

Effects of Silicon Applications on Soybean Rust Development Under Greenhouse and Field Conditions

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Abstract

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Soybean rust (SBR), caused by *Phakopsora pachyrhizi*, is one of the most destructive fungal diseases affecting soybean production. Silicon (Si) amendments were studied as an alternative strategy to control SBR because this element was reported to suppress a number of plant diseases in other host-pathogen systems. In greenhouse experiments, soybean cultivars inoculated with *P. pachyrhizi* received soil applications of wollastonite (CaSiO_3) (Si at 0, 0.96, and 1.92 t ha⁻¹) or foliar applications of potassium silicate (K_2SiO_3) (Si at 0, 500, 1,000, or 2,000 mg kg⁻¹). Greenhouse experiment results demonstrated that Si treatments delayed disease onset by approximately 3 days. The area under disease progress curve (AUDPC) of plants receiving Si treat-

ments also was significantly lower than the AUDPC of non-Si-treated plants. For field experiments, an average 3-day delay in disease onset was observed only for soil Si treatments. Reductions in AUDPC of up to 43 and 36% were also observed for soil and foliar Si treatments, respectively. Considering the natural delayed disease onset due to the inability of the pathogen to overwinter in the major soybean production areas of the United States, the delay in disease onset and the final reduction in AUDPC observed by the soil Si treatments used may lead to the development of SBR control practices that can benefit organic and conventional soybean production systems.
