Managing Nematode Population Densities on Tomato Transplants Using Crop Rotation and a Nematicide[1]

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Abstract: Millet, milo, soybean, crotalaria, and Norman pigeon pea were used in conjunction with clean fallow and a nematicide (fensulfothion) for managing nematode populations in the production of tomato transplants (*Lycopersicon esculentum* Mill.). Clean fallow was the most effective treatment in suppressing nematode numbers. After 2 years in tomato, root-knot nematodes increased in numbers to damaging levels, and fallow was no longer effective for complete control even in conjunction with fensulfothion. After 4 years in tomato, none of the crops used as summer cover crops alone or in conjunction with fensulfothion reduced numbers of root-knot nematodes in harvested tomato transplants sufficiently to meet Georgia certification regulations. Milo supported large numbers of *Macroposthonia ornata* and *Pratylenchus* spp. and crotalaria supported large numbers of *Pratylenchus* spp. Millet, milo, soybean, crotalaria, and pigeon pea are poor choices for summer cover crops in sites used to produce tomato transplants, because they support large populations of root-knot and other potentially destructive nematodes. *Key Words: Meloidogyne incognita, M. javanica, Macroposthonia ornata, Paratrichodorus minor, Pratylenchus brachyurus, P. zeae,* millet, milo, soybean, crotalaria, pigeon pea.

Nematodes are a major problem in crop production. Severity of nematodes may increase if susceptible crops such as tomato plants are produced on the same land (10). In 1978, 43 of 1,274 hectares of tomato transplants grown in Georgia were not certified (1) because of damage caused by *Meloidogyne* (personal communication, Marvin J. Brown). Other nematodes such as stubby-root, lesion, and ring are limiting factors in tomato transplant production (7). Nematode control measures used by tomato transplant growers are clean fallow and preplant applications of nematicides (7, 11). Some information is available on chemical control of nematodes on tomato transplants (11, 14) and the influence of certain crop rotations on nematode populations (7), but available information is limited on combining cropping systems with soil chemical treatments for control. This research was done to determine the effects of cropping sequences and the nematicide fensulfothion on nematode population densities on tomato direct-seeded for transplant production.

MATERIALS AND METHODS

Experimental plots were established in 1971 on Tifton sandy loam (65% sand, 25% silt, 10% clay) to evaluate 31 crop rotation systems (Table 1) for managing nematode populations on tomato transplants. The plots were located near Climax, Georgia, on soil that had been used for transplant production. The soil was naturally infested with *Meloidogyne incognita* (Kofoid & White) Chitwood, *M. javanica*

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(Treub) Chitwood, *Macroposthonia ornata* (Raski) de Grisse & Loof, *Paratrichodorus minor* (Colbran) Siddiqi, and *Pratylenchus* spp. [a mixture of *P. brachyurus* (Godfrey) Filip. and Sch. Stek. and *P. zeae* Graham]. Experimental plots were single beds 1.93 m wide × 10.7 m long. Treatments were arranged in a randomized complete block design with six replications. The cropping sequences included pearl millet (Mt) [*Pennisetum americanum* (L.) Leeke]; milo (Mo) [*Sorghum vulgare* Pers.]; soybean (S) [*Glycine max* (L.) Merr. 'Bragg']; crotalaria (C) [*Crotalaria spectabilis* Roth]; pigeon pea (P) [*Cajanus cajan* (L.) Millsp. 'Norman']; clean fallow (F), and tomato (T) [*Lycopersicon esculentum* Mill. 'Campbell 28'].

The first crop was planted in June as a summer cover crop in 1971 (Table 1). Tomato seeds were sown in each plot (5 rows per plot 30 cm apart) in April, 1972–1976. One-half of each plot was treated with fensulfothion (11.2 kg active/ha incorporated into the top 15-cm soil layer with a tractor-driven rototiller one day before seeding) from 1974–1976; and the other half was not treated.

The tomato transplants were harvested in June, when most plants in the best plots reached marketable size (ca. 15 to 25 cm tall). Seedlings were taken from a 3-m section of the center row and the yield (number of marketable plants) was extrapolated to a number per ha. Fifty plants were selected randomly from each plot and examined for root-galls. Roots were washed in tap water and indexed on a 1–5 scale (1 = no galls, 2 = 1–25, 3 = 26–50, 4 = 51–75, and 5 = 76–100% roots galled). Immediately after tomato plants were harvested, the summer treatments were imposed on each plot. As each crop became mature, the shoots were cut with a tractor-mounted rotary mower and incorporated into the soil with a disc harrow in September or October each year.

Soil samples (800 cm^3) were taken in February, June, and October each year beginning in June 1972 and continuing through June 1976. Soil samples consisted of a composite of 20 cores (2 cm diam × 20 cm deep) collected randomly throughout the plot from the root zone of plants in each replicate. The composite samples were mixed thoroughly, and a 150-cm^3 aliquant for each replicate was processed by a centrifugal-flotation method (8). Extracted nematodes were placed in calibrated dishes for identifying and counting.

RESULTS

Numbers of *Meloidogyne* spp. larvae in the soil were generally lower in February than in June and October of each year (Table 1). All crops supported reproduction of *Meloidogyne* spp. The greatest influence of summer cover crops on *Meloidogyne* spp. occurred in October 1973 and 1974, when the numbers of larvae were greater in milo plots than in the other plots, although the differences were not always significant ($P = 0.05$). The increase in numbers of *Meloidogyne* spp. on milo was also evident in February and June 1975 in the Mt-T-Mo-T, Mo-T-Mt-T, S-T-Mo-T, and P-T-Mo-T cropping sequences and in June in the C-T-Mo-T cropping sequence. The numbers of *Meloidogyne* spp. larvae were near or below detectable levels in F-T-F-T plots through February 1975. After that time the numbers of *Meloidogyne* spp. increased on tomato in these plots, and would fluctuate to low numbers in February and resurge on tomato.

On the basis of root-gall indices, control in *Meloidogyne* spp. was complete on tomato transplants in 1972 and 1973 in the Mt-T-Mt-T, Mo-T-C-T, Mo-T-P-T, S-T-F-T, P-T-C-T, P-T-P-T, and F-T-F-T cropping sequences (Table 2). Even though the root-gall indices were low, the numbers of *Meloidogyne* spp. larvae were recovered in increasing numbers with time in most plots. The application of fensulfothion before seeding tomatoes in 1974 protected seedlings adequately in the P-T-Mt-T, P-T-C-T, and P-T-P-T cropping sequences to meet certification standards (1), which specify that transplants must be free of root-knot nematodes. Root-gall indices of tomato in untreated plots were greater following milo in 1974 than following other crops. In 1975 and 1976, root-gall indices and population densities increased in untreated and treated plots to levels that neither the summer cover crops, the nematicide, or the two combined controlled the root-knot nematode completely.

The numbers of *M. ornata* were near or

TABLE 1. Effect of summer cropping-sequence on the field populations of *Meloidogyne* spp. in a tomato transplant production system in Climax, Georgia, USA.

Cropping sequence: Summer	Spring	Summer	Spring	Number of *Meloidogyne* spp. larvae/150-cm³ soil										
1971 1973 1975	1972 1974 1976	1972 1974 1976	1973 1975 ——	1972	1973			1974					1975	
									June		October		February	
				June	Feb.	June	Oct.	Feb.	Untreated	Treated[y]	Untreated	Treated	Untreated	Treated
Mt	T	C	T	20	0 c[x]	0 d	53 bc	2 c	37 c-e	13 de	110 c-e	97 c-e	5 e	53 de
Mt	T	S	T	325	0 c	30 cd	155 bc	0 c	182 a-e	498 a-c	188 b-e	95 c-e	25 de	145 de
Mt	T	P	T	100	0 c	0 d	103 bc	0 c	410 a-e	7 e	32 c-e	3 e	17 de	212 b-d
Mt	T	Mo	T	3	12 a-c	137 a-d	133 bc	0 c	482 a-d	177 a-d	928 a	693 a	123 de	162 de
Mt	T	Mt	T	0	0 c	0 d	37 bc	0 c	113 b-e	20 de	42 c-e	23 de	7 e	32 de
Mt	T	F	T	25	0 c	0 d	12 bc	0 c	13 de	0 e	2 e	2 e	2 e	10 e
Mo	T	C	T	22	5 bc	192 a-d	73 bc	62 bc	77 b-e	350 a-e	63 c-e	43 c-e	30 de	105 de
Mo	T	S	T	65	0 c	155 a-d	548 a	147 a	298 a-e	352 a-e	120 c-e	63 c-e	55 de	373 b
Mo	T	P	T	1	0 c	57 cd	182 bc	57 bc	92 b-e	25 de	90 c-e	33 c-e	40 de	198 de
Mo	T	Mt	T	25	0 c	353 ab	247 b	98 ab	388 a-e	528 ab	80 c-e	42 c-e	150 de	107 de
Mo	T	Mo	T	197	5 bc	122 b-d	127 bc	37 c	77 b-e	593 a	317 bc	110 c-e	47 b-d	147 de
Mo	T	F	T	2	0 c	32 cd	143 bc	15 c	70 b-e	43 c-e	3 e	8 de	3 e	23 de
S	T	Mt	T	0	0 c	2 d	0 c	2 c	530 ab	113 b-e	83 c-e	20 de	27 de	13 de
S	T	C	T	5	2 bc	34 cd	75 bc	0 c	80 b-e	202 a-e	128 c-e	32 c-e	18 de	118 de
S	T	P	T	35	0 c	2 d	20 bc	38 c	430 a-e	13 de	175 b-e	67 c-e	13 de	70 de
S	T	Mo	T	0	27 ab	397 a	12 bc	0 c	27 de	52 c-e	738 a	295 b-d	63 de	155 de
S	T	S	T	148	12 a-c	100 b-d	115 bc	15 c	197 a-e	58 c-e	125 c-e	145 c-e	38 de	57 de
S	T	F	T	0	0 c	48 cd	15 bc	7 c	75 b-e	20 de	0 e	8 de	0 e	22 de
C	T	Mt	T	533	15 a-c	312 a-c	167 bc	22 c	202 a-e	43 c-e	102 c-e	28 de	50 de	115 de
C	T	S	T	3	2 bc	43 cd	102 bc	10 c	65 b-e	32 c-e	82 c-e	17 de	27 de	42 de
C	T	P	T	88	0 c	3 d	78 bc	35 c	67 b-e	18 de	20 de	20 de	2 e	28 de
C	T	Mo	T	180	20 a-c	80 b-d	20 bc	7 c	107 b-e	93 b-e	420 b	278 b-e	40 de	602 a
C	T	C	T	22	5 bc	10 d	45 bc	22 c	210 a-e	17 de	120 c-e	113 c-e	20 de	37 de
C	T	F	T	0	0 c	20 d	38 bc	2 c	85 b-e	100 b-e	2 e	0 e	2 e	0 e
P	T	Mt	T	40	15 a-c	47 cd	30 bc	0 c	13 de	3 e	147 c-e	17 de	25 de	352 bc
P	T	C	T	0	0 c	5 d	8 bc	3 c	18 de	3 e	47 c-e	55 c-e	3 e	100 de
P	T	S	T	0	3 bc	5 d	62 bc	5 c	12 de	3 e	148 c-e	45 c-e	5 e	30 de
P	T	Mo	T	18	32 a	143 a-d	48 bc	8 c	45 c-e	35 de	718 a	198 b-e	92 de	137 de
P	T	P	T	0	30 a	0 d	20 bc	5 c	7 e	0 e	20 de	37 c-e	7 e	8 e
P	T	F	T	1733	2 bc	7 d	18 bc	10 c	163 a-e	0 e	28 de	8 de	0 e	0 e
F	T	F	T	30	0 c	17 d	0 c	0 c	0 e	0 e	0 e	2 e	0 e	3 e

(continued)

TABLE 1. (Continued)

Cropping sequence: Summer 1971 / 1973 / 1975	Spring 1972 / 1974 / 1976	Summer 1972 / 1974 / 1976	Spring 1973 / 1975 / ——	1975 June Untreated	1975 June Treated	1975 October Untreated	1975 October Treated	1976 February Untreated	1976 February Treated	1976 June Untreated	1976 June Treated
Mt	T	C	T	123 e-h	115 e-h	57 c-i	12 g-i	8 cd	0 d	707 bc	698 bc
Mt	T	S	T	527 b-h	514 b-h	38 d-i	47 d-i	28 a-d	10 cd	1802 a-c	747 bc
Mt	T	P	T	318 c-h	308 c-h	28 e-i	50 c-i	5 cd	10 cd	1205 a-c	1093 a-c
Mt	T	Mo	T	1923 a	1925 a	68 b-i	65 b-i	52 a-d	2 cd	1077 a-c	1272 a-c
Mt	T	Mt	T	340 c-h	318 c-h	23 e-i	22 f-i	3 cd	0 d	737 bc	1070 a-c
Mt	T	F	T	155 d-h	140 d-h	0 i	2 i	2 cd	0 d	142 c	1218 a-c
Mo	T	C	T	58 gh	52 gh	37 d-i	40 d-i	20 a-d	13 b-d	2233 ab	280 bc
Mo	T	S	T	640 b-h	620 b-h	40 d-i	48 c-i	3 cd	10 cd	608 bc	953 bc
Mo	T	P	T	693 b-h	1097 a-h	7 hi	45 d-i	27 a-d	25 a-d	1378 a-c	2057 a-c
Mo	T	Mt	T	1353 a-f	1687 ab	33 d-i	73 b-i	3 cd	10 cd	1345 a-c	1557 a-c
Mo	T	Mo	T	1065 a-h	910 a-h	7 hi	72 b-i	5 cd	18 a-d	485 bc	893 bc
Mo	T	F	T	183 c-h	542 b-h	5 i	57 c-i	12 cd	13 b-d	1833 a-c	1157 a-c
S	T	Mt	T	355 c-h	1172 a-h	62 c-i	75 b-i	2 cd	0 d	1012 bc	445 bc
S	T	C	T	860 a-h	445 b-h	120 a-e	30 d-i	7 cd	0 d	553 bc	608 bc
S	T	P	T	1332 a-f	1172 a-h	42 d-i	45 d-i	25 a-d	12 cd	1803 a-c	1530 a-c
S	T	Mo	T	1395 a-d	798 a-h	13 g-i	10 g-i	32 a-d	65 ab	302 bc	782 bc
S	T	S	T	1312 a-g	668 b-h	17 g-i	28 e-i	8 cd	3 cd	512 bc	595 bc
S	T	F	T	160 d-h	178 c-h	13 g-i	2 i	5 cd	15 b-d	258 bc	93 c
C	T	Mt	T	520 b-h	263 c-h	53 c-i	23 e-i	70 a	23 a-d	1198 a-c	327 bc
C	T	S	T	325 c-h	135 d-h	43 d-i	45 d-i	8 cd	50 a-d	280 bc	792 bc
C	T	P	T	832 a-h	330 c-h	63 b-i	5 i	7 cd	30 a-d	1140 a-c	873 bc
C	T	Mo	T	1435 abc	1395 a-d	77 b-i	57 c-i	8 cd	22 a-d	1382 a-c	3107 a
C	T	C	T	247 c-h	587 b-h	90 a-i	20 f-i	33 a-d	3 cd	518 bc	1450 a-c
C	T	F	T	250 c-h	68 gh	97 a-i	50 c-i	12 cd	0 d	1102 a-c	1172 a-c
P	T	Mt	T	628 b-h	972 a-h	127 a-d	67 b-i	10 cd	0 d	862 bc	1422 a-c
P	T	C	T	715 a-h	48 h	145 a-c	77 b-i	17 b-d	15 b-d	1667 a-c	1718 a-c
P	T	S	T	687 b-h	103 f-h	105 a-h	115 a-f	13 b-d	10 cd	1913 a-c	2273 ab
P	T	Mo	T	962 a-h	1378 a-e	158 ab	170 a	22 a-d	55 a-c	1622 a-c	2257 ab
P	T	P	T	338 c-h	312 c-h	75 b-i	48 c-i	3 cd	5 cd	1292 a-c	1122 a-c
P	T	F	T	187 c-h	102 f-h	107 a-g	87 a-i	3 cd	0 d	2117 a-c	1750 a-c
F	T	F	T	13 h	30 h	67 b-i	20 f-i	2 cd	0 d	755 bc	420 bc

[x]Mt = millet, Mo = milo, S = soybean, C = crotalaria, P = pigeon pea, T = Tomato, and F = clean fallow.
[y]Fensulfothion, 11.2 kg active/ha.
[z]Means followed by the same letter, in a single column prior to February 1974, and in double columns (untreated and treated) thereafter, do not differ ($P = 0.05$) according to Duncan's multiple-range test. No-letters indicates nonsignificance.

TABLE 2. Effect of summer cover crops and fensulfothion on root-gall indices of tomato transplants in Climax, Georgia, USA.

Cropping sequence[w]				Root-gall indices[x]							
Summer	Spring	Summer	Spring			1974		1975		1976	
1971 1973 1975	1972 1974 1976	1972 1974 1976	1973 1975 —	1972	1973	Untreated	Treated[y]	Untreated	Treated	Untreated	Treated
Mt	T	C	T	1.00 b[z]	1.03	1.28 c-i	1.04 hi	1.24 e-h	1.43 d-h	3.09 a-i	2.18 d-i
Mt	T	S	T	1.01 b	1.34	1.66 b-i	1.30 c-i	1.50 c-h	1.64 a-h	2.49 c-i	3.22 a-i
Mt	T	P	T	1.06 b	1.62	1.59 b-i	1.06 g-i	1.51 c-h	1.39 e-h	2.32 c-i	2.03 e-i
Mt	T	Mo	T	1.01 b	1.54	1.83 a-d	1.26 c-i	1.79 a-e	2.23 a	2.80 a-i	3.12 a-i
Mt	T	Mt	T	1.00 b	1.00	1.26 c-i	1.02 hi	1.24 e-h	1.57 b-h	2.76 a-i	2.50 c-i
Mt	T	F	T	1.02 b	1.00	1.27 c-i	1.01 hi	1.16 e-h	1.12 f-h	1.72 i	2.61 b-i
Mo	T	C	T	1.00 b	1.00	2.03 ab	1.40 b-i	1.40 e-h	1.25 e-h	4.15 ab	1.93 f-i
Mo	T	S	T	1.00 b	1.23	2.38 a	1.80 a-f	1.43 d-h	1.58 b-h	2.92 a-i	2.81 a-i
Mo	T	P	T	1.00 b	1.00	1.82 a-e	1.50 g-i	1.51 c-h	1.56 c-h	4.26 a	3.15 a-i
Mo	T	Mt	T	1.14 b	1.33	2.41 a	1.73 b-g	1.65 a-h	1.39 e-h	2.97 a-i	2.29 c-i
Mo	T	Mo	T	1.01 b	1.38	1.82 a-e	1.62 b-i	1.54 c-h	1.58 b-h	1.89 g-i	2.10 d-i
Mo	T	F	T	1.06 b	1.09	1.55 b-i	1.55 b-i	1.12 f-h	1.29 e-h	2.64 b-i	2.88 a-i
S	T	Mt	T	1.00 b	1.00	1.37 b-i	1.14 f-i	1.60 b-h	1.60 b-h	2.70 a-i	2.21 d-i
S	T	C	T	1.12 b	1.00	1.41 b-i	1.52 b-i	1.31 e-h	1.31 e-h	2.99 a-i	2.46 c-i
S	T	P	T	1.19 b	1.08	1.68 b-h	1.14 f-i	1.28 e-h	1.19 e-h	2.85 a-i	2.97 a-i
S	T	Mo	T	1.00 b	1.15	1.62 b-i	1.14 f-i	2.20 ab	1.38 e-h	2.36 c-i	3.33 a-h
S	T	S	T	1.12 b	1.37	1.87 a-c	1.21 c-i	1.57 b-h	1.49 d-h	2.18 d-i	2.71 a-i
S	T	F	T	1.00 b	1.00	1.22 c-i	1.34 c-i	1.37 e-h	1.09 gh	1.81 hi	2.01 e-i
C	T	Mt	T	1.71 a	1.73	1.79 a-f	1.20 c-i	1.51 c-h	1.55 c-h	2.63 b-i	2.41 c-i
C	T	S	T	1.00 b	1.22	1.30 c-i	1.03 hi	1.31 e-h	1.27 e-h	2.25 d-i	2.86 a-i
C	T	P	T	1.06 b	1.21	1.53 b-i	1.16 d-i	1.42 d-h	1.09 gh	3.52 a-e	1.71 a-i
C	T	Mo	T	1.09 b	1.77	1.52 b-i	1.31 c-i	2.06 a-d	1.77 a-f	3.51 a-f	3.02 a-i
C	T	C	T	1.03 b	1.08	1.59 b-i	1.10 g-i	1.39 e-h	1.38 e-h	2.42 c-i	3.64 a-d
C	T	F	T	1.13 b	1.00	1.27 c-i	1.27 c-i	1.53 c-h	1.16 e-h	2.59 b-i	2.50 c-i
P	T	Mt	T	1.13 b	1.13	1.25 c-i	1.00 i	1.64 a-h	1.20 e-h	3.42 a-g	1.91 g-i
P	T	C	T	1.00 b	1.00	1.22 c-i	1.00 i	1.53 c-h	1.20 e-h	2.98 a-i	3.14 a-i
P	T	S	T	1.00 b	1.04	1.22 c-i	1.04 hi	1.52 c-h	1.67 a-h	2.77 a-i	2.87 a-i
P	T	Mo	T	1.16 b	1.55	1.68 b-i	1.10 g-i	1.75 a-g	2.15 a-c	3.57 a-e	3.87 a-c
P	T	P	T	1.00 b	1.00	1.23 c-i	1.00 i	1.05 h	1.15 e-h	2.01 e-i	2.47 c-i
P	T	F	T	1.03 b	1.27	1.39 b-i	1.05 g-i	1.18 e-h	1.10 gh	2.47 c-i	2.43 c-i
F	T	F	T	1.00 b	1.00	1.10 a-i	1.04 hi	1.14 e-h	1.04 h	1.79 hi	1.99 e-i

[w]Mt = millet, Mo = milo, S = soybean, C = crotalaria, P = pigeon pea, T = tomato, and F = clean fallow.
[x]Fensulfothion, 11.2 kg active/ha.
[y]1-5 scale: 1 = no galls, 2 = 1–25%, 3 = 36–50%, 4 = 51–75%, and 5 = 76–100% roots galled.
[z]Means followed by the same letter, in a single column prior to 1974 and in double columns (untreated and treated) thereafter, do not differ ($P = 0.05$) according to Duncan's multiple-range test. No-letters indicates nonsignificance.

below detectable levels on millet in October each year in clean fallow plots and in all plots after October 1975 (Table 3). *M. ornata* increased when milo occurred in the cropping sequence in 1973 and 1974 and reached the highest levels in February and June 1974 in plots planted with milo as a summer cover crop in 1973. The influence of fensulfothion on *M. ornata* was greatest in June 1974, when numbers of *M. ornata* in untreated plots were at moderate levels (142 or more/150 cm^3 soil). At lower levels, numbers of nematodes were not significantly reduced by fensulfothion.

Numbers of *P. minor* in the soil were lower in February and October than in June each year (Table 4). The greatest numbers of *P. minor* were in the S-T-C-T and Mt-T-C-T cropping sequences in June 1974 and were reduced ($P = 0.05$) by fensulfothion. Numbers of *P. minor* were significantly reduced by fensulfothion only when they were greater than 68/150 cm^3 soil in untreated plots.

Pratylenchus numbers were greater in plots planted with milo and crotalaria than in other plots (Table 5). *Pratylenchus* spp. were more numerous in Mo-T-C-T, S-T-C-T, C-T-C-T, and P-T-C-T cropping sequences than in other cropping sequences in October 1974 and February 1974. Numbers of *Pratylenchus* spp. were reduced to lower levels in Mt-T-F-T, S-T-F-T, P-T-F-T, and F-T-F-T than in other cropping sequences. The numbers of *Pratylenchus* spp. were reduced ($P = 0.05$) in fensulfothion-treated plots when numbers were high in June and October 1974 in the Mo-T-C-T cropping sequence, and in S-T-C-T, C-T-C-T, and P-T-C-T cropping sequences in October 1974. Numbers of *Pratylenchus* spp. were less ($P = 0.05$) in fensulfothion-treated plots than in untreated plots only when population densities were greater than 127/150-cm^3 soil in untreated plots.

The influence of these cropping systems and the nematicide on the yield and quality of tomato transplants has been reported (10).

DISCUSSION

In the southeastern United States, the success of a cover crop in controlling root-knot nematodes is important when a root-knot-nematode-susceptible crop such as tomato follows the cover crop. Root-knot-resistant plant species are available that are suitable for cover crops (6, 12, 15, 16). Little is known, however, about the relationship of such crops to other economically important nematodes, such as *M. ornata, P. minor,* and *Pratylenchus* spp., some of which can damage tomato transplants (2, 3). Furthermore, continued use of root-knot-resistant cover crops could increase population densities of other parasitic nematodes to damaging levels. Millet, which is commonly grown in rotation with tomato transplants, supports damaging populations of *Belonolaimus, Pratylenchus,* and *Paratrichodorus* (2, 6). Milo [*Sorghum bicolor* (L.) Moench] supported large numbers of *Pratylenchus brachyurus* and *Paratrichodorus minor* (7).

Meloidogyne species have a wide host range and can also build up on "resistant" cultivars. Bragg soybean is moderately resistant to *M. incognita* but susceptible to *M. javanica* (5). In our study, the numbers of root-knot nematodes increased in the S-T-S-T cropping sequence. This indicated that the level of resistance in 'Bragg' is too low for its use as a summer cover crop for suppressing the complex root-knot species found in sites for tomato transplant production. Preliminary observations indicated that, under greenhouse conditions, *M. incognita* and *M. javanica* attack 'Gahi' but not 'Gahi 3' and 'millex 22' pearl millet (9).

Crotalaria reduced root-knot nematode populations (13) and prevented reproduction of *M. incognita, M. incognita acrita, M. javanica,* and *M. hapla* (7). However, the numbers of *Meloidogyne* spp. increased in the C-T-C-T cropping sequence. Crotalaria did not sufficiently reduce *Meloidogyne* spp. in a cropping sequence in order to grow a root-knot susceptible crop such as tomato. Crotalaria was a good host for *Pratylenchus* spp. as reported by others (2, 3, 6).

Pigeon pea is supposedly resistant to *M. incognita, M. javanica, M. hapla,* and *M. arenaria* (W. T. Fike, personal communication), but in our tests the roots of pigeon pea were severely galled by *M. javanica,* indicating the possibility of a race of *M. javanica* different from the one used in the North Carolina tests. In addition,

TABLE 3. Effect of summer cropping-sequence on the field populations of *Macroposthonia ornata* in a tomato transplant production system in Climax, Georgia, USA.

Cropping sequence[x]												
Summer	Spring	Summer	Spring						1974			
1971	1972	1972	1973	1972	1973				June		October	
1973	1974	1974	1975									
1975	1976	1976	——	June	Feb.	June	Oct.	Feb.	Untreated	Treated[y]	Untreated	Treated
Mt	T	C	T	13 ef[z]	5 c	10 ce	0 c	3 f	5 e	0 e	0 d	0 d
Mt	T	S	T	3 f	0 c	5 ce	0 c	0 f	2 e	0 e	2 d	0 d
Mt	T	P	T	7 ef	2 c	0 e	0 c	2 f	0 e	0 e	0 d	0 d
Mt	T	Mo	T	3 f	135 b	23 b-e	0 c	8 f	3 e	2 e	25 bc	15 cd
Mt	T	Mt	T	45 a-e	0 c	0 e	0 c	2 f	0 e	0 e	0 d	2 d
Mt	T	F	T	5 f	7 c	5 c-e	0 c	5 f	5 e	2 e	0 d	0 d
Mo	T	C	T	58 a-c	13 c	18 b-e	18 bc	283 c-e	37 cde	15 de	0 d	7 d
Mo	T	S	T	37 a-f	7 c	0 e	7 c	408 a-c	37 cde	67 cd	0 d	0 d
Mo	T	P	T	67 a	2 c	13 c-e	0 c	533 ab	208 a	45 cde	0 d	2 d
Mo	T	Mt	T	22 c-f	0 c	17 b-e	3 c	630 a	142 b	82 c	3 d	3 d
Mo	T	Mo	T	62 ab	168 ab	53 b	18 bc	217 c-f	53 cde	52 cde	15 cd	32 ab
Mo	T	F	T	55-a-d	0 c	12 c-e	7 c	307 b-d	148 b	72 c	3 d	3 d
S	T	Mt	T	7 ef	5 c	0 e	0 c	12 f	3 e	0 c	0 d	0 d
S	T	C	T	3 f	12 c	12 c-e	0 c	55 ef	15 de	2 e	0 d	3 d
S	T	P	T	15 ef	10 c	3 c-e	2 c	162 d-f	12 e	2 e	0 d	2 d
S	T	Mo	T	18 d-f	195 a	95 a	5 c	28 ef	2 e	8 e	12 cd	43 a
S	T	S	T	28 b-f	10 c	33 b-e	8 c	13 f	3 e	7 e	0 d	0 d
S	T	F	T	10 ef	0 c	2 de	0 c	22 ef	5 e	7 e	0 d	0 d
C	T	Mt	T	12 ef	0 c	3 c-e	5 c	35 ef	2 e	5 e	0 d	0 d
C	T	S	T	3 f	7 c	42 bc	33 a-c	45 ef	5 e	2 e	7 d	0 d
C	T	P	T	7 ef	5 c	12 c-e	25 bc	20 ef	5 e	3 e	0 d	5 d
C	T	Mo	T	2 f	35 c	25 b-e	48 ab	52 ef	8 e	5 e	7 d	8 d
C	T	C	T	5 f	22 c	33 b-e	67 a	32 ef	15 de	10 e	3 d	0 d
C	T	F	T	13 ef	2 c	3 c-e	7 c	8 f	0 e	3 e	0 d	0 d
P	T	Mt	T	25 b-f	0 c	10 c-e	7 c	0 f	2 e	0 e	0 d	0 d
P	T	C	T	38 a-f	3 c	0 e	10 bc	7 f	2 e	0 e	0 d	2 d
P	T	S	T	13 ef	8 c	5 c-e	10 bc	12 f	2 e	0 e	2 d	5 d
P	T	Mo	T	3 f	123 b	43 bc	32 a-c	28 ef	7 e	2 e	7 d	5 d
P	T	P	T	5 f	3 c	2 de	13 bc	3 f	3 e	5 e	0 d	0 d
P	T	F	T	8 ef	0 c	0 e	7 c	8 f	0 e	0 e	0 d	0 d
F	T	F	T	22 c-f	0 c	7 c-e	7 c	7 f	0 e	0 e	0 d	2 d

(continued)

TABLE 3. (Continued)

Cropping sequence				1975						1976			
Summer-Spring-Summer-Spring				February		June		October		February		June	
1971 / 1973 / 1975	1972 / 1974 / 1976	1972 / 1974 / 1976	1973 / 1975 / ——	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated
Mt	T	C	T	0 c	2 c	17 a-d	2 ef	0	0	2 de	2 de	0	2
Mt	T	S	T	7 c	0 c	8 b-f	2 ef	0	0	2 de	2 de	0	0
Mt	T	P	T	0 c	3 c	23 a	0 f	0	0	5 de	0 e	0	0
Mt	T	Mo	T	37 ab	10 bc	10 b-f	3 ef	3	2	5 de	0 e	0	5
Mt	T	Mt	T	0 c	2 c	18 a-c	2 ef	0	0	7 de	2 de	0	0
Mt	T	F	T	0 c	2 c	20 ab	0 f	2	0	5 de	0 e	2	0
Mo	T	C	T	7 c	3 c	23 a	0 f	10	2	23 ab	5 de	5	5
Mo	T	S	T	13 bc	2 c	20 ab	3 ef	0	0	8 c-e	27 a	12	8
Mo	T	P	T	5 c	8 bc	5 d-f	13 a-e	10	0	8 c-e	15 a-d	5	7
Mo	T	Mt	T	13 bc	2 c	0 f	0 f	22	0	15 a-d	5 de	2	8
Mo	T	Mo	T	17 bc	12 bc	12 a-f	12 a-f	0	0	20 a-c	20 a-c	10	10
Mo	T	F	T	20 bc	5 c	3 ef	7 c-f	3	0	13 b-e	3 de	8	3
S	T	Mt	T	0 c	2 c	0 f	2 ef	0	0	2 de	2 de	0	5
S	T	C	T	3 c	18 bc	2 ef	2 ef	0	0	2 de	2 de	3	3
S	T	P	T	10 bc	2 c	0 f	2 ef	3	0	2 de	3 de	0	3
S	T	Mo	T	60 a	47 a	7 c-f	17 a-d	12	0	8 c-e	0 e	8	0
S	T	S	T	7 c	3 c	0 f	0 f	0	2	8 c-e	2 de	0	0
S	T	F	T	2 c	2 c	0 f	5 d-f	0	0	2 de	0 e	2	12
C	T	Mt	T	0 c	0 c	0 f	0 f	0	0	0 e	0 e	0	2
C	T	S	T	0 c	2 c	0 f	2 ef	0	0	2 de	0 e	0	3
C	T	P	T	2 c	18 bc	0 f	10 b-f	0	0	2 de	7 de	3	5
C	T	Mo	T	7 c	10 bc	5 d-f	2 ef	0	0	0 e	3 de	0	2
C	T	C	T	7 c	12 bc	2 ef	3 ef	0	0	0 e	0 e	5	3
C	T	F	T	0 c	0 c	0 f	7 c-f	0	0	5 de	0 e	2	3
P	T	Mt	T	0 c	3 c	0 f	0 f	0	0	5 de	2 de	8	2
P	T	C	T	2 c	10 bc	2 ef	0 f	0	0	0 e	3 de	0	5
P	T	S	T	2 c	12 bc	3 ef	0 f	0	0	0 e	0 e	3	0
P	T	Mo	T	45 a	53 a	3 ef	5 d-f	3	0	2 de	3 de	0	7
P	T	P	T	5 c	8 bc	3 ef	2 ef	5	2	2 de	0 e	0	2
P	T	F	T	0 c	2 c	0 f	0 f	3	0	5 de	2 de	2	0
F	T	F	T	12 bc	13 bc	5 d-f	3 ef	22	0	0 e	3 de	0	3

[x]Mt = millet, Mo = milo, S = soybean, C = crotalaria, P = pigeon pea, T = tomato, and F = clean fallow.
[y]Fensulfothion, 11.2 kg active/ha.
[z]Means followed by the same letter, in a single column prior to February 1974 and in double colums (untreated and treated) thereafter do not differ ($P = 0.05$) according to Duncan's multiple-range test. No-letters indicates nonsignificance.

TABLE 4. Effects of summer cropping-sequence on the field populations of *Paratrichodorus minor* in a tomato transplant production system in Climax, Georgia, USA.

Cropping sequence[x]													
Summer-Spring-Summer-Spring								1974					
1971	1972	1972	1973		1973				June		October		
1973	1974	1974	1975	1972									
1975	1976	1976	—	June	Feb.	June	Oct.	Feb.	Untreated	Treated[y]	Untreated	Treated
Mt	T	C	T	108 ab[z]	0 b	33	2	10 a	83 a	30 c-i	3 ab	5 ab
Mt	T	S	T	100 a-c	5 b	30	0	5 ab	57 a-d	22 d-i	2 b	0 b
Mt	T	P	T	70 a-c	0 b	23	0	3 b	63 a-c	32 c-i	3 ab	7 ab
Mt	T	Mo	T	68 a-c	8 b	20	2	5 ab	33 c-i	42 b-h	3 ab	0 ab
Mt	T	Mt	T	108 ab	0 b	10	0	0 b	33 c-i	48 b-e	2 b	0 b
Mt	T	F	T	150 a	5 b	28	0	2 b	25 d-i	7 hi	5 ab	0 b
Mo	T	C	T	62 bc	3 b	17	0	7 ab	27 d-i	3 i	0 b	2 b
Mo	T	S	T	65 bc	2 b	13	3	0 b	13 e-i	22 d-i	5 ab	0 b
Mo	T	P	T	37 bc	3 b	35	0	0 b	20 e-i	2 i	10 a	2 b
Mo	T	Mt	T	43 bc	0 b	28	0	0 b	20 e-i	12 f-i	5 ab	3 ab
Mo	T	Mo	T	62 bc	0 b	23	0	0 b	23 d-i	5 i	0 b	2 b
Mo	T	F	T	25 bc	0 b	33	0	0 b	20 e-i	7 hi	2 b	0 b
S	T	Mt	T	25 bc	3 b	36	0	0 b	30 c-i	30 c-i	5 ab	2 b
S	T	C	T	20 c	0 b	15	0	2 b	68 ab	13 e-i	2 b	3 ab
S	T	P	T	37 bc	3 b	15	2	0 b	42 b-h	8 g-i	2 b	5 ab
S	T	Mo	T	52 bc	3 b	5	0	2 b	33 c-i	18 e-i	3 ab	3 ab
S	T	S	T	57 bc	0 b	17	0	0 b	33 c-i	12 f-i	3 ab	3 ab
S	T	F	T	97 a-c	2 b	12	0	0 b	47 b-f	32 c-i	2 b	3 ab
C	T	Mt	T	20 c	8 b	13	0	3 b	18 e-i	15 e-i	5 ab	3 ab
C	T	S	T	15 c	3 b	18	0	0 b	32 c-i	17 e-i	2 b	3 ab
C	T	P	T	27 bc	0 b	25	0	0 b	32 c-i	18 e-i	0 b	0 b
C	T	Mo	T	28 bc	8 b	13	0	0 b	13 e-i	12 f-i	2 b	0 b
C	T	C	T	18 c	30 a	13	0	0 b	27 d-i	5 i	2 b	0 b
C	T	F	T	80 a-c	12 b	15	0	2 b	28 d-i	8 g-i	2 b	0 b
P	T	Mt	T	72-a-c	7 b	17	3	0 b	12 f-i	17 e-i	0 b	0 b
P	T	C	T	43 bc	5 b	12	5	0 b	32 c-i	27 d-i	7 ab	0 b
P	T	S	T	38 bc	2 b	23	2	3 b	43 b-g	13 e-i	3 ab	0 b
P	T	Mo	T	65 bc	7 b	18	0	0 b	18 e-i	13 e-i	2 b	2 b
P	T	P	T	37 bc	5 b	3	0	2 b	33 c-i	10 g-i	3 ab	7 ab
P	T	F	T	43 bc	5 b	7	0	0 b	32 c-i	20 e-i	3 ab	0 b
F	T	F	T	73 a-c	2 b	22	0	0 b	12 f-i	22 d-i	3 ab	2 b

(continued)

TABLE 4. (Continued)

Cropping sequence				1975						1976			
Summer-	Spring-	Summer-	Spring	February		June		October		February		June	
1971 / 1973 / 1975	1972 / 1974 / 1976	1972 / 1974 / 1976	1973 / 1975 / ——	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated
Mt	T	C	T	2	2	0 f	17 a-f	20 a	0 d	0	2	43	38
Mt	T	S	T	7	8	2 ef	8 c-f	3 cd	2 cd	0	3	33	28
Mt	T	P	T	7	10	0 f	18 a-f	8 bc	0 d	0	0	30	32
Mt	T	Mo	T	10	12	3 ef	10 b-f	2 cd	2 cd	2	0	12	63
Mt	T	Mt	T	3	15	2 ef	18 a-f	8 bc	0 d	2	0	32	22
Mt	T	F	T	5	3	0 f	20 a-f	5 b-d	0 d	2	7	23	25
Mo	T	C	T	3	0	0 f	23 a-f	8 bc	0 d	0	0	18	42
Mo	T	S	T	2	2	3 ef	20 a-f	3 cd	0 d	0	2	20	42
Mo	T	P	T	8	7	7 d-f	8 c-f	7 b-d	0 d	2	2	43	30
Mo	T	Mt	T	8	3	32 a-c	15 a-f	8 bc	0 d	2	2	15	25
Mo	T	Mo	T	12	5	25 a-e	23 a-f	7 b-d	3 cd	0	0	20	20
Mo	T	F	T	2	2	22 a-f	25 a-e	2 cd	0 d	2	5	40	17
S	T	Mt	T	7	3	8 c-f	33 ab	2 cd	2 cd	0	0	12	15
S	T	C	T	3	10	8 c-f	5 d-f	3 cd	0 d	9	2	13	48
S	T	P	T	0	7	22 a-f	12 a-f	2 cd	0 d	2	0	13	28
S	T	Mo	T	3	18	18 a-f	32 a-c	0 d	0 d	3	0	7	48
S	T	S	T	2	5	23 a-f	17 a-f	12 b	0 d	5	0	23	13
S	T	F	T	2	3	32 a-c	2 ef	2 cd	0 d	5	0	40	27
C	T	Mt	T	2	12	13 a-f	5 d-f	0 d	0 d	5	0	23	28
C	T	S	T	2	5	15 a-f	15 a-f	0 d	0 d	0	5	18	25
C	T	P	T	0	3	12 a-f	23 a-f	2 cd	0 d	0	2	35	32
C	T	Mo	T	3	13	10 b-f	12 a-f	0 d	0 d	3	0	12	22
C	T	C	T	0	2	2 ef	18 a-f	5 b-d	0 d	12	0	20	25
C	T	F	T	2	3	7 d-f	25 a-e	2 cd	0 d	3	0	13	55
P	T	Mt	T	2	3	10 b-f	10 b-f	0 d	0 d	0	3	20	22
P	T	C	T	2	2	0 f	8 c-f	2 cd	0 d	3	2	17	28
P	T	S	T	7	8	17 a-f	20 a-f	0 d	0 d	2	2	17	22
P	T	Mo	T	2	2	15 a-f	15 a-f	2 cd	0 d	2	2	17	25
P	T	P	T	3	5	28 a-d	13 a-f	2 cd	0 d	3	0	20	28
P	T	F	T	3	0	33 ab	35 a	0 d	0 d	2	2	13	7
F	T	F	T	2	0	20 a-f	17 a-f	0 d	0 d	5	0	15	12

[x]Mt = millet, Mo = milo, S = soybean, C = crotalaria, P = pigeon pea, T = tomato, and F = clean fallow.
[y]Fensulfothion, 11.2 kg active/ha.
[z]Means followed by the same letter, in a single column prior to February 1974 and in double columns (untreated and treated) thereafter, do not differ ($P = 0.05$) according to Duncan's multiple-range test. No-letters indicates nonsignificance.

TABLE 5. Effect of summer cropping-sequence on the field populations of *Pratylenchus* in a tomato transplant production system in Climax, Georgia, USA.

Cropping sequence[x]												
Summer	Spring	Summer	Spring					1974				
1971	1972	1972	1973	1972	1973				June		October	
1973	1974	1974	1975									
1975	1976	1976	——	June	Feb.	June	Oct.	Feb.	Untreated	Treated[y]	Untreated	Treated
Mt	T	C	T	2	10 de[z]	5	0 e	0 f	0 c	2 c	13 d	17 d
Mt	T	S	T	2	7 e	3	0 e	0 f	0 c	0 c	7 d	2 d
Mt	T	P	T	2	2 e	0	0 e	0 f	2 c	0 c	0 d	8 d
Mt	T	Mo	T	2	35 b-e	12	0 e	2 f	0 c	0 c	17 d	12 d
Mt	T	Mt	T	2	3 e	3	0 e	0 f	0 c	0 c	0 d	3 d
Mt	T	F	T	2	2 e	0	0 e	0 f	3 bc	0 c	2 d	0 d
Mo	T	C	T	8	10 de	154	113 a	160 ab	127 a	18 bc	592 a	325 bc
Mo	T	S	T	3	12 de	8	58 b-d	183 a	15 bc	33 bc	63 d	20 d
Mo	T	P	T	2	2 e	10	70 b	105 a-e	60 b	3 bc	22 d	13 d
Mo	T	Mt	T	7	0 e	8	62 bc	67 b-f	42 bc	20 bc	0 d	3 d
Mo	T	Mo	T	0	42 b-e	47	42 b-e	135 a-c	23 bc	13 bc	52 d	32 d
Mo	T	F	T	3	2 e	15	35 b-e	83 b-f	40 bc	10 bc	3 d	2 d
S	T	Mt	T	0	0 e	2	3 e	0 f	2 c	0 c	2 d	0 d
S	T	C	T	0	60 bc	10	12 e	17 ef	2 c	35 bc	273 bc	120 d
S	T	P	T	7	13 de	5	3 e	48 c-f	12 bc	23 bc	5 d	7 d
S	T	Mo	T	2	63 b	8	3 e	15 ef	3 bc	27 bc	28 d	22 d
S	T	S	T	0	5 e	7	13 de	8 ef	0 c	3 bc	3 d	3 d
S	T	F	T	2	0 e	0	2 e	2 f	2 c	3 bc	0 d	0 d
C	T	Mt	T	10	2 e	2	13 de	33 d-f	19 bc	5 bc	2 d	0 d
C	T	S	T	7	28 b-e	2	40 b-e	40 d-f	23 bc	20 bc	98 d	27 d
C	T	P	T	13	8 e	10	12 e	122 a-d	57 bc	32 bc	20 d	12 d
C	T	Mo	T	20	103 a	10	25 c-e	143 ab	33 bc	53 bc	35 d	33 d
C	T	C	T	2	130 a	18	23 c-e	118 a-d	35 bc	27 bc	595 a	338 b
C	T	F	T	10	5 e	2	15 de	65 b-f	18 bc	18 bc	5 d	0 d
P	T	Mt	T	10	0 e	0	3 e	0 f	2 c	2 c	0 d	2 d
P	T	C	T	5	55 b-d	5	27 b-e	10 ef	15 bc	28 bc	227 c	83 d
P	T	S	T	5	23 b-e	3	20 c-e	15 ef	32 bc	13 bc	10 d	7 d
P	T	Mo	T	0	17 c-e	20	18 c-e	17 ef	18 bc	13 bc	35 d	27 d
P	T	P	T	0	43 b-e	3	33 b-e	30 d-f	7 bc	2 c	23 d	3 d
P	T	F	T	8	0 e	2	12 e	7 ef	7 bc	2 c	3 d	0 d
F	T	F	T	3	0 e	0	2 e	0 f	0 c	2 c	0 d	0 d

(continued)

TABLE 5. (Continued)

Cropping sequence				1975						1976			
Summer-Spring-Summer-Spring				February		June		October		February		June	
1971 1973 1975	1972 1974 1976	1972 1974 1976	1973 1975 ——	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated	Untreated	Treated
Mt	T	C	T	42 d-f	42 d-f	12	10	0 g	0 g	18 c	2 c	0 b	0 b
Mt	T	S	T	18 d-f	3 f	50	40	0 g	0 g	2 c	20 c	0 b	0 b
Mt	T	P	T	3 f	18 d-f	2	2	2 fg	0 g	0 c	3 c	0 b	0 b
Mt	T	Mo	T	45 d-f	97 d-f	7	6	2 fg	0 g	8 c	7 c	0 b	0 b
Mt	T	Mt	T	0 f	13 d-f	8	7	0 g	0 g	0 c	17 c	0 b	2 b
Mt	T	F	T	2 f	2 f	0	0	0 g	0 g	2 c	5 c	5 b	0 b
Mo	T	C	T	283 b	482 a	8	7	47 e-g	13 fg	15 c	17 c	3 b	2 b
Mo	T	S	T	62 d-f	28 d-f	5	3	12 fg	3 fg	8 c	62 a-c	0 b	0 b
Mo	T	P	T	52 d-f	32 d-f	5	4	7 fg	8 fg	8 c	15 c	5 b	0 b
Mo	T	Mt	T	10 d-f	3 f	2	0	5 fg	5 fg	0 c	2 c	0 b	0 b
Mo	T	Mo	T	53 d-f	77 d-f	7	8	7 fg	12 fg	20 c	13 c	3 b	0 b
Mo	T	F	T	17 d-f	5 ef	2	2	53 e-g	8 fg	17 c	108 ab	2 b	0 b
S	T	Mt	T	0 f	3 f	2	0	0 g	0 g	5 c	0 c	0 b	2 b
S	T	C	T	145 cd	512 a	23	7	20 fg	0 g	7 c	5 c	0 b	0 b
S	T	P	T	7 d-f	2 f	5	12	20 fg	2 fg	0 c	2 c	0 b	0 b
S	T	Mo	T	57 d-f	27 d-f	3	7	3 fg	0 g	28 c	20 c	2 b	0 b
S	T	S	T	2 f	48 d-f	0	0	3 fg	2 fg	12 c	8 c	2 b	0 b
S	T	F	T	2 f	3 f	0	0	0 g	0 g	3 c	2 c	0 b	0 b
C	T	Mt	T	3 f	2 f	0	0	77 c-f	7 fg	15 c	18 c	0 b	5 b
C	T	S	T	22 d-f	58 d-f	2	0	62 d-g	48 e-g	33 c	52 a-c	5 b	0 b
C	T	P	T	18 d-f	33 d-f	5	8	160 b	35 fg	32 c	53 a-c	3 b	5 b
C	T	Mo	T	25 d-f	100 d-f	12	3	143 bc	117 b-e	35 c	108 ab	2 b	3 b
C	T	C	T	305 b	278 b	17	30	247 a	127 b-d	110 a	32 c	3 b	15 a
C	T	F	T	0 f	3 f	0	7	110 b-e	60 d-g	27 c	5 c	3 b	5 b
P	T	Mt	T	2 f	3 f	0	0	0 g	7 fg	2 c	10 c	0 b	0 b
P	T	C	T	143 c-e	253 bc	25	30	3 fg	2 fg	10 c	38 bc	0 b	5 b
P	T	S	T	10 d-f	52 d-f	2	13	3 fg	7 fg	17 c	20 c	0 b	0 b
P	T	Mo	T	65 d-f	113 d-f	8	5	10 fg	2 fg	7 c	8 c	2 b	0 b
P	T	P	T	28 d-f	38 d-f	10	17	25 fg	15 fg	15 c	3 c	5 b	2 b
P	T	F	T	0 f	0 f	0	0	2 fg	0 g	10 c	8 c	0 b	0 b
F	T	F	T	0 f	0 f	2	0	0 g	0 g	0 c	0 c	0 b	0 b

[x]Mt = millet, Mo = milo, S = soybean, C = crotalaria, P = pigeon pea, T = tomato, and F = clean fallow.
[y]Fensulfothion, 11.2 kg active/ha.
[z]Means followed by the same letter, in a single column prior to February 1974 and in double columns (untreated and treated) thereafter, do not differ ($P = 0.05$) according to Duncan's multiple-range test. No-letters indicates nonsignificance.

pigeon pea supported low to moderate numbers of *P. minor* and *Pratylenchus* spp.

Clean fallow is an effective method of reducing nematode numbers; however, even after 6 years of clean fallow, root-knot nematodes were found in soil (7). Effectiveness depends upon the length of fallow and the temperature and moisture content of the soil. The effectiveness of fallow in reducing nematode populations is enhanced by periods of severe drought, which usually occur in May and June immediately after transplant harvest. Brodie and Murphy (4) made use of that in attempts to control nematodes in tomato-transplant production fields in Georgia. They found, while working with very low numbers of nematodes, that 6 weeks of fallow between tomato-transplant harvest and planting of the cover crop was as effective as continuous fallow in preventing an increase in the population density of *P. brachyurus* and *P. minor*. Continuous fallow was more effective than 6 weeks of fallow in preventing an increase in the population density of *M. incognita*. We had little differences in numbers of *M. ornata* and *P. minor* in plots fallowed annually and those fallowed biennially after tomato. Control of *Meloidogyne* spp. and *Pratylenchus* spp., however, was greater with cropping sequences that included clean fallow biennially than when summer cover crops were included each year. Control of *Meloidogyne* spp. and *Pratylenchus* spp. over a long period was best with the F-T-F-T cropping sequence. Although root-knot control was nearly 99% in fallowed plots treated with fensulfothion for 4 years, this degree of control does not meet the standards of Georgia certification regulations. In other cropping systems the integrated use of fensulfothion and cultural practices such as clean fallow may be beneficial where control of nematodes need not be complete. Clean fallow might have a place under special circumstances, but certain limitations exist where land use for crop production is high and water is adequate. Clean fallow for extended periods results in greater soil erosion and might alter the soil structure to its detriment.

Root-knot nematodes increased in plots treated with fensulfothion each year. This suggests the possibility that these nematodes may develop tolerance to this chemical.

Millet, milo, soybean, crotalaria, and pigeon pea are poor selections of summer cover crops because they support large populations of *Meloidogyne* spp. and other pathogenic nematodes. Additional research will be required to determine more suitable integrated systems for tomato transplant production.

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