Preliminary characterization of Thanatephorus cucumeris, causal agent of web blight of dry beans in the Dominican Republic

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INTRODUCTION

In the Dominican Republic (DR), web blight, caused by Thanatephorus cucumeris (Frank) Donk (anamorph: Rhizoctonia solani Kuhn) has become one of the most destructive diseases of dry beans (Phaseolus vulgaris L.). Yield losses, in commercial fields, have been estimated at 60 to 80% (1) where the disease is prevalent in the San Juan de la Maguana Valley (400 masl) in the southwest, in the Cibao Valley (250 masl) in the north central and the northeast region (75 masl). Some degree of disease control has been achieved with applications of benomyl fentin, acetate and carbendazim, starting at early stages of bean growth. High cost of the fungicides and the requirement for multiple applications make this practice unaffordable to medium and small farm holders. Currently, all of the commercially grown cultivars and landraces are susceptible to web blight.

Information on web blight in the tropics is based primarily on studies done in Mexico, Costa Rica and Brazil (3) on beans of meso-american origin. Most beans grown in the DR are of andean origin. Thus, information regarding pathogen characterization and disease ecology and epidemiology in the DR is needed to devise improved disease management strategies to facilitate screening for tolerant bean genotypes. This report addresses prevalence, distribution and variability among isolates of the web blight pathogen in the main bean growing regions of the Dominican Republic.

MATERIALS AND METHODS:

Surveys in the 1990/91 bean growing season were conducted at three locations in the southwest region and five in the north central. At each location one to three commercial fields were sampled. From each field, no less than 50 samples of diseased leaves and/or pods were collected in paper bags. Portions of diseased tissue were stained with cotton blue in lactophenol and examined microscopically or plated directly on 2% Water Agar amended with antibiotics (WA). Characteristic hyphae were observed within 48 hr and morphological identification was confirmed by subculturing on (Difco) Potato Dextrose Agar (PDA) according to Parmeter and Whitney (7) and Sherwood (8).

Nuclear condition and anastomosis tests were conducted as described by Kronland et al. (4). Other characteristics of the isolates, such as colony growth rate and color and development, type and production of microsclerotia on WA were also recorded.

Groups of two or more isolates from each locality were selected for pathogenicity tests. Screenhouse-grown plants (1-week-old) of Pompadour Checa were inoculated on the stem and on each fully expanded unifoliolate leaf, with mycelial disks (0.5 cm dia.) from the growing edge of the fungal colony. After 48 hr in a mist chamber at 95% RH and from 25-28°C, plants were placed on screenhouse benches and rated for lesion size on a scale of 1-6 the following day.

Controls consisted of agar discs without mycelia and highly-virulent AG-4 R. solani isolated from bean seeds collected in San Cristobal (S.C.).

RESULTS AND DISCUSSION:

The survey confirmed that web blight is widespread in the main bean growing areas and indicated that there are

RESULTS AND DISCUSSION:

The survey confirmed that web blight is widespread in the main bean growing areas and indicated that there are virulence differences among isolates of the pathogen (Fig. 1). Disease severity and incidence in bean fields surveyed in the north central region ranged from 5-25% and 40-100%, respectively. Symptoms characteristic of those produced by basidiospores were abundant in all surveyed fields indicating that the inoculum of this epidemic was airborne. Under favorable conditions of high humidity and high temperature these lesions coalesced and developed into large necrotic areas, causing severe defoliation of bean plants. Isolates obtained from leaf samples from these locations (La Vega, Moca and Salcedo) were AG-2-2. These isolates are slow growing (9-15 mm/day) and produce abundant loose brown sclerotia arranged in concentric rings or aggregated in the center of the culture plates. Even though they were isolated from infected leaves, they exhibited low virulence in stem or leaf tests. Similar results have been obtained with AG-2-2 isolates by other workers (2,5).

Isolates obtained from bean plants with web blight symptoms in the Buena Vista area in southwest were found to have AG-1 characteristics. They were further identified as AG-1-IB (6). These isolates grow very fast (20-25 mm/day) and produce microsclerotia on plant tissue, WA and PDA. In pathogenicity tests, they were very aggressive on bean stems and leaves. Severe pod infection, seed transmission was found with AG-1-IB. Seed quality is often severely affected by R. solani.

In the 1991/92 growing season, pathogen variability in other DR bean growing areas will be investigated. In addition the ecology and epidemiology of prevalent isolates needs to be studied since AG-groups are highly dependent on the host/or cultivar (6) and this must be considered when breeding for disease resistance.

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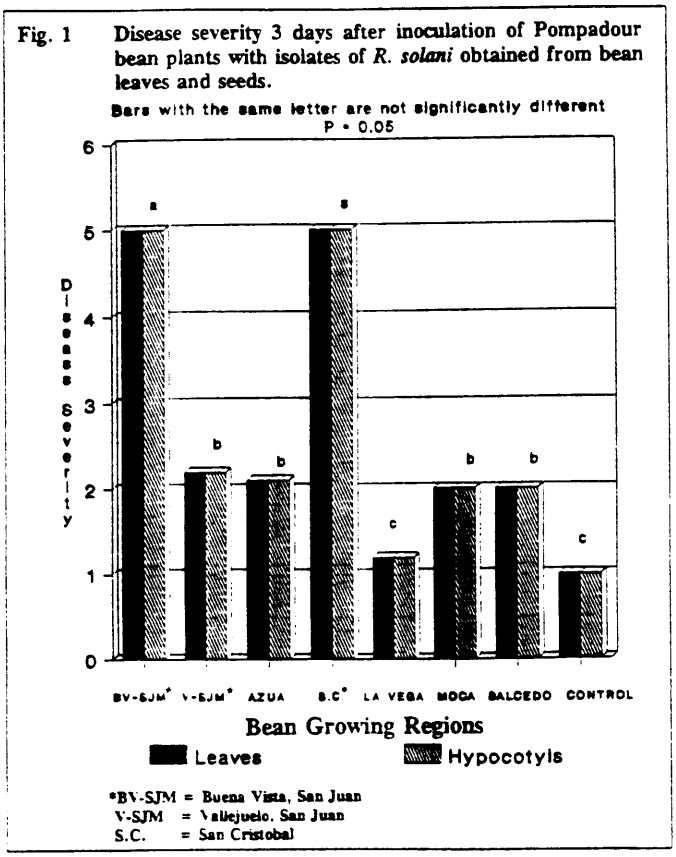

Fig. 1 Disease severity 3 days after inoculation of Pompadour bean plants with isolates of *R. solani* obtained from bean leaves and seeds.