PHOSPHORUS FERTILITY AND SUDDEN DEATH SYNDROME

Sudden death syndrome (SDS) has been confirmed in the lower Midsouth soybean production region as reported in a previous article on this website. This indicates that this disease may become a major soybean pest in the more southern portion of the region in coming years. During the 2013-2015 cropping seasons, its presence was significant in Missouri and Tennessee.

Soybean pests are best managed if preventive practices can be instituted before significant onset of the disease or infestation by the pest. In the case of SDS, two tools are available to manage or lessen the effect of this disease–seed treatment (click here for research results), and resistant varieties (click here for Univ. of Tenn. trials with SDS ratings). Control of the disease with foliar fungicides is not an option.

A report of research results from Kansas provides support for another tool to use against SDS. In that report, entitled "Effect of soil-test phosphorus and phosphorus fertilization on the severity of soybean sudden death syndrome", authors Adee, Diaz, and Little provide evidence that long-term phosphorus (P) fertilization to keep soil P at optimum levels was associated with reduced SDS severity and subsequent soybean yield loss to this disease. Details of that research follow.

A long-term fertilizer application experiment was conducted on a silt loam soil near Topeka, Kansas (39 deg.latitude) since 1983. The site was in a bi-annual corn-soybean rotation, and Nitrogen (N), P, and potassium (K) fertilizer treatments were applied before the corn crop in the rotation.

P fertilizer treatments over the 31-year period were 0, 30, and 60 lb. P_2O_5/acre prior to 2014.

Soil samples were analyzed for soil-test P before planting Asgrow 3833 soybean variety on the site in 2014.

There was no record of SDS at this site prior to 2014. However, in 2014, foliar symptoms of SDS were observed at the R5 growth stage, and foliar symptom severity was rated as the percentage of leaf area with SDS symptoms. Population densities of the causal organism (*Fusarium virguliforme*) expressed as colony forming units (CFUs) were measured in the soil following soybean harvest.

The uppermost soybean trifoliate leaflets were analyzed for total P at the R6 growth stage. Soybean plant height was measured at maturity, and yield data were collected.

P fertilization over the period prior to 2014 significantly affected measured variables in 2014. Specifically, in treatments where 0, 30, and 60 lb. P_2O_5/acre were applied, soil-test P was 6.5, 14.9, and 45.6 ppm, SDS severity was 58%, 43%, and 23%, leaf P concentrations were 0.15%, 0.18%, and 0.26%, CFUs were 71, 62, and 42/g. of soil, plant height was 30, 36, and 37 in., and seed yield was 34, 45, and 53 bu/acre, respectively.

Interestingly, prior to 2014 when SDS was not present, the highest P rate in the study resulted in

a yield increase of about 6 bu/acre compared to the yield increase of 18.9 bu/acre in 2014 when SDS was a significant presence.

Thus, as the P rate increased, the severity of SDS decreased, and this was associated with taller plants and greater seed yield. Also, the severity of SDS was negatively correlated with soil-test P (R^2=0.69) and leaf tissue P (R^2=0.81).

The above results suggest that maintaining an optimum level of soil P may be another tool to decrease the effect of SDS in the Midsouth.

The above results provide further impetus for adhering to the age-old recommendation of testing soil for nutrient status, and adding the amount of P necessary to maintain the soil level at least slightly above the medium soil test category (in the above study, soil test P resulting from the 60 lb. P_2O_5/acre rate was 45.6 ppm, which equates to about 91 lb P/acre. This value is just above the high end of the medium category designated by the MSU soil testing lab).

K application over the 31-year period at the test site showed no relation to SDS in this study.

Composed by Larry G. Heatherly, Oct. 2016, larryheatherly@bellsouth.net