

# *Criconemoides ornatus* Parasitic on Peanuts<sup>1</sup>

NORMAN A. MINTON AND D. K. BELL<sup>2</sup>

**Abstract:** Roots, pods, and pegs of 'Argentine' and 'Starr' peanut cultivars inoculated with *Criconemoides ornatus* were severely discolored with brown necrotic lesions. Nematodes were attached to roots, pods, and pegs often in large numbers. Small necrotic lesions were often superficial, but necrosis in large lesions usually extended deep into the tissues. Lesions were present on roots of all ages. Many lateral root primordia, and young roots were killed resulting in reduced numbers of laterals. Pod yields from nematode infected plants were reduced about one-half.

Ring nematodes (*Criconemoides* spp) are found in many peanut (*Arachis hypogaea* L.) fields in the southeastern United States (1, 2) and have not been considered a major pest since relatively high numbers may be associated with healthy plants. Occasionally, however, they are present in fields of unthrifty plants where no other known pathogens are detected. In 1953, this nematode was associated with extreme chlorosis of peanuts in Georgia (5). Graham (3) reported "Spanish" peanut plants inoculated with *Criconemoides* sp. were stunted and infected roots were decayed. This paper reports the host response of two cultivars of peanut inoculated with *Criconemoides ornatus* Raski.

## MATERIALS AND METHODS

Microplots were established in 16 stainless steel containers 0.8 m in diameter and 0.6 m deep. The containers located in a saran shadehouse were filled with methyl bromide fumigated Tifton sandy loam. Drainage was provided through a hole in the bottom of the container and a 6-cm layer of coarse gravel beneath the soil. Fertilizer was applied according to experiment station recommendations determined by soil analysis. Eight containers were seeded to 'Argentine' and eight

to 'Starr' peanuts. Twenty seeds were planted in each container in a circular row 12 cm from the container wall.

Soil in four containers planted to each cultivar was infested with *C. ornatus*. Nematodes were collected by the centrifugal-flotation method (4) from greenhouse infested soil where peanut plants were growing, washed 30 min in 0.001% 8-hydroxyquinoline sulfate, and returned to tap water. Seeds were planted one per hole with approximately 75 nematodes placed below each seed in the inoculated plots. One week later 200,000 *C. ornatus* per container were dispensed into 4-cm deep trenches 4 cm from the plants on both sides of the row and covered with soil. Four containers planted to each cultivar served as controls.

After 130 days plants were harvested and the soil was assayed for nematodes. Percent dead plants, fresh pod weight, and root and pod discoloration were recorded. Discoloration was scored from 1-5 with the least and the most severely discolored roots and pods receiving ratings of 1 and 5, respectively. Twenty-five pods from each replication were surface-disinfected in 0.5% NaOCl for 5 min and placed on rose bengal-streptomycin agar in petri dishes. After incubation for five days at 28 C, fungus colonies growing from pods were enumerated.

## RESULTS AND DISCUSSION

Large numbers of *C. ornatus* were recovered from infested plots and none from the controls (Table 1). Several natural fungal

Received for publication 9 May 1969.

<sup>1</sup> Cooperative investigations of Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture and the University of Georgia College of Agriculture Experiment Stations, Coastal Plain Station, Tifton. Journal Series Paper No. 502.

<sup>2</sup> Nematologist, Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture and Plant Pathologist, respectively. Coastal Plain Experiment Station, Tifton, Georgia 31794.

TABLE 1. Effects of *Criconeoides ornatus* on two peanut cultivars.

Treatment and cultivar	Number nematodes per 150 cc soil (thousands) <sup>a,b</sup>	Percent dead plants <sup>a,b</sup>	Fresh pod weight (g) <sup>a,b</sup>	Discoloration index <sup>b,c</sup>	
				root	pod
<b>TREATMENT:</b>					
<i>C. ornatus</i>	10 a	23.8 a	151.3 a	4.2 a	4.3 a
Control	0 b	4.1 a	287.7 b	1.0 b	2.0 a
<b>CULTIVAR × TREATMENT:</b>					
<b>'Argentine':</b>					
<i>C. ornatus</i>	12	31.7	115.4	4.2	4.7
Control	0	7.7	289.4	1.0	2.0
<b>'Starr':</b>					
<i>C. ornatus</i>	8	16.3	191.9	4.2	3.7
control	0	1.5	287.3	1.0	2.0

<sup>a</sup> Data transformed to  $\sqrt{n+1}$  for statistical analysis.

<sup>b</sup> Data subjected to split-plot analysis. Treatment means with a letter in common do not differ at the 5% level. Cultivar × treatment interactions did not differ at 5% level.

<sup>c</sup> Discoloration index based on 1 = none, 2 = light, 3 = moderate, 4 = heavy, 5 = very heavy.

contaminants were isolated from pods from all plants (Table 2). The same kinds of fungi occurred in both treatments of the two peanut cultivars. All fungi with the exception of *Aspergillus flavus* Lk. (Fr.) were more abundant in pods from nematode inoculated plants than from the controls, but differences were not significant.

Differences in percentages of dead plants were not significant between treatments, but the data strongly suggest that ring nematodes can contribute to reduction of peanut stands.

Fresh pod weight in the inoculated treatment was significantly decreased; yields were about half those of the control plots. Indices of roots and pod and peg discoloration due to necrotic lesions were also significantly greater in inoculated than in non-inoculated plants (Fig. 1). Cultivar × treatment interactions were not significant indicating both cultivars responded similarly to the treatments (Table 1, 2). Since fungal flora were similar in all treatment, necrosis apparently was caused primarily by *C. ornatus*. Nematodes were at-

TABLE 2. Fungi isolated from pods of two peanut cultivars inoculated with *Criconeoides ornatus*.<sup>a</sup>

Treatment and cultivar	<i>Aspergillus flavus</i>	<i>A. niger</i>	<i>Fusarium</i> spp.	<i>Penicillium</i> spp.	<i>Trichoderma viride</i>	Total fungi <sup>b</sup>
<b>TREATMENT:</b>						
<i>C. ornatus</i>	1.1	2.5	3.5	5.2	15.9	31.4
Control	1.5	0.9	1.0	3.4	12.8	23.3
<b>CULTIVAR × TREATMENT:</b>						
<b>'Argentine':</b>						
<i>C. ornatus</i>	1.7	2.5	3.3	6.2	16.0	33.1
Control	2.8	0.2	0.7	2.3	15.6	23.6
<b>'Starr':</b>						
<i>C. ornatus</i>	0.7	2.6	3.7	4.3	15.8	29.7
Control	0.5	1.7	1.2	4.7	10.3	23.0

<sup>a</sup> Number of fungi from 25 pods × 4 replications = 100 pods cultured for each treatment. Data subjected to split-plot analysis. Differences were not significant at the 5% level for any fungus.

<sup>b</sup> Includes fungi listed and other less frequently occurring fungal species.

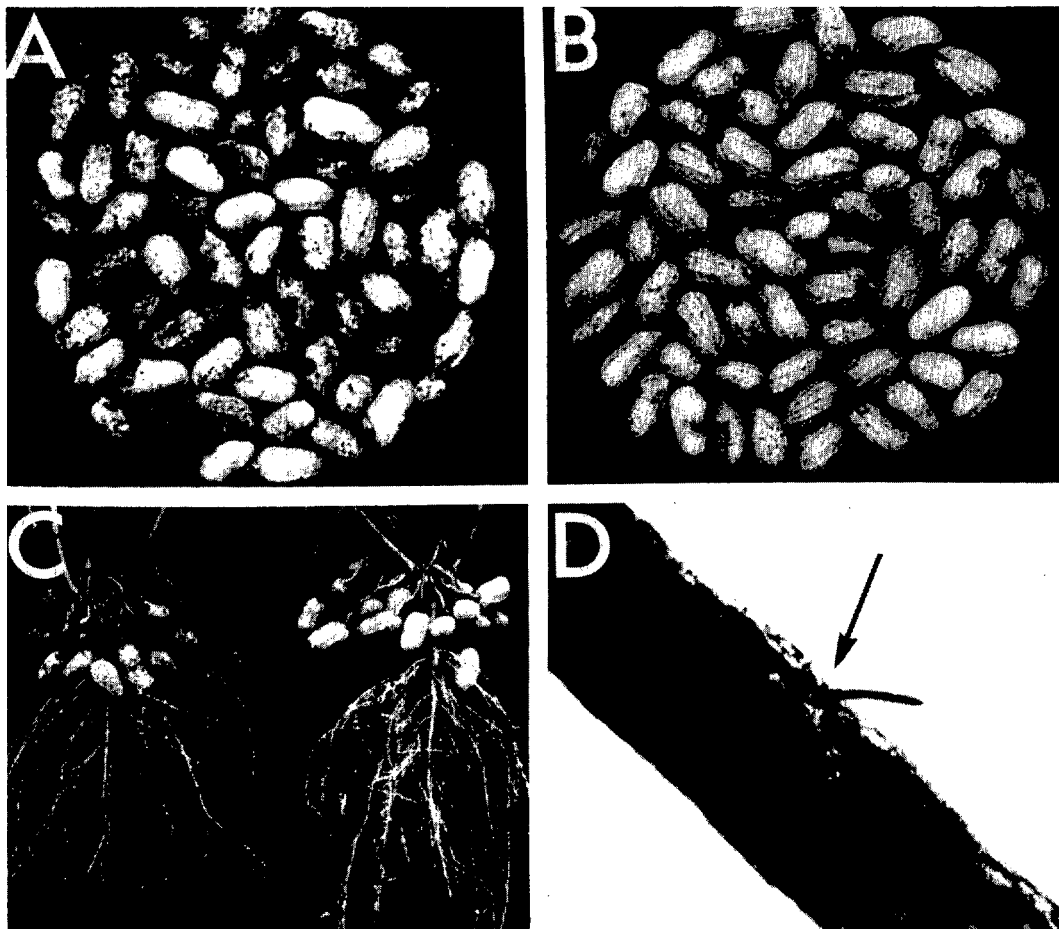


FIG. 1. (A) Peanut pods inoculated with *Criconemoides ornatus*; (B) Peanut pods not inoculated; (C) Peanut roots and pods: left inoculated with *C. ornatus*, right not inoculated; (D) *C. ornatus* (arrow) partially embedded in peanut root.

tached to roots, pods, and pegs often in large numbers. Lesions were present on roots of all ages. Small necrotic lesions were often superficial, but necrosis in large lesions usually extended deep into the tissues. Many root primordia and young roots were killed reducing the number of laterals (Fig. 1). Possibly the inocula in the experiment were greater than usually found under natural conditions. Nevertheless, our results indicated that *C. ornatus* is parasitic on plants, and when in large numbers may cause extensive injury and reduced pod yield.

#### LITERATURE CITED

1. ANON. 1960. Distribution of plant-parasitic nematodes in the south. Southern Regional Project S-19 Cooperative Series Bull. 74. 72 pp.
2. BOYLE, L. W. 1950. Several species of parasitic nematodes on peanuts in Georgia. Pl. Dis. Rep. 34:61-62.
3. GRAHAM, T. W. 1955. Pathogenicity of *Rotylenchus brachyurus* on tobacco and of *Criconemoides* sp. on tobacco and peanuts. Phytopathology 45:347. (Abstr.)
4. JENKINS, W. R. 1964. A rapid centrifugal-flotation technique for separating nematodes from soil. Pl. Dis. Rep. 48:692.
5. MACHMER, J. H. 1953. *Criconemoides* sp., a ring nematode associated with peanut "yellows." Pl. Dis. Rep. 37:156.