

FACTORS AFFECTING GLYPHOSATE CONTROL OF COMMON LAMBSQUARTERS. Chris M. Boerboom¹, David E. Stoltenberg¹, Mark R. Jeschke², Timothy L. Trower³, and John M. Gaska³,
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Common lambsquarters is the most problematic weed in soybean and one of the top three most problematic weeds in corn in Wisconsin. Glyphosate is the most frequently used herbicide for weed control in soybean and its use is increasing in corn. Several factors may account for inconsistent common lambsquarters with glyphosate. Of these factors, we investigated the potential for growth stage, environmental conditions, rain, and dust to contribute to poor common lambsquarters control.

Dose response experiments were conducted to determine if common lambsquarters growth stage affects sensitivity to glyphosate. Glyphosate at rates up to 3 kg ae ha⁻¹ was applied to 8- to 10-cm and 18- to 20-cm tall common lambsquarters. Four replicated field experiments were conducted at three sites over 2 years. The dose that reduced biomass by 50% (ED₅₀) was determined and the ED₅₀ values of the two growth stages were compared. At three sites, the ED₅₀ values were 1.9 to 8.9 times greater when glyphosate was applied later to the taller common lambsquarters than when applied earlier to smaller common lambsquarters. The ED₅₀ values were similar at the fourth site. The reduced efficacy of glyphosate applied to taller common lambsquarters may be partially responsible for its inconsistent control. Agri-professionals in Wisconsin reported in 2006 that over 25% of applications in soybean are made to common lambsquarters greater than 20-cm tall.

A replicated field experiment was conducted in 2006 to determine if weather conditions affect common lambsquarters control when glyphosate is applied under identical application parameters. Glyphosate at 0.84 kg ha⁻¹ plus 1 kg ha⁻¹ ammonium sulfate was applied to 9-cm tall common lambsquarters during 15 dates from June 14 to July 31 and to 33-cm tall common lambsquarters during 3 dates from August 3 to 7. Plots were tilled sequentially to produce plants of the desired size. Glyphosate was applied on 18 dates, which ranged widely in environmental conditions. Daily temperatures were as low as 10 C and as high as 33 C on the day of application. Despite these variations, common lambsquarters control was 98 to 100% at 14 days after treatment on 17 of the 18 application dates. On the remaining date, common lambsquarters was not controlled because 1 mm of rain fell as the application was being completed. These results suggest common lambsquarters can be consistently controlled over a range of environmental conditions when small plants are treated.

Replicated field experiments were conducted to determine the effect of rain on common lambsquarters control by glyphosate. Glyphosate at 0.84 kg ha⁻¹ was applied to common lambsquarters at 0.5, 1, 2, and 4 hr prior to a simulated rainfall. Rainfall was simulated by applying high volumes of water with a field sprayer. Two glyphosate formulations were tested with and without the addition of 0.25% nonionic surfactant. Common lambsquarters was up to 30-cm tall in 2005 and up to 25-cm tall in 2006. Common lambsquarters control by glyphosate was reduced by simulated rain after 4 hr in both years. Without rainfall, glyphosate formulation or the addition of surfactant did not affect the level of common lambsquarters control in 2005 and control exceeded 90%. In 2005, additional surfactant increased control with both glyphosate formulations with or without rainfall and control exceeded 95% without rainfall.

Two demonstrations were conducted to determine if the application of dust affects common lambsquarters control by glyphosate. At two field locations in Wisconsin, dust, which was generated with a lawn mower or leaf blower, was spread over common lambsquarters. In paired plots, the dust was removed from one plot by spraying a high volume of water on the plot. After the leaves dried, the plots were sprayed with 0.84 kg ha⁻¹ of glyphosate. At both locations, the application of dust visually reduced common lambsquarters control and the plants appeared to be nontreated at one site.

Numerous factors affect the ability of glyphosate to control common lambsquarters. Growth stage, glyphosate rate, rain, and dust affected control in these experiments and demonstrations. Other factors such as time of day, carrier volume, and potentially resistant biotypes may also affect control. Glyphosate applications at early common lambsquarters growth stages should increase the consistency of performance, but may not overcome some of these factors.