Researchers have established a link between plant nutrition and the severity of disease, including disease-suppressing effects of Ca, K, Cl, Mn, B, and P (Brennan, 1992; Rupe et al., 2000; Sweeney et al., 2000; Thomason et al., 2001; Fixen et al., 2004). Many studies have evaluated interactions between diseases and plant nutrition in small grains (Brennan, 1992; Gasper et al., 1994; Howard et al., 1999; Kettlewell et al., 2000; Mann et al., 2004; Sanogo and Yang, 2001; Thomason et al., 2001). However, such research on soybean has primarily evaluated soil-borne diseases (Howard et al., 1999; Rupe et al., 2000; Sanogo and Yang, 2001). Similarly, soil fertility appears to be related to problems with soybean aphids (Aphis glycines Matsumura) (Myers and Gratton, 2006). Low soil K availability and low leaf K levels were associated with an increase in the abundance of aphids as well as rates of aphid population increase. Using KCl both as a pre-plant or foliar application combined with a fungicide may synergistically reduce the severity of diseases and increase yield. The possible benefits of a foliar application of KCl include reduced application costs, improved disease suppression and nutrient response of the crop, and increased application flexibility in response to environmental conditions during the growing season. Interactions between fertilizer and fungicide management programs have not been examined in the central United States. We hypothesized that soybean may benefit more from foliar fungicide applications when the plants grow in soils low in K, where they could be more susceptible to some foliar diseases. Potassium chloride (KCl) preplant- or foliar-applied with fungicides to soybean [Glycine max (L.) Merr.] may allow farmers to increase yields when soil potassium (K) availability is reduced and/or when Septoria brown spot (SBS) (Septoria glycines), frogeye leaf spot (FLS) (Cercospora sojina), or sudden death syndrome (SDS) (Fusarium solani (Mart.) Sacc. f. sp. glycines) are present. The objective of this research was to determine soybean yield response, severity of foliar diseases, and plant tissue concentrations of K and Cl in plots treated with preplant, soil-applied KCl and a foliar application of KCl alone or in combination with foliar strobilurin fungicide applications at two stages of development. Experiments were conducted in northeastern (Novelty) and southeastern (Qulin) Missouri in 2006 and 2007 on soils with low to medium K.

Leaf K concentrations increased 0.14 to 0.61% following preplant KCl compared to non-treated or foliar KCl (data not presented). Leaf Cl concentrations increased significantly with preplant KCl at Qulin and foliar KCl at R4 at Qulin and Novelty (data not mentioned). At Novelty, preplant KCl reduced the severity of SBS and FLS up to 6% (data not presented), and increased yield 5 bu/acre, while foliar KCl increased yield 2 bu/acre (Figure 1). An R4 application of strobilurin fungicides increased yields 3.4 to 5.4 bu/acre at Novelty. At Qulin, soybean yield increased 5.8 bu/acre with preplant KCl (Figure 1), while there were variable effects of fungicides on the severity of SBS, FLS, or SDS (data not presented), and no yield increase due to fungicides or foliar KCl (Figure 1). Foliar applications of KCl were no substitute for preplant KCl.
Figure 1. Soybean grain yield response to no KCl (muriate of potash), preplant application of KCl at 170 to 180 lb/acre K, and foliar application of KCl at 16 lb/acre K at Qulin and Novelty, Missouri. Data were combined over fungicide treatments, foliar application timings, and two years (2006 and 2007). Letters that are different indicate a significant difference between treatments for each site ($P < 0.05$).

References


