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SEVERITY OF DISEASE CAUSED BY *THIELAVIOPSIS BASICOLA* AND *ROTYLENCHULUS RENIFORMIS* IN CONCOMITANT OR SEQUENTIAL INTERACTIONS

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Abstract

Greenhouse experiments were conducted to determine plant health in the presence of *T. basicola* and *R. reniformis* when acting independently, sequentially or concomitantly. Coparasitism resulted in lower plant height and dry weight material compared to plants inoculated with only one pathogen or non-inoculated plants. For most measurements, prior inoculation with either pathogen did not predispose the plant to the other. Concomitant populations reduced plant vigor and health when inoculated at planting compared to inoculation at 14 days after planting.

Introduction

Multiple-parasite relationships on crops grown in the field are common. Fungi, nematodes, viruses and bacteria may develop complex, interactive associations with plant roots. Each year, nematode and fungal pathogens cause considerable losses as independent agents. The interactive association of these pathogens can result in substantial yield losses. *Rotylenchulus reniformis* alters the structure and physiology of plant roots and may play an important role in the pathogenesis of fungi.

Interactions between the reniform nematode and plant pathogenic fungi have been investigated for many disease complexes on a number of crops. The effects of root-rot and wilt diseases of cotton caused by *Fusarium oxysporum*, *Rhizoctonia solani* and *Verticillium dahliae* are all markedly increased in the presence of *R. reniformis.* Root damage by nematodes and subsequent changes in root physiology appear to be responsible for the increase in disease severity and/or populations of many fungi.

Recent surveys have indicated that *Thielaviopsis basicola* is often found in association with many nematode species found in the south. Yet, the interactive relationship between *T. basicola* and *R. reniformis* has not been investigated. The unknown distribution of *T. basicola* in Mississippi and a lack of resistant commercial varieties for both pathogens further makes this investigation relevant.

The objectives of our study were i) to determine the severity of disease caused by *T. basicola* and *R. reniformis* when acting independently, sequentially or in concomitant situations.

Materials and Methods

Greenhouse experiments were conducted using Deltapine (DPL) 50 cotton. Treatments were arranged in a randomized complete block design with five replications and both tests were harvested 63 days after planting. Results were subjected to an analysis of variance and means were separated with Fisher's protected least significant difference test.

Treatments were: 1) an uninoculated control, 2) *T. basicola* and *R. reniformis,* concomitantly at planting, 3) *T. basicola* alone at planting, 4) *R. reniformis* alone at planting, 5) *T. basicola* followed by *R. reniformis*, sequentially, 6) *R. reniformis* followed by *T. basicola*, sequentially, 7) *R. reniformis* alone at 14 days after planting (DAP), 8) *T. basicola* alone at 14 DAP, and 9) *T. basicola* and *R. reniformis,* concomitantly at 14 DAP. All subsequent inoculations, involved in sequential treatments, were made 14 days after the initial inoculation at planting.

An inoculum density of 5000 *R. reniformis* juveniles and eggs per 500 cm^2 of soil and an inoculum density of 200 *T. basicola* propagules/gram of soil was used in this study.

The soil type used in this study was a Bosket silty loam (27% sand, 61% silt, 12% clay, pH 7.2, CEC 14.5, OM .86%). The inoculum for *T. basicola*, applied at planting, was sprayed into the soil and throughly mixed. Inoculation of *T. basicola* at 14 DAP was inserted into three holes (0.8 cm diameter and 4.0 cm deep) surrounding each plant. The inoculum for *R. reniformis* was, also, inserted into three holes surrounding each seed or plant.

Eight seeds were planted in trays (32.4 cm X 12.4 cm X 10.4 cm), each containing 3900 cm^2 of soil. The plants were thinned to six at 14 DAP. Atmospheric temperature was maintained between 18-37° C while soil temperature ranged from 20-36° C.

Data included seedling survival counts, plant height, shoot dry weights, and quantifications of each pathogen.Surviving seedlings were counted at 14 DAP. *Rotylenchulus reniformis* was extracted from the soil and process by gravity screening and centrifugal flotation. Quantifying *T. basicola* utilized a pour-plate procedure of Specht and Griffin.

Results

Effect of Independent, Concomitant and Sequential Inoculations - No significant differences were found with regard to seedling survival or plant height at 31 DAP. Final plant height (63 DAP) was significantly shorter, where *T. basicola* and *R. reniformis* were concomitantly inoculated at planting, as compared to all other treatments. The concomitant inoculations resulted in the shortest plants (Table 1). The control plants produced more dry weight plant material than all other treatments, while the concomitant treatment produced the least amount.

In experiment 1, more nematodes were recovered from the concomitant inoculations of *T. basicola* and *R. reniformis* at planting. In the second experiment, *R. reniformis* alone at planting, and *R. reniformis* followed by *T. basicola* sequentially, yielded the most nematodes (Table 2). *T. basicola* followed by *R. reniformis* sequentially and *T. basicola* alone at planting, yielded the most fungal propagules in the first experiment . This was also true for the second experiment, but only the concomitant situation at planting and *T. basicola* alone at planting, yielded a significantly increased population.

Influence of Plant Growth Stage on Symptomology from Concomitant Inoculations - The three treatments in this predetermined comparison included a non-inoculated control, concomitant populations of *T. basicola* and *R. reniformis* applied at planting, and a concomitant population applied at 14 DAP. The final comparison of the control, the concomitant inoculation at planting, and the concomitant inoculation at 14 DAP, revealed a taller control plant, as well as, more dry weight (Table 4). In the first experiment, the concomitant inoculation at planting, produced more nematodes than the concomitant inoculation at 14 DAP, but in the second experiment, no differences were found . In the first experiment, the concomitant inoculation at 14 DAP, yielded more propagules of *T. basicola* than the concomitant inoculation at planting, but in the second experiment, no differences were detected.