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TESTS WITH THREE UBIQUITOUS MATERIALS FOR BIOCONTROL OF *MELOIDOGYNE INCOGNITA* INFECTING TOMATO PLANTS

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Summary. Slurries of onion and garlic, and dried water hyacinth were applied to tomato plants infected with *Meloidogyne incognita* in replicated, randomized glasshouse tests. After two months, plant weights and number of root knots/g root were evaluated. There were no evidences of increased plant growth or nematode control resulting from treatments.

In the quest for materials that can control plant pathogenic nematodes, 'biocontrol' has become the preferred research activity due to the stigma that has become attached to the use of chemicals that are carcinogenic, or otherwise noxious to humans. There is great interest in the suppressive effects of antagonostic organisms or substances derived from living organisms on plant-parasitic nematodes. An example of this was the use of allyl isothiocyanate from *Brassica nigra* L. by Ellenby (1945) for controlling *Globodera rostochiensis*. Under this concept, three materials obtained from water hyacinth [*Eichornia crassipes* (Mart.) Solms-Laub], onion (*Allium cepa* L.) and garlic (*Allium sativum* L.) were investigated in two glasshouse tests for their activity against the root-knot nematode, *Meloidogyne incognita* (Kofoid *et* White) Chitw. infecting tomato seedlings.

Water hyacinth is a freshwater subtropical plant that can clog waterways due to its prolific growth. There have been several research projects investigating potential uses for this noxious waterweed, none of which appears to have produced economically feasible results.

Onion and garlic have long been hailed as health foods, even promoting the existence of devotees who extol the 'magical' properties of these vegetables (Watanabe, 1974). Both contain several sulfur-containing heterocyclic compounds, and garlic contains dialyl thiosulfinate or 'allicin' (Carson, 1987) which has been shown to have antibacterial properties (Carvallito and Bailey, 1944).

Two separate tests were made, one involving only dried, powdered water hyacinth and the other using onion and garlic slurries applied to pots in which nematode-infected tomato seedlings were growing. Both trials sought to determine nematode-antagonistic properties of these soil additives to *M. incognita* infections of tomato plants.

Materials and methods

In the first test, 487 g of peeled onion and 185 g of peeled garlic cloves were each reduced to a fine slurry in a food macerator. The slurry was diluted by adding 480 ml of water to the onion and 840 ml to the garlic in order to bring each up to a 1,000 ml volume of stock slurry.

Two-month-old tomato plants were each inoculated with 2,700 eggs of *M. incognita* in a water suspension pipetted on to the soil in 15-cm pots. Twenty days later the onion and garlic treatments were applied as soil drenches and dug in at 6 to 10 mm soil depth. Application rates are listed in Table I.

In the second test, water hyacinths obtained from a local pond were dried overnight at 62°C in a forced-air oven. The dried material was then coarsely ground. Twenty 2-month-old tomato plants in 15-cm diameter pots were each inoculated with 3 egg masses of the root-knot nematode, *M. incognita*. Twenty plants were not inoculated and served as controls. Three weeks later 4, 2, 1 and 0 g (equivalent to rates of 0.23, 0.12, 0.06 and 0 parts of dried material per 100 parts soil) of powdered water hyacinth were applied to both nematode-infected and non-infected plants.

In both tests, the additives were incorporated 6 to 10 mm deep into the soil of 5 replicate pots/treatment. The pots were completely randomized within a glasshouse in which ambient temperatures were 22-28°C.

Plants in both tests were harvested 11 weeks after inoculation and 8 weeks after treatment with the plant material. Aerial parts were cut, dried and weighed. Roots were washed, partially dried with towelling and weighed, after which each root system was cut into 12-14 mm lengths, thoroughly mixed, and a gram sample was ran-

domly selected and the nematode-induced root-knots counted under a microscope.

Results

In the first test involving garlic and onion, plants receiving applications of the garlic stock slurry were noticeably wilted the day after application. Three of the five replicates died as a result of treatment. None of the plants treated with dilutions of the garlic stock, or those treated with onion were similarly affected.

Table I presents the data obtained. Neither onion, garlic nor onion/garlic slurry amendments to the soil appeared to have any appreciable effect on either root-knot development, or growth of infected plants as compared to the untreated, infected control.

TABLE I - *Reaction of* Meloidogyne incognita-*infected tomato seedlings to garlic and onion slurries.*

Treatment	Dried top wt. (g)	Fresh root wt. (g)	No. knots /g root
Onion Stock Slurry [1]	16.6 a	33.7 a	167 a
50% Onion Stock Dilution	13.7 ab	29.8 a	164 a
25% Onion Stock Dilution	14.7 ab	25.7 a	189 a
12.5% Onion Stock Dilution	10.9 b	26.9 a	174 a
Garlic Stock Slurry	–	–	–
50% Garlic Stock Dilution	15.4 ab	27.9 a	155 a
25% Garlic Stock Dilution	13.2 ab	23.9 a	164 a
12.5% Garlic Stock Dilution	12.3 ab	25.2 a	171 a
Onion-Garlic Stock Mix (50/50)	12.5 ab	28.0 a	171 a
50% Onion-Garlic Stock Dilution	14.3 ab	29.6 a	154 a
25% Onion-Garlic Stock Dilution	13.4 ab	28.0 a	173 a
12.5% Onion-Garlic Stock Dilution	16.2 ab	30.2 a	175 a
Untreated Controls	13.8 ab	27.7 a	171 a

Values are means of 5 replicates. Means with the same letter in vertical columns are not significantly different (LSD = 0.05).
[1] Treatments 1-8 and 9-12 received 75 and 50 ml of the aqueous materials respectively.

TABLE II - *Reaction of tomato seedlings infected with* M. incognita *to soil applications of dried water hyacinth.*

Plant Condition	Application rate as % of soil wt	Dried top wt. in g	Fresh root wt. in g	Knots per g root
Nematode-Infected	0.23	7.7 a	15.9 a	283 a
	0.12	6.0 a	12.9 a	317
	0.06	6.0 a	13.5 a	322
	0	6.5 a	13.1 a	310
Not Infected	0.23	13.0 b	8.9 b	–
	0.12	11.0b	8.9 b	–
	0.06	14.2 b	10.7 b	–
	0	15.5 b	10.5 b	–

Values are means of 5 replicates. Means with the same letter in vertical columns are not significantly different (LSD = 0.05).

The second test using dried water hyacinth gave results suggesting that water hyacinth had no effect in reducing root- knot gall development. There was a similar average number of root-knots on all four of the treated groups of nematode-affected plants (Table II).

One interesting aspect of this test was that the specific amount of water hyacinth powder applied to the plants did not seem to influence plant growth significantly. There was little difference in results obtained from the 4 g and from th 0 g treatments for both the infected and non-infected plants.

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