Dec 3rd, 12:00 AM

Sudden death syndrome management update

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Sudden death syndrome (SDS) was severe in many fields across Iowa in 2014, resulting in yield loss and frustration for farmers. There are a few positive things that we can learn in a year like this, though. For one, many soybean varieties were pushed to their limits, allowing farmers to get a really good evaluation of the genetic resistance for SDS in a variety. Additionally, other beneficial management strategies can be identified that complement variety resistance.

This talk will highlight some of the SDS management research completed over the past several years by faculty members at Iowa State University and in neighboring states. This also includes research from many graduate students.

Much of this research is funded through the soybean check off from Iowa Soybean Association, the North Central Soybean Research Program, and the United Soybean Board. We thank all of our sponsors for this research.

SDS and glyphosate

Glyphosate is used to control weeds in soybean; however, its effect on SDS is not clearly understood. Therefore, the objective of this study was to examine the impact of glyphosate on SDS, yield, and plant nutrition under field conditions. Fourteen field experiments were conducted in Iowa, Illinois, Indiana, Michigan, Wisconsin, and Ontario, Canada during 2011 to 2013. The experiment consisted of six treatment combinations of glyphosate and herbicides not containing glyphosate. Results indicated that the various herbicide treatments had no effects or interactions on disease (Figure 1). Glyphosate treatments also tended to yield more than herbicide treatments not containing glyphosate. Additionally, there was no interactions between glyphosate treatments and total manganese in plant tissue. The interaction of glyphosate with other nutrients in plant tissue was inconclusive. This fourteen location-year study demonstrated that glyphosate application did not increase SDS severity or adversely affect soybean yield under field conditions.

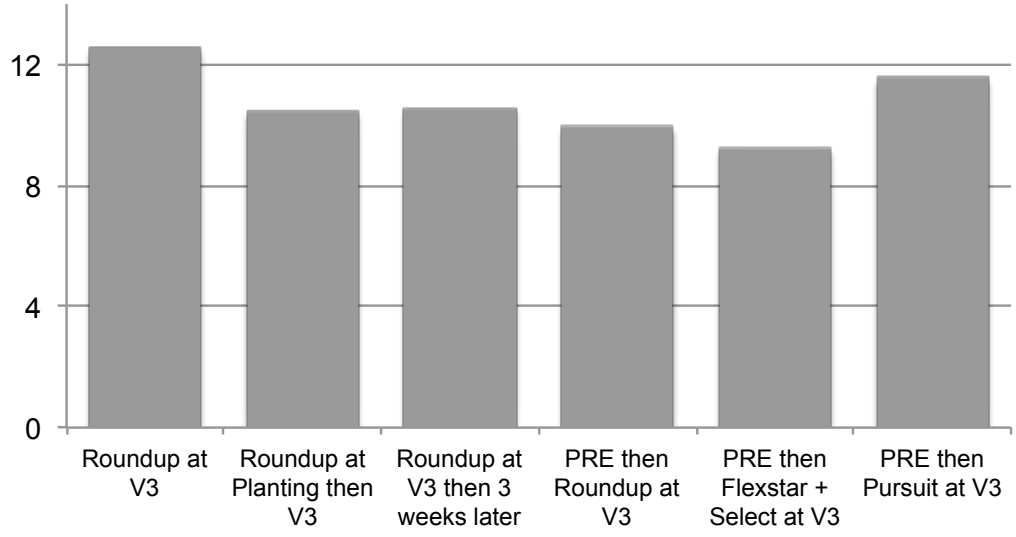

Figure 1. Mean foliar disease index (FDX), which is a combination of disease incidence, and severity in six different herbicide treatment combinations averaged across 14 locations to examine the effect of glyphosate on SDS of glyphosate-resistant soybean.

ILeVO® as a new tool

The foundational management strategy for SDS is using resistant varieties. However, in years such as 2010 or 2014 when environmental conditions are favorable for disease development, it is evident that resistance alone does not provide adequate control or reduce farmer risk sufficiently. Also, SDS continues to move into new areas. An effort to combat SDS in fields is ILeVO, a new seed treatment by Bayer CropScience. We evaluated ILeVO in many environments including fields with different SCN populations and planting dates (Table 1), using different product formulations. The main conclusion was that ILeVO seed treatment was effective at reducing SDS severity levels in many different environments compared to control plots. Research also revealed planting earlier than mid May increases SDS risk.

Table 1. Evaluation of ILeVO on soybeans planted at different dates at two locations in Iowa.

Approximate Planting Date	Disease index	
	Industry Standard	Industry Standard + ILeVO
Hinds Farm, IA (Inoculated)		
May 1	39.9	27.3
May 15	50.4	17.1
May 30	35.2	11.5
June 15	44.8	16.6
Roland, IA (Non-inoculated)		
May 1	46.6	39.8
May 15	78.8	22.4
May 30	79.5	55.9
June 15	44.8	17.4

Fusarium virguliforme detection

A study was conducted in five different labs to determine the most effective diagnostic protocol for quantifying *Fusarium virguliforme* on roots and in soil. The first study was an extensive determination of the most appropriate qPCR protocol to quantify DNA of *F. virguliforme* in soybeans grown under different management strategies. We observed significant differences among the assays in ability to correctly identify *F. virguliforme* and assay quantification limits (Table 2). The most effective and consistent assay across different laboratories was identified and is now being used to evaluate management strategies in the other research.

Table 2. Percentage of true positive results in confirmed *F. virguliforme* samples and false positive results in confirmed negative samples as shown by six different qPCR assays.

Assay	False positive in negative isolates	True positive
A	8	93
B	32	92
C	54	92
D	3	83
E	60	92
F	7	88

Fine-tuning fungicide decisions in Iowa

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There are many questions about the use of fungicide in corn and soybean. These include when to apply fungicide, where to apply the fungicide, and if fungicides are beneficial before or after hail events. Iowa State University has many ongoing projects with the goal of helping to answer these questions. Some of the research is funded by BASF, the Iowa Soybean Association, and USDA-NIFA through the North Central IPM Center. We thank our sponsors for their support. Data are still being summarized so are not included in this report, but will be presented at the meeting. The presentation will cover:

Timing and placement

Many farmers and agribusinesses are interested in applying fungicide at different timings than the commonly recommended R1 in corn and R3 in soybean. Interest in in-furrow applications and V5-V7 applications in corn and soybeans has grown. For farmers who have in-furrow application abilities, some believe that applying a fungicide may protect the seedling while the early vegetative stage applications may be tank mixed with an herbicide. We have a project comparing fungicide application in-furrow, application at V5-V7, and applications at R1 (corn) and R3 (soybean) to determine plant and yield response to these applications.

In-furrow

A multi-state in-furrow study in both corn and soybeans further addresses questions about applying in-furrow pesticide and fertilizer treatments. The corn project includes an insecticide, fungicide, starter fertilizer, and a combination of all the treatments while the soybean portion includes a starter fertilizer, two fungicides, and a combination of starter fertilizer and fungicide. The goal is to identify a treatment that maximizes return on investment for those interested in in-furrow applications.

Hail events

Many farmers and agronomists have been interested in the effects of fungicide application before or after a hail event. This is addressed by an ongoing project in both corn and soybean that involves hail at different reproductive stages with various commercially available fungicides applied before and after hail. Hail is simulated using a machine that can propel ice at high velocities into crops causing defoliation and other tissue injury.

Weather parameters

A final project involves trying to understand corn and soybean yield response to fungicide application in relation to weather parameters. Weather stations were installed near field plots and fungicides were applied at multiple timings. The stations recorded temperature, relative humidity, rainfall, and leaf wetness. The goal is to develop fungicide application recommendations based on these weather parameters and yield responses to better predict economical responses.