PARASITISM OF MELOIDOGYNE SPP. ON GRAPE AND KIWIFRUIT BY THE FUNGAL EGG PARASITES PAECILOMYCIES LILACINUS AND VERTICILLUM CHLAMYDOSPORIUM

BY

M. C. A. MERTENS1) and G. R. STIRLING2)

1) Wageningen Agricultural University, Binnenhaven 10, 6709 PD Wageningen, The Netherlands. 2) Plant Pathology Branch, Queensland Department of Primary Industries, Meiers Road, Indooroopilly, Queensland, 4068, Australia.

At various times during the growing season, Meloidogyne egg masses were collected from the roots of either grape or kiwifruit, or from tomato plants grown in association with these two crops. Between 23% and 87% of the eggs were found to be parasitized by fungi. Paecilomyces lilacinus and Verticillium chlamydosporium were the only species consistently isolated from these parasitized eggs. The fungicides mancozeb and iprodione, when used in combination at 150 mg/l, markedly suppressed radial growth of both P. lilacinus and V. chlamydosporium on agar but had no effect on hatch of Meloidogyne eggs or motility of second-stage juveniles. They were therefore used to estimate the degree of natural suppression of root-knot nematodes occurring in grape vineyards and kiwifruit orchards. When applied to field soil in pots, the fungicides reduced population densities of both P. lilacinus and V. chlamydosporium and significantly reduced the percentage of eggs parasitized. However, this did not result in a significant increase in the number of root-knot nematode juveniles in the soil. This suggested that the egg-parasitic fungi had little impact on root-knot nematode populations and that the fungi were mainly eliminating nematodes in excess of the carrying capacity of the root system.

INTRODUCTION

Paecilomyces lilacinus (Thom) Samson and Verticillium chlamydosporium Goddard have a worldwide distribution and are thought to be important in regulating populations of cyst nematodes (Heterodera and Globodera spp.) and root-knot nematodes (Meloidogyne spp.). The fungi are consistently found in association with both groups of nematodes (Morgan-Jones & Rodriguez-Kabana, 1988) and they were the only fungal egg parasites recovered from root-knot nematodes in a recent survey of tropical and sub-tropical soils in Australia (Stirling & West, 1992).

Although V. chlamydosporium has been studied extensively in cyst nematodes and is known to play a role in the natural suppression of the cereal cyst nematode (Heterodera avenae Woll.) in Europe (Kerry et al., 1982a, b), there is little information on the role of this species or P. lilacinus in the population dynamics of root-knot nematodes. Gaspard et al. (1990a, b) found that both fungi were common in California tomato fields but greenhouse studies sug-
gested that naturally occurring populations of these fungi played a minimal role in suppressing root-knot nematodes. However, nematodes and their antagonists would be expected to suffer considerable disruption from the cultivation and crop rotation practices that are employed in such annual cropping systems. Since antagonists of nematodes need time to establish an equilibrium with their host, suppressiveness usually takes years to develop and tends to be favoured by monocultures and perennial cropping systems where host nematodes are always available (Stirling, 1991). The objective of this work therefore was to determine whether naturally occurring egg-parasitic fungi played a role in suppressing root-knot nematodes on two perennial crops, kiwifruit (*Actinidia deliciosa* (A. Chev.) Liang et A. R. Ferg.) and grape (*Vitis vinifera* L.), at two sites in Australia.

**MATERIALS AND METHODS**

*Observations on egg-parasitism in the field*

A 20-year-old grape vineyard on a grey, sandy loam soil (56% coarse sand, 29% fine sand, 8% silt, 7% clay) at Stanthorpe, Queensland, and an 8-year-old kiwifruit orchard on red clay soil (9% coarse sand, 14% fine sand, 14% silt, 63% clay) at Kingaroy, Queensland, were selected for this study. Although the sites were naturally infested with the root-knot nematodes, *Meloidogyne arenaria* (Neal) Chitwood and *M. hapla* Chitwood, respectively, the plants appeared to be healthy and showed no symptoms of decline due to nematodes. Observations at each site commenced in spring, when new season’s growth had commenced after a period of winter dormancy. Soil temperatures at a depth of 10 cm were monitored during the study period with a Grant squirrel® data-meter logger.

In November 1990, at the beginning of the study period, soil samples were collected to determine nematode and fungal populations at each site. Twelve soil samples, each consisting of five 2 cm diam cores from depths of 0-30 cm, were taken from randomly selected plants. Nematodes were extracted from 100 ml sub-samples with a modification of the Baermann technique (Whitehead & Hemming, 1965). A 1 g sub-sample of soil from each site was used to prepare a 10-fold dilution series in water and fungal population densities were determined by plating out 0.1 ml aliquots of the appropriate soil dilution onto selective media for *P. lilacinus* (Mitchell et al., 1987) and *V. chlamydosporium* (De Leij & Kerry, 1991). The former medium was modified by reducing the benomyl concentration from 50 mg/ml to 0.5 mg/ml.

Roots were collected periodically from the field during the spring and early summer and examined for the first flush of mature *Meloidogyne* egg masses. Egg production commenced about mid-November and in mid-December a sample of 30 mature egg masses was collected. The percentage of parasitized eggs in