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CORN AND SOYBEAN
INITIATIVE

Partnership Matters

ISU Research and Extension

January 2007

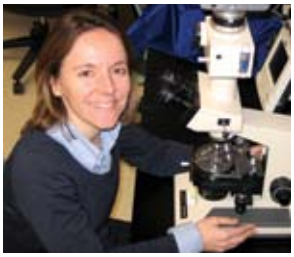
RESEARCH BRIEF—

Sudden death syndrome dynamics

What's new. A soybean disease called sudden death syndrome (SDS) has reared its ugly head in parts of Iowa over the past decade. The disease develops as a root rot and is caused by the infection of soybean roots by a soilborne fungus, *Fusarium solani* f.sp. *glycine*. The fungus produces a toxin that causes foliar symptoms to develop. Soybean yield losses from SDS can range from only slight to 100 percent. Actual yield loss may depend in part on when plants become infected and can vary dramatically from field to field. SDS is often first observed infesting round or elliptical patches in fields, but under favorable conditions for disease development, the infested area can spread through the entire field.

ISU research. SDS was first discovered in Iowa soybean fields in 1993. Research on the extent and severity of SDS in Iowa was conducted by X. B. Yang, ISU plant pathologist, in the mid- to late 1990s. Factors that underlie the variability of disease development still need investigation, including components of the field environment. These components include conditions that trigger aggressiveness of different strains of *Fusarium solani* present in a field and can determine why some soybean plants can be infected yet not express foliar symptoms or experience severe yield loss.

ISU plant pathologist Leonor Leandro, funded by the Iowa Soybean Association, is beginning studies that should help agronomists understand factors that favor disease development so that practical and economically effective management tactics can be developed for producers to use in SDS problem fields.



ISU plant pathologist Leonor Leandro

What's next. Studies will begin to explore the following questions:

- What level of the pathogen is needed in the soil for disease development to progress?
- How early do roots need to be infected for disease to reach economically significant levels?
- How does the infection spread within the soybean root and lead to vascular damage resulting in increased yield loss?
- What are the best methods for screening for SDS resistance among varieties to help farmers make management decisions?
- What conditions trigger infected plants to express foliar symptoms so that scouting and field diagnosis can be facilitated?

continued—

RESEARCH BRIEF—

Stored grain: A new use for oxygen

What's new. Grain in storage is a perishable commodity. Preventing, or at least slowing, losses to stored grain is important in maintaining quality and marketable volume. Grain storage losses are caused by both insect damage and microbial growth. Fortunately, we can manage the key factors involved to avert rapid damage. These include lowering moisture content and temperature at binning and keeping the grain in good condition. Sometimes fungicides and insecticides are added during binning to retard damage to grain. As we face potential increases in corn acreage, coupled with the need for additional grain storage to meet needs from grain ethanol production and increased livestock feeding operations, effective grain storage practices will increase in importance.

ISU research. Practical uses of innovative materials for protecting grain begin with research that shows how the materials affect both the grain itself and the organisms in the grain that are targeted for control. One material being examined is ozone (O_3). ISU agricultural engineer Carl Bern and his research team are looking at the use of ozone gas, a highly reactive molecule made up of three oxygen atoms, to extend storage life of grain, especially corn. Ozone naturally occurs around electrical arcs (lightning) and is a very active oxidizing agent. Ozone generators are available that produce ozone at relatively low cost. While toxic, ozone breaks down fairly quickly to typical oxygen molecules (O_2) in the air. Ozone has been used in special industrial situations to kill organisms, including some insects and many microorganisms. Possible positive and negative properties of ozone include the following:

Grain in storage: A perishable commodity

Positive properties

- Ozone is naturally occurring, easy to generate and relatively cheap. Food grade and organic grain storage could particularly benefit.
- Ozone is toxic to organisms but quickly breaks down completely to nontoxic oxygen gas, and its chief reaction product with organisms is carbon dioxide.
- Ozone has a pronounced smell that allows its presence to be detected by humans, but the smell is lost as the ozone breaks down.
- Data show ozone treatment can detoxify some mycotoxins, particularly aflatoxin, but additional research is needed before this use is practical.

continued—

Sudden death syndrome dynamics, *continued*—

- How do soil conditions, especially infestation with soybean cyst nematodes, affect SDS development? ISU is part of a multi-state research program focused on the relationship of SDS and soybean cyst nematode infestation.

Studies will be conducted that incorporate both laboratory and field work and results will be available through extension programming.

Learn more. For more information, go to the ISU Extension Distribution Center's Online Store (**www.extension.iastate.edu/store)** for PM 1570, *Soybean Sudden Death Syndrome.* For articles on soybean root diseases, including SDS, search the archives of the *Integrated Crop Management* newsletter at **www.ent.iastate.edu/ipm/icm**.

ISU MEMBER PROFILE—

Jim Fawcett

Extension field crops specialist, southeast Iowa

Origin

Raised on a farm near West Branch, Iowa, in Cedar County

Training

- Ph.D. in weed science, University of Wisconsin–Madison, 1986
- M.S. in crop production and physiology, Iowa State University, 1980
- B.S. in agronomy, Iowa State University, 1978

Extension positions/other experience

- ISU Extension field crops specialist for Benton, Linn, Iowa, Johnson, Jones, Keokuk and Washington counties, October 1988–present
- Pesticide research and product development with Stauffer and ICI chemical companies in California, Iowa and North Carolina, 1986–1988
- ISU Extension area crops specialist in northwest Iowa, December 1980–December 1982

Notable achievements

- ISU Extension Agricultural Award: Crops, 2000
- Epsilon Sigma Phi, Extension Professional's State Mid-Career Award, 1999
- ISU Board of Regents Award for Staff Excellence, 1996
- Member of Gamma Sigma Delta, Phi Kappa Phi and Epsilon Sigma Phi societies
- Published four articles in refereed journals and co-authored more than 30 articles in non-refereed journals

Personal

- Married to Kathleen, nurse manager at University of Iowa Hospitals
- Enjoy travel (have traveled through all 50 states), boating and relaxing in the hot tub

Quotable quote

"Having studied and observed agriculture in Europe, New Zealand, Australia, Costa Rica, Brazil and the East and West coasts of the United States, I've come to appreciate the great soil, climate, infrastructure and people resources we have here in Iowa."

Stored grain: A new use for oxygen, *continued*—

Negative properties

- Ozone is an oxidizer and may cause dry matter losses to the grain, although such losses are likely minor.
- Ozone is a toxic gas, so monitoring and other safety oversights during use are necessary.
- Once the ozone has broken down, there is no remaining protective effect; however, reduction of initial insect and microbial populations help prolong storage life.

What's next. Further studies are planned concerning the use of ozone in grain protection, particularly for special situations. With the potential volatility in corn acreage and production levels in future Iowa crop years, and with at least some increase in longer term grain storage for ethanol and other extended uses likely, grain storage life will be a greater issue. Ozone as a grain treatment may have particular value in special situations; for example, food grade commodities, preserving high-value seed stocks and in emergency grain treatment (flooding, mycotoxins, etc.) issues.

Learn more. Contact Carl Bern for additional information about ozone research and other grain storage information. Phone 515-294-1270 or e-mail **cjbern@iastate.edu**.

ISU BY THE NUMBERS—

The ISU Seed Testing Laboratory

Year seeds were first tested on campus	1895
Years of combined seed testing experience (by current staff)	95
Years of ISU Seed Testing Laboratory experience (by longest current employee)	35
Undergraduate students now working at the ISU Seed Testing Laboratory	48
Species of field crops/vegetables/flowers tested at the lab	over 300
Vials of seed in the purity lab herbarium used for identification	6,575
Pathogens the seed health lab can check for to certify seeds for phytosanitary export	over 200
Herbicide and insect biotech traits the trait testing lab can check for	15
Equivalent acres of corn "planted" in a typical day for corn germination testing	2

For more information, see **www.seeds.iastate.edu/seedtest**.

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