

## **Manganese Deficiency and Fertilization of Soybeans**

James J. Camberato  
Revised March 2004

### **Precautions for mixing manganese fertilizers with glyphosate**

Extensive research in Michigan (1) and Virginia (2) has shown that Mn fertilizers tank-mixed with glyphosate greatly reduce the effectiveness of glyphosate. The amount of reduction in weed control is dependent on the weed, Mn fertilizer, glyphosate formulation, and adjuvant. Weed control decreases may be as great as 50%. Reductions in control of common lambsquarters, large crabgrass, morningglory spp., smooth pigweed and velvetleaf were documented in these studies.

In the Michigan studies, Mn sulfate, MnEAA (Mn-ethylaminoacetate), and Mn lignin sulfonate reduced glyphosate efficacy, but Mn-EDTA did not. Adding the adjuvants diammonium sulfate (AMS), EDTA, and citric acid lessened the reductions in weed control to various levels dependent on the Mn source. In the Virginia studies Mn-glucoheptonate reduced glyphosate efficacy more than Mn lignin sulfonate. A Fact Sheet from Monsanto Company states: "User assumes responsibility for weed control and plant health risks associated with tank mixtures of Roundup WeatherMAX and manganese fertilizers" (3).

(1) Bernards, M. K. Thelen, and D. Penner. 2002. The manganese fertilizer antagonism of glyphosate story for 2002. [www.css.msu.edu/varietytrials/corn/Cropping%20Systems/mngly.pdf](http://www.css.msu.edu/varietytrials/corn/Cropping%20Systems/mngly.pdf)

(2) Bailey, W.H., D.H. Poston, H.P. Wilson, and T.E. Hines. 2002. Glyphosate interactions with manganese. *Weed Technology* 16:792-799.

(3) Monsanto Company. 2003. Recommendations for the use of Manganese with Roundup WeatherMAX<sup>®</sup> Herbicide in-crop on Roundup<sup>®</sup> Ready Soybeans. [www.nachurs-alpine.com/ images/Monsanto%20Manganese%20Recommendations%20061903.pdf](http://www.nachurs-alpine.com/images/Monsanto%20Manganese%20Recommendations%20061903.pdf)