CARIBBEAN FOOD CROPS SOCIETY

PROCEEDINGS

ELEVENTH ANNUAL MEETING

EFFECT OF PLASTIC MULCH AND PLASTIC CANOPY ON NEMATODE POPULATION AND SOUTHERN BLIGHT OF TOMATO

by

N. D. SINGH

and

M. S. SANDHU
Department of Crop Science
The University of the West Indies
St. Augustine, Trinidad, W.I.

ABSTRACT

Effects of black plastic mulch and clear plastic canopy on the nematode populations and southern blight of tomato were investigated at the University Field Station, Trinidad. The results showed significant differences ($p = 0.05$) in the effectiveness of the various treatments against populations of *Rotylenchulus reniformis*, *Aphelenchus avenae*, *Meloidogyne incognita* and *Tylenchus* sp. The incidence of southern blight *(Sclerotium rolfsii)* was reduced in the black plastic mulch and mulch plus clear plastic canopy treatments but greatly increased in the clear plastic canopy treatment when compared with the control.

Much of the reduction in yield of agricultural crops in the Eastern Caribbean has been partly attributed to plant parasitic nematodes either directly or in association with other soil borne disease-causing organisms e.g. *Fusarium, Sclerotium rolfsii* Sacc. and *Pseudomonas solanacearum* Sm. (1, 2, 7).

The conventional practice of vegetable crop rotation and other cultural practices e.g. fallowing, occasional flooding and use of organic manure do not seem to be effective in preventing the build-up of plant pathogens. Soil fumigants have been found to be effective in significantly reducing nematode populations (11) but because these fumigants are expensive their use is restricted to high value crops. The effects of plastic mulch on the nematode populations and on southern blight have not been investigated in the Eastern Caribbean. Sandhu and Dalal (10) recently reported the effects of black plastic mulch and clear plastic canopy on the soil properties and their relationship to tomato yield in low-land tropics. The beneficial effects of plastic mulches and/or clear plastic canopies have been reported by other workers (4, 6, 9).

The purpose of this study was, therefore, to investigate the effect of black plastic (polyethylene) mulch and clear plastic canopy on nematode population and southern blight of tomato.

MATERIALS AND METHODS

The experiment was carried out on River Estate sandy clay loam soil at the University Field Station, Trinidad. The site selected was infested predominantly with *Meloidogyne incognita* (Kofoid and White) Chitwood, *Pratylenchus zeae* Graham, *Helicotylenchus dihystera* (Cobb) Sher, *Rotylenchulus reniformis* Linford and Oliveira, *Tylenchus* sp. *Tylenchorhynchus* sp. and *Criconemoides* sp. Less abundant plant parasitic nematodes were *Aphelenchus avenae* Bastian and *Xiphinema* sp. Southern blight caused by *Sclerotium rolfsii* Sacc. was also prevalent at this site. The treatments included (i) black polyethylene used as a mulch, (ii) clear polyethylene row cover (canopy), (iii) combined mulch and canopy, and (iv) control. The method for laying down the polyethylene sheet and setting up the canopy with its supporting frame were as described by Sandhu and Dalal (10).

A randomized complete block design with six replicates was used. Each plot was 2. 75 m x 1. 52 m in size with a buffer row between each treatment. Six-week old tomato plants var. Floradel were transplanted in

TABLE 1

Effect of Plastic Mulch and Plastic Canopy on Nematode Population and Southern Blight of Tomato (mean of six replicates)

Treatments	Number of Nematodes per 200 ml Soil								
	Pratylenchus zeae	*Helicotylenchus dihystera*	*Tylenchus* sp.	*Tylenchorhynchus* sp.	*Rotylenchus reniformis*	*Aphelenchus avenae*	*Criconemoides* sp.	*Meloidogyne incognita*	Southern blight[1]
Mulch plus Canopy	196 ab[2]	142 a	134 a	104 a	11288 c	36 b	855 a	83 b	5.5
Mulch	138 a	128 a	121 a	74 a	7599 bc	18 a	775 a	48 a	10.0
Canopy	313 b	80 a	177 ab	76 a	4909 ab	48 b	1240 b	124 b	47.7
Control	260 b	71 a	225 b	103 a	4005 a	38 b	1103 ab	118 b	14.0

1. Mean percent of plants infected with southern blight.

2. Means in columns flanked by a letter in common do not differ significantly ($P > 0.05$)

rows spaced 0.3 m apart. Soil samples were taken from each plot two months after transplanting for nematode counting (8). Each sample (200 ml) was processed by modified Cobb's decanting and sieving method (5). Duplicate samples consisting of ten percent of each nematode suspension, were examined under the stereo-microscope and generic counts made. Species identification was done under the compound microscope with specimens fixed in TAF (5).

RESULTS

When the nematode population counts were analysed using Friedman's Non-Parametric Analysis of Variance with a ln (x + 1) transformation (3) there were significant differences (P = 0. 05) in the effectiveness of the various treatments on populations of *Rotylenchulus reniformis, Tylenchus* sp., *Aphelenchus avenae* and *Meloidogyne incognita* (Table 1).

Using Duncun's Multiple Range Test on the transformed data, *R. reniformis* was significantly increased with mulch alone and mulch plus canopy compared with the control. On the other hand, *Tylenchus* sp. was reduced in the mulch alone and mulch plus canopy treatments *M. incognita* and *A. avenae* were significantly reduced (P = 0. 05) in the mulch only treatment. Canopy alone had no significant effect on any nematode population.

Symptoms of southern blight first appeared at the time of flowering and continued to spread throughout the period of fruit development. The incidence was greatly increased in the canopy treatment compared with the control (Table 1). On the other hand, mulch alone and mulch plus canopy reduced the incidence of southern blight.

DISCUSSION

It has been reported that plastic mulch and/or clear plastic canopy bring about changes in soil moisture level, soil and air temperature, plant nutrient uptake, weed and disease development (6, 9, 10). These factors

are also known to affect nematode population. Therefore it would be difficult under field conditions to separate the effects of plastic mulch and/or clear plastic canopy on the nematode populations from those of the other biotic and soil physical factors. However, Overman and Jones (9) reported that soil conditions under plastic mulch did not reduce root galling but alleviated the damage to tomato by root knot nematodes. The results obtained in her study cannot be compared quantitatively since in almost all cases nematode population counts were not reported. On the other hand, Jones *et al* (6) found that plastic mulch reduced the severity of *S. rolfsii* in tomato. This difference in southern blight control has been attributed to the high nitrogen regimes and moisture levels as well as microorganisms antagonistic to *S. rolfsii.*

The increase in the population of *R. reniformis* with polyethylene mulch may result in greater crop damage. It may be important therefore, to consider the integrated research recommended by Overman and Jones (9) where use of polyethylene mulch, high analysis soil fertilizers, seep irrigation and broad spectrum soil fumigants is required to assure high quality yield of tomato in soil of low fertility infested with nematodes and other soil borne disease organisms.

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