

ILLINOIS

SOYBEAN

RUST

PROGRAM

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INTRODUCTION

The Illinois Soybean Rust Program is a coordinated effort between the Illinois Soybean Checkoff Board, Illinois Fertilizer and Chemical Association, Illinois Seed Trade Association, Professional Crop Consultants of Illinois, University of Illinois, U of I Extension Service, Southern Illinois University, National Soybean Research Center at the U of I, USDA-APHIS & -ARS and the Illinois Department of Agriculture. The purpose of the program is to detect and eradicate soybean rust if and when it appears in Illinois. If soybean rust goes undetected and untreated, it can cause up to an 80% reduction in soybean yields.

In the summer of 2003, Illinois soybean producers suffered a tremendous crop loss due to the infestation of Soybean Aphids. By the time the aphids were detected and economic justifications were given for spraying, much valuable time was lost during the planning process because it started too late. Advanced planning is the key to effectively handling any issue. The Illinois Soybean Rust Program is the best way to stay ahead of the problem of soybean rust so valuable time is not lost.

Although soybean rust is a serious threat to Illinois agriculture, there are a few factors that may help in our efforts to contain and eradicate the problem. Losses from soybean rust are covered under the Federal Crop Insurance Program like other crop losses. It took four years for soybean rust to spread to most areas of Brazil, so Illinois may have some time to protect its crops from damage. Finally, soybean rust cannot over-winter below freezing temperatures. This means that it will have to be re-introduced every spring. This also allows for the possibility for planning and treatment of crops.

SYNOPSIS OF SOYBEAN RUST

Soybean rust, caused by the fungus *Phakopsora pachyrhizi*, may result in soybean yield losses of up to 80%. Although the disease has not yet occurred in the continental U.S., projected losses of \$7.1 billion per year were estimated in a 1984 economic risk analysis, although more recent estimates indicate less of a loss (up to \$2 billion per year) primarily because of the increase in fungicide management options. A less aggressive species, *P. meibomia*, also causes soybean rust in geographically limited areas and is not considered a threat to soybean production.

The first report of rust (*P. pachyrhizi*) was from Japan in 1902. By the 1950s the disease was reported in most Asian countries. It was not until the 1990s that the disease was confirmed in the Western Hemisphere. The first report was from Hawaii in 1994. The disease was first found in South America in 1999 and is now in four countries. The continental U.S. is the only major soybean producing area in the world where soybean rust has not been found. The rapid spread of *P. pachyrhizi* and its potential to cause severe yield losses makes this the most destructive foliar disease of soybean.

Phakopsora pachyrhizi infects over 95 species of plants from more than 42 genera, including soybean and related *Glycine* species. Included in the list are many of the wild and edible legumes. The full host range of both rust species has not been clearly identified and may be complicated by pathotypes and differential reactions within host species. Included in the list is kudzu (*Pueraria lobata*), which is widespread in the U.S. and in parts of Illinois. This species as well as other hosts could serve as an inoculum reservoir or bridge host (alternative host) for *P. pachyrhizi* in the southern U.S. The large number of host species increases the likelihood that this pathogen will survive and over winter in the southern U.S., as well as in Central America. To our knowledge the fungus can only survive on living hosts and would not survive the temperate climate or the winters in Illinois.

Like most rust fungi, *P. pachyrhizi* produces a copious amount of spores that originate from structures called uredinia. These can develop 5 to 8 days after urediniospores germinate and infect leaves and can be reproduced as early as 9 days after infection. Urediniospore production can continue for up to 3 weeks. Uredinia may develop for up to 4 weeks after a single inoculation, and secondary uredinia will arise on the margins of the initial infections for an additional 8 weeks. Thus, from an initial infection, there could be first generation pustules that maintain sporulation for up to 15 weeks. Successful re-infection is dependant on the availability of moisture. At least 6 hours of free moisture is needed for infection with maximum infections occurring with 10 to 12 hours of free moisture. Temperatures between 15 and 28 C (~60-82F) are ideal for infection.

With the confirmed identification of the Asian soybean rust in South America, the U.S. Department of Agriculture's Animal Plant Health Inspection Service (APHIS), Agricultural Research Service (ARS), Cooperative State Education and Extension Service (CSREES), the United Soybean Board (USB), and other federal and state agencies are concerned about the introduction of soybean rust in the continental U.S. There are major efforts in place for surveillance, detection, and diagnosis of soybean rust by USDA-APHIS in conjunction with the CSREES Regional Plant Disease Diagnostic Centers, and the state of Illinois. APHIS has developed a National Strategic Action Plan for dealing with soybean rust (www.aphis.usda.gov/ppq/ep/pestdetection/soybean_rust/soybeanrust.html). Other web sites that have more information include: APSnet Feature: Soybean Rust: Is the U.S. Soybean Crop At Risk? (<http://www.apsnet.org/online/feature/rust/>), and Soybean Rust from The Plant Health Initiative (<http://www.planthealth.info/rust/rust.htm>).

IDENTIFICATION OF SOYBEAN RUST

Accurate diagnosis is critical to determine the first occurrence of soybean rust in the continental U.S., in the state of Illinois, and in a county and field within the state. Accurate and timely identification is the key to determining whether a response will be attempted and, if so, the extent, direction, and magnitude of that response.

The most common symptom of soybean rust occurs as small (2-5 mm²) tan to dark brown polygonal lesions. Within each lesion is one to many erumpent, globose uredinia where the spores are produced. Urediniospores are released through the circular ostiole. Lesions are found primarily on leaves. A hand lens of X20 or greater is useful to view the lesions. Incubating suspected infected leaves overnight in a closed bag under high humidity also may be needed to induce fungal sporulation. Spores of the soybean rust pathogen can be observed using a compound microscope. Early symptoms of soybean rust may be confused with bacterial pustule (caused by *Xanthomonas axonopodis* pv. *glycines*), or bacterial blight (caused by *Psuedomonas savastanio* pv. *glycinea*), and brown spot (caused by the fungus *Septoria glycines*), although none of these produce rust spores that can be easily diagnosed under a compound microscope.

In the field, lower leaves of plants usually show symptoms first as a few scattered lesions. As infection and colonization increase, leaves may turn yellow and prematurely defoliate. Under very rapid disease development the leaves may just turn dark and hang on the plant. Normally, as the plant matures and sets pods, infection progresses rapidly under the right environmental conditions (i.e., moisture, high humidity and heat) to cause high rates of infection in the middle and upper leaves of the plant. Clouds of spores have been observed within and above canopies of highly infected plant stands. Plant may become defoliated and mature up to 1 to 3 weeks before normal.

SCOUTING COMMITTEE ACTION PLAN

Training

- 1) Distribution of soybean rust sample bags similar to those displayed by Dr. Glen Hartman (i.e. rust-similar foliar disease photos, sampling procedure information, etc.). Primary contact for suspect sample noted as Distance Diagnostic Digital Imaging (DDDI) Units at the U of I Extension Offices throughout Illinois. Secondary contact for suspect sample noted as U of I Plant Clinic. Sample bag specifics coordinated via Jean Trobec (IFCA), and Dr. Dean Malvick (U of I), and Nancy Pataky (U of I). (**Completion date not available**).
 - Distributed to Certified Crop Advisors (CCAs)
 - Distributed to fertilizer dealerships
 - Distributed to seed companies
 - Distributed to Extension Unit Offices
 - Secondary distribution to producer clientele via stakeholders
 - Distribution funding possibly via Syngenta and Bayer
- 2) Distribution of “Soybean Rust Fact Sheet” (**Currently available resources**) and “Glossy Leaf Symptoms Photo Set” (**May need to be developed depending upon National Extension progress on the issue-determined by June 1**)
 - Distribution online
 - Link available at stakeholder websites
Commonly linked site via North Central Soybean Research Program
Soybean Rust website -
<http://www.ncipmc.org/soybeanrust/index.html>
 - PDF file available for stakeholder websites
 - Distribution via hard copy
 - Distributed to Certified Crop Advisors
 - Distributed to fertilizer dealerships
 - Distributed to seed companies
 - Distributed to Extension Unit Offices
 - Secondary distribution to producer clientele.
 - Funding via ISPOB
- 3) Articles on soybean rust, rust-similar foliar diseases, etc. and pertinent updates published in the University of Illinois’ *Pest Management and Crop Development Bulletin* published by **mid-June 2004**. (Note: Articles on this topic have been published in the *Pest Management and Crop Development Bulletin* since 2002. Those past articles can be found in *PMCDDB* issues:
 - No.4/April16, 2004: <http://www.ipm.uiuc.edu/bulletin/article.php?issueNumber=4&issueYear=2004&articleNumber=8>
 - No.2/April 03, 2003: <http://www.ipm.uiuc.edu/bulletin/pastpest/articles/200302h.html>
 - No.13/June 21, 2002: <http://www.ipm.uiuc.edu/bulletin/pastpest/articles/200218e.html>
 - No. 18/July 26, 2002: <http://www.ipm.uiuc.edu/bulletin/pastpest/articles/200213k.html>).
- 4) “In House” Extension training to review issue/acclimate units to issue at Extension regional meetings or at Regional Unit Leader meetings
 - Retraining of Units in photography for DDDI soybean rust pre-screening option (**Available online June 1**)
 - Retraining of Units in handling plant samples (**Currently available online**)
 - Specific Unit training in handling suspect soybean rust samples utilizing methods highlighted by sampling committee – (**Available online June 1**)
 - Retraining of Units in sample submission to U of I Plant Clinic (**Available online by June 1**)

- 5) Regional soybean rust training program (**June 2004**)
- Dr. Dean Malvick, Dave Feltes, and Dr. Susan Ratcliffe coordinating
 - Ninety plus locations (possible) throughout the state
 - Delivered via telenconference with Powerpoint CDs provided to locations
 - CDs stored at locations for future reference
 - Speaker list TBA
 - Estimated cost of \$50 per site
 - Twelve cooperating Northcentral states (tentative)

Pre-detection Scouting and Sample Submission

- 1) Producers, 1500 Certified Crop Advisors, Professional Crop Consultants, U of I Extension, SIU Agriculture Department Staff, IFCA Membership, Seed Dealers, Etc.
- “Look Low As You Go” - soybean rust vigilance program examining the lower quarter of plants
 - Examine the undersides of leaves on the lower quarter of plants
 - Suspect observation
 - Pre-screening via DDDI
 - Plant sample maintained utilizing sampling committee protocol
 - Digital photographs, up to 5, submitted to DDDI website via U of I Extension Units for prescreening
 - Plant sample stored following sampling committee protocol in refrigerator until diagnosis returned
 - Non-rust samples weeded out
 - Proposed two to three hour turn around between submission to website and diagnostician feedback
 - Specific soybean rust form available at DDDI website
 - Soybean rust diagnostician contact numbers available on website for pre-submission phone call
 - ~ Dean Malvick, (217) 265 - 5166
 - ~ Suzanne Bissonnette, (217) 333 - 4901
 - ~ Bruce Paulsrud, (217) 244 - 9646
 - ~ Nancy Pataky, (217) 333 - 0519
 - Unit DDDI locations
 - Possible non-Extension DDDI submission following training
(Pilot program – not available in 2004)
 - Suspect diagnosis – plant sample submitted via overnight mail to Nancy Pataky, U of I Plant Clinic
- 2) Extension Professionals
- ISPOB funded soybean disease survey (**June 2004 – August 2004**)
 - Coordinator - Dr. Dean Malvick
 - 7 Extension professionals
 - Suzanne Bissonnette, Champaign Extension Center, (217) 333-4901
 - Dennis Epplin, Mount Vernon Extension Center, (618) 242-9433
 - Robert Bellm, Edwardsville Extension Center, (618) 692-9808
 - Dave Feltes, Quad Cities Extension Center, (309) 792-2500
 - Matt Montgomery, Sangamon-Menard Extension Unit, (217) 782-4617
 - Jim Morrison, Rockford Extension Center, (815) 397-7714
 - Russ Higgins, Matteson Extension Center, (708) 720-7520
 - Surveys in several parts of Illinois

- Three week intervals
- Suspect samples submitted for pre-screening via DDDI and plant sample submitted to U of I Plant Clinic if needed for diagnosis

Post-confirmation Scouting and Sample Submission

- 1) Producers, 1500 Certified Crop Advisors, Professional Crop Consultants, U of I Extension, SIU Agriculture Department Staff, IFCA Membership, Seed Dealers, Etc.
 - Examine the lower quarter of plants
 - Suspect observation
 - Pre-screening via DDDI with observation database maintained via DDDI
 - Pre-screening via primary triage personnel with observations submitted to DDDI database
 - Suspect prescreening – Plant sample submitted via overnight mail to U of I Plant Clinic
- 2) Extension Professionals
 - ISPOB funded soybean disease survey (June 2004 – August 2004)
 - Coordinator - Dr. Dean Malvick
 - 7 Extension professionals
 - Suzanne Bissonnette, Champaign Extension Center, (217) 333-4901
 - Dennis Eppin, Mount Vernon Extension Center, (618) 242-9433
 - Robert Bellm, Edwardsville Extension Center, (618) 692-9808
 - Dave Feltes, Quad Cities Extension Center, (309) 792-2500
 - Matt Montgomery, Sangamon-Menard Extension Unit, (217) 782-4617
 - Jim Morrison, Rockford Extension Center, (815) 397-7714
 - Russ Higgins, Matteson Extension Center, (708) 720-7520
 - Surveys in several parts of Illinois
 - Three week intervals
 - Suspect samples submitted for pre-screening via DDDI and plant sample submitted to U of I Plant Clinic if needed for diagnosis

Available Soybean Rust Training and Resources

- Soybean Rust Fact Sheet available via North Central Soybean Research Program website - <http://www.ncipmc.org/soybeanrust/index.html>
- APSnet Feature: Soybean Rust: Is the U.S. Soybean Crop At Risk? - <http://www.apsnet.org/online/feature/rust/>
- Laboratory for Soybean Disease Research Website (Featuring Soybean Rust Information from Dr. Glen L. Hartman, National Soybean Research Center) - <http://www.soydiseases.uiuc.edu/>
- USDA-APHIS Soybean Rust Page - http://www.aphis.usda.gov/ppq/ep/soybean_rust/
- APHIS National Strategic Action Plan for Dealing with Soybean Rust - http://www.aphis.usda.gov/ppq/ep/soybean_rust/sbrplan12-03.pdf
- Articles on Soybean Rust available via back issues of the University of Illinois' *Pest Management and Crop Development Bulletin*
 - No.4/April16, 2004: <http://www.ipm.uiuc.edu/bulletin/article.php?issueNumber=4&issueYear=2004&articleNumber=8>
 - No.2/April 03, 2003: <http://www.ipm.uiuc.edu/bulletin/pastpest/articles/200302h.html>
 - No.13/June 21, 2002: <http://www.ipm.uiuc.edu/bulletin/pastpest/articles/200218e.html>
 - No. 18/July 26, 2002: <http://www.ipm.uiuc.edu/bulletin/pastpest/articles/200213k.html>).
- Regional soybean rust training program (**June 29, 2004**)
 - Sites available throughout the state
 - For a detailed list of host site locations visit the University of Illinois' IPM website - <http://www.ipm.uiuc.edu/>

University of Illinois Extension DDDI Unit Locations

COUNTY OFFICE	ADDRESS	CITY/ZIP	PHONE	FAX
Adams	330 S. 36 th St.	Quincy, 62301	217-223-8380	217-223-9368
Bond	POB 187	Greenville, 62246	618-664-3665	618-664-9227
Boone	930 W. Locust St.	Belvidere, 61008	815-544-3710	815-544-4606
Bureau	850 Thompson St.	Princeton, 61356	815-875-2878	815-875-2870
Calhoun/Jersey	818 S. Park St.	Hardin, 62047	618-576-2293	618-576-8013
Carroll	807D S. Clay St	Mt. Carroll, 61053	815-244-9444	815-244-3836
Cass	651 S. Job	Virginia, 62691	217-452-3211	217-452-7260
Champaign	801 N Country Fair	Champaign, 61821	217-333-7672	217-333-7683
Christian	1120 N Webster	Taylorville, 62568	217-287-7246	217-287-7248
Clark	15493 N State HW1	Marshall, 62441	217-826-5422	217-826-8631
Clay	235 Chestnut St.	Louisville, 62858	618-665-3328	618-665-4985
Clinton	1163 N 4 th St.	Breese, 62230	618-526-4551	618-526-4597
Coles	707 Windsor Rd.	Charleston, 61920	217-345-7034	217-348-7940
Cook Chicago South	8751 S. Greenwood	Chicago, 61619	773-768-7779	773-768-4818
Cook Chicago North	2840 N. Lincoln Ave.	Chicago, 60657	773-755-2223	773-755-7776
Cook/North Suburban	1699 Wall St.	Mt. Prospect, 60056	847-437-6449	847-437-7583
Cook/South Suburban	5527 Miller Circle Dr.	Matteson, 60443	708-720-7500	708-720-7509
Crawford	301 S. Cross St.	Robinson, 62454	618-546-1549	618-544-3222
DeKalb	1350 W. Prairie Dr.	Sycamore, 60178	815-758-8194	815-758-8199
DeWitt	POB 347	Clinton, 61727	217-935-5764	217-935-8932
DuPage	310 S CountyFarm Rd.	Wheaton, 61944	630-653-4114	630-653-4159
Edgar	210 W. Washington	Paris, 61944	217-465-8585	217-463-1192
Edwards	350 N. Seventh	Albion, 62806	618-445-2934	618-445-3746
Effingham	1209 Wenthe Dr.	Effingham, 62401	217-347-7773	217-347-7775
Ford/Iroquios	912 W. Seminary Ave.	Onarga, 60955	815-268-4051	815-268-4058
Franklin	1212 Rte 14 West	Benton, 62812	618-439-3178	618-439-2953
Fulton	15411 N IL 100 Hwy	Lewistown, 61542	309-547-3711	309-547-3713
Greene	RR3, Box 129C	Carrollton, 62016	217-942-6996	217-942-3827
Grundy	1802 N. Division St.	Morris, 60450	815-942-2725	815-942-9519
Hancock	550 N. Madison St	Carthage, 62321	217-357-2150	217-357-3598
Henry/Stark	26234 N 100 Ave	Galve, 61434	309-853-1533	309-853-1634
Jackson	402 Ava Rd.	Murphysboro, 62966	618-687-1727	618-687-1612
Jasper	1401 Clayton	Newton, 62448	618-783-2521	618-783-2232
Jefferson	4618 Broadway	Mt. Vernon, 62864	618-242-0780	618-242-0781
Johnson	208 E. Main St	Vienna, 62995	618-658-5321	618-658-2028
Kane	535 S. Randall Rd.	St. Charles, 60174	630-584-6166	630-584-4610
Kankakee	1650 Commerce Dr	Bourbonnais, 60914	815-933-8337	815-933-8532
Kendall	7775B IL Rte 47	Yorkville, 60560	630-553-5823	630-553-5871
Lake	100 S US Hwy 45	Grayslake, 60030	847-223-8627	847-223-9288
LaSalle	1689 N 31 st Rd. Ste 2	Ottawa, 61350	815-433-0707	815-433-5454
Lawrence	600 Cherry Lane	Lawrenceville, 62439	618-943-5018	618-943-4968
Lee	280 W. Wasson Rd	Amboy, 61310	815-857-3525	815-857-3527
Livingston	1412 S. Locust St.	Pontiac, 61764	815-842-1776	815-842-6547
Logan	980 N. Postville Dr.	Lincoln, 62656	217-732-8289	217-735-5837

University of Illinois Extension DDDI Unit Locations (continued)

COUNTY OFFICE	ADDRESS	CITY/ZIP	PHONE	FAX
Macon.....	2535 Millikin Pkwy	Decatur, 62526	217-877-6042.....	217-877-4564
Macoupin.....	210 N. Broad St.	Carlinville, 62626.....	217-854-9604.....	217-854-7804
Madison.....	900 Hillsboro	Edwardsville, 62025	618-650-7050.....	618-655-9951
Marion.....	1404 E. Main	Salem, 62881.....	618-548-1446.....	618-548-9891
Marshall/Putnam.....	327 Edward St.....	Henry, 61537.....	309-364-2356.....	309-364-2804
Mason.....	133 S. High.....	Havana, 62644.....	309-543-3308.....	309-543-6239
McDonough.....	3022 W. Jackson St.....	Macomb, 61455.....	309-837-3939.....	309-833-3019
McHenry.....	POB 1430	Woodstock, 60098.....	815-338-4747.....	815-338-4755
McLean.....	402 N. Hershey Rd.....	Bloomington, 61704	309-663-8306.....	309-663-8270
Monroe.....	901 Illinois Ave.	Waterloo, 62298	618-939-3434.....	618-939-7708
Montgomery.....	1 Industrial Park Dr.....	Hillsboro, 62049.....	217-532-3941.....	217-532-3944
Morgan.....	104 N. Westgate Ave. ..	Jacksonville, 62650	217-243-7424.....	217-243-1544
Moultrie/Douglas.....	122 S. Walnut St.....	Arthur, 61911	217-543-3755.....	217-543-3757
Ogle.....	421 W. Pines Rd	Oregon, 61061	815-732-2191.....	815-732-4007
Peoria.....	4810 N. Sheridan Rd. ...	Peoria, 61614	309-685-3140.....	309-685-3397
Perry.....	3764 State Rt 13/127...	Pinckneyville, 62274	618-357-2126.....	618-357-3934
Piatt.....	210 S. Market St.	Monticello, 61856	217-762-2191.....	217-762-2703
Pike.....	1301 E. Washington.....	Pittsfield, 62363	217-285-5543.....	217-285-5735
Randolph.....	313 W. Belmont St.....	Sparta, 62286	618-443-4364.....	618-443-1922
Rock Island.....	4550 Kennedy Dr.....	East Moline, 61244.....	309-796-0512.....	309-796-0673
Saline.....	34 Veterans Dr. Ste D ..	Harrisburg, 62946.....	618-252-8391.....	618-253-3006
Sangamon.....	POB 8467	Springfield, 62791	217-782-4617.....	217-524-6662
Shelby.....	1125 W. North 2 nd	Shelbyville, 62565.....	217-774-9546.....	217-774-9549
Stephenson.....	2998 W Pearl City Rd ..	Freeport, 61032	815-235-4125.....	815-232-9006
Tazewell.....	1505 Valle Vista	Pekin, 61554.....	309-347-6614.....	309-347-5472
Vermillion.....	25 E. Liberty Lane	Danville, 61832	217-442-8615.....	217-442-8628
Warren.....	1000 N. Main.....	Monmouth, 61462	309-734-5161.....	309-734-5532
Washington.....	9623 Wall St.	Nashville, 62263.....	618-327-8881.....	618-327-8882
Wayne.....	2-B Frontier Dr.	Fairfield, 62837	618-842-3702.....	618-842-4725
Whiteside.....	100 E. Knox.....	Morrison, 61270	815-772-4075.....	815-772-4077
Will.....	100 Manhattan Rd.....	Joliet, 60433	815-727-9296.....	815-727-9364
Williamson.....	1306 N. Atchison Ave..	Marion, 62959.....	618-993-3304.....	618-997-1542
Winnebago.....	4311 W. State St.	Rockford, 61102.....	815-986-4357.....	815-986-4329
Woodford.....	117 West Center.....	Eureka, 61530	309-467-3789.....	309-467-6034

SAMPLING COMMITTEE ACTION PLAN

I. Who Will Test Samples for the Presence of Soybean Rust?

The soybean rust pathogen is on the U.S. Select Agent list produced by the U.S. Dept. of Homeland Security. This rust pathogen cannot be transported across state lines without the appropriate permit. Testing of suspect soybean rust plant material should be done within the state of Illinois.

The Plant Clinic at the University of Illinois has been designated as a triage lab for soybean rust sampling by the National Plant Diagnostic Network (www.npdn.org). The clinic director (Nancy Pataky) has participated in training to identify the soybean rust pathogens at an NPDN Asian soybean rust diagnostic training session in Ft. Dietrick, Maryland (Spring, 2003). She also participated in a PCR technique workshop for soybean rust identification in Beltsville, Maryland (Winter, 2004). The University of Illinois Plant Clinic served as the expert lab in a January, 2004 soybean rust release scenario. The purpose of the scenario was to work through communications protocols from sample submission to confirmation of a soybean rust molecular analysis using PCR. The bi-state scenario involved Illinois and Iowa and included the state plant regulatory officer (SPRO) and state plant health director (SPHD) from Illinois as well as university and USDA specialists. All of these experiences point to the University of Illinois Plant Clinic as the primary diagnostic lab for soybean rust unknowns in Illinois.

II. Where Should samples be Sent for Testing?

To avoid overloading the Plant Clinic with soybean rust suspect samples, the U of I Extension DDDI labs will act as a pre-screening/triage lab. The list of U of I Extension DDDI (distance diagnostic digital imaging) Labs is attached. However, if samples are sent directly to the U of I Plant Clinic please phone before sending or delivering such samples. The University of Illinois Plant Clinic telephone number is 217-333-0519. The address is:

Plant Clinic
1401 W. St. Mary's Rd.
Urbana, IL 61802

For those wishing to hand deliver samples, the clinic location map is available at <http://plantclinic.cropsci.uiuc.edu/>. A plant clinic specimen data form should accompany any plant sample submitted to the Plant Clinic. The data form is available at the clinic web site or local extension offices throughout Illinois.

III. How Will Samples be Tested for Soybean Rust?

Plant samples will be examined for rust pustules with the aid of a dissecting microscope. Suspect pustules will be sectioned and examined with a compound microscope for the presence of rust spores. University of Illinois and USDA plant pathology specialists may be called to examine suspect positives. The Plant Clinic microscope-mounted, web-based, live, video camera may then be used to communicate directly with APHIS, PPQ staff in Beltsville, Maryland. If the sample remains a soybean rust infected suspect after this initial examination, then tissue will be sent to APHIS, PPQ specialists with appropriate PPQ forms for PCR testing. Molecular testing with PCR is a relatively quick method of positive identification of rust to the species level. It is a definitive way to identify *Phakopsora pachyrhizi*. APHIS PPQ specialists have been designated as the final determinants of an initial soybean rust find in a state. Should soybean rust be confirmed in Illinois, subsequent samples may be tested using the molecular testing PCR technique at the NPDN regional expert lab in East Lansing, Michigan.

IV. How To Prepare a Sample

Soybean rust may appear on any above-ground soybean plant part. The leaves are the easiest to work with in the lab and comprise the typical suspect sample submitted. Ideally samples should include about 20 leaves, flat, dry, and between dry paper toweling. They should be packaged in two layers of zip lock plastic bags. The bags should be clearly labeled with a permanent marker providing: date, host plant, collector's name, phone #, collection location within the field, location of the field, county, township & section, and nearest intersection. GPS information is helpful if available. If the sample is mailed, the seams of the box must be taped shut. It is best to keep the sample refrigerated or on ice until it arrives at the testing lab.

V. Payment for Samples

When a sample is sent through the U of I Extension DDDI Lab, the fee will be paid by a third party. When a sample is sent directly to the U of I Plant Clinic without first being tested by the U of I Extension DDDI Lab, the fee of \$12.50/sample must be paid by the sample submitting entity. The University of Illinois Plant Clinic requires a payment of \$12.50 per sample at the time a sample is submitted. Checks should be made payable to the University of Illinois. Samples sent to APHIS PPQ specialists for PCR testing may or may not require additional payment. Illinois APHIS officials are currently trying to request funds through the NAPIS program to possibly cover the expense of some testing. At this point we encourage testing but ask that individuals contact the Plant Clinic before sending samples so that samples can be screened and so that payment plans can be negotiated.

VI. Special Confidentiality Note

It must be noted that when a positive soybean rust case is found in Illinois, the official announcement will be made by the Director of Agriculture or his designate. This person will be able to provide resources and answer questions that will surely follow. The Plant Clinic staff will not release results of soybean rust testing and cannot make an announcement directly. National protocol prohibits release of such information until a positive has been confirmed through APHIS PPQ.

Note: Please complete this **entire** form before submitting specimen(s). This will ensure more timely and accurate diagnosis.

Plant Clinic
1401 W. St. Mary=s Road
University of Illinois
Urbana, IL 61802
(217)333-0519

PLANT CLINIC SPECIMEN DATA FORM

Plant Clinic No. _____

Date Received _____

County _____

Submitted by _____

Respond to: _____

Grower _____

Address _____

Commercial _____ Home Grower _____ Consultant _____

Crop or Plant _____ Variety _____

Phone _____ E-mail _____

Appearance of Plant Parts:

Roots: normal _____ poor growth _____ galls or swellings _____ discolored _____ rotted or decayed _____ other _____

Stem, trunk, or branches: normal _____ poor growth _____ galls or swellings _____ cankered _____ external discoloration _____
top dieback _____ cracked _____ rotted or decayed _____ other _____

Leaves: normal _____ abnormal growth _____ galls or swellings _____ wilted _____ falling prematurely _____
spotted or blighted _____ yellowed _____ mottled _____ rotted _____ shotholed _____ other _____

Fruit or flowers: normal _____ abnormal growth _____ spotted _____ rotted _____ mottled _____ other _____

Condition Appears: Serious _____ Potentially serious _____ Minor _____

Distribution: scattered plants _____ Groups of plants _____ Most planting _____ In low areas _____ Slopes _____
No association with terrain _____ Other _____

Symptoms Appeared in Past: _____ days; _____ weeks; _____ months

Conditions Prior to Symptom Development: Temperature Range _____ Rainfall Amount _____ Humidity _____
Storms with high winds _____ Hail _____ Blowing soil _____ Lightning _____

Soil Type or Mix: _____ Organic matter _____ % pH _____

Planting History: Crop two years previous _____ One year previous _____

Year current crop last planted in this area _____ Did problem occur previously? _____

Tillage History: _____

Soil Test Information _____ Type of nitrogen used _____

Chemicals Applied This Year: Fertilizer _____

Herbicide(s) & rates _____ Type of application _____

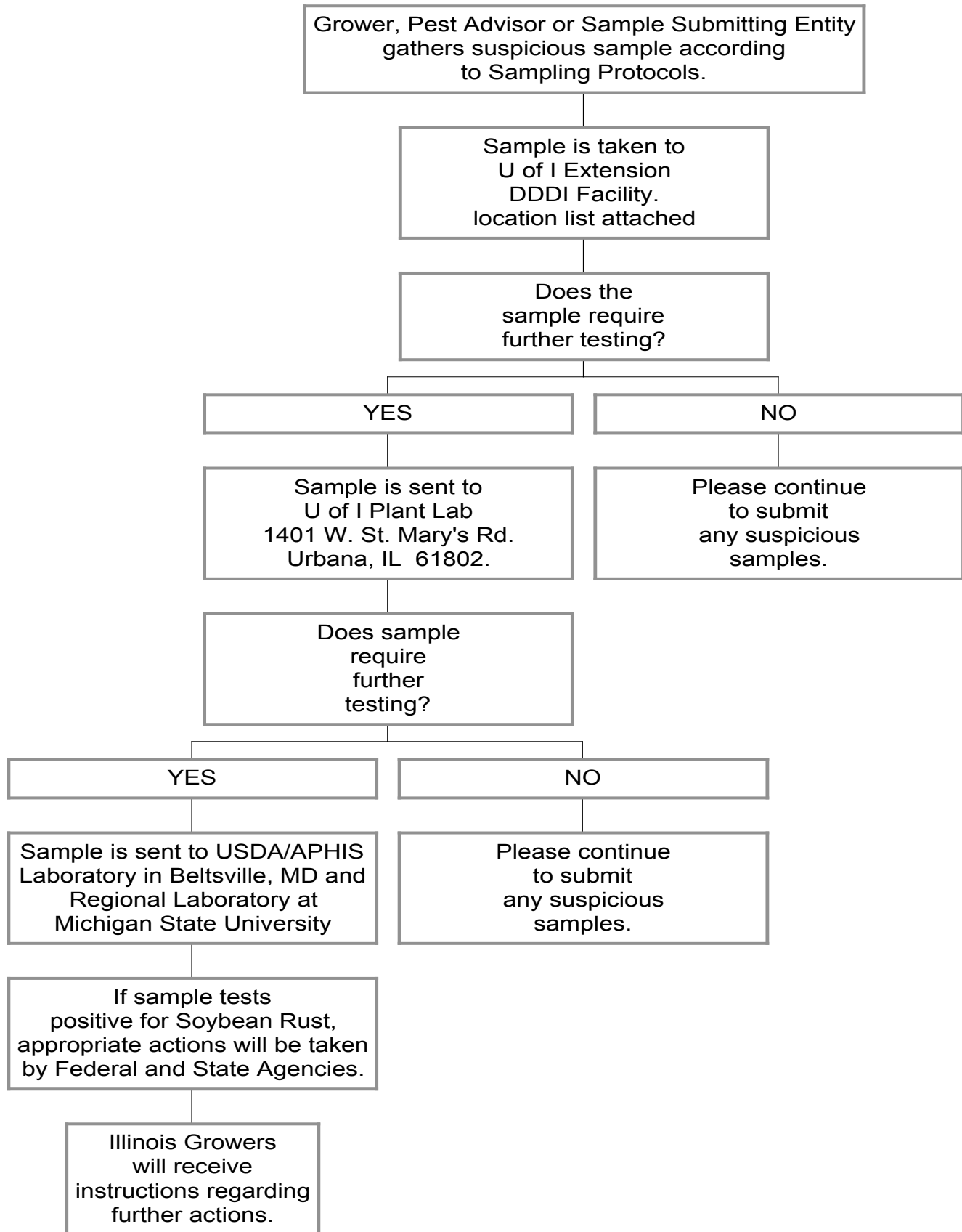
Herbicide(s) previous year _____ Insecticide(s) _____

Fungicide(s) _____ Nematicide(s) _____

SUSPECTED PROBLEM AND COMMENTS:

Do Not Write Below This Line

Soybean Rust Sample Submission Flow Chart



Sample Submission Action Plan

Step 1 – Grower, Pest Advisor or other Sample Submitting Entity brings sample to U of I extension DDDI (Distance Diagnostic Digital Imaging) location. (attached list gives all locations and contact information)

Note: any Sample Submitting Entity may submit samples directly to the U of I Plant Lab. However, the individual or group submitting the sample must then pay the sample processing charge of \$12.50/sample. If the sample is submitted through the U of I Extension DDDI Unit, the fee will be paid by a third party.

Step 2 – DDDI staff acknowledges receipt and enter sample into system assigning a unique lab ID number to the sample.

Step 2a – DDDI staff examines and takes digital images.

Step 2b – Images are downloaded onto the system for diagnosis by a qualified plant pathologist.

Step 2c – The diagnostician will contact submitting lab staff with initial diagnosis and recommendation for further testing. If sample needs further testing, skip to step 4.

Step 3 – When sample is found to be negative for soybean rust and needs no further analysis, the DDDI staff will explain what was found, why it has not been identified for SBR, and why it is important for the person who submitted the sample to continue to submit suspicious plant samples.

Step 4 – When a sample is found to need further analysis, the DDDI lab staff must package the sample following the protocol outlined in the Sampling Plan. Once packaged as described, the sample is double bagged in zip-able bags and sealed in a box with tape. Sample submission slip must be included in the box. The sample can be either hand delivered to the U of I Plant Lab or sent OVERNIGHT through a delivery service. (same day hand delivery is preferred)

Step 5 – When the sample arrives at the U of I plant lab for diagnosis, it will be checked into the system using the sample number assigned at the DDDI location.

Step 5a – Diagnosis will be made by expert lab personnel.

Step 5b – If the samples check positive for SBR, continue to step 6.

Step 5c – If the sample does not contain SBR, plant lab personnel will call the submitting DDDI lab and report finding. DDDI personnel will then follow the instruction in **Step 3**.

Step 6 – Upon finding a sample that is thought to have SBR, the U of I Plant Lab staff divides the sample and sends to both the NPDN Expert Lab and the APHIS Confirming Diagnosis Designate for diagnosis, unless the Designate indicates to the U of I Plant Lab to send only to one of the two entities.

Step 6a – The U of I Plant Lab personnel will package the samples as described in the Sampling Plan and send to the appropriate location(s).

Step 6b – The U of I Plant Lab informs Expert Lab and APHIS Diagnosis Designate of sample shipment time and delivery method, including tracking number and sample number.

Step 7 – Nancy Pataky of the U of I Plant Lab will make the appropriate phone calls.

Step 7a – Dave McKay, the APHIS SPHD, will be contacted and informed of the suspect sample being entered into the system.

Step 7b – Mark Cinnamon, the IL SPRO, will be contacted and informed of the suspect sample being entered into the system. Mark Cinnamon will initiate the Illinois Primary Response Call List.

Step 8 – Illinois Primary Response Call List members will meet regarding what steps will be taken in the event of a positive identification for SBR.

FUNGICIDE COMMITTEE ACTION PLAN

According to a paper by Miles, Hartman and Frederick from USDA-ARS, *Managing Soybean Rust: Host Resistance and Chemical Control*, three fungicides are registered for use on soybean, labeled for soybean rust and are commercially available. These fungicides are Quadris[®], Bravo[®], and Echo[®]. Quadris contains the active ingredient azoxystrobin while Bravo and Echo both contain the active ingredient chlorothalonil. All three products are registered with the Illinois Department of Agriculture for use in the state. See Table 1 for information regarding these products. Other products may contain the above-mentioned active ingredients, or other active ingredients, but do not have soybean rust listed on their labels. If a product has soybeans listed on the label as a target crop but does not have soybean rust listed as a target pest, the product registrant may add soybean rust as a target pest through USEPA PR Notice 98-10 (40 CFR 152.46). Under Section 2(ee) of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), fungicides registered for use on soybeans may be applied even if soybean rust is not on the label, provided that compliance with the application rate and other use directions on the label is maintained.

In anticipation of limited supplies of existing products, possibly less than desirable efficacy against soybean rust for some of the above-mentioned fungicides, and the need for a wider array of treatment products, a Section 18 emergency exemption approval application has been submitted to the USEPA for approval of the use of nine additional products involving seven different active ingredients or combinations of active ingredients. See Table 2 for information regarding these products. The use of the Section 18-approved products will not be allowed until soybean rust is confirmed by USDA-APHIS in the United States. The section 18 submittal requested approval of up to two applications of the section 18 fungicides on all of the acres planted to soybeans in Illinois. Treatments are to be made from reproductive stages R-1 to R-6 (beginning bloom to full seed). Pre-harvest intervals must be observed for the various products that may be applied. USEPA must approve the emergency use of the requested products through the granting of an exemption under the provisions of section 18 of FIFRA.

Plant pathologists from the USDA-ARS, University of Illinois have recommended the following product use regimen:

If disease is expected, but not yet present (preventative):

- ◆ Treat with propiconazole + trifloxystrobin (Stratego) or pyraclostrobin + boscalid (Pristine).
 - ◆ If a second application is needed, treat with chlorothalonil or a Section 18 triazole product (propiconazole, tebuconazole, myclobutanil, or tetraconazole).
- or -**
- ◆ Treat with azoxystrobin or pyraclostrobin.
 - ◆ If a second application is needed, treat with a Section 18 triazole product (propiconazole, tebuconazole, myclobutanil, or tetraconazole).

If disease is expected, but not yet present (preventative), and develops after initial treatment:

- ◆ Treat with azoxystrobin or pyraclostrobin.
- ◆ If a second application is needed, treat with a Section 18 triazole product (propiconazole, tebuconazole, myclobutanil, or tetraconazole).
- ◆ If a third application is needed, treat with chlorothalonil if pre-harvest interval allows or a Section 18 product.

If disease is established on site (curative treatment):

- ◆ Treat with a Section 18 triazole product (propiconazole, tebuconazole, myclobutanil, or tetraconazole).
- ◆ If a second application is needed, retreat with a Section 18 product. If the disease is at a minimal level, treat with azoxystrobin.
- ◆ If a third application is needed, treat with chlorothalonil if pre-harvest interval allows. If the second application was with a triazole, then a strobilurin (azoxystrobin, pyraclostrobin, or trifloxystrobin) compound can also be used for the third treatment.

If the disease is discovered in the state, additional pesticide applicators may be needed to apply fungicides. The Illinois Department of Agriculture will make every attempt to promptly license individuals requesting a pesticide applicator's license. Provisions within the Illinois Pesticide Act require the training, certification and licensure of pesticide applicators in this state. To become certified, an applicator must successfully complete one or more examinations covering various aspects of pesticides and their safe application. Department of Agriculture staff will attempt to schedule and conduct special testing sessions at airports or other non-traditional locations for non-certified aerial pesticide applicators entering Illinois to assist with pesticide applications to control soybean rust. Such testing sessions will be scheduled on an as-needed/requested basis, considering available staff and budgetary resources.

Regulations adopted under authorities granted in the Illinois Pesticide Act require state approval for the construction and use of operational and secondary containment structures and systems at agrichemical facilities where 300 gallons or more of liquid pesticide or 300 pounds or more of dry bulk pesticides are mixed or transferred. If soybean rust is discovered in Illinois, numerous out-of-state aerial pesticide applicators are expected to come to Illinois to assist in the pesticide application efforts. Considering the number of acres that may require treatment, it can be assumed that applicators will exceed the containment requirement threshold at every loading site. The Department does not have statutory authority to grant a waiver to the containment requirements. The Department believes that the best approach to containment compliance would be for non-Illinois based aerial applicators to align themselves with existing state-licensed aerial applicators and operate from existing airport/landing strip containment facilities that have already been permitted and built. A second option would be for non-Illinois applicators to utilize portable containment systems that would meet the environmental protection requirements of the regulation and would not be as economically burdensome as permanent systems. The Department will make applicators aware of these two options whenever and wherever possible.

No guarantee, warranty, or endorsement is implied by the listing of any product within this report. The use of brand names does not imply approval of any product to the exclusion of others that may also be suitable for use.

Table 1. Fungicides currently registered in Illinois for use on soybeans with soybean rust listed as a target pest.

Trade Name	Chemical Name (active ingredient)	EPA Reg. No.	Registrant	Application Rate (per acre)
Quadris®	Azoxystrobin	100-1098	Syngenta Crop Protection, Inc Greensboro, NC 27419	6.2-15.4 oz.
Bravo Weather Stik®	Chlorothalonil	50534-188-100	Syngenta Crop Protection, Inc Greensboro, NC 27419	1.5-2.25 pts.
Bravo Ultrex®	Chlorothalonil	50534-201-10182	Syngenta Crop Protection, Inc Greensboro, NC 27419	1.4-2.2 lbs.
Echo® 720	Chlorothalonil	60063-7	Sipcam Agro USA, Inc. Roswell, GA 30076	1.5-2.5 pts.
Echo® 90DF	Chlorothalonil	60063-10	Sipcam Agro USA, Inc. Roswell, GA 30076	1.25-2 lbs.

Table 2. Fungicides for which a Section 18 emergency exemption has been requested from USEPA to aid in the control of soybean rust.

Trade Name	Chemical Name (active ingredient)	Formulation	EPA Reg. No.	Registrant	Application Rate (per acre)
Tilt®	Propiconazole	3.6EC	100-617	Syngenta Crop Protection, Inc Greensboro, NC 27419	4 oz.
PropiMax™	Propiconazole	3.6EC	62719-346	Dow AgroSciences, LLC Indianapolis, IN 46268	4-8 oz.
Bumper®	Propiconazole	41.8EC	66222-42	Makhteshim-Agan New York, NY 10176	4 oz.
Folicur®	Tebuconazole	3.6F	3125-394 or 264-752	Bayer CropScience Research Triangle Park, NC 27709	3-4 oz.
Laredo™ EC	Myclobutanil	25EC	62719-412	Dow AgroSciences, LLC Indianapolis, IN 46268	4-8 oz.
Laredo™ EW	Myclobutanil	25EW	62719-493	Dow AgroSciences, LLC Indianapolis, IN 46268	4.8-9.6 oz.
Stratego®	Propiconazole + Trifloxystrobin	2.08F	264-779 or 3125-562	Bayer CropScience Research Triangle Park, NC 27709	5.5-10 oz.
Domark™	Tetraconazole	125SL	60063-RE	Sipcam Agro USA, Inc. Roswell, GA 30076	10-13 oz.
Pristine®	Pyraclostrobin + Boscalid	38%WD	7969-199	BASF Corporation Research Triangle Park, NC 27709	8-16 oz.
Headline®	Pyraclostrobin	2.09EC	7969-186	BASF Corporation Research Triangle Park, NC 27709	6-12 oz.

MEDIA COMMITTEE ACTION PLAN

Purpose: to develop a mechanism for members of the Soybean Rust Media Planning Committee to exchange important information in the event Soybean Rust (SBR) is suspected or detected in the United States.

The intent of the plan is to share information. This will help ensure an accurate and unified message is presented when members answer questions from the press and disseminate information to constituents. It is not designed to manage the crisis itself. In other words, the plan is not a mechanism for public and private officials to determine the best course of action to control the disease. However, the decisions these officials make should be included in the information that is shared when the media plan is activated.

Outline:

I. Prep plan

A. SBR Plan press release

- i. To be distributed to media throughout the state on or about May 15 and emphasize awareness of the potential rust problem as well as an active plan for its detection and eradication.*

B. Chemical Approval press release

- i. Upon Section 18 approval of the chemicals needed to fight or treat soybean rust, a release will be distributed statewide.*

C. Planning Committee press releases

- i. As the SBR Plan evolves, releases updating the public about the progress of the four planning committees will be issued.*

D. Agency press releases

- i. Agencies will be responsible for writing and sending press releases announcing their own soybean rust-related programs or community outreach. As a courtesy, these releases should be sent to members of the Media Planning Committee.*

II. Crisis Communications Plan

A. How to share information

- i. Information shall be shared with committee members or their representatives through a conference call. The member activating the plan is responsible for scheduling the conference call and notifying fellow members of the arrangements. If the member activating the plan is not able to make arrangements, the conference call can be set-up through the Illinois Department of Agriculture by calling the Office of Public Information at (217) 785-9272. The member activating the plan is encouraged to share as much detail as possible about the suspected or confirmed case of soybean rust, as well as information about the message that will be communicated to the public. Members then will discuss how to best execute the message. **By participating in a conference call, each member agrees to protect any and all information deemed confidential by the member providing that information.****

Soybean Rust Media Planning Committee			
Name	Organization	E-mail address	Phone number
Jeff Squibb	Ill. Dept. of Agriculture	jsquibb@agr.state.il.us	(217) 782-4712
Chris Herbert	Ill. Dept. of Agriculture	cherbert@agr.state.il.us	(217) 557-5678
Lyle Roberts	Illinois Soybean Assoc.	robertsl@ilsoy.org	(309) 663-7692
Ed Mies	Illinois Soybean Assoc.	jmies@hotmail.com	(217) 435-7091
Todd Gleason	University of Illinois	tgleason@uiuc.edu	(217) 333-9697

B. When to share information

- i.* In determining whether to activate the crisis communications plan, the primary guiding factor should be known or anticipated media interest. Anytime media coverage of a soybean rust emergency --- defined as either a confirmed or *suspected* case of the disease --- is known or anticipated, notification of members shall take place. Practically, this means the earliest point at which notification might take place is when either a rumor spreads that the disease is present in the United States or a sample has been sent to a laboratory for testing **and** a media inquiry is received. The latest point at which notification should take place is upon confirmation of the United States' initial soybean rust case.

1. When soybean rust is confirmed

- a.** Confirmation of soybean rust will come from Plant Protection and Quarantine's national mycologist (PPQ is affiliated with the Animal and Plant Health Inspection Service, a branch of the United States Department of Agriculture). After the disease is confirmed, PPQ and APHIS's Legislative and Public Affairs (LPA) staff will communicate the detection.
- b.** LPA and CSREES (Cooperative State Research, Education and Extension Service) will coordinate with the affected state and the American Soybean Association to prepare a press release announcing the detection of soybean rust.
- i.** LPA and CSREES will distribute the press release and coordinate answers to reporters' questions.
- ii.** PPQ will post the release on its website and staff a toll-free hotline to answer questions.
- c.** CSREES will hold evening public meetings to address issues and concerns in the area where soybean rust is found.
- d.** CSREES, LPA and state public affairs officials will be available to the media.

- e. The Media Planning Committee most likely will issue a supplementary press release that reminds farmers and interest groups of the Illinois Soybean Rust Plan. The release will emphasize Illinois' preparedness and review the specific steps that either have or will be taken to control the disease.

C. Where to share information

- i. Committee members are encouraged --- especially when the crisis communications plan has been activated --- to share soybean rust press releases with the Illinois Soybean Association for posting on its soybean rust web page, which shall act as a clearinghouse for information on the disease.

D. What information to share

- i. Personal information will not be released without consent. Therefore, if asked about a case of soybean rust, only a location identification will be provided, unless the farm operator has no objections. For example, committee members might confirm rust has been found in "Sangamon County," but would not release the fact the positive sample was collected on the "John Smith" farm without his consent.

III. Chain of Command

To ensure accurate and unified information, we ask that only the Committee Chairperson comment on his or her committee's plan to the press or public about the Illinois Soybean Rust Program. If other members of a committee are asked about the Illinois Soybean Rust Program, inquiries should be directed to the committee chairperson or to the Media Chairperson at the Illinois Department of Agriculture. It is not being suggested that it is inappropriate to speak with the press or public about soybean rust, but when asked about the Illinois Soybean Rust Program specifically, it is important to direct questions to those who are the most knowledgeable about the program to avoid misinformation

RESEARCH

Host resistance. In cooperation with the USDA-ARS Foreign Disease-Weed Science Research Unit (FDWSRU) at Ft. Detrick and support from the United Soybean Board, part of the research focus has been to identify resistant germplasm and evaluate fungicide efficacy. There are over 16,000 soybean accessions in the USDA Germplasm Collection located at the University of Illinois. These soybean accessions are being evaluated for resistance to *P. pachyrhizi* in the USDA-ARS FDWSRU Biosafety Level 3 Containment Greenhouses, along with commercial and public cultivars grown in the U.S. The germplasm evaluations are done on seedlings using a mixture of isolates from Africa, Asia and South America. From the 16,00 soybean accessions screened to date, less than 100 have been identified as having some level of resistance. None of the U.S. commercial cultivars evaluated were found to be resistant to the mixed inoculum. The soybean accessions showing some level of resistance will be further evaluated using individual isolates to detect race specific and/or partial resistance. They also will be planted in field trials in Brazil, Paraguay, China, Thailand, South Africa and Zimbabwe to be evaluated for adult plant resistance. Additionally, the 1,000 plus *G. soja* accessions will be screened along with verification of the perennial *Glycine* spp. previously reported as having resistance. As sources of resistance have been identified, crosses have been made to incorporate these resistance traits into adapted backgrounds for commercial use. This work is being done both by scientist in the private and public sector.

Fungicides. Fungicide applications will be the primary tool used to control soybean rust should it arrive in the U.S. in the near future. Our current research is designed to answer some of the questions raised about fungicide application and efficacy on soybean. The first question to be addressed is which fungicides, among those that could be or are already registered for use in the U.S., are effective in controlling soybean rust. To answer this question a multi-location efficacy trial has been established to evaluate 17 fungicides in a replicated trial where two vs. three applications were compared. The second question to be addressed involves improving the methods of fungicide application. A multi-state project, funded by the Critical Issues Program of USDA-CSREES, to examine aerial and ground application methods is in progress. The aerial application experiment will evaluate canopy penetration using different volumes of water with two fungicides. The ground application experiment will compare canopy penetration and coverage with different application volumes and nozzle types, within and above the canopy. Both ground and aerial applications will start at flowering with additional applications at 20-day intervals. Crucial questions still remain regarding the availability of fungicides and the equipment to apply them should a severe epidemic occur in the U.S. There is a further need to determine the timing, minimum number of applications, and effective rates for each compound, as well as the economics of using fungicides on soybeans.

Control of soybean rust can be accomplished through utilization of fungicides and selection away from super susceptible cultivars. Partial resistance or tolerance may be the most effective resistance strategies, especially when combined with stacked single genes or single genes with broad resistance. The scenario that is playing out now in Brazil will provide information needed to develop effective control strategies before the pathogen arrives in the continental U.S. Each season without the introduction of the disease into the U.S. allows for additional fungicides to be evaluated and registered, application methods to be improved, and provides time for the incorporation of resistance and/or tolerance into commercial germplasm.

Source primarily from: Miles, M.R., R.D. Frederick, and G.L. Hartman. 2003. Soybean rust: Is the U.S. crop at risk? <http://www.apsnet.org/online/feature/rust/>

STAKEHOLDERS

The Illinois Soybean Checkoff Board has developed a stakeholder list of over 1,000 names of individuals, businesses and groups involved in agriculture that would be affected if and when soybean rust appears in Illinois or the U.S. When it is determined that the stakeholders need to be advised of current situations regarding soybean rust, the Illinois Soybean Checkoff Board will contact the stakeholders electronically (email).

SPECIAL RECOGNITION

Glen Hartman and Monte Miles have been a tremendous help in the planning of the Illinois Soybean Rust Program. The program has benefited from their knowledge and expertise in the area of soybean rust.

Organizational Chart

Illinois Department of Agriculture: Coordinating Organization

Charles “Chuck” Hartke, Director

Jim Larkin, Program Facilitator

217-785-8212

jlarkin@agr.state.il.us

April DeAtley

217-785-8504

adeatley@agr.state.il.us

Scouting Committee Co-Coordinator:

Jean Trobec

Illinois Fertilizer and Chemical Association

309-827-2774

jeant@ifca.com

Matt Montgomery

University of Illinois Extension

217-782-4617

mpmontgo@uiuc.edu

Sampling Committee Coordinator:

Nancy Pataky

University of Illinois Plant Clinic Director

217-333-2478

npataky@uiuc.edu

Fungicide Committee Coordinator:

Scott Frank

Illinois Department of Agriculture, Environmental Programs

217-785-2427

sfrank@agr.state.il.us

Media Committee Coordinator:

Jeff Squibb

Illinois Department of Agriculture, Public Information Office

217-782-4712

jsquibb@agr.state.il.us