EFFECTS OF INFESTATION BY ROOT KNOT NEMATODE *MELOIDOGYNE INCOGNITA* CHITWOOD ON YIELD AND QUALITY OF TOMATOES IN THE PORT MORESBY AREA OF PAPUA NEW GUINEA

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ABSTRACT

Infestation with Meloidogyne incognita *reduced the mean number of fruit per plant by 5.5 ($P < 0.05$) in tomato variety 'Red Cloud', which represented a crop loss of 23.4 percent. Fruit size and plant dry weight (excluding fruit) were not affected. Fruit of infested plants showed significantly less Growth Cracking but earlier Blossom End Rot.*

INTRODUCTION

The root knot nematode *Meloidogyne incognita* Chitwood is widely recognised throughout the tropics as a major pest of tomato. In Papua New Guinea it was recorded as a pest by Thrower (1958, 1960) and Shaw (1963), and it is frequently encountered in the Port Moresby area.

This communication reports correlations between *M. incognita* infestation and fruit yield and quality.

MATERIALS AND METHODS

The analysis is based on data recorded on twenty plots of a spraying trial reported by Dodd (1977, in press). Four plants chosen at random from each plot were evaluated for *M. incognita* infestation. Measurements were made of the total number of fruit per plant, and of mean fruit size (mean weight in grams of individual undamaged fruit) over four consecutive harvests for two of the four plants, after which they were dug up. The degree of nematode damage to roots was assessed using a four point scale modified from Martin (1959) as follows: 1 = roots normal with no sign of galls, 2 = slight damage with small galls sparsely distributed on some roots, 3 = moderate damage with galls on most roots, 4 = severe damage, with large coalescing galls along nearly all roots. After assessment, shoots were cut off at the former soil level, oven dried at 90°C for 24 hours, and dry weights were recorded. Correlations between root damage score, shoot dry weight, fruit number per plant and mean fruit size were calculated using results from 36 of the original 40 plants, four of which were excluded as they died during the harvest period.

The general level of infestation within each plot was calculated by totalling root damage scores. Correlations were calculated between this value and plot results for total yield and the incidence of the physiological fruit disorders Growth Cracking and Blossom End Rot.

RESULTS AND DISCUSSION

Of the 36 plants assessed for fruit number, fruit size, shoot dry weight and root damage, 13 were healthy; amongst the 23 infested plants, 34.8 percent were severely galled. Nematode infestation significantly reduced yield from a mean of 23.5 fruit per plant to 18.0 for infested plants, representing a crop loss of 23.4 percent ($P<0.05$) and there was a significant negative correlation between fruit number per plant and

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root damage score ($r = -0.39$; $P<0.05$). Plot values of the total weight and total number of fruit per plant showed highly significant negative correlations with values for plot infestation levels ($r = -0.70$ and -0.72 respectively; $P<0.001$ for both). Fruit size and shoot dry weight were unaffected and the latter showed no correlation with fruit number, fruit size or plot infestation level, thus lower yields did not result from a reduction in fruit or plant size. The exact cause of yield reduction is not clear but an increased rate of abortion of flowers and immature fruit is a possible factor.

The significant negative correlation between plot infestation values and the proportion of fruit with the physiological disorder Growth Cracking ($r = -0.46$; $P< 0.05$) probably resulted from the disruption of vascular tissues and water uptake following nematode infestation (Krusberg 1963), since Growth Cracks are mainly caused by rapid movement of water into developing fruits (Wilson 1957). The different fungicide and insecticide treatments which the plots received were shown to have had no effect on the level of nematode infestation (Dodd, in press).

The 23.4 percent reduction in fruit yield amongst infested plants shows that *M. incognita* is an important factor in lowering the productivity of tomato crops. Control of this pest and other species of root knot nematode requires expensive and laborious treatments such as soil fumigation and drenching, which are quite inappropriate for the home food garden and are not yet used by commercial vegetable growers in Papua New Guinea. Similarly, the grafting of tomato plants onto resistant root stocks of tomato or other Solanaceous species has neither been practised nor advocated in P.N.G. The avoidance of soils known to be infested would seem to be the best way of dealing with this pest.

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REFERENCES

DODD, J. (1977). *Tomato cultivation in the Port Moresby area of Papua New Guinea: the effects of pest and disease control, and pruning on fruit yields.* Unpublished M.Sc. thesis, University of P.N.G. Library, Port Moresby and Department of Primary Industry Library, Konedobu.

DODD, J. (in press). Effects of pests and diseases on the yield and quality of tomatoes in the Port Moresby area, Papua New Guinea. *Papua New Guin. agric. J.*.

KRUSBERG, L.R. (1963). Host response to nematode infection. *Ann. Rev. Phytopathol.*, 1:219-240.

MARTIN, G.C. (1959). Root knot nematode in the Federation of Rhodesia and Nyasaland. *Nematologica*, 3 (4): 332-349.

SHAW, D.E. (1963). Plant pathogens and other microorganisms in Papua and New Guinea. *D.A.S.F. Res. Bull.* No. 1, Port Moresby, P.N.G.

THROWER, L.B. (1958). Observations on the root knot nematode in Papua and New Guinea. *Trop. Agric. Trin.*, 37 (2): 121-124.

THROWER, L.B. (1960). The root knot nematode. *Papua and New Guin. agric. J.*, 13 (3): 119-124.

WILSON, I.S. (1957). Growth Cracks in tomatoes. *Queensl. Agric. J.*, 83 (7): 371-374.

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CORRINGENDUM

The pages of *Table 1* which starts on page 28 have been printed out of order and numbered incorrectly. The correct page order is 30, 28, 29, 31.