SCREEN-HOUSE EVALUATION OF THE NEMATICIDAL POTENTIAL OF BITTER-LEAF (VERNONIA AMYGDALINE) DEL, ON ROOT-KNOT NEMATODE MELOIDOGYNE INCOGNITA ON TOMATO (LYCOPERSICON ESCULENTUM) (L) MILL

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ABSTRACT

The toxic effects of Bitter-leaf (Vernonia amygdalina on root-knot nematode (Meloidogyne incognita of tomato was tested in screen house at Kabba College of Agriculture Kabba, Kogi State Nigeria in July 2002 and repeated at the same time in 2003. plastic pots 11-litre capacity were filled with stream sterilized sandy loam soil and arranged in the screen house. Tomato (Var Roma VF was transplanted into each of the plastic pots three weeks after sowing. Each pot was inoculated with 2000 juveniles of Meloidogyne incognita. The treatments were made up to four levels 0.5, 1.0, 1.5 and 2.0 tones/ha of bitter leaf powder while there was an untreated control denoted by 0 tonne/ha. The experimental design was a completely randomized design. It lasted for six months. The result from the experiment showed that bitter-leaf powder brought about significant increases in growth and yield of nematode infested tomato as compared with the control at 10 and 12 weeks after planting (WAP). The growth parameter (height and leaf) were significantly higher in treated plants compared with untreated control. The nematode multiplication rate and root gall index were significantly reduced in treated plants than in the control. Treatment at higher rates appear to control the nematode than at the lower rates which results in improved growth and yield of the treated plant compared with untreated control.

Keyword: Root-knot nematode, evaluation, tomato, Bitter-leaf powder, Growth, yield.

INTRODUCTION

Tomato Lycopersicon esculentum (L) mill is a very important vegetable crop and it is widely eaten all over the world and it is growth for its edible fruits which can be eaten raw or cooked for stew, salads and processed into purse, soup, and ketchups. After processing, oil can be extracted from the seed and the residual seed cake used for animal feeds. The average ripe fruit had been reported to contain 90 kilocalories of energy, 1.0g of crude protein, 24mg of phosphorus 0.4mg of riboflavin, 0.05mg of thiamin and 0.1mg of Niacin Sp and Gustav 1991). In Nigeria, the yield of tomato is low as a result of attack by many pests notable among which are the root-knot nematode belonging to the genus Meloidogyne (Verma and Anwar 1997: Fatoki 2001). There is an urgent need to increase tomato production in order to meet its dietary supply for the over-increasing population

all over the world. There is the need to contend with the menace of the root-knot nematode in tomato production.

The most effective and most rapid control of nematode is achieved by the use of chemicals known as nematicides, however, this approach is responsible for significant ecological damage, serious human health problems and spiraling cost of production (Schillhorn Van Veen et al, 1997); Keenmore 1996: Mumford and Stonehouse 1994). There are several attractive alternatives which are subject to research and some have already been incorporated into commercial agriculture (Marrone, 1999; Dent and Waage; 1999). Beside their safety and specificity, some of these natural products offer an additional advantage of allowing farmers to maintain or produce their own pest control product rather than depending on outside markets. Maqbool et al, 1987, Alam et al, 1980, have suggested the use of organic amendments for controlling nematode. Hoan and David (1979) have also suggested the use of plant extract for the control of root-knot nematode Meloidogyne incognita. Plant extracts and other related plant products are cheap and are readily available compared with conventional nematicide. Their environmental safety (Oyedunmade et al, 1995: Zurren and Onayemi, 1981). In an environmental conscious world holds promise for their acceptability and use by resource constraint farmers. Natural plant products are at present in the focus of research efforts because of their ability to produce environmentally less harmful but efficacious chemical substances. (Schmutterer, 1990). This would greatly minimize the use of toxic synthetic chemicals (Jackai et al, 1992).

This research work was therefore conducted to evaluate the effects of V. amygdalina leaf powder on the growth and yield of root-knot nematode infested tomato, Lycopersicon esculentum variety Roma VF, and on the root and soil population as well as gall index of infested tomato growing in the medium treated with V. amygdalina leaf powder.

MATERIALS AND METHODS

The experiment was conducted in a screen house at Kabba College of Agriculture, Ahmadu Bello University in the year 2002 between July and December and it was repeated at the same time in the year 2003. steam-sterilized soil was filled into 11 litre capacity plastic post and were arranged properly on a concrete floor of the screen house. The experimental design was completely randomized design comprising of five treatments and each repeated four times fresh V. amygdalina leaves were sun dried and milled into powder form.

Tomato variety Roma VF was raised in stem-sterilized nursery soil and was transplanted into each of the pots already arranged in the screen-house after a period of three weeks. Inoculation with 2000 juveniles of M. incognita followed after two weeks of transplanting while the leaf was applied by banding and incorporated into soil in pots at the rates of 0 (untreated control) 0.5, 1.0, 1.5 and 2.0 tones/ha. Weeds were controlled regularly by hand pulling while visual observation lasted for 120 days. Plant height and number of leaves were recorded at 8, 10 and 12 weeks after planting (WAP) while number of branches/plant was recorded at 14 WAP. At harvest, plants from each plot were carefully uprooted. Washed of adhering soil particles and rated for galling using infection class index of 0.5 as described by Tylor and Saaser (1978).

Final nematode population was determine by the Whitehead and Hemming (1965) from 200g soil sample collected

from around the root zone of plant that were up rooted, nematode population was determine by the method of Byrd et al, 1983. Analysis of varience was carried out on all data and where necessary means were separated using Duncan's multiple range test (DMRT).

RESULT

The effect of various level of leaf powder of Venonia amygdalina on the growth and yield of tomato variety Roma VF and on root knot nematode infested soil are outline in Table 1. The number leaves, branches and height recorded were significantly higher ($P<0.05$) in the treated plant than in the control at 10 and 12 weeks after planting (WAP), while they were not significantly different at 8 WAP.

Generally, the higher concentration of bitter leaf treatment were far more effective in increasing the number of leaves and branches per plant than lower concentrations (0.5 and 1. tone/ha).

The various levels of bitter-leaf (V. amygdalina) treatment brought about varied soil population which in turn determine the multiplication rate, (Table 3). The various treatments levels also brought about varied root population and gall indices. The V. amygdalina treatments at 1.5 and 2.0 reduced the soil and root populations significantly compared with lower concentration of 0.5 and 0 1.0t/ha. Multiplication rate and gall index were also lower in soil with 1.5 and 2t/ha and significantly different from the treatments at lower concentrations. Final nematode population, multiplication rate and gall index were significantly less in all treated plants than in the untreated control.

DISCUSSION

The observation from this experiment shows that the root-knot nematode Meloidogyne incognita affects the growth of tomato adversely as manifested in the number of leaves, branches and height of the untreated control plants compared with the treated ones. The improved growth observed in treated plants is a manifestation of the reduction in adverse effects of the nematode M. incognita as a result of reduced nematode population in treated soil due to toxicity of the V. amygdalina treatment.

This reduction in nematode population in turn promoted good growth and yield of tomato. Similar observations have been made by earlier researcher. The importance of various soil amendments and plant materials incorporated into the soil in reducing nematode population build up in the by other workers. Ajayi et al (1993), Abadir et al (1996), Egunjobi and Olaitan (1986), Verman and Anwar (1997).

The V. amydalina leaf treatment suppressed the root knot nematode population of treated tomato and also reduced gall index while they increase the growth and yield of tomato.

The negative relationship observed between nematode population and root galling index and those of growth and yield suggested that the damage was due to nematode density and their activities in plant tissue. This observation agrees with Sasser et al (1975), who reported high population of nematode species brought about a high negative correlation for densely versus growth-index and yield factor Firoza and Magbool (1996) and Aktar and Mahmood (1996), reported laboratory ovicidal action of V. amygdalina leaf extract which may be related to low nematode population build up in the field.

The active ingredient in bitter leaf have been reported as Flavonoid (Bose et al (1973), Sesquiterpene Lactone, Sterol

including lactone of pyridine, guinoline and diterpenoid type Arene (1972), and Alpha and (Okoro 1993). It is evident that the release of the alkaloids, flavonoids and acid mentioned above from V. amygdalina leaves incorporated into the root-knot nematode endemic soil on which soyabean was planted suppressed population build up of nematode and decomposition of plant materials would also improved soil fertility which could encourage crop growth in treated crop and consequently high yield (Oyedunmade and Olabiyi 2004).

The significance of this study thus under scores the potency of V. amygdalina leaf as a viable alternative to synthetic nematicides for the control of root-knot nematode pests on susceptible crop in nematode endemic areas, similar research should be conducted on the field. The result can guide us in recommending this plant to agrochemical companies for manufacturing botanical based nematicide for the sake of environmental safety.

Table 1: Effect of Venonia amygdalina (bitter-leaf) powder on the growth of tomato Var Roma VF infected with root-knot nematode M. incognita

Bitter-leaf Powder Concentration	Average plant height						Average number of leaves plant					
t/ha	8 WAP		10 WAP		12 WAP		8 WAP		10 WAP		12 WAP	
	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
0.5	35.5	33.3	51.3b	56.31b	60.7b	61.0b	10.33a	9.38a	18.3b	12.67a	22.43b	22.31b
1.0	36.1	37.8	66.6bc	66.7c	71.0c	71.2c	10.00a	10.11a	18.67b	18.00b	23.07b	22.70b
1.5	38.1	38.9	68.0c	68.3cd	77.7c	72.0c	9.30a	10.00a	20.00bc	20.00bc	24.69bc	24.70bc
2.0	38.7	39.0	70.3d	72.31d	72.3c	75.3d	10.00a	10.33a	22.00c	22.33c	27.03c	27.33c
0 (control)	35.4	38.1	41.7a	38.1a	45.0a	42.9a	7.33a	8.00a	12.00a	10.33a	13.50a	15.67a
S.E	N.S	N.S	2.173	3.106	2.438	2.593	2.96	2.53	1.96	1.88	1.85	1.89

Means with different alphabets in the same column differ significantly P(0.05)

Table 2: Effect of bitter leaf powered on yield component of tomato Var Roma VF infected with M. incognita

Bitter leaf Powder Concentration	Average Number of Fruit		Average yield Per plant (g)		Yield (t/ha)	
(t/ha)	2002	2003	2002	2003	2002	2003
0.5	8.06b	8.50b	183.00b	194.67b	9.63	8.74
1.0	10.34bc	10.26c	236.67c	240.00c	10.39	10.47
1.5	10.68bc	10.44cd	259.37cd	262.00d	12.24	12.27
20	11.12d	11.34d	278.33d	281.00e	13.20	13.34
0 (control)	4.79a	5.18a	49.99a	70.45a	2.40	3.05

Mean with different alphabets in the same column differ significantly (P(0.05)

Table 3: Initial root-knot nematode population and effect of different levels of bitter leaf powder (Venonia amygdalina) leaf on the final nematode population, nematode multiplication and gall index of infected tomato root

Neem Concentration	Initial Nematode (Pi) Population		Final Nematode (Pf0) Population		Nematode (Pf/pi x 100) Multiplication Rate		Root Gall Index		Juvenile In 5g Root	
	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
0.5	2000	2000	783.33b	763.67b	38.60	37.50	2.70b	2.93b	13.67b	15.00b
1.0	2000	2000	737.33c	705.67c	35.06	35.01	2.60b	2.83	11.67bc	13.00c
1.5	2000	2000	599.60	616.33d	29.06	30.06	2.47b	2.47b	9.00c	10.00d
2.0	2000	2000	503.67e	495.33e	25.30	24.98	2.37a	2.43a	7.00d	7.60f
0 (control)	2000	2000	244.1a	22.65a	1.23	117.20	4.50	4.00	27.00	26.60d

Means with different alphabets in the same column differ significantly P(0.05)

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