period in controlled environment growth chambers. Percentages of plants which survived the test were determined and surviving bentgrass plants were returned to the plant breeder.

Methodology also was developed to conduct similar screening studies on vegetatively propagated bentgrasses. This research revealed the potential for further complexities to exist in the etiology of take-all patch of bentgrasses, which was thought at that time to be caused by *Gaeumannomyces graminis* var. *avenae*. In New York, it was demonstrated that *Phialophora graminicola* caused a hot weather form of take-all patch on bentgrasses, and this was confirmed during the development of disease screening methods for this project. These initial findings had relevance to the likelihood that certain disease management strategies would be ineffective during the summer months. Unfortunately, the project was terminated prematurely because the principal investigator moved to another university.

North Carolina State University - Dr. Leon T. Lucas

Spring Dead Spot Disease

The project on spring dead spot of bermudagrass was completed in the fall of 1987. Fungi were isolated from bermudagrass with spring dead spot symptoms throughout this study. Selected isolates of the fungi were used to inoculate bermudagrass in the greenhouse. The inoculated pots were exposed to outside winter conditions during January to May, and spring dead spot symptoms developed with two of the isolates used. The symptoms produced were typical of spring dead spot symptoms on golf course fairways. The fungus that caused the disease was identified as *Gaeumannomyces graminis*, and was the first report of this fungus being associated with spring dead spot of bermudagrass. The fungus was identified on the inoculated plants and from spring dead spot samples collected in May throughout North Carolina and Alabama.

Fungicides and fertilizer treatments were evaluated at four locations in the southeastern United States for the control of spring dead spot. Rubigan applied in September (1 oz. of product per 1000 square feet) and Tersan 1991 (8 oz. of product per 1000 square feet) applied in November were fungicides that gave the best control. Cold hardiness of bermudagrass following treatments with fungicides was evaluated in a study at Raleigh, North Carolina. Plugs of turf that were treated with Tersan 1991 in the fall survived cold temperatures better than other treatments.

Mississippi State University - Dr. J. V. Krans

Refinement of the Host-Pathogen Interaction System

The Host-Pathogen Interaction System (HPIS) is an *in vitro* cell selection system developed in conjunction with efforts to obtain creeping bentgrass with resistance to *Rhizoctonia solani*. The HPIS is a unique cell selection technique which permits the simultaneous transfer of various substances from a disease organism to a callus culture during concurrent growth, yet which avoids direct physical contact between the organisms. The assembly and application of HPIS evolved through a series of experiments dating back to 1988.

Isolates from the USGA culture collection of *Rhizoctonia* spp. (courtesy of Dr. Phil Colbaugh, Texas A&M University), were co-cultured (concurrently grown) with creeping bentgrass callus in the HPIS. The pathogenic isolates inhibited callus growth and development, whereas the non-pathogenic isolates had no effect on callus viability. Studies were conducted to determine effects of various tissue culture media on vigor and pathogenicity of *R. solani*, primarily hormones and energy source concentrations. Various HPIS cultural studies were conducted, focusing on the length of incubation, duration of concurrent growth-interactions, establishing cultural practices for calli following co-culturing in the HPIS, and examining the persistence of toxicity within the HPIS plates.

Some important questions pertaining to HPIS protocol were answered by these refinement studies: 1) pathogenicity at the whole plant level is similar to pathogenicity at the cellular level; 2) media components, especially growth hormones and energy sources, play an important role in the pathogenic expression of *R. solani* in the HPIS; and 3) the use of HPIS can be maximized with successive co-cultures.

Recent research efforts have focused on using HPIS to obtain creeping bentgrass germplasm with enhanced resistance to *Rhizoctonia solani*, as well as developing an *in vitro* screening technique to verify enhanced resistance at the plantlet level.

Two co-culture procedures, simultaneous and delayed, were evaluated for obtaining bentgrass callus with resistance to *R. solani*. The simultaneous co-culture procedure was designed to allow the callus a gradual exposure to the toxic substances of *R. solani* over a period of 10 days, whereas the delayed co-culture procedure exposed