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HORIZONTAL AND VERTICAL DISTRIBUTION OF *ROTYLENCHULUS RENIFORMIS* IN A MISSISSIPPI COTTON FIELD

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Abstract

The study was conducted in 2000 and 2001 to examine the horizontal and vertical distribution of the reniform nematode (*Rotylenchulus reniformis*) in a Mississippi cotton field. In a continuous cotton production field, soil samples were collected at planting in 2000 and 2001 and at harvest in 2001. the reniform nematode was found at all sample points and depths. The highest number of nematodes at planting were found at the 46-60 cm depths in 2000 and 76-90 cm depths in 2001. At harvest the highest number of nematodes was found at the 0-15 cm depths.In 2000 after corn the highest number of nematodes was found at the 76-90 cm depths. At planting with cotton in 2001 the highest number of nematodes was found at the 46-60 cm depths. At harvest the highest numbers were found at the in the upper most 0-15 cm depths

Introduction

Cotton (*Gossypium hirsutum* L.) is the most important fiber crop in the world, In the United States 17 states across the southern region grow cotton totaling 15 million bales in 2000. Mississippi is considered the second highest cotton producing state in the number of harvested acres. Plant-parasitic nematodes are the most important pathogens associated with cotton beltwide and cause yield losses averaging 3.5 % annually. In Mississippi cotton yield losses caused by nematodes average greater than 6.6 % annually.

Studies on reniform nematode population and distribution are limited. In Mississippi a preliminary study on the horizontal and vertical distribution of the reniform nematodes was reported by Lawrence, et al., in 1994. They determined that the reniform nematode was uniformly distributed across a 0.52 hectare test plot and were found at a depth of 46 cm. However, population numbers varied at each sample point across the 0.52 hectare plot.

A more in-depth study is needed to better understand the population distribution of the reniform nematode. The objective of this study was to examine the vertical and horizontal distribution of the reniform nematode in a continuous cotton producing system and cotton-corn rotation system.

Materials and Methods

The study was conducted in a continuous cotton production field and cotton-corn rotation system field and naturally infested with the reniform nematode (*Rotylenchulus reniformis*). The fields were located at Glen Allan, Mississippi. Each field was mapped with sixteen points on 0.52 hectare grids using a Global Positioning System (GPS). A single soil core, dimensions 5.08 cm diameter x 121.92 cm deep, was collected from each grid intersection using a Model 4804 Concord Soil Sampler. Each single core was divided into 8 depths : 0-15 cm, 16-30 cm, 31-45 cm, 46-60 cm, 61-75 cm, 76-90 cm, 91-105 cm, and 106-120 cm. Soil samples were collected at planting and at harvest. Nematodes were extracted using the gravity screening and centrifugal flotation method and counted with a stero-microscope.

Results

Reniform nematodes (*Rotylenchulus reniformis*) were found at each of sixteen sample points. This nematode appeared to have an even horizontal distribution across the established cotton production and cotton-corn rotation fields. However, the numbers of the reniform nematodes varied at each sample point.

In the continuous cotton production field, the number of nematodes for the sixteen points ranged from 2,996 to 11,433 nematodes per 100 cc soil in 2000 and 2,523 to 16, 042 nematodes in 2001. At harvest nematode numbers ranged from 1, 597 to 6, 310 nematodes per 100 cc soil.

The vertical distribution of the reniform nematode at 0-15 cm, 16-30 cm, 31-45cm, 46-60cm, 61-75cm, 76-90cm, 91-105 cm and 106-120cm averaged 899, 1,030, 1,198, 1,420, 1,258, 791, 765, and 370 nematodes per 100 cc soil, respectively in 2000. The highest number of nematodes were found at the 46-60 cm depths. In the spring of 2001 nematode numbers for each depth averaged 354, 409, 546, 654, 938 1,228, 930, and 610 per 100 cc soil. The highest number of nematodes were found at the 76-90 cm depths. At harvest the average nematode numbers for each depth were 837, 649, 394, 523, 720, 579, 391 and 219 per 100 cc soil . The highest number of nematodes were found at the 0-15 cm depths.

In the cotton-corn rotation field, the number of nematodes for the sixteen points ranged from 566 to 20,986 nematodes per 100 cc soil after corn in 2000. In 2001 the number of nematodes for the sixteen points at planting ranged from 180 to 5,613 nematodes. At harvest nematode numbers ranged from 980 to 9,013 nematodes per 100 cc soil. The reniform nematode was uniformly distributed across the 0.52 hectare test site.

The vertical distribution of reniform nematode at 0-15 cm, 16-30 cm, 31-45cm, 46-60cm, 61-75cm, 76-90cm, 91-105 cm and 106-120cm averaged 373, 460, 554, 500, 573, 1,011, 843, and 319 nematodes per 100 cc soil, respectively in 2000. The highest number of nematodes were found at the 76-90 cm depths. In 2001at planting the average nematode numbers for each depth were 35, 156, 346, 474, 436, 464, 268, and 237 per 100 cc soil. The highest number of nematodes were found at the 46-60 cm depths. At harvest the average nematode numbers for each depth were 871, 428, 377, 716, 764, 516, 443, and 183 per 100 cc soil with the highest number of nematodes was at the 0-15 cm depths.

Reniform nematode numbers varied depending on the time of the sample was collected. The recovery of the reniform nematode at the lower soil sampling depths may help explain why nematode numbers are capable of reaching high levels after single year rotations such as corn. Additional research is necessary to better understand reniform nematode movement in a cotton field.