

EFFECT OF *ROTYLENCHULUS RENIFORMIS* INFECTION  
ON THE PHENOLIC CONTENTS OF COTTON,  
*GOSSYPIUM BARBADENSE*

by

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Diseased plant tissues usually contain higher levels of phenolic compounds than healthy tissues (Goodman *et al.*, 1967). This trend was first reported in plant-nematode interaction by Mountain and Patrick (1959) who reported that discoloration in peach roots infected with *Pratylenchus penetrans* (Cobb) Filipjev *et* S. Stekhoven, was due to the accumulation of phenolic compounds. Similar instances were reported in case of apple plants infected with *P. penetrans* (Pitcher *et al.*, 1960), tobacco infected with *P. minyus* Sher *et* Allen (Mountain, 1961) and chrysanthemum leaves infected with *A. ritzema-bosi* (Schwartz) Steiner (Wallace, 1961 and 1961a). Changes in phenolic levels of cotton resulting from infection by the reniform nematode, *Rotylenchulus reniformis* Lindford *et* Oliveira are reported here.

*Material and Methods*

Seeds of cotton, *Gossypium barbadense* L., cv. Giza 66 were planted in steam-sterelized clay soil in 15-cm clay pots which were kept in a greenhouse at  $30 \pm 5^{\circ}$  C throughout the experiment. After the seed had germinated the number of plants in each pot was reduced to three. Each pot was then inoculated with approximately 3,000 *R. reniformis* larvae. Control pots were not inoculated. There were four replicates of each treatment and the experiment was laid out in a completely random design.

Forty days after inoculation counts were made of the number of nematodes in each pot and root phenolic contents were deter-

mined. Total phenolic contents were measured colorimetrically (Swain and Hitillis, 1959) and readings were compared with those obtained from a standard gossypol solution. Free, conjugated, mono- and polyphenols were assayed according to the methods of Zucker and Ahrens (1958).

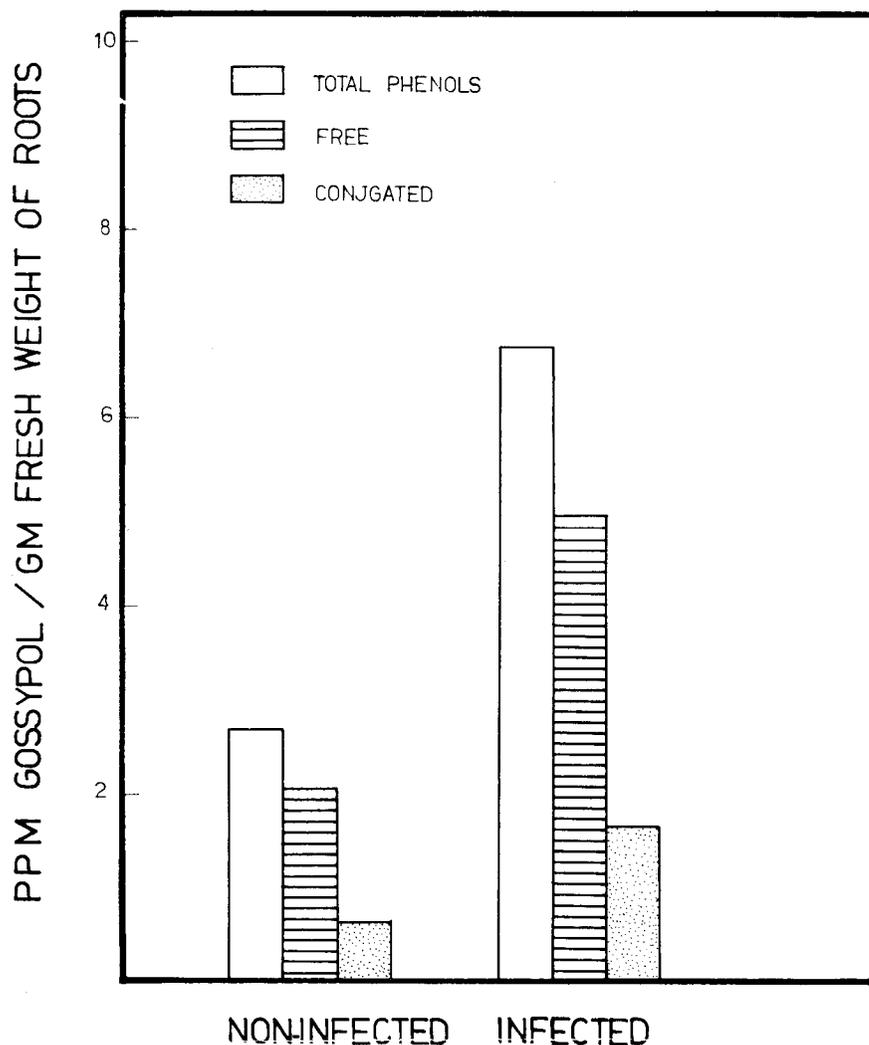


Fig. 1 - Amounts of total, free and conjugated phenols (as ppm gossypol) in cotton roots infected or not infected by *Rotylenchulus reniformis*.

## Results and Discussion

During the course of the experiment there was a significant increase in the populations of *R. reniformis* to almost twice that of the initial inoculum.

Amounts of monophenols were negligible and the phenolic constituents of the cotton roots, therefore, were considered to be mainly of the polyphenols. Total phenols in roots of infected plants were two and half times more than in non-infected roots. Most of this increase was due to the increase in free phenols rather than to conjugated phenols (Fig. 1). The present data agree to a great extent with the findings of other workers (Feldman and Hanks, 1968; Giebel, 1970; Mountain and Patrick, 1959; Rohde, 1965) that cellular structure in nematode infected tissues is altered in such a way that permits a contact between polyphenols and polyphenolases, which are normally separated in the cell, and accordingly excessive oxidation occurs and more free phenols are released in infected tissues. The corresponding increase of nematode population on roots of higher phenolic contents can be explained on the hypothesis that higher phenolic levels in infected roots may inhibit indole acetic acid oxidase which controls the levels of indole acetic acid (IAA) in plant tissues. Therefore, IAA will be accumulated in infected roots at a level higher than normal and consequently, this may favour nematode reproduction. According to Webster (1967) higher levels of auxins such as IAA promote nematode reproduction.

## SUMMARY

Amounts of total, free and conjugated phenols extracted from « Giza 66 » cotton roots (*Gossypium barbadense* L.) inoculated and non-inoculated with *Rotylenchulus reniformis* Lindford et Oliveira were determined colorimetrically. Nematode infection was associated with an increase in the phenolic level in cotton roots to almost 2½ times that of non infected roots, most of the increase being in the form of free phenols.

## RIASSUNTO

Effetto di *Rotylenchulus reniformis* sul contenuto in fenoli di radici di Cotone, *Gossypium barbadense*.

La quantità totale di fenoli estratti da radici di cotone « Giza 66 » (*Gossypium barbadense* L.) inoculate con *Rotylenchulus reniformis* Lindford et Oliveira è stata determinata per via colorimetrica. L'infezione dei nematodi era

associata ad un aumento della quantità di fenoli nelle radici di cotone di quasi 2 ½ volte rispetto alle radici non infette, con un aumento maggiore di fenoli in forma libera.

#### R É S U M É

Effet de l'infestation par *Rotylenchulus reniformis* sur la composition phenolique du coton *Gossypium barbadense*

Les quantités de phénols totaux, libres et combinés, extraits des racines de coton *Gossypium barbadense* « Giza 66 » inoculés et non inoculés avec *Rotylenchulus reniformis*, ont été déterminées par colorimètre dans les racines des cotons. Une multiplication de la quantité des phénols par presque 2,5, est associée à l'infestation par le nématode. L'essentiel de cet accroissement étant dû à des phénols libres.

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