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Sclerotinia Blight Development In Peanut Vines Injured by Tractor Tires[1]

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ABSTRACT

Peanut plants injured by tractor tires during the application of pesticides were infected by *Sclerotinia sclerotiorum* more frequently than similar uninjured plants. Percentage of infection in injured plants was more than twice that in uninjured plants. Pod yields were less in injured plants infected with *S. sclerotiorum* than in uninjured plants infected with *S. sclerotiorum*. The relationship between tire injury and subsequent infection by *S. sclerotiorum* was clearly shown on aerial infrared photographs.

Key Words *Arachis hypogaea*, false color infrared photography, groundnut, soil-borne fungus, predisposition, wound-disease interaction.

Peanuts (*Arachis hypogaea* L.) are planted on ca. 42,930 ha in southeastern Virginia and produce revenues exceeding $60,000,000/yr. A major disease of peanuts in Virginia in 1976 was Sclerotinia blight, caused by *S. sclerotiorum* (Lib.) d By. (*S. minor* Jagger) (10). Losses due to this disease were extremely heavy in Virginia during 1976 (8).

Sclerotinia blight was first observed at a few locations in Virginia in 1971 (6) and several infested fields were noted in 1972 and 1973. The widespread occurrence of Sclerotinia blight in the major peanut-producing counties of Virginia in 1974 was verified by the use of aerial infrared photography (9). Comparison of photographs obtained during the 1974, 1975, and 1976 growing seasons indicated that Sclerotinia blight was moderate in 1974, slight in 1975, and moderate to severe in 1976 (4). Peanut varieties currently planted in Virginia are susceptible to *S. sclerotiorum* (7) and only partial control can be expected with available fungicides (2).

Cercospora leafspot of peanuts, caused by *Cercospora arachidicola* Hori (*Mycosphaerella arachidicola* W. A. Jenkins) and *C. personata* (Berk. & Curt.) Ell. & Ev. (*M. berkeleyii* W. A. Jenkins), can be adequately controlled with fungicides in Virginia. Four to six fungicide applications made at 14 day intervals beginning in mid July, usually made with tractor-mounted sprayers, are necessary for leafspot control. Rows of peanuts are spaced 91 cm apart. Tractor tires are 30-36 cm wide. During the latter part of the growing season, peanut plants in adjacent rows overlap so plants at this stage of development can be damaged extensively by the tractor tires during fungicide application.

Some relationship between plant injury and infection by *S. sclerotiorum* has been demonstrated in other crops (1, 5, 11). Without a carbon source isolates of *S. sclerotiorum* from clover were not infectious to clover unless the plants were inoculated at the site of a natural or artificial wound (11). Foliar infection of crucifers occurred only through leaf abrasions or in areas where dried flower parts were present (5). Ascospores readily infected injured bean plants at any stage of development but infected uninjured plants only in the blossom stage (1). In another study, however, bean plants injured by cultivation equipment were no more susceptible than uninjured plants to infection by *S. sclerotiorum* (3).

The purpose of this research was to determine the relationship between tractor-tire injury and subsequent infection by *S. sclerotiorum* in peanut plants.

Materials and Methods

Peanut fields in which Sclerotinia blight was severe and in which plants had been injured by tractor tires during application of leafspot fungicides were selected for this study. Rows of peanut plants injured by tractor tires were chosen at random within the selected fields. The severity of infection with *S. sclerotiorum* on the side of the row that exhibited tire injury was compared with the severity of infection on the other, uninjured side of the same row. Each row exhibited injury on only one side, since the tractor tracked in the middle, between the two rows. Infection counts were made on August 25, 1976, on 12-m row segments at four locations. Plants exhibiting signs of infection (one or multiple infection sites) on the lateral branches were considered to be infected. The percentage of plants infected was determined by dividing the number of infected plants by the total number of plants per row.

The relationship between tractor-tire injury and reduction in pod yield due to subsequent infection by *S. sclerotiorum* was studied. Again, peanut fields were selected having both tractor-tire injury and Sclerotinia blight. Immediately after digging, adjacent rows (6 m long) with and without tractor-tire injury were identified. Pods were handpicked from two rows with tractor-tire injury and from the two adjacent rows without tire injury. Yields were calculated after pods were dried to ca. 10% moisture content.

Fields were photographed on September 14 and September 24 with infrared film using techniques discribed previously (8).

Results and Discussion

In some peanut fields with severe Sclerotinia blight the relationship between increased disease severity and plant injury by tractor tires was evident. Plants injured by tires during the application of Cercospora leafspot fungicides were more susceptible than uninjured plants to infection by *S. sclerotiorum* (Table 1). At four locations, the percentage of infection in plants on the tire injured side of the row averaged 110% greater

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Table 1. The relationship between peanut plant injury caused by tractor tires and predisposing of plants to *Sclerotinia sclerotiorum*, causal agent of Sclerotinia blight.

Field Location [2]	Number of plants infected/row [1]		Increase in disease (%)
	Uninjured	Injured	
1	26[a] [3]	40[a]	54
2	21[a]	38[a]	81
3	21[a]	53[b]	152
4	17[a]	43[b]	153

1/ Each row was characterized by having tire injury on one side.

2/ Fields were located in Southampton County, VA, where Sclerotinia blight was severe in 1976.

3/ Each value is the mean number of plants per 12-m row segment for four replicates on August 25, 1976. Within each field, means with different superscript letters are significantly different at the 5% level, according to the t-test.

than that on the uninjured side of the row. At field locations 3 and 4, characterized by excessive vine growth plants were more susceptible to tire injury and subsequent infection by *S. sclerotiorum* than those at locations 1 and 2, which had less vine growth.

In fields severely infected with *S. sclerotiorum* peanut pod yields were lower in rows that were injured by tractor tires than in adjacent uninjured rows (Table 2). Yields from injured and uninjured rows in such fields averaged 1736 and 2658 kg/ha, respectively. In fields where Sclerotinia blight was minimal, tire injury caused only a slight reduction in yield.

Table 2. The effect of foliage injury caused by tractor tires and severity of Sclerotinia blight on pod yields of peanuts.

Field location [1]	Disease severity	Pod Yield		Decrease in pod yield (%)
		Uninjured (kg/ha)	Injured (kg/ha)	
5	Severe	2971[a] [2]	1640[b]	45
6	Severe	2344[a]	1832[a]	22
7	Slight	3290[a]	3113[a]	5
8	None	3973[a]	3758[a]	5

1/ Fields located in Southampton County, VA, where Sclerotinia blight was severe in 1976.

2/ Each value is the mean for three replicates, 2 rows wide and 6 m long. The uninjured plots were adjacent to the injured plots. Within each field, means with different subscript letters are significantly different at the 5% level according to the t-test.

The relationship between tire injury and subsequent infection of injured plants by *S. sclerotiorum* was clearly demonstrated by aerial infrared photography (Fig. 1). Note the alternating bands of gray and pink across the lower peanut field shown in Fig. 1A. The gray bands are rows that had been injured by tractor tires and were severely infected with *S. sclerotiorum*. The bands of pink located between the bands of gray in the photographs are rows of uninjured plants, exhibiting a lesser degree of infection with *S. sclerotiorum*.

Symptoms of Sclerotinia blight in a peanut field may be first detected on aerial photographs in row middles in which the foliage had been injured by tractor tires. Note the alternating faint, light-gray bands in the lower peanut field shown in Fig. 1B which was taken September 14. These gray bands, resembling those reported by Powell, et al. (9) are the initial symptoms of Sclerotinia blight in peanut plants photographed on infrared false color film, are in middles of rows that were injured by tractor tires. Fig. 1A shows the same field 10 days later (September 24). Note the increased prominence of the alternating gray bands, representing increased disease.

The relationshp between tire injury and subsequent infection of injured plants by *S. sclerotiorum* is also demonstrated in Fig. 1C, which shows the same patterns that were evident in Fig. 1A and 1B.

Because of a prolonged summer drought, plant growth was scanty in a large portion of the field in Fig. 1D. This scanty growth appeared as light areas in the photograph. Symptoms of Sclerotinia blight were not detected within these areas. However, where plant growth was abundant in the upper part of the field, symptoms of Sclerotinia blight were readily apparent in the photograph. The pattern of tire injury and subsequent infection by *S. sclerotiorum* were also evident in these areas of denser plant growth.

The lower portion of the field shown in Fig. 1E was characterized by tire injury and Sclerotinia blight symptoms. However, a strip several rows wide (note arrow) in the upper portion of the field lacked either tire injury or severe blight symptoms. The remainder of the field was characterized by having both tire injury and severe blight symptoms. According to the owner, the rows with tire injury and Sclerotinia blight had been treated with pentachloronitrobenzene (PCNB) at 11.2 kg/ha. The uninjured rows, which did not have severe blight symptoms, had been treated with PCNB at the same rate plus O-ethyl S, S-dipropyl phosphorodithioate (ethoprop) at 3.36 kg/ha.

As others (1, 5, 11) have shown with crops such as beans, clover and crucifers, we have demonstrated in this study that tractor tire injury of foliage predisposes peanut plants to infection by *S. sclerotiorum*. The injured foliage probably serves as a food base that is quickly colonized by *S. sclerotiorum* and from which the fungus spreads immediately to other, uninjured plant tissue. Others (1, 3, 5, 11) have shown that exogenous energy sources such as flower casts and moribund leaf tissue, are prerequisites for infection. Foliage injury should, therefore, be kept to a minimum in peanut fields with histories of Sclerotinia blight. Tractor use should be curtailed once the plant foliage meets in the row middle. During the latter part of the growing season, pesticides should be applied by aircraft or in irrigation water to avoid plant injury.

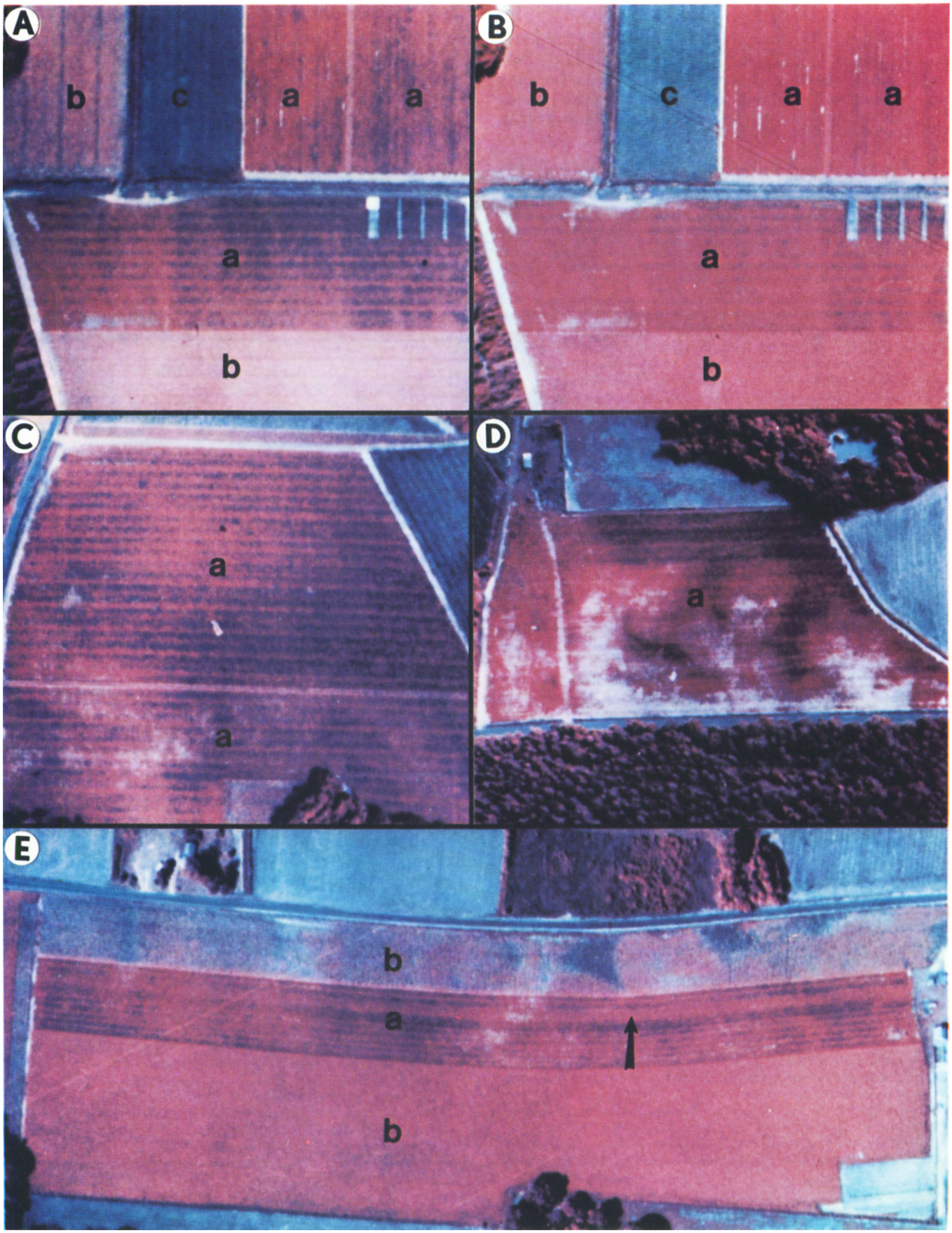

Fig. 1. Aerial infrared false-color photographs of peanut fields infected with *Sclerotinia sclerotiorum*, showing increased disease severity where plants were injured by tractor tires. Diseased areas appear dark bluish gray and healthy areas appear pink. Field B was photographed September 14, 1976; all other fields were photographed September 24, 1976. Sections labelled "a", "b" and "c" are planted to peanuts, soybeans, and corn, respectively.

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