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INFLUENCE OF INTERSPECIFIC COMPETITION  
ON THE POPULATION DENSITIES OF PHYTONEMATODES

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## I. INTRODUCTION

The ecologist faces in nature an interacting system in which one species population stands in direct and functional relation to some other species population. Investigators of laboratory populations stress an aspect of interspecies population analysis designated as the mixed-species problem.

In mixed-species studies, attention is focussed on the growth form of the two species unit usually involving competition for food, niche or space. Such investigations are conducted under laboratory conditions in which accurate population counts are feasible.

In the field of the agricultural nematology, several mixed-species population studies have recently been dealt with. The author (1978) started a study of such interspecies approach; i.e. interaction of the citrus nematode and the reniform nematode parasitizing grape.

In the present work, further laboratory analysis was demonstrated in order to measure quantitatively the competitive pressure between three locally associated species which are in direct relation with the similarity of the niche they occupy.

A preliminary varietal test was conducted to find out a cultivar of grape, out of 12 cultivars, which can be used as a suitable host for all three nematode species; viz. the citrus, the reniform and the root-knot nematodes.

The influence of intergeneric competition population densities of these nematodes, and the interacting effects, if any, between the feeding sites of these nematodes coinhabiting grape roots were investigated.

## II. REVIEW OF LITERATURE

### A- Nematode-Nematode Interactions

It is unusual that under field conditions a single species of nematode would infect a plant in the absence of any other parasitic organisms (Mountain, 1965). Ostenbrink (1966) observed that plant-parasitic nematodes generally occur in polyspecific communities and that many species have a wide host range with considerable overlap; thus, many opportunities exist for competition, synergism and other types of interactions.

It is natural to find several species of the same genus in the same ecological niches. Costenbrink (1966) found two species of lesion nematodes; Pratylenchus crenatus Loof and P. penetrans (Cobb) Chitwood and Oteifa maintain themselves permanently in the same soil, thriving side by side in the cortex of the same plant, though the rate of reproduction and maximum density may be different.

Oteifa et al., (1970) and Hake et al., (1977) revealed the presence of polyvalent populations of Helicoverpa sp., H. javanica (Treub), H. incognita (Kofoid & White), H. incognita serita (Chitwood), H. arenaria (Neal) and H. arenaria Thamesi (Chitwood), in sandy soils of Bahria province,

Egypt. They found also that cultivation different crops typically differentiated the population densities of individual species.

Ferris (1976) found that soils samples from different regions at the root-zone of six vines planted with tomato var. 'Pearson' had both M. arenaria and M. incognita, but he did not determine whether the two species occupied the same galls or feeding sites.

Interactions of two or more species of plant parasitic nematodes have been reported by several workers.

1. Interactions between species of the same genus

a) Interactions of Meloidogyne species

Studies on interactions between species of Meloidogyne were limited to two species of different optimum temperatures.

Chapman (1960) showed that both temperature and inoculum level differentially affected infection and reproduction of M. incognita (a warm climate species) and M. hapla (a cold climate species) coincidentally infecting tomato roots (var. Rutgers). Under conditions of intense competition and temperatures preferentially favorable for the development of M. incognita; 100% of the tomatoes were

M. incognita. Conversely, under conditions of reduced competition and temperatures preferentially favorable for the development of M. hapla; 57% of the females were M. incognita.

Johnson and Nusbaum (1970) attributed the depressive effects of M. incognita upon M. hapla in susceptible tobacco varieties to rapid necrosis of root tips caused by invasion of M. incognita larvae, causing reduction of the number of invasion sites for M. hapla.

Minlooh and Allen (1972) found that, in coincident infestation by M. hapla and M. javanica, the host (tomato) response favors a more rapid invasion by M. javanica and their species would be relatively more capable of invading the roots with increasing nematode density level. They concluded that the predominance of M. javanica was not due to any greater competitive ability of their species once penetration and taken place.

#### b) Interactions of Pratylenchus species

Competition between Pratylenchus spp. was demonstrated in pots (Ferris et al., 1967). A significantly higher number of P. penetrans than that of P. allani Ferris was recovered from soybean roots grown in pots which contained both species.

The female of P. penetrans significantly outnumbered the males in ratio from 3:1-5 in all pots whether singly added or mixed with the other species. P. alleni, on the other hand, had a ratio of females to males which was either equal or significantly favored the males. They concluded that the higher proportions of females in P. penetrans may be a factor contributing to the greater number of that species recovered from plant inoculated with both species.

## 2. Interactions between two genera

### a) Interactions between sedentary endo-parasitic nematodes

There are several reports on interactions of Meloidogyne spp. and other genera of plant-parasitic nematodes. Roos (1964) studied the interaction of M. incognita and Heterodera glycines Ichinohe on soybeans. He found that the degree of inhibition of M. incognita population in the presence of H. glycines varied indirectly with the initial population level of M. incognita. H. glycines populations were largely unaffected by low initial population of M. incognita, but high initial populations of M. incognita