

# **MANGANESE NUTRITION OF GLYPHOSATE-RESISTANT AND CONVENTIONAL SOYBEANS**

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## **ABSTRACT**

There is evidence to suggest that insertion of the gene that imparts glyphosate resistance in soybeans may have altered physiological processes that affect manganese (Mn) uptake and metabolism. This study was conducted in order to determine if glyphosate-resistant soybeans respond differently to applied Mn than conventional soybeans. The glyphosate-resistant soybean variety KS 4202 RR and its conventional isolate were grown on a Crete silt loam soil with a pH of 6.9 at the North Central Kansas Experiment Field. Granular manganese sulfate was applied in late April to give rates of 2.5, 5 and 7.5 lb Mn/a. A no Mn check plot also was included. Soybeans were planted with out tillage on May 10, 2005. The experiment was sprinkler irrigated. Yield of the conventional soybean variety was 12 bu/a greater than its glyphosate-tolerant isolate. Addition of Mn improved yield of the glyphosate-resistant variety but the yield of the conventional isolate decrease with increasing Mn rate.

## **INTRODUCTION**

There is evidence to suggest that glyphosate-resistant soybean yields may still lag behind that of conventional soybeans. Many farmers have noticed that soybean yields even under optimal conditions are not as high as expected. In Kansas, average yield seldom exceeds 60-65 bu/acre even when soybeans are grown with adequate rainfall and/or supplemental irrigation water. The addition of the gene that imparts herbicide resistance may have altered other physiological processes. Some scientists suggest that soybean root exudates have been changed and plants no-longer solublize enough soil manganese. Application of glyphosate also may retard manganese metabolism in the plant. Addition of supplemental manganese at the proper time may correct deficiency symptoms and result in greater soybean yields. Currently there is little information on manganese fertilization of soybeans in Kansas.

The objective of this research was to determine if glyphosate-resistant soybeans respond differently to applied manganese than conventional soybeans and if so to develop fertilization strategies that will prevent or correct deficiencies leading to improved yield for soybean producers.

## **METHODS**

The glyphosate-resistant soybean variety KS 4202 RR and its conventional isolate were grown on a Crete silt loam soil with sprinkler irrigation. The soil pH in the top 6 inches of soil at the site was 6.9. Manganese (Mn) fertilizer treatments consisted of broadcast, pre-plant soil applications of manganese sulfate at rates of 2.5, 5, and 7.5 lb/a A no Mn check treatment was also included. The experimental design was a randomized complete block with a split-plot

arrangement. Whole plots were herbicide resistant and conventional soybean varieties (isolines of KS 4202) and split plots were Mn rates.

## RESULTS

Yields were affected by an interaction between soybean variety and Mn rate (Figure 1). In the glyphosate-resistant variety KS 4202 RR, yields increased with addition of Mn up to the 5 lb/a rate. Yield of the conventional variety KS 4202 was 12 bu/acre greater than its glyphosate-resistant isolate KS 4202RR when no Mn was added. Yield of the conventional variety declined with increasing Mn rate. Tissue Mn concentration (upper most expanded trifoliolate at full bloom) in the herbicide resistant isolate was less than half of the conventional variety when no Mn was applied (Figure2).

Figure 1. Soybean yield response to applied manganese.

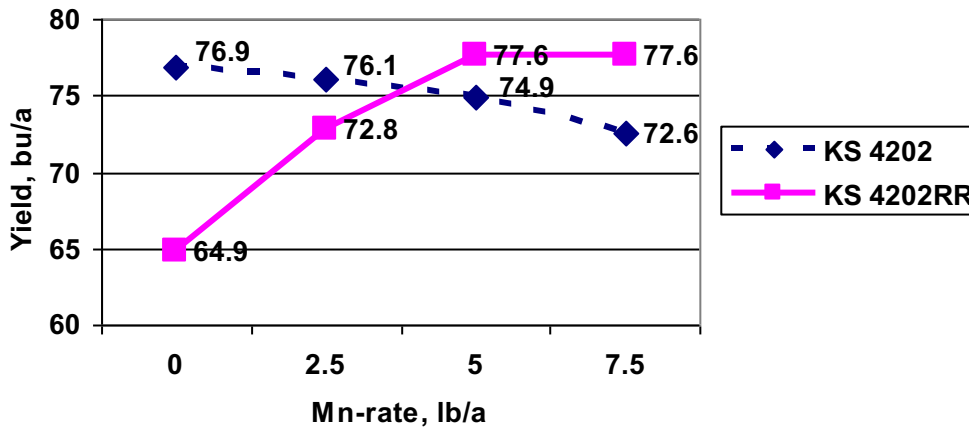


Figure 2. Soybean leaf tissue Mn concentration (uppermost expanded trifoliolate at full bloom).

