisons with and without bromixynil was also similar. BMP rates of atrazine can improve the effectiveness of mesotrione, flumetsulam & clopyralid and dicamba on certain weeds and increase grain yields. The data from 2008 would indicate that bromoxynil, mesotrione, and dicamba may be potential replacements for atrazine. The data from 2009 suggest that herbicide programs performed equally well, with and without atrazine on the weed species evaluated in this trial. However, more research is necessary with this herbicide comparison, specifically on giant ragweed control.

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