CHARACTERIZATION OF ISOLATES OF *Rhizoctonia solani* THAT CAUSE WEB BLIGHT ON COMMON BEANS IN CENTRAL AMERICA AND THE CARIBBEAN WITH IMPLICATIONS FOR DISEASE MANAGEMENT.


Web blight (WB) of common bean (*Phaseolus vulgaris* L.) is caused by aerial isolates of *Rhizoctonia solani* Kuhn [teleomorph = *Thanatephorus cucumeris* (Frank) Donk]. The disease is widespread in Central America and the Caribbean and causes mild to severe yield and seed quality losses (3,4).

Current control practices are ineffective or unaffordable for medium to small land holders. Breeding for resistance has been difficult because little is known about pathogen variation and disease resistance mechanisms. (1). Most commercially grown bean cultivars are susceptible to WB. Cultivar reaction to WB is variable in countries where the International Varietal Nurseries (IVN) are evaluated. Whether this variation is due to the pathogen or environment or both is not known. Research on *R. solani* in the region has been very limited. In this study we attempt to: 1) determine the anastomosis groups of WB isolates from Central America and the Caribbean and their distribution in the region and 2) evaluate virulence/pathogenicity of the isolates and its effect on current disease management strategies.

MATERIALS AND METHODS.

A WB disease survey was initiated in 1993. Samples of bean leaves with WB symptoms (3) were collected in bean fields in Panamá, Guatemala, Honduras, Puerto Rico and the Dominican Republic (DR). Samples were wrapped in white tissue paper, placed in paper bags and brought directly or mailed to our laboratory in the Dominican Republic. Sections of diseased leaves were examined microscopically or plated directly on 2% water agar amended with 30 μl/L of metalaxyl (Ridomyl 2E,25% a.i.) and 60 μl/L of streptomycin sulphate (1 g/ml sterile distilled water). Plates were incubated at 25-28 C. Anastomosis (AG) and intraspecific (ISG) groups and cultural characteristics were determined for each isolate (7,8). Virulence of the isolates was determined on leaves of cultivars PC-50 (Andean-derived origin) and ICA-PIJAO Mesoamerican-derived origin), and pathogenicity was determined on leaflets of corn (*Zea mays*) cv.CESDA-88 in the growth chamber and the screenhouse.

RESULTS AND DISCUSSION.

The WB pathogen was variable at the AG and ISG level within and among countries. Even with the limited sample size, we found a diverse population of *R. solani* affecting common beans in the countries sampled. WB is documented in bean fields in Cuba and Honduras for the first time. Very few isolations were successful from leaves that were dehydrated or decayed during transportation. However, most leaf samples arrived intact and showed two types of lesion. The most common was the typical WB symptom. The other lesion type was similar to that resulting from inoculation with basidiospores of *T. cucumeris*, and was found in samples from Panamá and the DR where the sexual stage occurs frequently (4). Only colonies of multinucleate *R. solani* were isolated from the sampled leaves. Of the 49 isolates initially characterized, 31 were AG-1 and 18 were AG-2. Isolates of AG-2 were associated
with lesions resembling those caused by basidiospores. Of the AG-1 isolates, 17 were AG-1-IB and produced macrosclerotia (0.5-2.0 cm) and 12 produced microsclerotia (< 0.1 cm). Two isolates from leaves with typical WB symptoms from a bean field in Cuba produced sclerotia distinctively different in size (0.2-0.5 cm), shape and texture. These isolates were identified as AG-1-IA (sakakii type) (6,7,8). Isolates of this group have been associated with sheath blight on rice in Japan but not with WB symptoms on common beans (6). Cultural characteristics of isolates of AG-1 and AG-2 remained stable after multiple culture transfers and reisolations from inoculated leaves. Characterization of the WB pathogen has important implications for disease control strategies, since different AG/ISGs differ in their ecology and epidemiology (6). In soybean and rice, foliar blights are caused by \textit{R. solani} AG-1-IA and AG-1-IB, respectively. Their differentiation is critical to understanding inoculum density/disease incidence relationships and making intercropping and crop rotation decisions for both crops. Temperature optima, fungicide sensitivity and conditions favoring propagule survival vary between these ISGs (5,6). In bean fields where WB is caused by isolates of either AG-2 or AG-1-IB (microsclerotia type), aerial rather than soil propagules may play an important role in the life cycle of the pathogen and disease development. Therefore, measures aimed at reducing sporulation, mycelial growth and microsclerotia development on the foliage are likely to be more effective than those reducing soil propagules. Soil mulching is an example of a practice recommended for reducing rain-splashed soil propagules that has met with little success in some countries because it overlooks the airborne phase of the pathogen. Isolates from the six countries differed in virulence and rate of growth. Isolates characterized as AG-1 grew faster at 25 and 30 C and were more virulent on beans than those characterized as AG-2. These results agree with reports from fields where isolates of AG-1 incite severe WB symptoms such as rapid defoliation, and pod and seed infection (3,4).

All of the isolates were pathogenic to corn and produced watersoaked lesions around the inoculation sites. Abundant mycelia developed on the diseased corn seedlings when kept in a mist chamber for 72 h. After 2-3 weeks of dry storage at 10 C, \textit{R. solani} mycelia associated with corn tissue was infectious to beans. Corn is an important rotational crop with common beans in Central America, and crop rotation is recommended for integrated WB management (3). Our results suggest that corn residues may serve as sources of inoculum and could increase rather than decrease outbreaks of WB. Further studies are in progress with a larger number of isolates to determine their AG/ISG typing, virulence and host range. Research on aerial isolates of \textit{R. solani} will benefit agronomists and breeders of the region in the search for sources of resistance and development of efficient disease management strategies.

REFERENCES.