

Brown stem rot and its interaction with the soybean cyst nematode

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Brown stem rot (BSR) of soybeans is caused by the fungal vascular pathogen *Cadophora gregata* (previously named *Phialophora gregata*). BSR is an economically important disease of soybeans in the north central United States, being prevalent in 68 to 73% of the soybean fields of Illinois, Iowa, and Minnesota (Workneh et al. 1999). There are two genetic types (called genotypes) of *C. gregata* that differ in their ability to cause foliar symptoms on susceptible soybeans (Chen et al. 2000). Infection by genotype A of the fungus can result in mild to severe brown discoloration of the pith and severe foliar symptoms on susceptible soybeans and mild or no foliar symptom on resistant soybeans. In contrast, infection by genotype B of the fungus causes mild to severe brown discoloration of the pith, but mild or no foliar symptoms. Soybeans can be colonized by both genotypes of the fungus without exhibiting stem or foliar symptoms (Tabor et al. 2003a). Consequently, “hidden” yield loss due to BSR may frequently occur.

The soybean cyst nematode (SCN) is considered the most damaging soybean disease in Iowa. The nematode is widely distributed in the Midwestern United States (Workneh et al. 1999) and occurs in many fields in which BSR also is occurring. Observations were made in the early 1990s to suspect that soybean cultivars bred to be resistant to BSR were exhibiting greater-than-normal levels of symptoms of the disease when grown in fields infested with SCN. Greenhouse, growth chamber, and field research was initiated at Iowa State University in the mid 1990s to investigate the interaction of BSR with SCN.

Results of our research demonstrated that SCN increases the incidence and severity of BSR in numerous soybean cultivars, including cultivars that are susceptible and resistant to genotype A of the BSR fungus (Tabor et al. 2003b) (Figure 1). In addition to making BSR symptoms worse, SCN infection increases the incidence and severity of colonization of the soybean stems by genotype A of the BSR fungus (Table 1). The BSR fungus is more widespread in stems of plants infected with SCN than in non-SCN infected plants.

The effect of SCN on increasing BSR symptoms is amplified with increasing population densities of SCN. Similarly, colonization by the BSR fungus occurs earlier as the population density of SCN increases (Figure 2). This SCN population density effect is most pronounced in SCN-susceptible cultivars (Tabor et al. 2006). Soybean cultivars with resistance to both SCN and genotype A of the BSR pathogen are the least affected.

Soybean cultivars with resistance to both SCN and genotype A of the BSR fungus are available, and growers are advised to use these cultivars where both SCN and genotype A of the BSR fungus are present. Currently, we are testing several SCN-resistant cultivars to determine whether the resistance protects against genotype B of the BSR fungus and the effects of SCN on BSR symptoms and colonization of stems by the fungus.

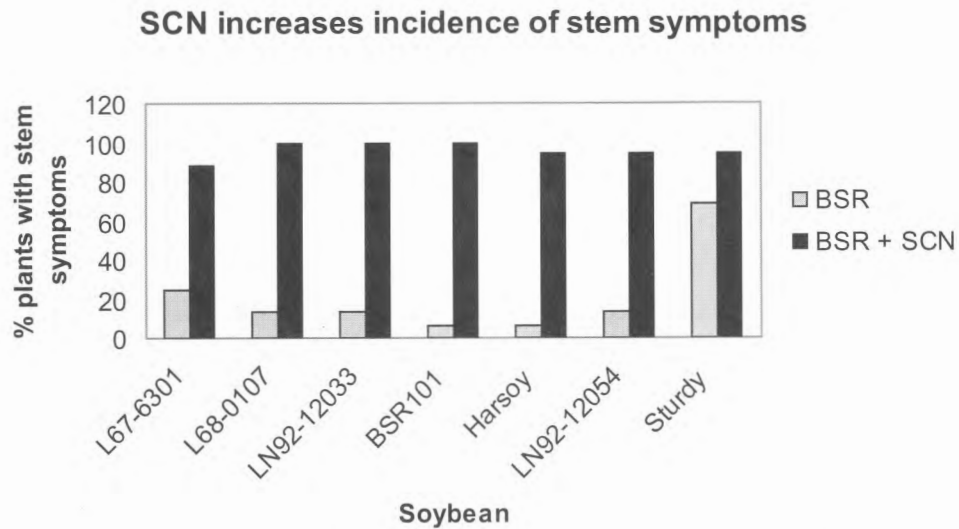


Figure 1. The incidence of BSR stem symptoms in the presence and absence of SCN in growth chamber experiment (Tabor et al. 2003b).

Table 1. Incidence and severity of stem colonization by genotype A of the BSR fungus in soybean cultivars after inoculation with various combinations of the BSR fungus, *C. gregata* (C. g.) and SCN, *Heterodera glycines* (H. g.). (adapted from Tabor et al. 2003b)

Soybean cultivar	Pathogen reaction		Incidence (% plants colonized)		Severity (% colonization)	
	C. g	H. g	C. g.	C. g. + H. g.	C. g.	C. g. + H. g.
Sturdy	S	S	65	100	57	100
BSR101	R	S	0	92	0	91
PI 84946-2	R	S	20	93	32	83
PI 437833	R	S	7	87	3	57
PI 437970	R	S	0	80	0	60
PS2465N	R	R	3	79	13	35
Freeborn	R	R	1	38	6	22

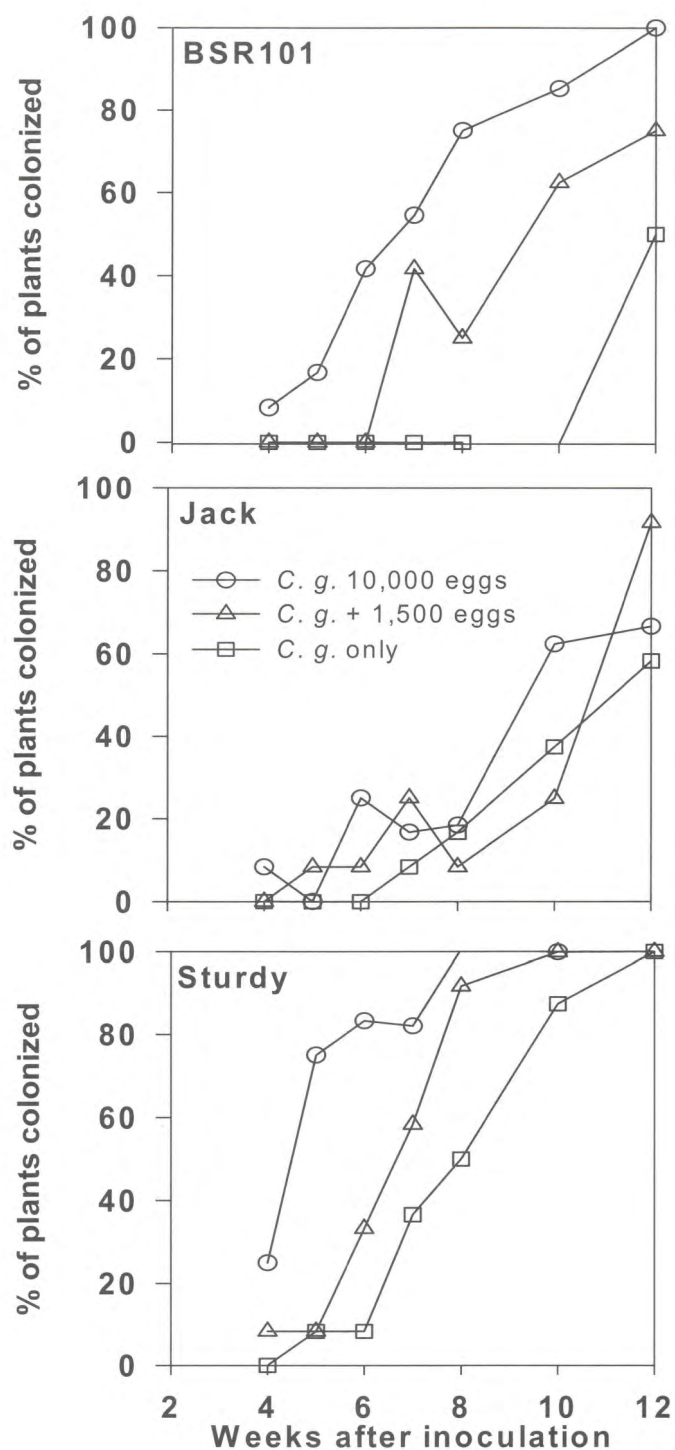


Figure 2. Colonization of stems of soybean cultivars by genotype A of the BSR fungus, *Cadophora gregata* (C.g.), in the absence or presence of two population densities of SCN, *Heterodera glycines* (H. g.). BSR101 is resistant to genotype A of *C. gregata* but susceptible to SCN, Jack is resistant to both *C. gregata* and SCN, and Sturdy is susceptible to both. (adapted from Tabor et al. 2006)

Literature Cited

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