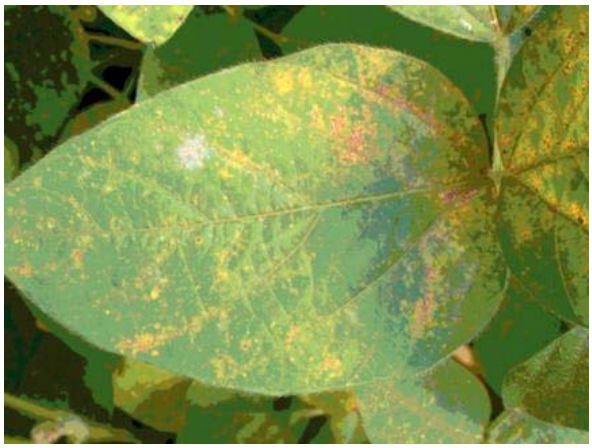
Michigan Department of AGRICULTURE

SOYBEAN RUST ACTION PLAN



Soybean Rust - *Phakopsora pachyrhizi*

In cooperation with the following agencies and organizations:

United States Department of Agriculture
Michigan State University
Michigan Soybean Promotion Committee
Michigan Agri-Business Association
Michigan Farm Bureau

Last Revision: January 9, 2005

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MICHIGAN DEPARTMENT OF AGRICULTURE
SOYBEAN RUST ACTION AND RESPONSE PLAN

INTRODUCTION

Action Statement

This document is intended for use as guidance in planning for the possible introduction and establishment of Asian Soybean Rust (ASBR), *Phakopsora pachyrhizi*, in Michigan. This plan provides information for federal, state and private stakeholders on the protection, detection, response and recovery from the introduction of ASBR in Michigan soybean production areas.

Background Information and Introduction

Soybean rust is caused by either of two fungal species, *Phakopsora pachyrhizi* known as the Asian species, and the New World species, *P. meibomiae*. *Phakopsora pachyrhizi*, the more aggressive of the two pathogens, has been reported in various countries including Argentina, Australia, Bolivia, Brazil, Cambodia, China, Ghana, India, Indonesia, Japan, Korea, Malaysia, Mozambique, Nepal, Nigeria, New Guinea, Paraguay, the Philippines, Rwanda, Sierra Leone, South Africa, Taiwan, Thailand, Uganda, United States (Hawaii only), Viet Nam and Zimbabwe. This document deals with the more virulent pathogen, *Phakopsora pachyrhizi.*

There are 30 species of legumes, other than soybean reported to be hosts for soybean rust in nature; 60 species of legumes have been successfully inoculated under greenhouse conditions (see attachment B). One widespread host in the United States is kudzu or *Pueraria lobata*. It is believed that kudzu could serve as an inoculum reservoir for soybean rust; thereby, maintaining an inoculum source that may play a significant role in ASBR epidemiology. Additionally, there are a variety of other important hosts that are leguminous crops or weeds that have shown varying degrees of susceptibility to both species of soybean rust. Two important alternate hosts in the State of Michigan are dry beans and snap beans.

If introduced to Michigan soybean production areas, *Phakopsora pachyrhizi* could cause large crop and economic losses to soybean growers and associated industries. Estimated loss in yields per acre can reach 50%. Other leguminous crops may also suffer losses. ASBR spreads primarily by wind-borne spores across regions dependent upon prevailing winds and environmental conditions conducive to disease development. Recent infestations in Africa have been widespread in the same year in which they were first detected. However, in South America, two to three years were required from the time of detection for widespread occurrence. Because of the wind-born distribution of the spores and the rapid rate of disease spread, it is unlikely that an eradication program designed to eliminate the pathogen or disease upon its detection in Michigan would be appropriate or effective. For this reason the Recovery Plan has been developed as part of this plan.

Commercial U.S. soybean cultivars are not resistant or tolerant to *Phakopsora pachyrhizi*. Fungicides have been used effectively in other countries to mitigate the impacts on soybean production. There are currently two fungicides labeled for use on soybeans in the United States. However, effective dosage rates and application methods require further development. Efforts are being made by chemical companies, researchers, and the soybean industry to identify additional efficacious chemicals, formulations, and application rates and methods. Efforts are

underway by states to attain Section 18 registrations to use pesticides in the United States that are presently in use offshore.

Identification

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. It will also help determine program changes and failures.

Symptoms of soybean rust appear identically regardless if they are caused by *Phakopsora pachyrhizi* or *Phakopsora meibomiae*. Host plants infected with soybean rust first exhibit small lesions that gradually increase in size and turn from gray to tan or brown. They become polygonally shaped restricted by leaf veins, and may eventually reach 2 to 3 square millimeters.

Infection begins on the lower first leaves of plants and appears as chlorotic or mosaic-like areas with uredinia observed usually at or after the plant flowering stage. Lesions may appear on most above-ground plant parts, but are most common on the underside of the leaves. 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.

Plants show two different lesion reactions to infection by soybean rust. Tan lesions consist of small uredinia surrounded by slightly discolored necrotic areas on leaf surfaces. Early stages show an ostiole, or small hole, where urediniospores emerge. As uredinia become larger, they release masses of tan colored urediniospores that appear as light brown or white raised areas. Uredinial pustules become more numerous with advancing infection and often will coalesce forming larger pustules that break open releasing masses of urediniospores.

The other type of lesion that occurs with soybean rust infection is the reddish-brown lesion. These lesions have larger areas of necrosis that are reddish brown surrounding a limited number of uredinia. A few urediniospores are usually visible on the surface.

Early symptoms of soybean rust are easily confused with bacterial pustule (caused by *Xanthomonas campestris pv. phaseoli* (Smith) Dye), or bacterial blight (caused by *Psuedomonas glycinea* Coerper), and brown spot (caused by the fungus S*eptoria glycines).* The diseases also occur often on the underside of soybean leaves causing a raised light brown blister within a lesion. These leaf lesions vary from small specks to large irregular brown areas that form when small lesions coalesce. A hand lens or dissecting microscope are usually used to distinguish these disease symptoms from ASBR, but early the stages of disease are difficult to distinguish if no spores, conidia, or bacteria are evident.

Recovery

The occurrence of ASBR will have an impact on the production of soybeans in Michigan. Because of the severity of the disease and costs to prevent or control field infections it is possible the production of soybeans could become unprofitable. Growers can expect an increase in production costs related to fungicides and their application to protect the crop.

It is suggested that growers consider removing non-cultivated soybean rust host material from field borders. The removal of this material will reduce the amount of hosts available, thereby reducing the amount of available host material to initiate an infection while decreasing the availability of sites for inoculum buildup.

The best long term strategy for minimizing the effects of soybean rust in the United States is in the development of resistant/tolerant varieties. There are thousands of plant lines of soybean in germplasm repositories and screening for soybean resistance has been on-going for several years in other countries and the United States in the containment facilities at the ARS Foreign Disease-Weed Science Research Unit in Ft. Detrick, Maryland. However, the availability of cultivars with good resistance and other characters desired in soybean for commercial production is still five to seven years away.

Fungicides have been shown to be effective in controlling soybean rust in Zimbabwe, South Africa and Brazil. Currently there are three fungicides Quadris (azoxystrobin), Bravo (chlorothalonil) and Headline (pyraclostrobin) registered for ASBR control in the United States. The scientific community and industry agree that the development and use of resistant/tolerant varieties is the long range goal to overcome production losses associated with ASBR.

ACTION AND RESPONSE PROTOCOLS

Plan Objective

The objective of this action plan is to provide technical and educational support for local decisions, thereby, minimizing the impacts of and facilitating the dissemination of information on confirmed detection of ASBR in Michigan.

I. PURPOSE

A. To ensure rapid response to detection, identification, control, and eradication of soybean rust.

B. To ensure effective and timely communication between local, regional, state and federal government agencies; academia; and plant industry professionals, when/if detection of soybean rust occurs.

C. To define roles for soybean rust response, including but not limited to outreach, education, mitigation, authorities, and/or duties, and coordinate resources.

D. To ensure effective public notification of soybean rust concerns and response activities.

E. To ensure soybean rust surveillance at the local level in areas where this disease may occur.

F. To ensure the implementation of appropriate management control measures.

II. AUTHORIZATION

All actions taken during the execution of this plan are authorized by and conducted in accordance with provisions of the following:

A. Statutes:

1. The Insect Pest and Plant Disease Act, Act 189 of 1931, as amended. MCL 286.201-.226
2. Insect Pests and Plant Diseases, Act 72 of 1945. MCL 286.251-.259

B. Federal Regulations

1. Plant Pest Act 2000
   7CFR 301.51 (eradication programs)
2. Agricultural Bioterrorism Protection Act of 2002
   7CFR 331 and 9CFR 121

C. Plans:

1. Michigan Emergency Management Plan
2. MDA Invasive Species Management Plan
3. Appropriate local authorizations

III. ROLES AND RESPONSIBILITIES

A. Michigan Department of Agriculture (MDA)

MDA is the lead state agency to prevent the introduction into and the dissemination within Michigan of insect pests and diseases. Responsibilities will include but are not limited to coordination of the following activities:

1. Follow-up inspections on fields suspected of having soybean rust.

2. Notify and coordinate activities with appropriate local, state, and federal agencies and other appropriate organizations as related to program responsibilities.

3. Submit samples for identification to Michigan State University Plant Diagnostic Laboratory and USDA.

4. Inform the public of soybean rust threats.

5. Coordinate communication of soybean rust information with the United States Department of Agriculture Animal and Plant Inspection Service, Plant Protection and Quarantine (USDA-APHIS-PPQ), Michigan State University (MSU) and other appropriate universities, Natural Resource Conservation Service (NRCS), soybean growers, local conservation districts, and other plant pest experts.

6. Implement and maintain appropriate state and federal quarantines.

7. Review and coordinate control activities to ensure compliance with local, state, and federal laws.

8. Support survey, outreach and monitoring when appropriate.

B. USDA - APHIS, PPQ (Plant Protection and Quarantine)

USDA has the responsibility to prevent the introduction of foreign plant pests and diseases that have the potential for adversely impacting production agriculture and the environment. Therefore, USDA is working to delay the human assisted introduction of the disease through its safeguarding program. USDA will continue to support offshore information gathering, permitting and inspection activities. An effective program to reduce the human assisted movement of the disease will help to provide additional time in preparing for the entry of the disease. USDA has legislative authority under the Plant Protection Act to control the importation of commodities that may serve as pathway for the introduction of foreign plant and animal pests and diseases.

PPQ will:

1. Prohibit or require appropriate treatment of host material moving into the United States that may serve as a pathway for introduction.
2. Modify commodity entry standards as appropriate based on the pathway assessment and communicate standards to the Department of Homeland Security (DHS).
3. Collaborate with foreign cooperators in the offshore mitigation of the disease to reduce the risk of entry into the continental United States.
4. Provide identification to confirm *Phakopsora pachyrhizi*.
5. Provide federal funding for survey, outreach and monitoring when appropriate.

C. Michigan State University (MSU) and the North Central Plant Diagnostic Center

MSU and the North Central Plant Diagnostic Center assist in the identification, research and evaluation of soybean pests and diseases. Responsibilities include:

1. Assisting other agencies in the identification and control methods for soybean pests and disease.

2. Creating increased awareness of soybean rust through information, education and technology transfer.

3. Participating in “First Detector” and “First Detector Educator” training.

IV. MEMBERS OF THE SOYBEAN RUST ACTION TEAM

The role of the soybean rust action team is to provide a framework and a forum for state and federal agencies, MSU and the agricultural community to prepare, coordinate and implement programs and efforts that will reduce the impact of ASBR on Michigan growers . They will develop and implement appropriate response plans, gather and assess data, support or conduct investigations, and manage Michigan's response.

A. Soybean Rust Policy Group members are:

See attachment D for specific contact information.

1. MDA Deputy Director
2. MDA Pesticide and Plant Pest Management Division Director
3. MDA Plant Industry Section Manager
4. USDA-APHIS-PPQ State Plant Health Director

B. Soybean Rust Response Group members are:

See attachment E for specific contact information.

1. MDA Plant Industry Section Manager
2. MDA Nursery Program Manager
3. MDA Survey Manager
4. MDA Plant Pathologist
5. MSU Dept. of Plant Pathology Chairman
6. MSU Field Crop Plant Pathologist
7. North Central Plant Diagnostic Center Plant Disease Diagnostician
8. USDA-APHIS-PPQ State Plant Health Director
9. Michigan Soybean Promotion Committee Director
10. Michigan Agri-Business Association Representative
11. Michigan Farm Bureau Representative
12. Other appropriate staff/agencies as needed

a. Extension Disaster Education Network (EDEN) - MSU

C. Media/Communication Group members are:

See attachment F for specific contact information.

1. MDA Communications Officer
2. MDA Emergency Management Coordinator
3. USDA-APHIS (LPA) Legislative & Public Affairs Office Communication Specialist
4. Michigan State University Communications Officer

V. NOTIFICATION AND MOBILIZATION

A. In the event of a soybean rust detection by an organization other than the MDA, for example USDA-APHIS-PPQ or MSU, that agency will notify the MDA and upon official verification by the USDA-APHIS laboratory, the MDA will initiate the Soybean Rust Action Plan.

B. The Response Group upon notification, shall consult to assist the MDA in determining an appropriate response.

C. If a positive soybean rust identification is determined within Michigan requiring resources and expertise of other agencies, departments, universities, or other specialists, the MDA Director or designee from the Policy Group will confer with the appropriate agency director or designated representative. Once the decision to activate the Action Plan is made, the MDA Director, or their designee, will notify the necessary team members.

1. Activation of the Soybean Rust Action Plan:

a. MDA staff will follow established procedures for intra-department communication. The Plant Industry Section Manager or designee will have lead responsibility for notifying and mobilizing MDA staff and for ensuring proper communication with USDA-APHIS-PPQ.

2. Once activated, the Response Group will:

a. Determine the appropriate response method. Examples of potential response include:

1) Implement response plan and manage state response functions.

2) Investigate the method of soybean rust introduction.

3) Assess the risk of spread of the soybean rust from the initial infestation site.

4) Conduct intensive delimiting survey.

5) PPQ will provide temporary mapping capability.

b. Notify the MDA Director and the Policy Group of the need to mobilize additional resources if necessary (i.e., public information officer, other agencies, or departments, laboratory, or field/technical staff).

c. Assure coordinated communication between the site and the MDA Lansing office by all available means.

D. MDA will assign or secure support staff sufficient to manage communication and documentation needs.

VI. DIRECTION AND CONTROL

A. In recognition of the differing responsibilities of participating agencies, departments, etc., MDA and USDA-APHIS-PPQ will be the lead agencies. Other organizations may assist the lead agencies in many ways, but should not make survey/eradication decisions on their own, nor shall they take significant action without first coordinating all activities through MDA and USDA-APHIS-PPQ. In general, any participating agency will operate with close communication required to ensure a coordinated response with the MDA and USDA-APHIS-PPQ.

B. The Response Group under the direction of the Plant Industry Section Manager will organize work force activities and other resources. Work force organization will reflect the needs of the event including staff assignments for operations, finance, logistics, communications, records, and other needs.

C. Issues that cannot be resolved within the Response Group will be referred to the Policy Group for resolution.

VII. TASKS AND EXECUTION

A. The Policy Group will:

1. Activate the Response Group

2. Allocate resources and call in other agencies as needed..

3. Assign actions to the Response Group through the Plant Industry Section Manager.

4. Resolve issues related to Response Group activities.

5. Mobilize a Communication Group if necessary.

6. Develop inter-agency financial agreements.

B. The Response Group will:

1. Implement the response plan.

2. Follow the Soybean Rust Action Team flow chart for survey, response, and management options as needed (see attachment A).

3. Submit suspect samples of soybean rust submitted by the public and other entities for positive identification to the North Central Plant Diagnostic Center, MSU and USDA- APHIS-PPQ (see attachment H).

4. Secure authorization from EPA for section 18 quarantine exemptions allowing use of specific fungicide (see attachment I).

5. Determine critical crop development stage for fungicide applications which allow for economic control of the rust.

6. Communicate information regarding fungicide use, dosage, timing, etc. to producers.

7. Communicate with fungicide suppliers about needs and shipping schedules.

8. Identify and list licensed aerial and ground applicators.

9. Provide treatment equipment calibration and other appropriate technical assistance.

10. Devise appropriate management protocols for infested materials (i.e., eradication, quarantine, etc.).

11. Report and disseminate activity results internally and externally as required.

12. Coordinate activities of local agencies.

13. Coordinate field investigations and surveys.

14. Receive and assess data related to the soybean rust infestation.

15. Recommend additional resources needed to the Policy group.

C. The Media/Communication Group will:

1. Issue press releases and provide assistance with drafting press release(s) for local government and provide local support.

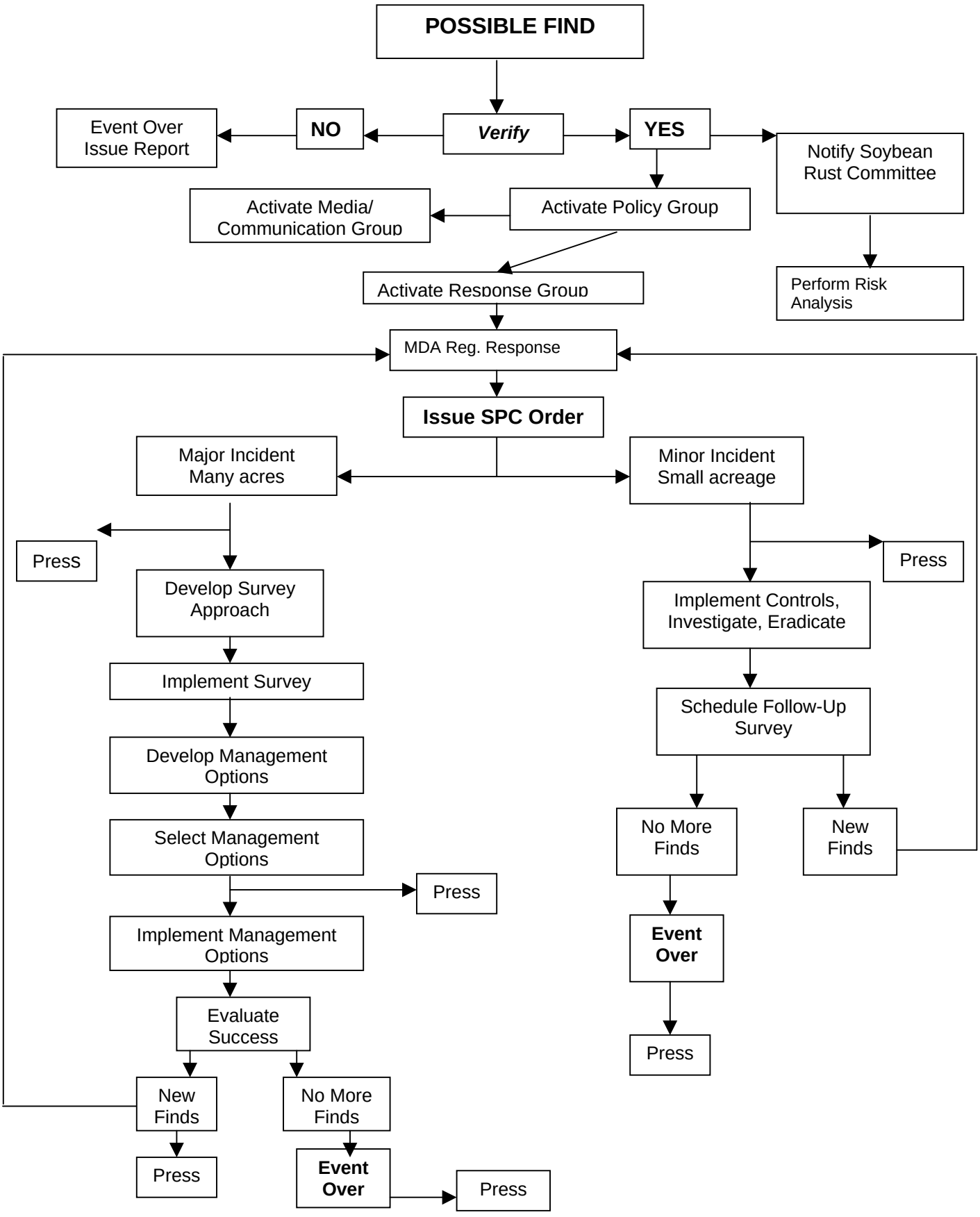
2. Hold press conferences when determined appropriate

    a. Spokespersons will be chosen by each agency. Typically, when a spokesperson is chosen, that person will act as spokesperson throughout the entire event in order to provide continuity.

    b. The media group will coordinate activities with technical experts to ensure their availability to assist in press briefings when needed.

3. Manage the media.

ATTACHMENT A – Soybean Rust Response Group Flow Chart



ATTACHMENT B - Soybean Rust Host List

Due to confusion over the taxonomy of the pathogens causing soybean rust, *Phakopsora meibromiae* and *Phakopsora pachyrhizi*, the list of hosts of *Phakopsora pachyrhizi* may be incomplete. According to various recent references, a large number of legume species are host plants for *Phakopsora pachyrhizi*. The following table lists legume species that develop rust symptoms and uredinia and urediniospores when inoculated with *Phakopsora pachyrhizi*.

Host scientific name	**Host common name**
Alysicarpus glumaceus	moneywort
Alysicarpus vaginalis	white moneywort
Cajanus cajan	pigeonpea
Cajanus sp.	cajanus
Calopogonium mucunoides	calopo/jicama
Canavalia gladiata	sword jackbean
Canavalia maritima	baybean
Cassia occidentalis	septicweed
Centrosema pubescens	flor de conchitas
Clitoria ternatea	Asian pigeonwings
Coronilla varia	purple crownvetch
Crotalaria anagyroides	rattlebox
Crotalariadissaromoensis	rattlebox
Crotalaria linifolia	rattlebox
Crotalaria pallida	smooth rattlebox
Crotalaria spp.	rattlebox
Crotolaria spectabilis	showy rattlebox
Delonix regia	royal poinciana
Desmodium discolor	ticktrefoil
Desmodium rhytidophyllum	ticktrefoil
Desmodium spp.	ticktrefoil
Desmodium triflorum	ticktrefoil
Desmodium varians	ticktrefoil
Dolichos axillaris	none
Glycine argyrea	glycine
Glycine canescens	glycine
Glycine clandestina	glycine
Glycine curvata	glycine
Glycine cyrtoloba	glycine
Glycine falcata	glycine
Glycine latifolia	glycine
Glycine latrobeana	glycine
Glycine max	glycine
Glycine microphylla	glycine
Glycine soja	wild soybean
Glycine spp.,	glycine
Glycine tabacina	glycine
Glycine tomentella	glycine
Hardenbergi violecea	None
Kennedia coccinea	cows clover
Kennedia prostrata	cows clover
Kennedia rubicunda,	cows clover
Kennedia spp.,	cows clover
Kummerowia stipulacea	Korean clover
Kummerowia striata	Japanese clover

Lablab purpureus	hyacinthbean
Lespedeza bicolor	shrubby lespedeza
Lespedeza juncea	Chinese lespedeza
Lotus americana	trefoil
Lotus major	trefoil
Lotus purshianus	trefoil
Lupinus albus	lupine
Lupinus angustifolius	narrowleaf lupine
Lupinus hirsutus	lupine
Lupinus luteus	European yellow lupine
Lupinus spp.	lupine
Macroptilium atropurpureum	purple bushbean
Macroptilium bracteatum	bushbean
Macroptilium lathyroides	bushbean
Macroptilium spp.	bushbean
Macrotyloma axillare	perennial horsegram
Medicago arborea	alfalfa
Melilotus officinalis	yellow sweetclover
Melilotus speciosus	sweetclover
Mucuna cochinchinensis	none
Neonotonia wightii	perennial soybean
Pachyrhizus erosus	yam bean
Phaseolus coccineus	scarlet runner
Phaseolus lunatus	sieva bean
Phaseolus spp.	bean
Phaseolus vulgaris	kidney bean
Pisum sativum	garden pea
Psophocarpus tetragonolobus	winged bean
Psoralea tenax	none
Pueraria lobata	kudzu
Rhynchosia minima	least snoutbean
Sesbania exaltata	bigpod sesbania
Sesbania sericea	papagayo
Sesbania vesicaria	bagpod
Teramnus uncinatus	white rooster's crest
Trifolium incarnatum	crimson clover
Trifolium repens	white clover
Trigonella foenum-graecum	sicklefruit fenugreek
Vicia dasycarpa	winter vetch
Vicia faba	horsebean
Vigna luteola	hairypod cowpea
Vigna mungo	black gram
Vigna radiata	mung bean
Vigna spp.	beans
Vigna unguiculata	blackeyed pea

ATTACHMENT C – Soybean Rust Action Plan Cooperating Agencies

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ATTACHMENT G – Soybean Rust Contact List

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USDA - Agricultural Research Service

Soybean/Maize germplasm, pathology and genetics research unit.

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Michigan Soybean Association

Michigan Soybean Promotion Committee

Providing information and education to producers.

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ATTACHMENT H – Sampling Action Plan

Federal/State Responsibility for Identification of *Phakopsora pachyrhizi* - Effective December 6, 2004

Phakopsora pachyrhizi, cause of Asian soybean rust (SBR), was found for the first time in the United States in Louisiana, November 6, 2004. It was subsequently found in additional southeastern states on soybeans as well as kudzu. The disease is likely to spread very rapidly to other soybean-growing areas in the US during the 2005 growing season by means of windborne spores. Therefore, APHIS is not attempting to prevent its spread via regulation. State regulatory officials, growers, extension agents, and others are very interested in quick detection of ASBR in order to effectively manage the disease. In this regard, APHIS will be allowing States to conduct their own diagnostics as they deem necessary after APHIS confirms the first detection on a host in a State.

APHIS has been working closely with stakeholders for several years to prepare for the arrival of SBR. A number of diagnosticians with the National Plant Diagnostic Network and State departments of agriculture have been trained to morphologically identify *P. pachyrhizi* and they have trained first responders. A few scientists have been trained to use real-time PCR to identify *P. pachyrhizi* and differentiate it from the morphologically similar but less aggressive *Phakopsora meibomiae*. The latter species has not been found in the continental US and therefore any *Phakopsora* species on soybean in the US is highly likely to be *P. pachyrhizi*. Ultimately, the soybean grower may not care to know if the soybean rust symptoms are caused by one or both of the *Phakopsora* species. States should decide whether identifications, after the initial PPQ-confirmed state/host records, are based on morphology, or morphology followed by real-time PCR.

Responsibilities for Identifying *Phakopsora pachyrhizi*

Issue	State	APHIS-PPQ	Outcome
First observation of SBR-like symptoms in a **State**	State sends sample to diagnostic lab. If the lab believes it may be SBR, a sample is sent to PPQ.	PPQ NIS (M. Palm or J. McKemy) examines morphologically. If *Phakopsora*, then a subsample is sent to CPHST (L. Levy) for real-time PCR.	New State record if confirmed positive by PPQ. State enters record into NAPIS.
First observation of SBR-like symptoms on a **host** not previously reported in a State	State sends sample to diagnostic lab. If the lab believes it may be SBR, a sample is sent to PPQ.	PPQ NIS (M. Palm or J. McKemy) examines morphologically. If *Phakopsora*, then a subsample is sent to CPHST (L. Levy) for real-time PCR.	New State*Host record if confirmed positive by PPQ. State enters record into NAPIS.
First observation of SBR-like symptoms in a **county** from a State where SBR has already been confirmed by PPQ	State sends sample to diagnostic lab. Identification may be based on morphology, or both morphology and PCR.	N/A. DO NOT SEND TO PPQ	New county record. State enters record into NAPIS.

Michigan Sampling Action Plan

1. Who will test samples for the presence of soybean rust?
The soybean rust pathogen, *Phakopsora pachyrhizi* is on the U.S. Select Agent list produced by the U.S. Department of Homeland Security. This pathogen can not be transported across state lines without the appropriate permit. Testing of samples suspected of having soybean rust should be done within the state of Michigan.

Diagnostic Services, Michigan State University's plant diagnostic lab has personnel trained to identify soybean rust. Training sessions for diagnosticians were conducted by USDA/APHIS in preparation for the arrival of these pathogens. Training included both sessions on molecular based diagnostic techniques (PCR) as well as information about the biology and diagnostic characteristics of the disease.

2. Where should samples be sent for testing?
Samples should be sent to:
Diagnostic Services
Michigan State University
101 CIPS
East Lansing, MI 48824-1311

For those wishing to hand deliver samples, the lab is located in the Center for Integrated Plant Systems. Enter the parking lot from Wilson Road, just east of Farm Lane. The main entrance faces the horticulture demonstration gardens. A reception desk is located just inside the main entrance. Call 517-355-4536 for questions, or more detailed directions.

3. How do I package a sample?
All above ground plant parts of soybeans and other hosts can be infected by soybean rust. Foliage is easiest to work with in the lab. Ideally samples should include about 20 leaves. Stems with foliage can be left intact, or leaves can be picked and layered between dry paper toweling. Do **not** add moisture to the sample. It is not necessary to send root tissue. Samples should be double bagged in zip lock plastic bags. The inner most bag should be clearly labeled, with a permanent marker indicate the location and field the sample was collected from. GPS information is helpful if available.

Samples should be shipped in sturdy boxes (no envelopes), seams of the box should be sealed with packing tape. Enclose a diagnostic submital form, completed with as much detail as possible. Feel free to make additional notes on the back of the form. Submital forms are available through county extension offices and can be downloaded from the lab's web site (http://www.cips.msu.edu/diagnostics/services/howto.html).

Samples should be shipped with overnight or priority delivery service. Do not ship samples on Fridays, mail is not delivered to the lab over the weekend. Keep the sample cool until shipping, after selecting the sample do not allow it to dry out in the car.

4. How will samples be tested for soybean rust?
Plant samples will first be examined for rust pustules using a dissecting microscope. Subsamples will be taken and examined at greater detail with a compound microscope for the presence of rust spores. Michigan State University, USDA and MDA plant pathology specialists may be called

to examine suspect samples. The lab also has a microscope-mounted web-based camera that can be used to communicate with specialists housed elsewhere. With this technology APHIS/PPQ staff can view the sample microscopically. After this initial examination samples still suspected of having soybean rust will be sent to USDA-APHIS-PPQ specialists in Beltsville, Maryland. APHIS/PPQ staff will use PCR to definitively identify *P. pachyrhizi* and/or *P. meibomiae*. USDA-APHIS-PPQ has been designated as the final determinants of an initial soybean rust find in a state. After confirming soybean rust in Michigan USDA-APHIS-PPQ will at some point give MSU's Diagnostic Services lab the authority to confirm subsequent samples by PCR.

5. Payment for samples.

A $15 fee is applied to samples submitted to the lab for disease diagnosis. A limited amount of funds was made available by the National Plant Diagnostic Network (NPDN). These funds will be used to pay the fee for a limited number of samples suspected of having soybean rust. Please contact the lab if you have questions about sample fee payment.

6. Will my sample results be kept confidential?

Because these pathogens are listed as select agents the diagnostic lab is required to report diagnosis to USDA-APHIS-PPQ and MDA. USDA-APHIS-PPQ posts a press release on their web site (http://www.aphis.usda.gov/ppq/ep/soybean_rust/), with each state's first confirmation of soybean rust. Information included in these press releases may include the county and host of the confirmed sample.

ATTACHMENT I – Fungicide Action Plan

The following four fungicides are currently registered for use on soybeans to control soybean rust: Quadris (azoxystrobin), Bravo/Echo (chlorothalonil) and Headline (pyraclostrobin). All four products are registered with the Michigan 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.

A Section 18 emergency exemption request 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 on page 3 of this section for information regarding these products. 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 Michigan. Treatments are to be made from reproductive stages R-1 to R-6 (beginning bloom to full seed). EPA 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 and Michigan State University have recommended the following 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 Michigan Department of Agriculture will make every attempt to promptly license individuals requesting a pesticide applicator's license. Provisions within the Natural Resources and Environmental Protection Act, Act 451 of 1994, Part 83 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 Michigan 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 Act 451, Part 83, Pesticide Control, require state approval for the construction and use of operational and secondary containment structures and systems at bulk agrichemical facilities. A bulk agrichemical facility is one that maintains liquid pesticide inventories in containers larger than 55 gallons or dry pesticide inventories in containers greater than 100 pounds for more than 15 consecutive days. Operational pad requirements also apply to any commercial applicator site where pesticide mixing and loading operations occur for more then ten days during a calendar year.

If soybean rust is discovered in Michigan, numerous out-of-state aerial pesticide applicators are expected to come to Michigan 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-Michigan 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-Michigan 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.

Federally-registered fungicides for use on soybeans for control of soybean rust (1/10/05)

Trade Name	Chemical Name (active ingredient)	EPA Reg. No.	Registrant
Quadris®	Azoxystrobin	100-1098	Syngenta Crop Protection, Inc Greensboro, NC 27419
Bravo Weather Stik®	Chlorothalonil	50534-188-100	Syngenta Crop Protection, Inc Greensboro, NC 27419
Bravo Ultrex®	Chlorothalonil	50534-201-10182	Syngenta Crop Protection, Inc Greensboro, NC 27419
Echo® 720	Chlorothalonil	60063-7	Sipcam Agro USA, Inc. Roswell, GA 30076
Echo® 90DF	Chlorothalonil	60063-10	Sipcam Agro USA, Inc. Roswell, GA 30076
*Pristine -	Pryaclostroin + boscalid	7969-199	BASF Ag Products Division Research Triangle Park, NC 27709
Headline	Pyraclostrobin	7969-186	BASF Ag Products Division Research Triangle Park, NC 27709

Federal registration expected before the 2005 growing season.

Fungicides for which section 18 quarantine exemptions have been requested from USEPA. The shaded boxes indicate section 18 exemptions which have been granted as of 1/10/05.

Trade Name	Chemical Name (active ingredient)	Formu-lation	EPA Reg. No.	Registrant
Tilt®	Propiconazole	3.6EC	100-617	Syngenta Crop Protection, Inc Greensboro, NC 27419
PropiMax™	Propiconazole	3.6EC	62719-346	Dow AgroSciences, LLC Indianapolis, IN 46268
Bumper®	Propiconazole	41.8EC	66222-42	Makhteshim-Agan New York, NY 10176
Folicur®	Tebuconazole	3.6F	3125-394 or 264-752	Bayer CropScience Research Triangle Park, NC 27709
Laredo™ EC	Myclobutanil	25EC	62719-412	Dow AgroSciences, LLC Indianapolis, IN 46268
Laredo™ EW	Myclobutanil	25EW	62719-493	Dow AgroSciences, LLC Indianapolis, IN 46268
Stratego®	Propiconazole + Trifloxystrobin	2.08F	264-779 or 3125-562	Bayer CropScience Research Triangle Park, NC 27709
Domark™	Tetraconazole	125SL	60063-RE	Sipcam Agro USA, Inc. Roswell, GA 30076

All of the section 18 product labels are available on MDA's website at www.michigan.gov/mda. Simply type "soybean rust" in the search box at the top right hand corner of the web page and you will routed directly to the labels.

Attachment J: Pesticide Labels for Control of Soybean Rust in the State of Michigan

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FIFRA Section 18 Quarantine Exemption Labels:

http://www.michigan.gov/mda/0,1607,7-125-1569_16988-105351--,00.html

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FIFRA Section 3 (Federally-Registered) Product Labels

Bravo Weather Stik (chlorothalonil)
http://www.ipmcenters.org/NewsAlerts/soybeanrust/BravoSupplementalSBR.pdf

Echo 720 (chlorothalonil)
http://www.ipmcenters.org/NewsAlerts/soybeanrust/Chlorothalonil-Echo.pdf

Headline Fungicide (pyraclostrobin)
http://www.ipmcenters.org/NewsAlerts/soybeanrust/Headline.pdf

Quadris Flowable Fungicide (azoxystrobin)
http://www.ipmcenters.org/NewsAlerts/soybeanrust/Azoxystrobin-Quadris.pdf