

# Susceptibility of edible leguminous hosts to *Phakopsora pachyrhizi* under field conditions in central Florida

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## Abstract

Asian soybean rust affects a large number of hosts. In addition to soybean (*Glycine max*), *Phakopsora pachyrhizi* has been shown to infect an additional 60 species in 26 other genera in controlled environment inoculations (Frederick et al. 2002). A number of these host plants are cultivated in the United States. In addition to *G. max* host species include: *Pachyrhizus erosus* (yam bean, jicama), *Phaseolus lunatus* (butter bean, lima bean), and *Vigna unguiculata* (cowpea, black-eyed pea). In 2005 Asian soybean rust was reported on three *Phaseolus* spp. grown in Quincy, FL (Lynch et al. 2005). Rust was detected in early December just before first frost when plants were at physiological maturity. Growers of edible legumes are concerned by the lack of data on field susceptibility and potential economic impact to these commercially-grown vegetable bean hosts. Defining susceptibilities of species and cultivars of dry and edible beans allows producers and consultants to better plan scouting and management efforts that will be employed as Asian soybean rust spreads into production areas each year. Five plantings of more than 15 varieties of edible beans were monitored for the development of soybean rust over two seasons. Plantings established at different times during the year were in close proximity to soybeans infected with *P. pachyrhizi*. Disease developed from natural inoculum in 2005 plantings, and spreader-rows of soybeans were inoculated with the pathogen in 2006 plantings. Soybean cultivars within the trial were the only beans that became infected with Asian soybean rust. These data suggest that under central Florida conditions, risks posed by Asian soybean rust to edible legumes other than soybean are minimal.

## Research Objectives and Rationale

The objective of this study was to assess the potential impact of Asian soybean rust (ASR) on leguminous species other than soybean.

Beans were planted adjacent to soybean spreader rows such that all bean varieties had equal chance of infection.



## Variety Trial Planting

2005 bean varieties were organized in a RCBD and were planted at 3 seeds per ft. Each block contained four 100-foot rows of each variety. 2005 planting dates were 5 May and 9 Aug. Bean varieties planted 5 May, except soybean, were harvested 21 July. Bean varieties are listed in Table 1. Soybean varieties also were replanted on 9 Aug, but plants from 5 May remained in the trial. No inoculations were made. The trial was scouted weekly for soybean rust symptoms from initiation until 9 Oct. Samples of suspect plant tissue were collected and processed in triplicate. Infection centers were marked with blue flags, and the spread of disease was recorded over time. 2006 bean varieties were planted 6 June and 21 September. Bean varieties listed in Table 2. Soybean spreader rows in the 6 June planting were point-inoculated 11 July, as soybeans entered R1 (flowering). Inoculations were made by stapling infected kudzu leaves to soybean trifoliolates. Infected kudzu leaves were collected from a source 3 mi from the soybean plots, incubated overnight in a room-temperature moist chamber, and used as inoculum the next day. Beans planted 21 Sept were inoculated twice per variety and five times per soybean spreader row. Inoculations were made 26 Oct (Fig 2).

## Results 2005

Disease was first recorded 13 Jul on one plant of Ina and Williams 82 varieties of soybean. By 11 Nov ASR had been confirmed on Ina (3 of 4 blocks), Williams 82 (2 of 4 blocks), Stressland (4 of 4 blocks), and Spencer (2 of 4 blocks) varieties of soybean. Spread from disease foci were documented with blue flags (Fig. 4). No soybean rust symptoms, pustules, or sporulation were observed on any non-soybean variety. No inoculations were made. Total number of plants across blocks and varieties were recorded over time (Fig. 3).

## 2006

Disease was first recorded 20 July at the inoculation points in the 6 June planting. Inoculations were made as stated above. Disease progress was slow and eventually stopped due to unusually dry conditions. Crop failure due to drought brought an end to this planting. Disease was recorded in the 21 Sept planting 10 Nov (blue flags indicate inoculation points Fig. 4). All soybean spreader row inoculation points were positive. Presence of the pathogen was confirmed with microscopy. No disease was recorded on any other bean variety or in any block except the spreader rows.

## Discussion

Although disease development was hindered by drought both years of this trial, enough disease developed naturally and from inoculation to draw some tentative conclusions. Even after direct inoculation in an irrigated field (21 Sept 2006 planting), no soybean rust symptoms or signs were observed in any bean except soybean. These data suggest that under central Florida conditions, and given the current population of the pathogen, risks posed by Asian soybean rust to edible legumes other than soybean are minimal.

Table 1

Planted 5-5-05		Planted 8-9-05	Planted 10-5-05
Amra bush bean	Pinto	Fordhook 242 lima bean	Maestro pea
bean		Gold Mine wax bean	Zipper Cream cowpea
Caprice bush bean		Golden Rod wax bean	Iron clay pea
Azuki bean		Hystyle snap bean	Oregon Sugar Pod II pea
Capricorn bush bean		Dusky snap bean	Edible soybean
Maestro pea		Amra snap bean	Charon bush bean
Charon bush bean		Azuki bean	Capricorn bush bean
Dusky bush bean		California blackeye cowpea	Carson wax bean
Leon bush bean		Iron clay pea	Derby bush bean
Tasman bush bean		Zipper Cream cowpea	Goldmine wax bean
Bronco bush bean		Stressland, Spencer, Ina, and Williams soybean (1 row of each per rep)	Burpee Stringless bush bean
Williams 82 soybean			Dwarf Gray Sugar pod pea
Ina soybean			Burpee Improved lima bean
Stressland soybean			
Spencer soybean			
Carson wax bean			
Goldmine wax bean			
Oregon Sugar Pod II pea			
Black turtle bean			

Table 2

Planted 6-6-06	Planted 9-21-06
GB75 bush bean	Fordhook 242 lima bean
Improved Golden wax bean	Improved Golden wax bean
Hystyle bush bean	Golden Rod wax bean
Masai bush bean	Charon bush bean
Spartacus bush bean	Titan bush bean
Titan bush bean	Dwarf horticultural shell bean
RS4345RRR soybean	Azuki bean
S65-M3 soybean	Black turtle bean
BeSweet 2020 edamame	RS4345RRR soybean
Fordhook 242 lima bean	Maestro pea
Maestro pea	Scarlet runner bean
California blackeye cowpea	Pinto bean
Dark Red kidney bean	Navy bean
Improved Golden wax bean	Myles chickpea
Dark Red kidney bean	Sierra chickpea

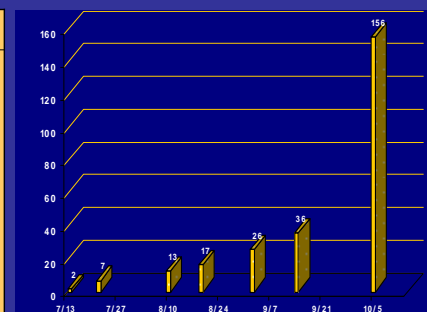


Fig. 3 Infected soybean plants over time 2005



Fig. 2. Infection on inoculated soybean leaf.



Fig. 4 Blue flags indicate inoculation points in soybean spreader rows and all legume variety blocks.

