EFFECTS OF ROOT-LESION NEMATODES (PRATYLENCHUS BRACHYURUS GODFREY AND P. ZEAE GRAHAM) AND FUSARIA MONILIFORME SHELDON ALONE OR IN COMBINATION, ON MAIZE *)

BY

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The effects of the association between the root-lesion nematodes, Pratylenchus brachyurus and P. zeae, and the root-rot fungus, Fusarium moniliforme, on maize growth, root-rot severity and root-lesion nematode population were studied under greenhouse conditions. Five inoculation treatments were applied and the effects monitored over 12 weeks. The results demonstrated that the root-lesion nematodes and the fungus affected plant growth more when combined than when alone, and were most severe during the seedling stage. Root-rot severity fluctuated during the experiment and significant differences between the treatments could only be found from 4 weeks following planting. The presence of the fungus facilitated the attraction and/or penetration of the root-lesion nematodes into the roots of the maize seedlings.

Keywords: pathogenic effects, root-rot incidences, population dynamics, host parasite relations, interactions, associations.

The associations between plant-parasitic nematodes and various plant-pathogenic fungi have been reviewed by Pitcher (1965 & 1978), Powell (1971), Bergeson (1972), and Dmowska (1982). Many reports are concerned with various plant-parasitic nematode species and Fusarium spp. but interactions on maize have received little attention. According to these studies, Hoplolaimus indicus (Sher), Meloidogyne incognita (Kofoid & White) Chitwood, M. javanica (Treub) Chitwood and Tylenchorhynchus vulgaris (Upadhyay, Swarup & Sethi), restricted growth of maize plants more when in association with Fusarium moniliforme than when inoculated singly (Nath et al., 1974; Palmer & MacDonald, 1974; Ibrahim & Rezk, 1978; Upadhyay & Swarup, 1981). Tylenchus agricola (de Man) increased the invasive potential of F. graminearum Schw. into maize roots (Kisiel et al., 1969).

Root-rot of maize, caused by F. moniliforme, is a major root disease in maize growing areas in South Africa. A survey revealed that a complex of Pratylenchus brachyurus and P. zeae are the predominant plant-parasitic nematodes associated with maize roots (De Waele & Jordaan, in press). The present study was con-

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ducted to investigate, under greenhouse conditions, the possible associations between *P. brachyurus*, *P. zeae* and *F. moniliforme* on maize plants with emphasis on plant growth, root-rot severity and root-lesion nematode population dynamics. For the purpose of this study, the two nematode species were used in a complex and not separately.

MATERIALS AND METHODS

There were six inoculation treatments: *Pratylenchus* spp. alone (P); simultaneous inoculation of *Pratylenchus* spp. and *F. moniliforme* (P + F) together; *F. moniliforme* alone (F); *Pratylenchus* spp. 3 weeks prior to *F. moniliforme* (PpF); *Pratylenchus* spp. 3 weeks after *F. moniliforme* (PaF); and an uninoculated control (C). Five maize (*Zea mays* L.) seeds of the cv. A471W were planted in each of 15 cm diameter polyethylene bags, containing 10 kg of a methyl-bromide sterilized Hutton soil (87% sand, 3% loam, 10% clay). *Pratylenchus* spp. inoculum, containing 500 nematodes/50 ml water (a mixture of 70% *P. brachyurus* and 30% *P. zeae*) was prepared from infested maize roots by using the Seinhorst mistifier (Goodey, 1963). *F. moniliforme* inoculum, containing 5 x 10⁵ conidia/50 ml water, was obtained from 15-day-old cultures on potato dextrose agar, and conidia were washed from the surface of the cultures into a flask.

The inoculations were carried out within 3 days following planting, except for the treatments PpF and PaF, when the fungi and nematodes, respectively, were inoculated 3 weeks after planting. Aqueous suspensions (50 ml) containing either the nematodes or the fungal inoculum were pipetted into the maize root zone using six inoculation tubes (4 and 8 cm deep), inserted into the soil prior to planting, to avoid root injury during the inoculation. Ambient temperatures fluctuated between 15-28°C, with a 13-hour photo period (no artificial light). Plants were watered once every 3 days and a commercial fertilizer was applied just prior to planting. The experiment was arranged in a randomized block design, with each treatment replicated five times and each replicate consisting of five plants per bag.

Plant height from base to leaf tips (subsequently referred to as plant height); stalk perimeter; length from base to youngest node (subsequently referred to as stalk length); and shoot dry mass were determined 2, 4, 8 and 12 weeks following planting. The root-rot severity was visually estimated on a percentage scale and the nematodes extracted by means of the sugar centrifugal flotation method (Coolen & D’Herde, 1972), and counted. Data were subjected to analysis of variance and the Student Newman Keuls sequential range test.

RESULTS AND DISCUSSION

The effects of the various treatments on plant growth, root-rot severity and *Pratylenchus* spp. population dynamics are presented in Figs. 1a-f. In order to