COMPARATIVE EFFECT OF GARLIC AND MARIGOLD ON *MELOIDOGYNE INCOGNITA* BY INTERCROPPING OR ROTATION WITH INFECTED TOMATO

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Abstract

Garlic and *Tagetes* were each planted either alone or combined with the nematized tomato plants. Data revealed that root galling of *M.incognita* on tomato roots, numbers of eggs/plant and J2 in soil were significantly decreased in single than in combined planting. *Tagetes* was generally more effective than garlic and Vydate. Residues of these two plants significantly decreased root galling of *M.incognita* and J2 in soil, in single than of intercrops. Tagetes residues was significantly more effective in reducing J2 in soil than garlic in single planting and even better than Vydate treatment. Although this was not significant in reducing root treatment galing due to this rotational effect. Garlic and in particular *Tagetes* residues were effective in improving shoots of the nematized tomato by 11.6 % to 16% respectively . However, this improvment was not achieved due to intercropping treatment. Vydate was the best treatment to improve plant growth .Garlic was recommended over all treatments.

INTRODUCTION

The use of non-persistent pesticides such as organic amendements, plant substance, plant extracts, antagonistic plant and others are often recommended in

view of the growing problem of soil pollution by the large scale use of persistant pesticides (Ehrilch & Ehrilch 1972). *Tagetes* spp. or marigold was known for nematoxic properties (Oostenbrink 1960), Daulton and Curtis 1963, Wallace 1963, Amonker and Banerji 1971, Hackney & Dickerson 1975, Alam et al 1980 and Ruelo 1983). Interculture of vegetables with *Tagetes* has been found effective in reducing nematode population (Alam *et al.* 1977). Huang (1984) indicated that marigold were effective in reducing *M.javanica* numbers in field soil and increasing carrot Yield. Siddiqui and Alam (1987) demonstrated that marigold in mix-culture significantly inhibited the development of *M.incognita* on tomato and egg-plant. The growth of all tested plants was improved when marigolds were present Sweelam (1988) observed that when *Tagetes erecta* was grown for a full season, *M.javanica* was greatly reduced in the soil and also reduced the severe damage of the crop.

Nematicidal effect of garlic has been reported by fewer workers (Redgrov 1993, Amonker *et al* 1971, Sukul *et al* 1974, Uchida et al 1975 and Gupta *et al* 1985). Build - up of *Meloidogyne* Spp. and other species of nematodes was greatly affected when garlic had rotated with tomato (Davide 1985). Raymundo (1985) also reported that garlic could reduce the root-knot nematode damage in potato field after introduced in cropping system. Hence, in the present investigation an attempt was made to compare between garlic and marigold as an intercrop with tomato and their impact in controlling the infecting root-knot *M.incognita.*

MATERIALS AND METHODS

Garlic (*Allium sativum*) and marigold (*Tagetes erecta*) were each evaluated singly and intercropped with tomato to control the infecting M.incognita under greenhouse conditions. Tomato seedlings cv. Pritchard (one month old) were transplanted singly in 25 cm diam. Plastic pots previously filled with steam sterilized sandy loam soil. Garlic and marigolds were each planted either alone or as intercropping with tomato seedlings at the same time of planting. Each planted pot was injected by approximately 3000 J2 of *M.incognita* poured in three homogenous holes in the soil, with about 3 cm depth. Enough nematode inocula were obtained from M.incognita pure stock culture reared from one single egg-mass on tomato plants. For comparison, Vydate 24% treatment was applied at the rate of 2L/feddan at planting time. Each treatment was applied in 4 pots, involving those of the non-

treated check plants. Pots were kept in greenhouse in completely randomized design and watered as needed. Three months later, plants were uprooted in which numbers of galls per plant and J2 in 250g soil were determined. Eggs/plant were extracted by NaCl 1.0% (Hussy and Barker 1973) but J2 in soil were extracted by Oostenbrink elutriator (Goodey 1963). All pots of the experiment that had the previous soil were replanted with tomato seedlings and received no additonal treatments except of watering to study the residual effect of prementioned treatments in nematode control. After 60 days, all tomato plants were uprooted and data of nematode and plant growth were recorded. Root gall index was estimated according to Taylor and Sasser (1987) as follows : O = no galls, 1 = 1-25, 2 = 26 - 50, 3 = 56-75, 4 = 76 - 100 and 5 = more than 100 galls / plant. Data were statistically analyzed using L.S.D. test (P = 0.05).

RESULTS AND DISCUSSION

Data presented in table (1) indicate that garlic and Tagetes reduced root galling of *M.incognita*, number of eggs / plant and J2 in soil, when used either alone or interplanting with tomato. Nematode numbers were greatly resricted by garlic and *Tagetes* in uniculture than when intercropping with tomato. Planting *Tagetes* alone was more effective to reduce root galling and J2 in soil compared to garlic alone or even to Vydate treatments. This effect may be due to polythienyls, the highly nematicidal compounds that have been isolated from Tagetes roots, and one of these compounds was shown to be and terthienyl (Uhlenbrok and Bijloo(1958) and also may be due to that Tagetes attracted some of J2 in the soil where they failed to develop and reprdouce due to lack of gaint cell formation (Hackney and Dickerson 1975 and Janese and Hussey 1977) whereas the nematicidal effect of garlic may be due to at least one of the following compounds : allicin diallyl disulphide oxide (Redgrovel 1933); Pyruvic acid and ammonia together with diallyl trisulphide (Amonker and Banerji 1971) and allicin only (Uchide *et al* 1975). Contradictory results were found by Oostenbrink et al (1958), Hackney and Dickerson (1975) and Caswell *et al* (1989). They reported that nematode multiplications were not affected due to combined planting with *Tagetes*. This effect may be explained by that such nematicidal effect requires long period of growing *Tagetes* to reveal itself (Oostenbrink *et al* 1958 and Daulton and Curtis (1963). Table (1) also reveal that residues of garlic and *Tagetes* significantly suppressed root galling and decreased number of J2 in soil

significat planting than those of the intercropping treatment. *Tagetes* singificantly decreased numbers of J2 in soil due to the residual effect of single planting which was also garlic and even Vydate, although differences were not significant among these treatments against root galling. Unexpectedly, shoot growth of the nematized tomato plants were not recovered due to garlic and *Tagetes* in combined planting with each of them. This effect may be due the small pot size which allowed limited root growth and consequently small shoots. On the contrary, of garlic and in particular *Tagetes* significantly improved shoot growth of the nematized tomatoes by 11.6 to 16.0 % when they preceeded transplanting. Vydate achieved the highest enhancement of tomato shoot growth compared to other treatments. Conclusively, garlic is more reecommenhed than *Tagetes* due to its economic importance although the latter was more effective in controlling *M. incognita* and was more therapeutic.

Table 1. Effect of garlic, *Tagetes* and their residues, in controlling *M. icognita*, applied either alone or intercropped with tomato

Treatments	Nematode Response			Wounded fruits		Shoot Response	Residual effect			
							Nematode Response		Shoot Response	
	Roots Gall Index	Eggs / plant		J2 in soil						
		No.in 1000 s	% Reduc-tion	No.	% Reduc-tion	Weight (g)	Root Gall Index	J2 in soil	Weight (g)	% Increase
Garlic alone						48.3			25.7	
Garlic + *M.i*	1.3	1.7	95.1	819	58.0	40.1	3.3	719	23.1	27.6
Garlic + Tomato				1444	25.9	67.5			26.8	
Garlic + Tomato + *M.i*	4.5					55.8	4.8	1238	20.2	11.6
Garlic	1.5	2.0	94.3			31				
Tomato	3.0	21.4	38.9			24.8				
Tagetes alone						46.2			27.4	
Tagetes + *M.i*	1.0	0.0	100.0	331	83.9	45.6	2.8	531	25.0	38.1
Tagetes + Tomato						74.5			24.7	
Tagetes + Tomato + *M.i*	4.0	23.7	32.6	1500	23.1	66.8	4.5	1319	21.0	16.0
Tagetes	1.0					38.1				
Tomato	3.0	23.7	32.6			28.7				
Vaydate	1.0	1.5	95.7	406		52.2	3.0	694	26.2	44.8
Tomato + *M.i*	5.0	35.0		1950	79.2	39.4	5.0	1463	18.1	
Check						60.3			28.5	
L.S.D p = 0.05	0.47	2.04		100.15		2.82	0.63	83.63	1.73	83.63

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مقارنة تأثير كل من الثوم والقطيفة فى مقاومة النيماتودا ملودوجين انكوجنيتا بواسطة زراعتة تحميلا او فى دورة مع الطماطم المصابة

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فى تجربة اصص بالصوبة – تمت دراسة تأثير زراعة كل من الثوم والقطيفة اما تحميلا على نباتات الطماطم المصابة او كمحصول سابق لزراعتها وذلك لمقاومة نيماتودا تعقد الجذور التى تصيب نباتات الطماطم.

وقد افادت النتائج بان زراعة نباتات القطيفة او الثوم كمحصول محمل على الطماطم كان له تأثيرا واضحا على خفض اعداد العقد النيماتودية واعداد البيض وكذلك اعداد اليرقات بالتربة بالرغم من ذلك فان تاثيرة على المجموع الخضرى لنباتات الطماطم المصابة لم يكن واضحة.

كما دلت النتائج على ان زراعة القطيفة او الثوم قبل الطماطم قد ادى الى انخفاض معنوى فى عدد العقد النيماتودية واعداد اليرقات بالتربة وكذلك زيادة اوزان المجموع الخضرى للطماطم بنسبة تراوحت بين ٦ ، ١١ ٪ الى ١٦٪ هذا وبالرغم من تفوق نباتات القطيفة على نباتات الثوم من مقاومة نيماتودا تعقد الجذور وزيادة النمو الخضرى للنباتات الا انه يوصى بادخال الثوم ضمن الدورة الزراعية مع الطماطم لمقاومة النيماتودا العقدية وذلك لانخفاض القيمة الاقتصادية لمحصول نبات القطيفة.