Genetic Variability of New Subgroups of *Rhizoctonia solani*, Cause of Web Blight of Dry Beans: Implication for Resistance Breeding and Disease Management

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Web blight of dry beans is caused by *Thanatephorus cucumeris* (Frank) Donk [Anamorph: *Rhizoctonia solani* (Kuhn)]. This disease is endemic in the Central America and Caribbean region. Examples of economic losses include US$7.1 million in El Salvador in 1993, 19% of bean production acreage damaged in Honduras in 1993 and 30-60% yield loss plus 50% bean seed damage in three provinces in the Dominican Republic in 1994. Web blight management is limited to use of a fungicide which is costly and not always effective. No web blight resistance is available at present in commercial varieties. Use of mulch for management of web blight is only effective for specific members of pathogen groups and particular locations.

*Rhizoctonia solani* is a complex species composed of subgroups within Anastomosis Groups. Members of at least six subgroups cause symptoms of web blight. Variability among members of these subgroups comes from virulence, fungicide resistance, optimal growth temperature and epidemiology (disease development rate, fungal propagule type, dissemination and survival). The objective of this study was to determine phenotypic and genotypic variation in *R. solani* isolates from bean fields throughout the Americas.

Materials and Methods

New subgroups of *R. solani* were determined by PCR-RFLP of the internal transcribed spacer region of rDNA from 45 web blight pathogen isolates from South and Central America plus the Caribbean in comparison to data reported by Carling et al. (1). Amplified product sequence generated by specific primers were compared to all known *R. solani* sequences reported in GenBank. Virulence was determined by the detached leaf test (DTL) (2).

Results and Discussion

New subgroups AG-1-IE, AG-1-IF and AG-2-2 WB are reported. These subgroups are associated with distinct web blight symptoms on common bean and can be distinguished by primers (Fig. 1). These three subgroups also differ in virulence as seen on the DLT using 28 lines/varieties of bean with some levels of resistance to web blight (Fig. 2). Isolates of AG-2-2 WB from wild Phaseolus spp. and commercial varieties have sequence similarity and are similar in other characteristics. None of the primers amplified isolates from the *R. solani* root and stem rot group (AG-4).

Genetic variation of the web blight pathogen can affect disease management and should be considered for dry bean breeding programs attempting to incorporate web blight resistance and other disease management strategies such as use of mulch.

References


Figure 2. Virulence (lesion size) of three isolates representing the three subgroups on 28 cultivars/lines of bean with partial resistance to web blight. *PR-5 = AG-1-IE; BV-1 = AG-1; AL2002 = AG-2-2WB