

Susceptibility of leguminous green manure species to *Rhizoctonia solani* and *Sclerotium rolfsii*

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ABSTRACT

Paula Júnior, T.J.; Teixeira, H.; Vieira, R.F.; Lehner, M.S.; Lima, R.C.; Queiroz, T.F.N. Susceptibility of leguminous green manure species to *Rhizoctonia solani* and *Sclerotium rolfsii*. *Summa Phytopathologica*, v.37, n.4, p.218-220, 2011.

We studied the susceptibility of species used as green manure in common bean fields to root rot (*Rhizoctonia solani*) and southern blight (*Sclerotium rolfsii*). Seeds of *Crotalaria breviflora*, *Canavalia ensiformis*, *Cajanus cajan*, *Dolichos lablab*, *Stizolobium cinereum*, *S. aterrimum*, and the bean cvs. “Pérola”, “Valente” and “Carnaval” were sown in soil infested by either *R. solani* AG-4 or *S. rolfsii* in greenhouse. The emergence of *D. lablab* seedlings in soil infested by

R. solani dropped to 62%. *C. breviflora*, *C. ensiformis* and cv. “Valente” presented the lowest root rot severity. The pathogen *S. rolfsii* drastically reduced seedling emergence in all species; no *C. cajan* and *S. cinereum* seedling emerged. All plant species presented high southern blight severity. We conclude that leguminous crops are not suitable as green manure for areas of bean cultivation with high *R. solani* and *S. rolfsii* populations.

Palavras-chave adicionais: *Phaseolus vulgaris*, crop rotation, soilborne pathogen, integrated management.

RESUMO

Paula Júnior, T.J.; Teixeira, H.; Vieira, R.F.; Lehner, M.S.; Lima, R.C.; Queiroz, T.F.N. Suscetibilidade de espécies de leguminosas usadas como adubo verde a *Rhizoctonia solani* e *Sclerotium rolfsii*. *Summa Phytopathologica*, v.37, n.4, p.218-220, 2011.

Estudou-se a suscetibilidade de leguminosas utilizadas como adubos verdes em campos cultivados com feijão à podridão-radicular (*Rhizoctonia solani*) e à podridão-do-colo (*Sclerotium rolfsii*). *Crotalaria breviflora*, *Canavalia ensiformis*, *Cajanus cajan*, *Dolichos lablab*, *Stizolobium cinereum*, *S. aterrimum*, e as cultivares de feijão Pérola, Valente e Carnaval foram semeadas em solo infestado por *R. solani* AG-4 ou *S. rolfsii* em casa de vegetação. A emergência de *D. lablab* em solo infestado por *R.*

solani foi reduzida a 62%. *C. breviflora*, *C. ensiformis* e Valente apresentaram a menor severidade de podridão-radicular. O fungo *S. rolfsii* reduziu drasticamente a emergência de todas as espécies; nenhuma plântula de *C. cajan* e *S. cinereum* emergiu. Todas as espécies apresentaram alta severidade de podridão-do-colo. As espécies de leguminosas testadas não são apropriadas para serem utilizadas como adubo verde em áreas de cultivo de feijão com alta população de *R. solani* e *S. rolfsii*.

Keywords: *Phaseolus vulgaris*, rotação de culturas, patógeno habitante do solo, manejo integrado.

Among the most important soilborne pathogens of common beans (*Phaseolus vulgaris* L.) in Brazil are *Rhizoctonia solani* Kühn [teleomorph *Thanatephorus cucumeris* (A. B. Frank) Donk] and *Sclerotium rolfsii* Sacc. [teleomorph *Athelia rolfsii* (Curzi) C.C. Tu & Kimbr.]. *R. solani* is the cause of many diseases in a broad array of host plant species (1). Most isolates of *R. solani* recovered from roots of common beans are members of the anastomosis group AG-4, but isolates of AG-2 have also been reported (7). Seed and seedling infections result in severe pre- and postemergence damping-off or root rots, which reduce plant stands (3). In the absence of host tissue, the pathogen survives in the soil as sclerotia and melanized mycelium, free or embedded in soil organic debris, originating from parasitized crops and weed hosts and/or from saprophytically colonized crop residues, comprising sources of inoculum for the following crop (5). The fungus *S. rolfsii* is one of the most widely distributed and destructive pathogens of several

economic crops (1). In common beans, the disease caused by *S. rolfsii* is called southern blight. Infections of beans occur at the soil surface or just below it, at any stage of plant growth. Symptoms include damping-off, lesions on lower stem and root tissues, progressive yellowing, wilting, and premature defoliation (1). Control efforts have often met with limited success, due in part to the extensive host range, prolific growth, and ability to produce large numbers of sclerotia that may persist in the soil for at least one year (4).

Integrated strategies including crop rotation may be used to provide a satisfactory control of *R. solani* and *S. rolfsii* in common beans. Species of Leguminosae used as green manure crops can fix nitrogen (N) from atmospheric air, enriching the soil with N. They also add many tons of organic matter to the soil, thereby improving water-holding capacity, nutrient content, friability, and texture of the soil. Furthermore, some species are used to control nematodes.

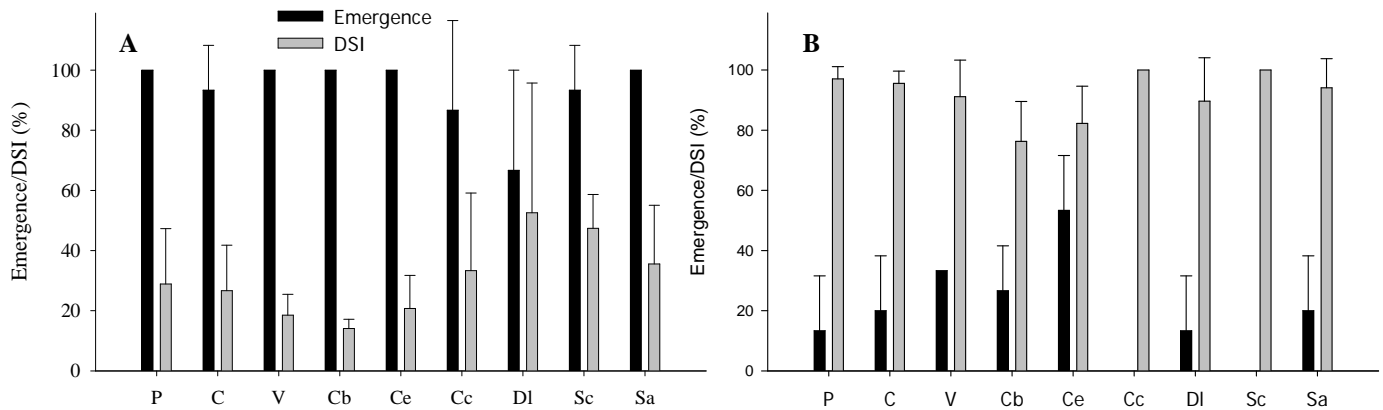


Figure 1. Seedlings emergence evaluated at 10 days after sowing (DAS) and disease severity index (DSI) at 30 DAS of root rot (*Rhizoctonia solani*) (A) and southern blight (*Sclerotium rolfisii*) (B) on *Phaseolus vulgaris* cvs. “Pérola” (P), “Carnaval” (C) and “Valente” (V); *Crotalaria breviflora* (Cb); *Canavalia ensiformis* (Ce); *Cajanus cajan* (Cc); *Dolichos lablab* (DI); *Stizolobium cinereum* (Sc); and *S. aterrimum* (Sa). Bars represent mean \pm SD.

However, the role of these plants as hosts of pathogens inhabitants of soil that generally infect dry beans is not clear yet. Crop rotation with legumes may have serious epidemiological implications for common beans, since infected plants increase the inoculum in the soil. We investigated the susceptibility of legumes to *R. solani* and *S. rolfisii* and the risks of the recommendation of crop rotation including legumes in fields infested by both pathogens.

Crotalaria breviflora DC., *Canavalia ensiformis* (L.) DC., *Cajanus cajan* (L.) Millspaugh, *Dolichos lablab* L., *Stizolobium cinereum* Piper & Tracy, *Stizolobium aterrimum* Piper & Tracy, and the bean cvs. “Pérola”, “Valente” and “Carnaval” were tested for their susceptibility to *R. solani* (AG-4) or *S. rolfisii*. The pathogens were isolated from infected dry bean plants and cultivated in potato-dextrose-agar medium for 10 days at 25 °C. Two 5 mm diameter mycelial-agar disks were transferred from the margin of growing colonies to 200 mL-Erlenmeyer flasks with 50 g of autoclaved rice grains. After six days of incubation in darkness at 25 °C, rice grains were dried on trays for 24 h before being used. The inoculum of each fungus was mixed with soil (2 g kg⁻¹ of soil) and put in 1 kg pots. The soil (red-yellow podzolic Cambic; pH = 5.9; Ca = 1.7 cmol_c dm⁻³; Mg = 0.8 cmol_c dm⁻³; Al = 0.0 cmol_c dm⁻³; H+Al = 2.5 cmol_c dm⁻³; P = 9.0 g dm⁻³; K = 42.0 g dm⁻³; and organic matter = 22.0 g kg⁻¹) was previously solarized for eight weeks using a transparent polyethylene film (1.5 mm). In a non-infested control, non-colonized autoclaved rice grains were mixed with solarized soil. Each pot was sown with three seeds of each legume at 3 cm depth. Pots were maintained in greenhouse and irrigated once a day with the same amount of water. A randomized complete block design with five replicates was used. The number of emerged seedlings was counted at 10 days after sowing (DAS). Hypocotyls were evaluated at 30 DAS for disease severity according to the 1-9 scale proposed by Abawi & Pastor-Corrales (1). The disease severity index (DSI) was calculated: $DSI(\%) = \frac{\sum (\text{scores of all plants})}{[9 \times (\text{total number of plants})]} \times 100$.

The emergence of seedlings in the non-infested control soil was 100%. The seedlings emerged from soil infested by *S. rolfisii* were fewer and the severity was higher compared with those from soil infested by *R. solani* (Fig. 1). The emergence of *D. lablab* in soil infested by *R. solani* dropped to 62% (Fig. 1A). *C. breviflora*, *C. ensiformis* and “Valente” presented the lowest severity of root rot (Fig. 1A). *S. rolfisii* reduced the emergence of all species; no *C. cajan* and *S. cinereum* seedling emerged (Fig. 1B). All species

presented high severity of southern blight (Fig. 1B). *R. solani* or *S. rolfisii* were re-isolated from all plants with symptoms of root rot or southern blight. We concluded that the use of *C. breviflora*, *C. ensiformis*, *C. cajan*, *D. lablab*, *S. cinereum* and *S. aterrimum* as green manure crops in bean fields can contribute to increase or at least to maintain the inoculum of *R. solani* and *S. rolfisii* in the soil. Therefore, these species are not suitable as green manure for fields with high population of the pathogens. Berni et al. (2) and Toledo-Souza et al. (6) also found that legume crop residues can increase soil populations of *Rhizoctonia* spp. and recommended that legumes should be avoided as previous crops to common beans. We suggest fallow or sowing of Gramineae to reduce the inoculum of the pathogens in infested areas, since it has been demonstrated that rotations of non-host crops may be effective in controlling *R. solani* (6) and *S. rolfisii* (4). Our results can be useful for the establishment of management programs of fields infested by *R. solani* and *S. rolfisii*.

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