ABSTRACT

WIDJAJA W. HADISOEGANDA, SOELARMAN TIRTAWIDJAJA, SOELAKSONO SASTRODIHARDJO AND DEWA MADE TANTERA, 1990. Root-knot nematodes (*Meloidogyne* species) of highland vegetables: Identification, distribution and other studies to strengthen the concept of integrated nematode control

Surveys and experiments were carried out from 1975 to 1986 to elucidate the nature, magnitude and economic importance of root-knot nematodes (*Meloidogyne* species) in highland vegetable crops in Indonesia. Surveys showed that the nematodes are widely distributed in large numbers, with an extensive host range and throughout the highland vegetable growing areas. Most common were *M. incognita* race 1 (45.9%), race 2 (2.2%), race 3 (2.0%) and race 4 (1.4%); *M. javanica* (38.6%); *M. arenaria* race 1 (1.0%), race 2 (5.3%); and *M. hapla* (1.0%). *M. javanica* was more prevalent in drier areas and *M. hapla* was only found above 2 000 m asl.

Experiments indicate that the tolerance limits or damage thresholds of *M. incognita* race 1 are 50, 300, 400 and 750 larvae kg soil^{-1} for tomato, potato, bean and cabbage respectively. Resistance may be quantified using an index of reproduction and this test for resistance to *M. incognita* race 1 and *M. javanica* in tomato, potato, cabbage, onions, common bean, sweet potato, weeds, legumes and forage crops was comparable but more accurate than published findings. A post-infectional type of resistance to *M. incognita* race 1 was found in *Crotalaria anagyroides*, soybean cv. Centennial, and tomato cv. Menared, whereas *Tagetes patula* possessed both a pre-and post-infectional type of resistance. There was no evidence that *T. patula*, *C. anagyroides* or the resistant soybean or tomato kill nematodes in the soil through a nematicidal action. However, there was a strong indication that root exudates of *T. patula*, weakened the infectivity of the larvae.

Experiments indicated that *Meloidogyne* spp. could be adequately controlled by cultural means; destruction of crop residues, weed control and rotation. When resistant crops were also used the effect was additive until the fourth successive crop, when a synergistic effect was observed. Nematicides, at the recommended doses, all reduced root infection and increased crop yield from 37% to 91%. Contact nematicides reduced soil populations in the first growing period but systemic nematicides had no effect and high populations occured after harvest. Efficacy of control was dependent upon dosage. Nematicide action was through a reduction in eggs hatched and reduced larval movement and root penetration: normal activity resumed when the concentration of the active ingredient in the soil water declined to less than 5 to 10 ppm.

Experiments indicated a synergistic interaction between *M. incognita* race 1 and *Pseudomonas solanacearum* and *Fusarium oxysporum* f.sp. *lycopersici* in the disease complex of tomato, manifested as an increase in disease severity and a breakdown of resistance due to multiple infection of epistatic pathogens. In tomato, the severity of infection by *F. oxysporum* was reduced by nematicide and/or fungicide; but nematicide and/or bactericide only midly reduced infection by *P. solanacearum*.