WEED DIVERSITY AND YIELD IN GLYPHOSATE-TOLERANT SOYBEAN FROM MINNESOTA TO LOUISIANA. Dean Peterson, Julio Scursoni, and Frank Forcella, Agricultural Science Technician, Instructor, and Research Agronomist; USDA-ARS, Morris, MN 56267; and University of Buenos Aires, Argentina.

Since their introduction in 1996, the use of glyphosate-tolerant soybean has grown from 5% of the total soybean acreage to 71% in 2001 or 54 million acres out of 75.4 million acres planted in the United States. The widely excepted use of this technology in North America facilitates examination of this new technology on a regional basis. In addition, this research provides an opportunity to compare several factors and address some of the current concerns in the European community regarding glyphosate-tolerant crops. The objectives of this study were to observe difference in yields along a latitudinal transect and compare yields to changes in weed diversity in glyphosate-tolerant soybean production systems. Data were collected in 2001 and 2002 from established weed management trials at 12 experiment stations along a north-south gradient throughout the central United States. The states (and number of experiment stations) included Minnesota (4), Iowa (3), Missouri (2), Arkansas (2), and Louisiana (1). Yield and weed diversity data were collected from the following selected herbicide treatments: One-Pass Glyphosate, Two-Pass Glyphosate, Standard Pre plus Glyphosate, Standard Pre only or Pre plus Standard Post or Standard Post only, and Weedy Check. Field methods and calculations included: yield samples collected by plot, density recorded by species, percent cover recorded by species, Shannon diversity (H') calculated by plot, effective species richness ($e^{H'}$) calculated by plot, 3 to 4 plots per treatment sampled at each location, and field sampling occurred in autumn, just prior to harvest. For crop yields, there were no latitudinal trends for weedy checks, possible slight decreases in maximum yield with latitude for 2-Pass Glyphosate and Pre plus Glyphosate treatments, and strong positive increases in maximum yield with latitude for 1-Pass Glyphosate and Pre/Post treatments. For weed diversity, there were not latitudinal trends, but distinct treatment effects: weedy checks had highest weed densities, but not necessarily the highest $e^{H'}$, and this was consistent between years; One-Pass Glyphosate <u>always</u> had high diversity; Standard Pre + Glyphosate had the best weed control and lowest diversity; and Two-Pass Glyphosate and Standard Pre + Post also had low diversities. Where weed species diversity is concerned, the One-Pass Glyphosate treatment allowed for the expression of the greatest diversity. In this case, the glyphosate suppressed the dominant species and allowed less common species too express themselves in the population, thereby increasing species richness. If weed diversity is valued by society, as in Europe, farmers can maintain better diversity with a One-Pass Glyphosate application than with traditional treatments and still maintain high yields, but only at higher latitudes. Below 40 N latitude, yields in the One-Pass Glyphosate treatment decreased by about 10%, and continued to decrease by about 2% per degree of latitude. There are many factors to consider when using latitude as an index. These factors may include: temperature, rainfall, growing degree days, varieties, cropping histories, and tillage management practices. Which of these factors explains the loss of yield in One-Pass Glyphosate is unknown.

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2002 North Central Weed Science Society Abstracts 57:129.