Pest Alert

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Surveillance for Soybean Rust in Florida

Timothy S. Schubert and **Wayne N. Dixon**

INTRODUCTION: Soybean rust is a very important exotic disease threatening commercial soybean (*Glycine max* (L.) Merrill) production in the US. Though Florida grew only 11,000 acres of soybean (out of a total of approximately 73.4 million acres nationwide) in 2003, the Gulf Coast states are considered the likely zone of introduction for soybean rust into North America. Varietal screening done in quarantine by the USDA reveals that virtually all the existing commercially grown soybean cultivars are susceptible. Environmental conditions in the US are expected to be very favorable for rust development. Should the disease be introduced into the US, it would likely spread throughout the main US soybean production area in one season, with forecast losses exceeding $7.2 billion per year (Kuchler *et al*. 1984).

In view of these facts, extensive surveys of various legume hosts for Asian soybean rust (*Phakopsora pachyrhizi* / *P. meibomiae*) are currently being done by the FDACS-DPI/CAPS, USDA-APHIS and UF-IFAS staff throughout Florida.

The common name 'soybean rust' is applied to two rust diseases caused by two different pathogens: *Phakopsora pachyrhizi*, H. Sydow and Sydow, and *P. meibomiae* (Arthur) Arthur (Ono, *et al* 1992). *Phakopsora pachyrhizi* is by far the more aggressive and more destructive of the two pathogens. The two are impossible to distinguish in the field and under the microscope, hence the unusual situation of a single common name for diseases caused by two different pathogens. *Phakopsora pachyrhizi* (*Pp*) and *P. meibomiae* (*Pm*) infect an unusually broad range of plant species in the Subfamily Papilionoidae in the Fabaceae (the legume family). The rust has never been found in the 48 contiguous states, but *Pm* was recorded from Puerto Rico in 1976 and *Pp* from Hawaii in 1994. One widespread naturalized host in the southern United States is kudzu (*Pueraria montana* (Lour.) Merr. var. *lobata* (Willd.) Maesen & S. M. Almeida. In addition to kudzu and soybean, yam bean, (*Pachyrhizus erosus* (L.) Urban), and cowpea (*Vigna unguiculata* (L.) Walp.) are the principal hosts of soybean rust, all of which are found in Florida. Both *Pp* and *Pm* are autoecious (no alternate hosts) and microcyclic (with uredinial and telial spore stages), with the obligate pathogens surviving and reproducing only on live hosts. Until 2001 when *Pp* was discovered in Paraguay, this damaging species was confined to Asia (an area bordered by Japan, Australia, India and China), with one exceptional introduction into Hawaii in 1994. *Pm*, the weaker pathogen, is prevalent in the western hemisphere. Only DNA tests can separate the two species since both have similar morphology under microscope (Reid *et al* 2002) (Fig.5). The following paragraph refers only to *Pp*.

Soybean rust is not seed-borne, although urediniospores could travel as contaminants in seed lots from infested areas. Urediniospores are very easily wind disseminated. Soybean is susceptible at any growth stage but symptoms usually appear at or after flowering (Fig. 1) and show up on the lower leaves first (Fig. 2). The pathogen prefers prolonged wet and cool conditions (8º-28ºC). Uredinial pustules appear 9-10 days later, which then produce urediniospores after 3 weeks. Long periods of leaf wetness when the mean daily temperature is less than 28°C favor secondary disease spread and subsequent epidemic development. Two types of foliar symptoms are produced: a) large tan lesions with abundant spore production (Fig. 3), and b) smaller red-brown lesions with fewer spores produced (Fig. 4). Lesion type can change on the same plant over time. Urediniospores are the sole source of infection. Though teliospores can germinate to produce basidiospores, these basidiospores are vestigial and apparently play no role in the disease cycle. Sources of resistance to the prevalent natural populations of soybean rust have been identified in countries facing this disease. A number of different fungicides are known to be effective in rust management. Depending on disease pressure, from one to three fungicide applications per season starting at flowering are recommended.

REFERENCES:

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Frederick, R.D., C. L. Snyder, G. L. Peterson, and M. R. Bonde. *2002. Polymerase chain reaction assays for the detection and discrimination of the soybean rust pathogens Phakopsora pachyrhizi and P. meibomiae. Phytopathology 92: 217-227.*

Kuchler, F., R. Duffy, R. Shrum, and W. M. Dowler. *1984. Potential economic consequences of the entry of an exotic fungal pest: The case of soybean rust. Phytopathology 74 (8): 916-920.*

Fig. 1. Typical foliar symptoms of soybean rust; most susceptible stage of soybean is at early flowering stage.
Photo credit: Clive Levy, Commercial Farmer's Union of Zimbabwe

Fig. 2. Young uredinia on the under surface of soybean leaf.
Photo credit: CABI

Fig. 3. Close-up view of tan lesion type of *Phakopsora pachyrhizi* on soybean leaves.
Photo credit: Reid Frederick, USDA-ARS

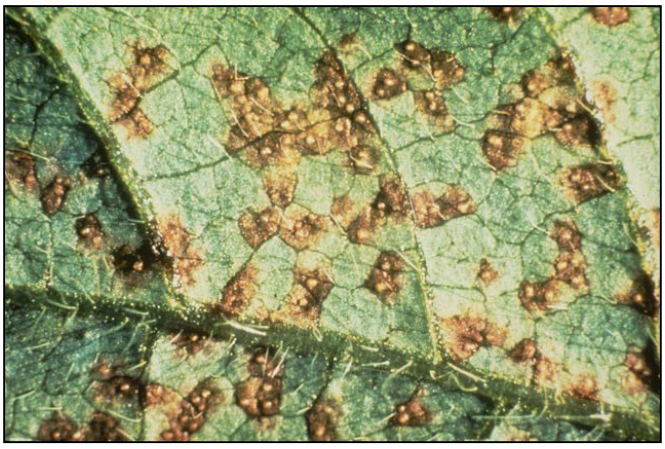

Fig. 4. Close-up view of the red-brown lesion type of *Phakopsora pachyrhizi*.
Photo credit: AVRDC, courtesy of Arnold Tschanz, USDA-APHIS-PPQ)

Fig. 5. Microscopic view of urediniospores of *Phakopsora pachyrhizi*.
Photo credit: CABI

More Soybean Rust Information (http:// www.doacs.state.fl.us/pi/enpp/pathology/sbr.html)