Detection of Rotylenchulus reniformis Infestations by Aerial Infrared Photography[1]

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Remote sensing techniques, particularly infrared photography, have been used for the detection of plant injury caused by an increasing list of organisms (1, 2, 3, 4, 5). These results led us to test the effectiveness of aerial infrared photography in locating infestations of *Rotylenchulus reniformis* Linford and Oliveria in cotton fields in the Lower Rio Grande Valley near Weslaco, Texas.

Aerial photographs were taken with a Zeiss RMK 15/34 camera using Ektachrome Infrared Film 8443. Fields were photographed from a Piper Cherokee 6 at altitudes of 609 and 1219 m at a ground speed of approximately 193 km/hr.

A 16.2-hectare field was fumigated (24 rows treated and six untreated throughout the field) with 1,3 dichloropropene and related C_3 chlorinated hydrocarbons (Telone®). The chemical was injected 25.4 cm deep in the row at approximately 74.8 liters/hectare in 101.6-cm rows with a commercial anhydrous ammonia applicator with two shanks 25.4 cm apart per row. One-half of the 16.2-hectare field (Fig. 1a) had been rotated during the previous year with grain sorghum (*Sorghum vulgare* L.), a nonhost of the reniform nematode, whereas the other half (Fig. 1b) had been planted with cotton (*Gossypium hirsutum* L. 'Stoneville 7A') during the previous year. Soil and root samples were examined just before treatment and twice after treatment to determine the effectiveness of the fumigant and rotation with grain sorghum and cotton on *R. reniformis*.

Figure 1 shows the treated field 61 days after planting. The darker red area (Fig. 1a) represents more vigorous plant growth resulting from the control of nematodes by crop rotation. The lighter red area (Fig. 1b) represents less vigorous plant growth due to the lack of rotation. However, since rotation was not practiced in this area, the effect of the nematicide can be ascertained by comparing the unfumigated rows (arrowheads, Fig. 1b) with the fumigated rows (rows between arrowheads, Fig. 1b). The unfumigated areas represent ground reflection due to lack of plant growth.

Figure 2 shows the same field 111 days after planting. Growth differences at this stage were not apparent without the aid of infrared photography. The effect of cotton-sorghum rotation is still evident (Fig. 2a), as are unfumigated strips in the nonrotated area (Fig. 2b). Circular patterns (Fig. 2c) are early symptoms of cotton root rot (*Phymatotrichum omnivorum*). Nematode counts from these areas are shown in Table 1. In conclusion,

TABLE 1. Effect of rotation and fumigation on *Rotylenchulus reniformis* in cotton.

Treatments	Sample date 2/28[a]	4/1	7/22
Cotton after cotton			
Fumigated	152	16	477
Nonfumigated	140	223	592
Cotton after sorghum			
Fumigated	18	3	691
Nonfumigated	13	52	488

[a]Pretreatment counts from 100 g soil; each figure is the average number of nematodes from four treated strips.

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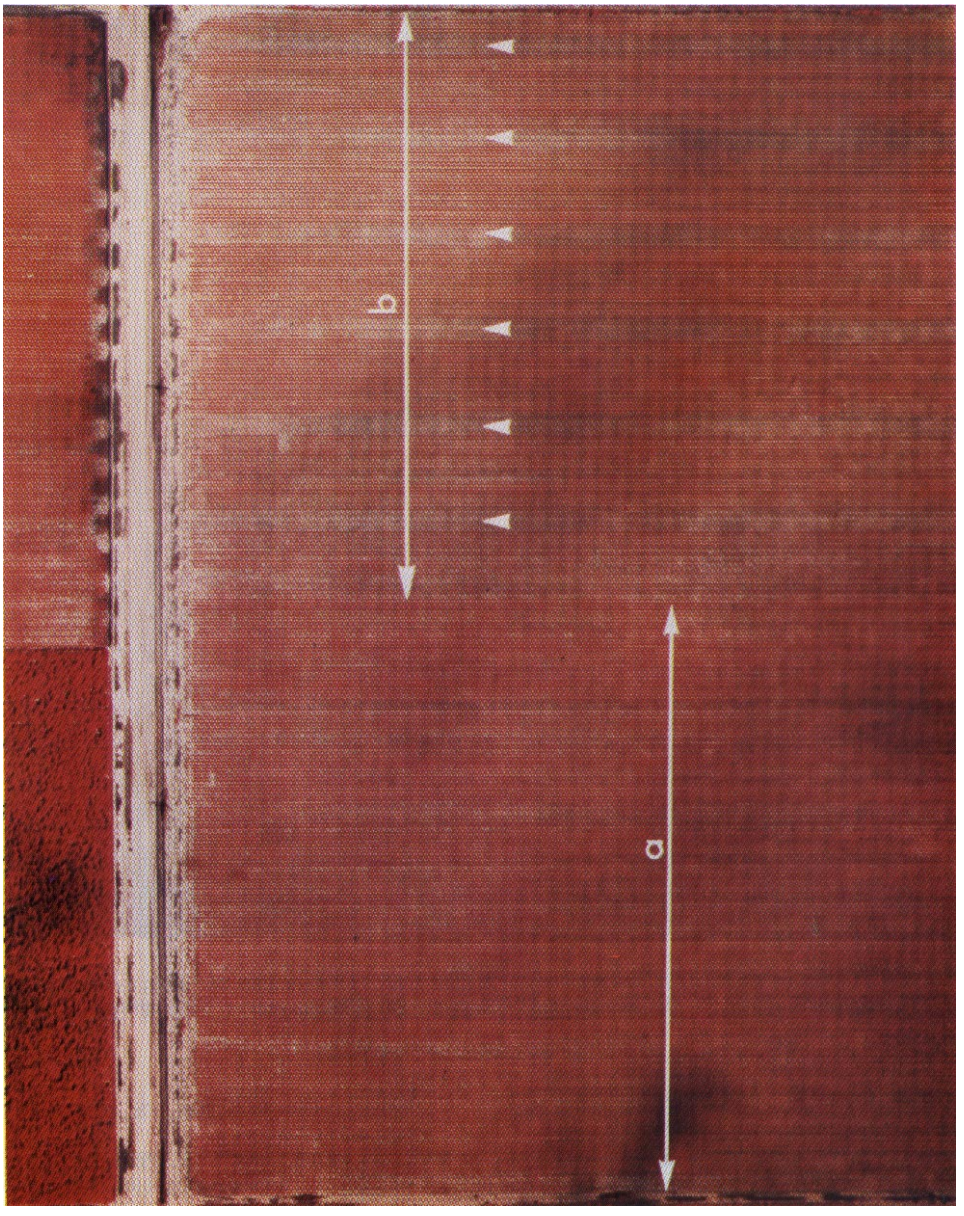

FIG. 1. Aerial infrared photo (609 m altitude) of a cotton field 61 days after planting; a–area rotated to grain sorghum the previous year; b–the area planted with cotton the previous year. Arrowheads indicate center of 6-row nonfumigated areas.

fumigation and sorghum rotation resulted in good initial control; however, populations of nematodes in fumigated areas were about the same as populations in unfumigated areas by the end of the season. Cotton yield was increased an average of 1261 kg/hectare (3/4 bale/acre) in fumigated areas where cotton was grown 2 years in succession. Yields were increased by only 420 kg/hectare (1/4 bale/acre) in fumigated areas of cotton-sorghum rotation.

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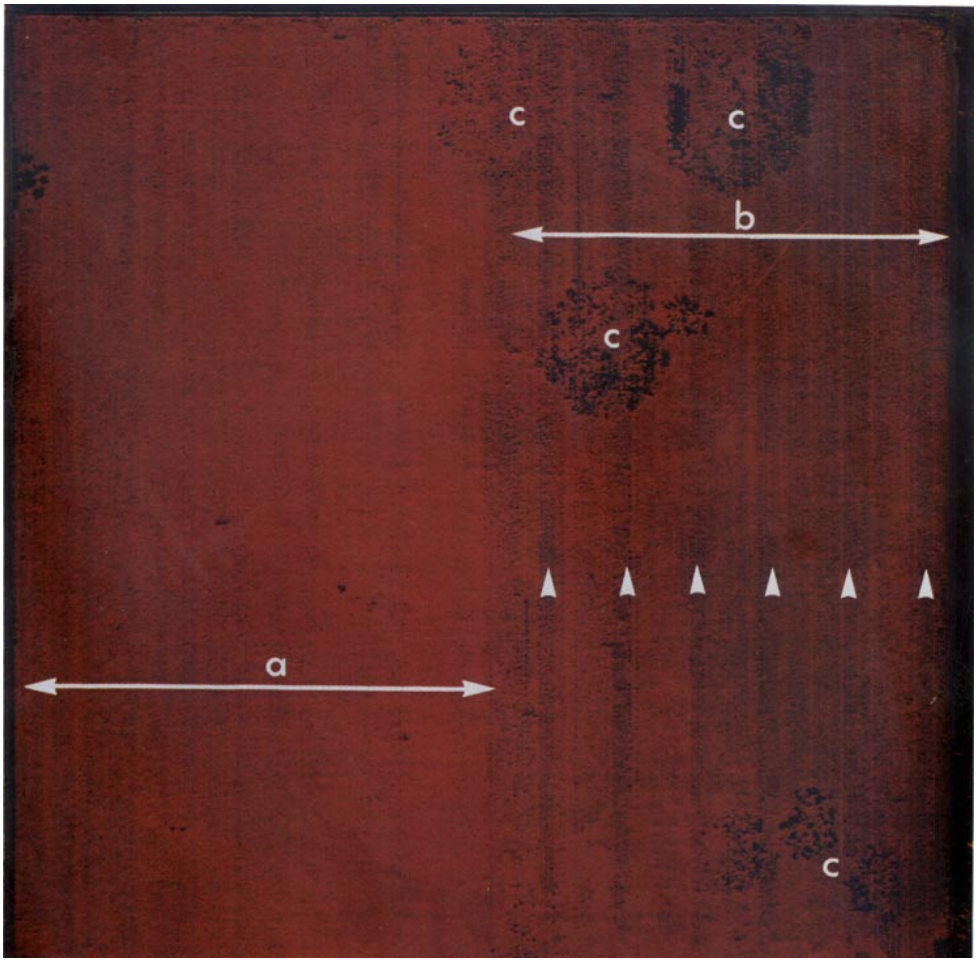

FIG. 2. Aerial infrared photo (1219 m altitude) of cotton field 111 days after planting; a–area rotated to grain sorghum the previous year; b–the area planted with cotton the previous year; c–early symptoms of cotton root rot.

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