CAPS Datasheets provide pest-specific information to support planning and completing early detection surveys.

Coniothyrium glycines

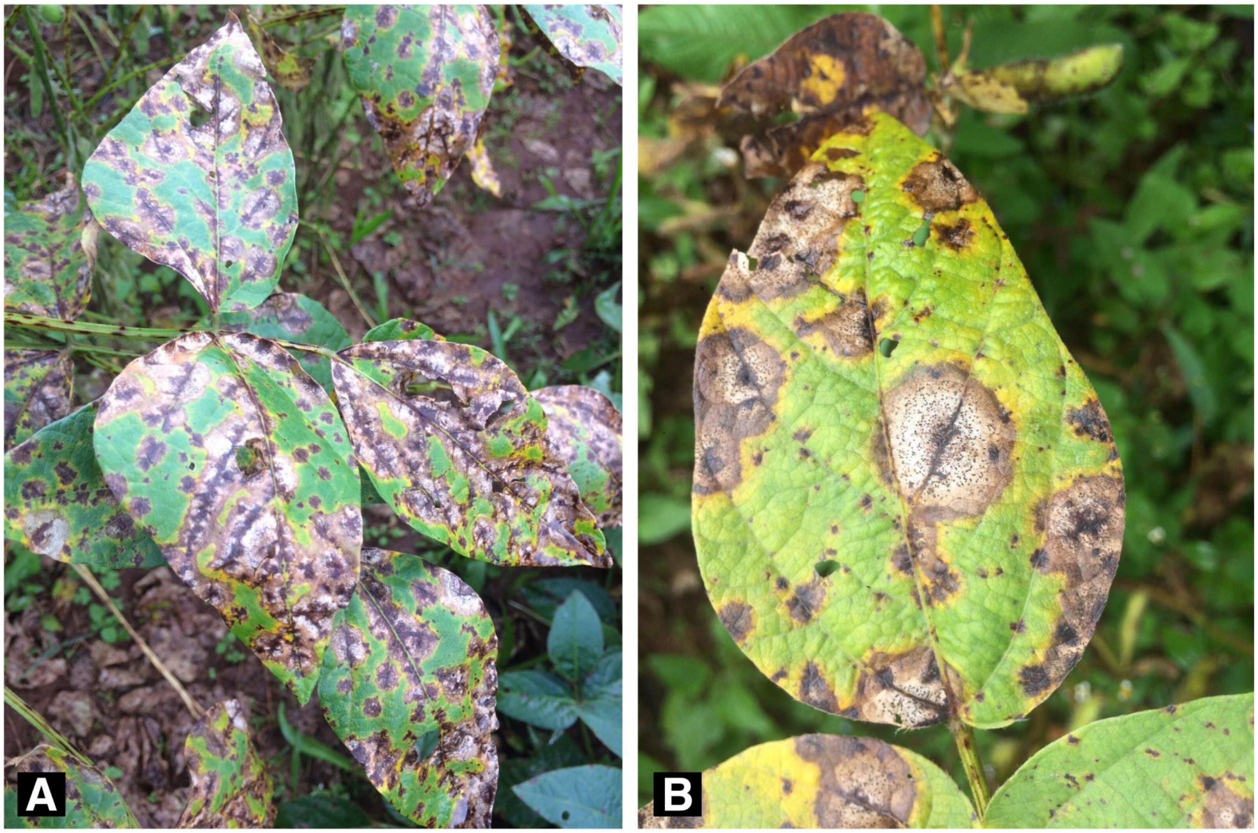

Figure 1. *Coniothyrium glycines*, causal agent of soybean red leaf blotch. Severely infected soybean plant with characteristic blotches on the upper side of the leaves **(A)** and an enlarged lesion with abundant pycnidia **(B).** Images from Koch Bach et al. (2024b).

Scientific Name

Coniothyrium glycines (R.B. Stewart) Verkley & Gruyter, 2012

Synonyms:

Pyrenochaeta glycines R.B. Stewart, 1957
Dactuliophora glycines C.L. Leakey, 1964
Dactuliochaeata glycines (R.B. Stewart) G.L. Hartman & J.B. Sinclair, 1988
Phoma glycinicola Gruyter & Boerema, 2004

Common Names

Disease: Red leaf blotch of soybean, leaf spot of soybean

Type of Pest

Fungus

Taxonomic Position

Class: Dothideomycetes, **Order:** Pleosporales, **Family:** Coniothyriaceae

Pest Recognition

This section describes characteristics of the organism and symptoms that will help surveyors recognize possible infections in the field, select survey sites, and collect symptomatic material. For descriptions of diagnostic features, see the Identification/Diagnostic resources on the AMPS pest page on the CAPS Resource and Collaboration website.

Pest Description

Coniothyrium glycines is a culturable, soilborne fungus (Hartman and Sinclair, 1992). Sclerotia (Figs. 4A and 4B) collected from leaf surfaces or screened from soil will germinate in 1-3 days on culture media, in a drop of water, or on moistened filter paper (Hartman et al., 1987).

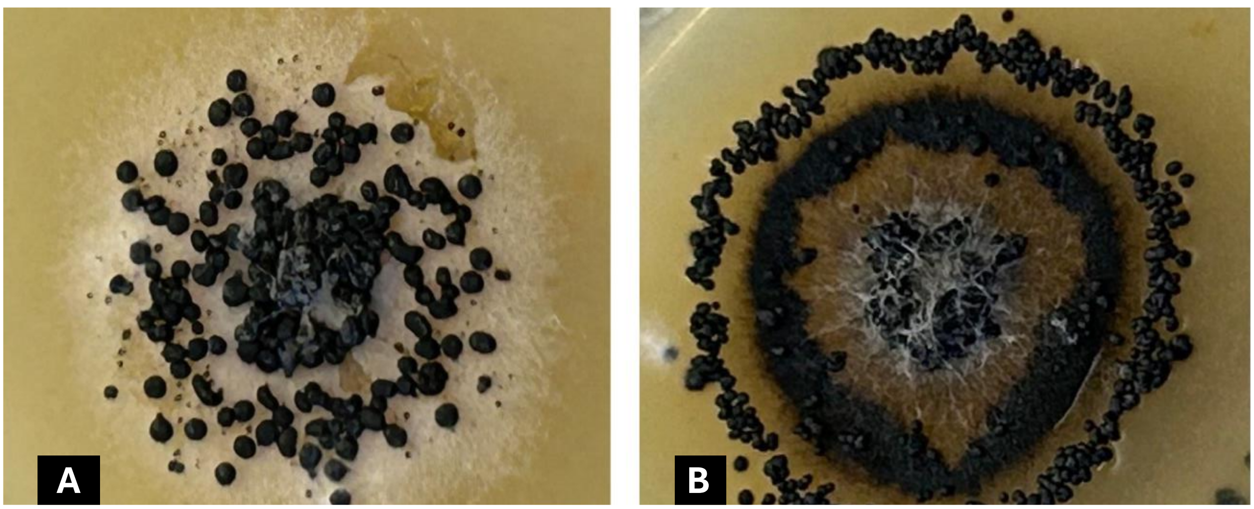

Figure 4. Sclerotia of *Coniothyrium glycines* in pure culture (**A** and **B**). Images from Koch Bach et al. (2024b).

Sclerotia are reinforced with melanin and germinate directly when fungal threads (hyphae) grow out. Hyphae later develop pycnidia, which contain asexual spores, conidia (Hartman et al., 1987). The yellow-brown, spherical to flask-shaped pycnidia are partially embedded in leaves, with a small pore that discharges spores (Stewart, 1957). Pycnidia develop on upper sides of leaves and are slightly smaller than sclerotia, which develop on undersides of leaves (Leakey, 1964).

Symptoms

Coniothyrium glycines is a fungal pathogen that causes red leaf blotch (RLB) of soybean (Glycine max) (Figs. 1A and 1B) (Koch Bach et al., 2024b).

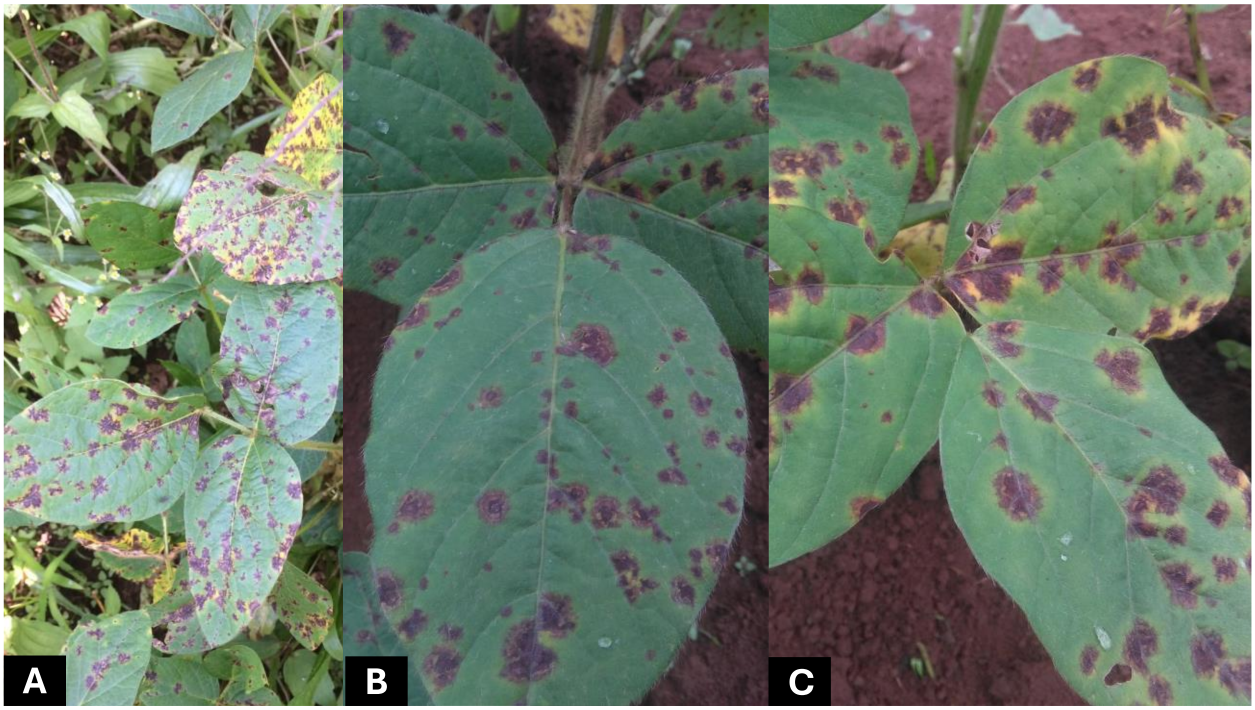

Figure 2. *Coniothyrium glycines* symptoms in young soybean leaves: trifoliolate leaf **(A)** and leaflet **(B)** with spots along the veins, and trifoliolate leaf with yellow halos around some spots **(C)**. Photos courtesy of Yechalew Sileshi.

The symptoms of RLB on its host are clearly visible. Symptoms in young soybean plants start with small, red or dark reddish-brown, circular or irregular lesions (localized spots) on the upper surface of leaves, mainly along the veins (Figs. 2A, 2B and 2C). As the disease progresses, lesions spread onto the lower leaf surface, expand in size, and often coalesce (Figs. 3A and 3B).

Blotching occurs on older lesions. Leaf blotches (blots or spots) are relatively larger than leaf lesions and have dark margins (Akem et al., 1992; Levy et al., 1990). Specifically, leaf blotches are brown to red with tan centers, roughly circular (occasionally somewhat irregular) and are approximately ¼ to ¾ inches in diameter (Akem et al., 1992; Stewart, 1957). A yellowish halo may sometimes occur on the outer edge of spots (Fig. 2C) (Akem et al., 1992). In old lesions, the central dead area may break up and fall out, causing the leaf to have a ragged appearance (Figs. 3A and 3B) (Stewart, 1957). Lesions also occur on stems, petioles, and pods (Figs. 3C, 3D and 3E) (Hartman et al., 1987).

Near the blotch centers, microscopic flask-shaped structures (pycnidia) develop, which contain asexual fungal spores. To unaided eyes, these pycnidia appear as black-brown flecks on blotch surfaces (Fig. 1B) (Stewart, 1957). Fungal resting structures, called sclerotia (Figs. 4A and 4B), are also visible on blotches and are primarily produced on the undersides of leaves (Hartman et al., 2011). Pycnidia and sclerotia are similar in color and shape (roughly circular and black), but sclerotia may be slightly larger (Koch Bach et al., 2024a).

Additional symptoms include leaf chlorosis (Stewart, 1957) and premature leaf senescence (Hartman et al., 1987; Hartman et al., 2011; Koch Bach et al., 2024b). Leaves dropping off the plant (abscission) is often the most noticeable symptom of the disease, with up to 100 percent defoliation reported in some genotypes or lines of soybean. Symptoms vary across soybean varieties or genotypes. All tested U.S. soybean cultivars are susceptible (Sinclair, 1989).

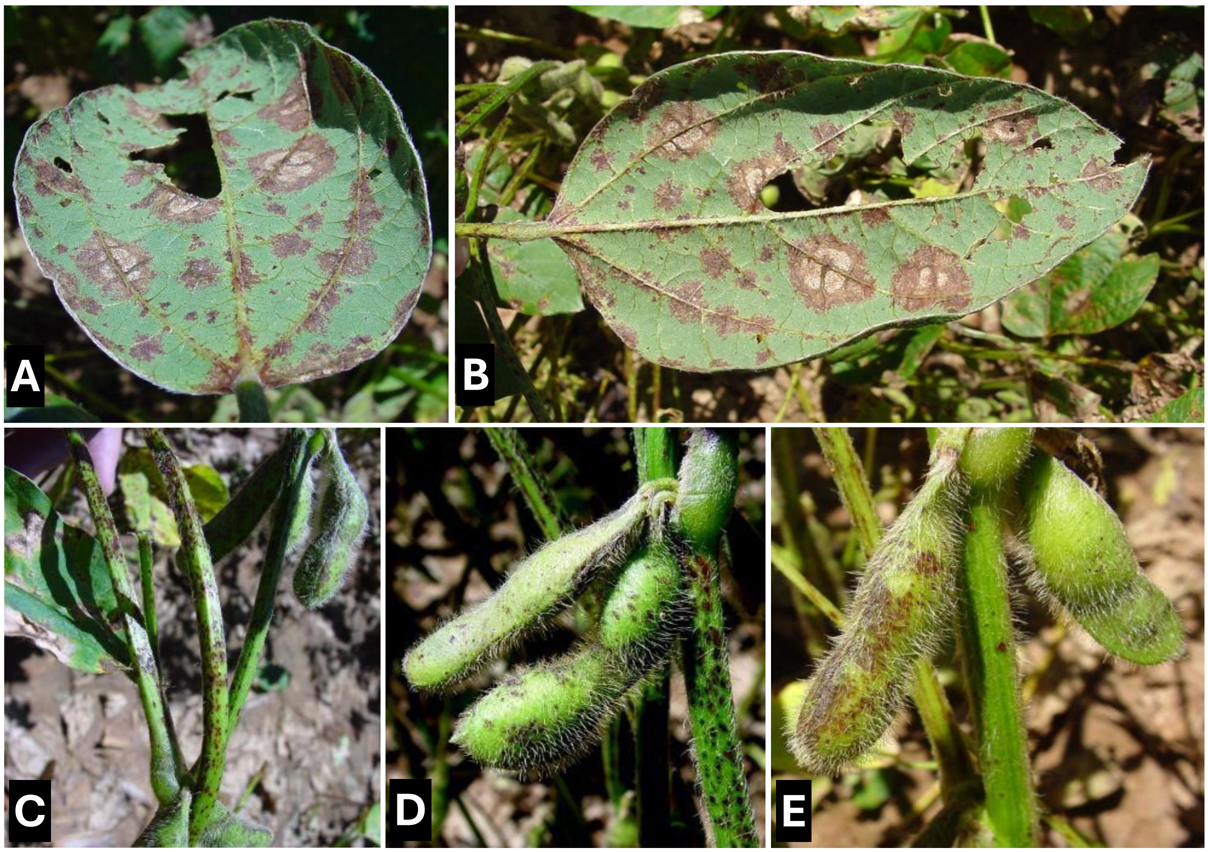

Figure 3. *Glycine max* (soybean) leaves (**A** and **B**), and petioles, stems, and pods (**C**, **D** and **E**) infected with *Coniothyrium glycines*. Photos courtesy of Frederik J. Kloppers.

Easily Mistaken Species

During the early stages of infection, RLB may be confused with Alternaria leaf spot, brown spot, or target spot (Hartman et al., 2009). As soybean RLB progresses, more characteristic leaf lesions develop.

To help to distinguish each similar species and to guide sample collection during visual surveys for this pathogen in the field, we listed how each species' symptoms differ below. Symptoms alone are not considered a valid method to pre-screen or confirm the identity of a pathogen. See the [Approved Methods for Pest Surveillance (AMPS) pest page] for approved pre-screening and identification methods.

Coniothyrum glycines: Lesions are circular to angular, mainly along veins, dark red on the upper surfaces of leaves, and reddish brown on the lower surfaces.

Alternaria alternata**:** Spots have concentric rings.

Septoria glycines**:** Lesions are irregularly shaped and often surrounded by yellow halos. No sclerotia will be present in lesion centers.

Corynespora cassiicola**:** Lesions are round to irregularly shaped, particularly along leaf margins, frequently surrounded by dull-green or yellowish-green halos, and larger spots are often distinctly zonate (marked with zones).

Commonly Encountered Non-targets

Alternaria alternata, *Septoria glycines,* and *Corynespora cassiicola* are present in the United States (WPFUS, 2025) and may be encountered during survey.

Biology and Ecology

The disease cycle of *C. glycines* has been fully characterized on soybean. New RLB epidemics begin in spring when rain splashes either sclerotia or asexual spores (conidia) from pycnidia from the soil upward onto leaf surfaces, where germination and infection occur (Hartman et al., 1987). Conidia germinate between 68 and 77°F (Hartman and Sinclair, 1992). Though this pathogen infects soybean plants at temperatures ranging from 68 to 77ºF, environmental variables such as temperature and relative humidity do not correlate to its severity (Murithi et al., 2022).

As the disease progresses, heavily diseased leaves age prematurely, drop from plants, and release sclerotia into the upper soil matrix as they decay. Sclerotia are hardy, allowing the pathogen to survive in the soil in the absence of a host and during unfavorable conditions (Hartman et al., 1987; Murithi et al., 2022).Sclerotia typically lay dormant from fall until the following spring, when they provide the starting inoculum for the next disease cycle (Hartman et al., 2009). Sclerotia can withstand challenging temperatures; 90% germinated after being held at 41°F for 18 months, and more than 22% germinated after heat-treatment at 212°F (Hartman and Sinclair, 1992).

Long-distance spread of this fungus could occur through transport of untreated plant material or via contaminated soil and debris accompanying seed from infected fields (Hartman et al., 2009). There is no evidence that the pathogen is seedborne or airborne.

Known Hosts

The host list below includes cultivated and wild plants that 1) are infected by the pest under natural conditions, 2) are frequently described as major, primary, or preferred hosts, and 3) have primary evidence for feeding and damage documented in the literature. Plants are highlighted in bold if they are commercially produced and the pest causes economically significant damage.

Table 1. Preferred hosts of *Coniothyrium glycines.*

Scientific Name	Common Name	Type/Use	References/Notes

Glycine max	**soybean**	**cultivated**	**(Hartman and Sinclair, 1992)**
Neonotonia wightii	perennial soybean	wild	(Hartman and Sinclair, 1992)

Both hosts are present in the United States, although *N. wightii* is only found in Hawaii (USDA-NRCS, 2025). In addition, *Glycine soja,* syn. *G. ussuriensis*, (wild soybean) and *Pueraria montana*, *syn. Glycine javanica*, (kudzu) are also reported as hosts of this pathogen (Farr and Rossman, 2025). However, we did not find direct evidence that these additional hosts are attacked by *C. glycines* under natural conditions.

Pest Importance

Coniothyrium glycines is listed on the United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ) Select Agents and Toxins list (7 CFR Part 331, 2025) due to its potentially devastating impacts to soybean production should it spread to the United States (CDCP-DRSC, 2025; Koch Bach et al., 2024b).

While *C. glycines* has only been confirmed in Africa, if the pathogen were introduced into major soybean-producing countries, losses could be substantial, as there is no complete host resistance to this disease (Hartman et al., 2011). *Coniothyrium glycines* caused yield losses of up to 50% in soybean in Zambia and Zimbabwe in the 1980s (Hartman et al., 2009; Hartman and Sinclair, 1996).

The United States is the leading soybean producer after Brazil, and soybean is the second most widely cultivated crop in the United States after corn (FAOSTAT, 2025). In 2023, soybean was harvested from 82.4 million acres in the United States, and the total harvest was 124.93 million tons (FAOSTAT, 2025). Of the total harvest, 53.6 million tons were exported from the US in 2023 at a value of over 28 billion dollars.

Coniothyrium glycines is listed as a harmful organism in Argentina, Brazil, and Peru (USDA-PCIT, 2025). There may be trade implications with these countries if this pest becomes established in the United States.

Known Vectors (or associated insects)

This species is not known to vector any other organisms, is not known to be vectored, and does not have any associated organisms.

Known Distribution

Table 2. Countries where *Coniothyrium glycines* is known to occur.

Continent	Country	References/Notes
Africa	Cameroon	(EPPO, 2025)
Africa	Congo	(EPPO, 2025; Farr and Rossman, 2025)

Continent	Country	References/Notes
Africa	Ethiopia	(Koch Bach et al., 2024a; Murithi et al., 2022; Stewart, 1957)
Africa	Kenya	(Murithi et al., 2022)
Africa	Malawi	(Koch Bach et al., 2024a)
Africa	Mozambique	(Koch Bach et al., 2024a)
Africa	Nigeria	(Akem et al., 1992)
Africa	Rwanda	(EPPO, 2025)
Africa	Tanzania	(EPPO, 2025)
Africa	Uganda	(Koch Bach et al., 2024a; Murithi et al., 2022)
Africa	Zambia	(Datnoff et al., 1986; Levy et al., 1990; Murithi et al., 2022)
Africa	Zimbabwe	(Koch Bach et al., 2024a)

There have been reports of *C. glycines* in India (Lenne, 1990) and Bolivia (Sinclair, 1989). However, these are unreliable reports, as both are sourced to herbarium records from the International Mycological Institute and have not been confirmed by any additional findings.

Pathway

The most likely pathway of entry for *C. glycines* is through transport of infected soybean plant materials, including pods, debris accompanying seed from infected fields, or contaminated soil (Hartman et al., 2009). Since 1984, there have been at least 369 interceptions of *Coniothyrium* spp. at U.S. ports of entry, frequently in baggage, general cargo, and permit cargo coming from multiple countries, including Zimbabwe and Nigeria, where *C. glycines* is known to occur (AQAS, 2025). While none of these interceptions were confirmed to be *C. glycines*, the interceptions demonstrate the ability of fungi like RLB to be transported long distances from many different countries.

In Africa, where RLB is already established, this disease is distributed uniformly throughout affected fields rather than in isolated pockets (Figs. 5 and 6) (Hartman et al., 1987). However, the distribution of this pathogen would be patchy if it were introduced to a new field.

The pathogen may be dispersed from field to field by sclerotia carried in contaminated soil during routine farm operations. More information on the epidemiology of RLB is lacking (Murithi et al., 2022; Proaño-Cuenca et al., 2023). However, the spread of this pathogen in Africa has likely been facilitated through infections on its native host, *N. wightii* (Koch Bach et al., 2024a).

Figure 5. A *Glycine max* (soybean) field infected with *Coniothyrium glycines* in Zambia. Photo courtesy of Frederik J. Kloppers.

Figure 6. A soybean field in Ethiopia severely infected with *Coniothyrium glycines*. Photo courtesy of Yechalew Sileshi.

Use the PPQ Commodity Import and Export manual listed below to determine 1) if host plants or material are allowed to enter the United States from countries where the organism is present and 2) what phytosanitary measures (e.g., inspections, *phytosanitary certificates, post entry quarantines, mandatory treatments) are in use. This manual is updated regularly.*

Agricultural Commodity Import Requirements (ACIR) manual: ACIR provides a single source to search for and retrieve entry requirements for imported commodities.

Potential Distribution within the United States

Based on where *C. glycines* is known to occur in the world and comparing those climates with Global Plant Hardiness Zones, we expect that *C. glycines* could establish in plant hardiness zones 10–13 (Takeuchi et al., 2018).

Only limited information is currently available on the potential distribution of this pathogen in the United States, but warmer areas that plant soybean crops are especially at risk for establishment (Carrera-Lopez, 2019). Though soybean plants are grown almost everywhere in the US, warmer areas of Texas, Louisiana, Mississippi, Alabama, Georgia, and South Carolina, have the highest risk of establishment and spread of this pathogen based on host availability (ASA, 2024; WPR, 2025) and climate suitability (Takeuchi et al., 2018). Additionally, Hartman et al. (2009) created a risk map that the areas of the USA that have the highest risk of introduction and establishment of this pathogen are the Mississippi River Valley, parts of the eastern Midwest, and the Mid-Atlantic coast.

Survey and Key Diagnostics

Approved Methods for Pest Surveillance*:

For the current approved methods and guidance for survey and identification, see Approved Methods for Pest Surveillance (AMPS) pest page on the CAPS Resource and Collaboration website.

References

7 CFR Part 331, 2025. Possession, use and transfer of select agents and toxins. https://www.ecfr.gov/current/title-7/subtitle-B/chapter-III/part-331.

Akem, C.N., Akueshi, C.O., Uwala, O.A. and Dashiell, K.E., 1992. Outbreak of red leaf blotch, caused by *Dactuliochaeta-glycines*, on soybeans in Nigeria. Plant Disease, 76(3): 323.

AQAS, 2025. AQAS Pest Interception History: *Coniothyrium* spp., United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Agricultural Quarantine Activity System (AQAS), https://arm.aphis.usda.gov/.

ASA, 2024. Soystats 2024, American Soybean Association (ASA), https://soygrowers.com/wp-content/uploads/2024/06/24ASA-001-Soy-Stats-Web.pdf.

Carrera-Lopez, D.A., 2019. Detection of the select agent *Coniothyrium glycines*, causal pathogen of red leaf blotch of soybeans using high throughput sequencing data, Oklahoma State University, Oklahoma, USA, 118 pp.

CDCP-DRSC, 2025. HHS and USDA Select Agents and Toxins, Federal Select Agent Program, Centers for Disease Control and Prevention (CDCP), Division of Regulatory Science and Compliance (DRSC), Atlanta, GA, https://www.selectagents.gov/sat/list.htm.

Datnoff, L., Levy, C., Naik, D. and Sinclair, J., 1986. *Dactuliophora glycines*, a sclerotial state of *Pyrenochaeta glycines*. Transactions of the British Mycological Society, 87(2): 297-301.

EPPO, 2025. EPPO Global Database. European and Mediterranean Plant Protection Organization.

FAOSTAT, 2025. Crops and livestock products. Food and Agriculture Organization of the United Nations, Statistics Division (FAOSTAT), Rome, Italy, https://www.fao.org/faostat/en/#home.

Farr, D.F. and Rossman, A.Y., 2025. Fungal Databases. United States Department of Agriculture (USDA), Agricultural Research Service (ARS), U.S. National Fungus Collections.

Hartman, G., Haudenshield, J., Smith, K., Tooley, P., Shelton, J., Bulluck, R., Engle, J.S., Magarey, R., Royer, M., Sutker, E., Cardwell, K., Herman, T. and Datnoff, L., 2009. Recovery plan for red leaf blotch of soybean caused by *Phoma glycinicola*. Government publication/report.

Hartman, G.L., Datnoff, L.E., Levy, C., Sinclair, J.B., Cole, D.L. and Javaheri, F., 1987. Red leaf blotch of soybeans. Plant Disease, 71(2): 113-118.

Hartman, G.L. and Murithi, H.M., 2019. Field Guide to African Soybean Diseases and Pests, Soybean Innovation Laboratory, Feed the Future Innovation Lab for Soybean Value Chain Research, Urbana, IL, USA, http://soybeaninnovationlab.illinois.edu/soybean-disease-diagnostic-guide.

Hartman, G.L., Rupe, J.C., Sikora, E.J., Domier, L.L., Davis, J.A. and Steffey, K.L. (Editors), 2015. Compendium of Soybean Diseases and Pests. 5th edition. APS Press, St. Paul, Minnesota, 201 pp.

Hartman, G.L. and Sinclair, J.B., 1992. Cultural studies on *Dactuliochaeta glycines*, the causal agent of red leaf blotch of soybeans. Plant Disease, 76(8): 847-852.

Hartman, G.L. and Sinclair, J.B., 1996. Red leaf blotch (*Dactuliochaeta glycines*) of soybeans (*Glycine max*) and its relationship to yield. Plant Pathology, 45: 332-343.

Hartman, G.L., West, E.D. and Herman, T.K., 2011. Crops that feed the World 2. Soybean—worldwide production, use, and constraints caused by pathogens and pests. Food Security, 3(1): 5-17.

Koch Bach, R.A., Murithi, H.M., Coyne, D. and Clough, S.J., 2024a. Phylogenetic analyses show the Select Agent *Coniothyrium glycines* represents a single species that has significant morphological and genetic variation. Mycologia: 1-13.

Koch Bach, R.A., Murithi, H.M., Slocum, C.R., Coyne, D. and Clough, S.J., 2024b. Remarkably high internal transcribed spacer haplotype diversity of the fungal select agent *Coniothyrium glycines* discovered throughout its range in sub-Saharan Africa. Phytopathology, 114(5): 955-960.

Leakey, C.L.A., 1964. *Dactuliophora*, a new genus of mycelia sterilia from tropical Africa. Transactions of the British Mycological Society, 47(3): 341-350.

Lenne, J.M., 1990. A World List of Fungal Diseases of Tropical Pasture Species, International Mycological Institute, Centro Internacional de Agricultura Tropical, Wallingford, UK.

Levy, C., Mahuku, G.S., Tattersfield, J.R. and Cole, D.L., 1990. Method of assessment of red leaf blotch on soybeans used to evaluate cultivar susceptibility and chemical control. Crop Protection, 9: 148-154.

Murithi, H.M., Pawlowski, M., Degu, T., Hunde, D., Malede, M., Obua, T., Mushoriwa, H., Coyne, D., Tukamuhabwa, P. and Hartman, G.L., 2022. Evaluation of soybean entries in the Pan-African trials for response to *Coniothyrium glycines*, the cause of red leaf blotch. Plant Disease, 106(2): 535-540.

Proaño-Cuenca, F., Carrera-Lopez, D., Luster, D., Zeller, K. and Cardwell, K., 2023. Genome sequence resources for five isolates of *Coniothyrium glycines*, causal pathogen of red leaf blotch of soybeans. PhytoFrontiers, 3(2): 452-455.

Sinclair, J.B., 1989. Threats to soybean production in the tropics: Red leaf blotch and leaf rust. Plant Disease, 73(7): 604-606.

Stewart, R.B., 1957. An undescribed species of *Pyrenochaeta* on soybean. Mycologia, 49(1): 115-117.

Takeuchi, Y., Fowler, G. and Joseph, A.S., 2018. SAFARIS: Global plant hardiness zone development. North Carolina State University, Center for Integrated Pest Management/United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, Science and Technology, Plant Epidemiology and Risk Analysis Laboratory, Raleigh, NC.

USDA-NRCS, 2025. The PLANTS Database. National Plant Data Team, Greensboro, NC USA. http://plants.usda.gov.

USDA-PCIT, 2025. Harmful Organisms by Country and Commodity: *Coniothyrium glycines*, United States Department of Agriculture (USDA), Animal and Plant Health Inspection Services (APHIS), Phytosanitary Certificate Issuance & Tracking System (PCIT), Phytosanitary Export Database (PExD), https://pcit.aphis.usda.gov/PExD/faces/ViewPExD.jsp.

WPFUS, 2025. Widely Prevalent Fungi of the United States. https://www.prevalentfungi.org/.

WPR, 2025. Soybean Production by State 2025. World Population Review (WPR). https://worldpopulationreview.com/state-rankings/soybean-production-by-state.

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Version

December 2025: Datasheet completed (Version 1)

Reviewers

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