PHOMOPSIS ASSOCIATED WITH COTTON BOLL DEVELOPMENT

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Abstract

A cotton boll rot was observed in northeast Louisiana in July 1995. The initial developing cotton boll, sepals, and peduncle rapidly become necrotic and die. These tissues appear hardened or mummified. The dead boll and peduncle remain attached hanging to the stem for several weeks before dropping. Diseased and healthy cotton bolls, leaves, petioles, flowers, stems sections and roots were aseptically assayed to identify the mycoflora present. Phomopsis sp. was isolated most frequently from diseased cotton bolls and petioles. In pathogenicity tests, using a sterile toothpick inoculation technique, Phomopsis sp. caused symptoms characteristic to the cotton blossom-boll rot previously observed. Phomopsis sp. was reisolated from the disease bolls completing Koch's postulates.

Introduction

Cotton boll rots cause losses in all cotton growing regions, however, the greatest losses (as high as 50%) regularly occur in the Louisiana Mississippi Delta region. Cotton of this area is characteristically tall with multiple lateral branches creating a damp foliar canopy ideal for fungal growth. A cotton boll rot has been observed in northeast Louisiana in recent summers. The initial developing cotton boll, sepals, and peduncle rapidly become necrotic and die. These tissues appear hardened or mummified. The dead boll and peduncle remain attached hanging to the stem for several weeks before dropping. The objective of our research was to examine the symptomatic cotton bolls which die and remain attached to the stems and determine the causal agent of the blosson-boll rot.

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Materials and Methods

Cotton plants were obtained from three different fields in northeast Louisiana. Diseased and healthy bolls were removed and sectioned for fungal isolation. The plant was then sectioned taking one 1mm cross section from each of the following locations: tap root, 4th stem node, 15th stem node, apical tip, leaf petioles, leaves, flower petals, ovary, pistil, sepals and pollen grains. Samples were washed in running tap water for 10 minutes, then surfaced-sterilized for 5 seconds in 100% ethanol followed by 4 minutes in 1% NaOCl. Sterile tissue sections were aseptically plated on acidified potato dextrose agar (APDA) and stored at room temperature for 14 days. During this time fungi were identified or subcultured for later identification.

Inoculum Preparations: Phomopsis sp. isolates were increased from a 5mm diameter inoculum disk placed in the center of each PDA plate. Sterile 1cm sections of round toothpicks were placed on the advancing edge of the Phomopsis isolate. Phomopsis mycelium encase the toothpicks in 14 days.

Field Plots: Cotton plots consisted of one row DPL 50 cotton plots 40' in length replicated 4 times. Initially developing cotton bolls, 20 from each rep, were labeled and inoculated with either Phomopsis sp. inoculated toothpicks or sterile control toothpicks. Disease ratings were observed 7 and 21 days after inoculation.

Insect isolations: Tobacco budworms, beat armyworms, tobacco budworm moths, boll weevils, and plant bugs were collected from the LSU Northeast Research Station - Macon Ridge Branch. Fungal isolations were made from the insect in using four techniques. Entire insects were surfaced-sterilized for 4 minutes in 100% ethanol followed by 4 minutes in 1% NaOCl, and aseptically plated on APDA for technique 1 and 2. In techniques 3 and 4 the entire insect was placed only in 100% ethonal for 4 minutes and aseptically planted on APDA. After plating, insects in techniques 2 and 4 were cut longitudenly with a scaple to release the intestines. Culture plates were stored at room temperature for 14 days. During this time fungi were identified or subcultured for later identification.

Results and Discussion

Cotton tissue samples from the three locations produced similar results. Phomopsis sp. was the fungus most frequently isolated from diseased cotton bolls with an average isolation of 58% from the three locations. Phomopsis sp. was also isolated from 51% of the leaf petioles; however, it was isolated from only 4% of the leaves. Phomopsis sp. was isolated with low frequency from the stem sections of the plant. Phomopsis sp. was not isolated from the flower petals, sepals, pistil, ovary or pollen grains or in the root system.

Phomopsis sp. is a pycindial fungus. Pycinidia are erumpent, dark brown to black, ostiolate, and irregularly globose in structure. Pycinidia produce alpha and beta spores. Alpha spores are hyaline unicellular, oblong-elipitical, and biguttulate. The average size is 2.5 x 6.5 un. Beta spores are hyline, unicellular, filiform, and slightly curved to straight. Both alpha and beta spores are produced in the same pycnidia. The ratio of aplha to beta spores varied tremendously depending on the age of the culture. The mycelium of the culture is hyaline, septate, uneven and approximate 8-10 un in diameter. Stroma is sometime produced in culture. These areas are dark, irregularly globose and scattered.

Disease incidence of toothpick inoculations of young developing bolls at 7 days after inoculation resulting in 80% of the inoculated bolls became infected with Phomopsis sp. The young bolls, sepals, and peduncle had died and the peduncle was hanging attached to the stem. The control toothpick inoculations had a 5% incidence of disease. Disease occurred as a lesions which had developed around the puncture wound. The control bolls continued to grow and enlarge. Phomopsis sp. was reisolated from the inoculated disease bolls. Several Fusarium spp. and Alternaria alternata were reisolated from the lesions on the control bolls.

Phomopsis sp. was not isolated from the tobacco budworms, beat armyworms, tobacco budworm moths, boll weevils, or plant bugs.
Fewer fungal cultures were isolated from the sterile insects compared to the non-sterile insects. Aspergillus spp., Penicillium spp., and Cladosporium sp. were most frequently isolated from the insects.

Phomopsis sp. was isolated most frequently form the disease cotton bolls. Inoculation of healthy bolls with Phomopsis sp. produced identical symptoms of the original boll rot and Phomopsis sp. was reisolated from the inoculated bolls. Therefore, Koch's postulated has been completed. Phomopsis sp. produces a boll rot which attacks bolls in the early stage of development. These bolls die and remain attached but hanging from the stem by the base of the peduncle.

References

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