Control of Plant Parasitic Nematodes on Grape Cuttings by Different Nematicides and Olive Oil Cake (Fitura)

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ABSTRACT

The effect of different nematicides and olive oil cake (Fitura) on the population of plant parasitic nematodes and growth of grape cuttings in the nursery has been studied. The volatile nematicides, methyl bromide and basamid were found highly effective in reducing the population of all the nematodes and increasing the growth of plants. The granular formulation of nematicides, vydate, nemacur and temik; and olive oil cake were found equally effective in reducing the population of nematodes below the economic injury level and improving the growth of plants. However, the use of olive oil cake provides some more advantages over nematicides such as improvement in the soil physical structure and its water holding capacity and plant's nourishment upon decomposition in addition to its toxic property against nematodes.

INTRODUCTION

Grape (*Vitis vinifera* L.) is an important crop in Libya and the propagation of nursery stock is usually from stem cuttings. Grape is susceptible to root-knot nematodes (*Meloidogyne* spp.) and the lesion nematodes (*Pratylenchus* spp.) and also a good host for *Xiphinema index* which has been proved to be vector of grapevine fanleaf virus (1, 14, 16, 18, 20). Therefore, it is necessary to produce nematode-free grape nursery stock to prevent the spread of nematodes from one place to another.

Several chemicals have been used to control nematodes associated with different crops and nursery stock (2, 3, 10, 13, 17, 19). Application of organic matters as a nourishment for plants in order to increase their growth and yield is a very old practice, but their effect on plant parasitic nematodes was not known. By mid century the toxic effect of organic matters against nematodes was realized and the efficacy of organic soil amendments for the control of plant parasitic nematodes has been tested on different crops (6, 8, 9, 11, 12, 21). Water extracts of some of the oil cakes have also been proved to kill nematodes and inhibit larval hatching (4, 7, 15).

In this study the effect of volatile and systemic nematicides and olive oil cake

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(Fitura) on the population of plant parasitic nematodes and growth of grape cuttings in the nursery are reported.

MATERIALS AND METHODS

The experiment was conducted in the fruit tree nursery in Ajdaida, Tripoli, which was naturally infested with *Meloidogyne javanica, Tylenchorhynchus* spp., *Trichodorus* spp., *Xiphinema* spp., *Pratylenchus* spp., *Rotylenchus* spp., *Aphelenchus* spp. and *Aphelenchoides* spp. Plots of 3 × 2 meter size were prepared and treated with methyl bromide @ 40 gm, 60 gm and 80 gm/m^2; basamid @ 30 gm, 45 gm and 60 gm/m^2; nemacur, vydate and temik @ 4 gm, 6gm and 8gm/m^2, respectively. Olive oil cake was used at the rate of 277.8gm, 416.7gm and 555.5 gm/m^2 on the basis of nitrogen content in it (1.8%). Nitrogenous fertilizers at the rate of 5gm, 7.5gm and 10gm nitrogen/m^2 were added to each plot except olive oil cake treated plots. Untreated plots served as control. Initial population of nematodes was determined before treatment. A waiting period of 4 days for methyl bromide, 21 days for basamid and 25 days for olive oil cake and one week for nemacur, vydate and temik was given before planting the grape cuttings. A completely randomized design was used for the experiment and the treatments were replicated three times.

Eight stem cuttings of grapevine of the same size and alomst of the same weight were planted in each plot. One hundred fifty days after planting, the total length and total fresh weight of plants were determined. Final population of nematodes was determined by Cobb's sieving and gravity method. Root-gall index was calculated from individual plants on a 0-4 scale where 0 = no galling, 1 = 1 − 10 galls, 2 = 11 − 25 galls, 3 = 26 − 50 galls and 4 = above 50 galls. The data were statistically analysed.

RESULTS AND DISCUSSION

Data presented in Table I show that all the chemicals tested were effective in reducing the population of plant parasitic nematodes. Methyl bromide was the most effective chemical in reducing the population of *Tylenchorhynchus* spp., *Trichodorus* spp. and *Aphelenchus* spp. Other nematode genera were completely controlled by methyl bromide at all rates of application. Basamid at applied rates reduced the population of nematodes but was more effective at the rates of 45 gm and 60 gm/m^2. Systemic nematicides also reduced the population with an effective rate of 8gm/m^2. Vydate was relatively a better nematicide for all the nematodes except *Rotylenchus* spp and *Xiphinema* spp. for which temik was found more effective. Olive oil cake was found to be equally effective as the systemic nematicides, however, it was slightly better than nemacur and temik when used in higher doses. These results are in agreement with those reported for the control of root-knot nematodes using the same chemicals (3, 10, 13, 17, 19). Similarity of the present results with that of earlier work using other organic materials for nematode control indicates that olive oil cake also contains some toxic substances which are liberated during decomposition (6, 8, 11, 21). The presence of certain chemicals toxic to nematodes has already been shown in water extracts of olive oil cake which inhibited the hatching of larvae and affected the mortality of different nematodes (7).

Root-gall formation was completely suppressed in methyl bromide and basamid treated plants compared to plants treated with systemic nematicides and olive oil cake. The growth of plants (length and fresh weight) was higher in methyl bromide treated

Table I — Population of plant parasitic nematodes and growth of plants affected by different nematicidal treatments on grape (*Vitis vinifera*).

Treatment	Dose gm/m²	Population of Plant parasitic nematodes/ 250gm soil								Length of plants (cm)	Weight of plants (gm)	Root-gall index
		Tylen	Mel	Tri	Aph	Aphel	Prat	Rot	Xiphi			
Methyl	40	17	-	27	23	-	-	-	-	144.9	127.7	0
Bromide	60	23	-	20	13	-	-	-	-	151.8	129.0	0
	80	3	-	17	7	-	-	-	-	175.1	154.7	0
	30	270	76	346	73	13	-	40	-	132.6	122.6	0
Basamid	45	80	56	350	46	10	-	33	-	134.4	125.4	0
	60	36	46	306	36	10	-	23	-	170.0	131.4	0
	4	490	580	470	216	93	43	83	53	89.6	84.9	1.67
Nemacur	6	546	450	400	170	66	40	76	56	131.8	98.4	1.25
(Granular)	8	373	333	413	160	100	20	66	33	157.1	113.5	0.89
	4	240	133	350	140	50	63	33	73	91.5	83.9	1.33
Vydate	6	200	106	213	110	30	56	20	50	134.7	98.9	1.00
(Granular)	8	156	100	166	73	6	26	6	13	158.0	116.8	0.67
	4	263	190	296	133	46	73	26	50	100.5	95.8	2.00
Temik	6	260	136	210	106	40	60	-	13	128.2	98.4	1.33
(Granular)	8	223	100	183	86	20	40	-	-	157.6	113.9	0.67
Olive	277.8	353	256	390	140	40	43	23	20	94.3	87.5	1.19
oil	416.7	186	156	290	116	20	36	26	13	135.2	98.8	1.00
cake	555.5	163	100	190	73	6	23	23	16	163.9	119.2	0.67
Untreated		1760	810	1716	293	186	420	446	753	87.6	82.9	3.23
Initial Population		193	256	79	135	74	65	64	45			
L.S.D. at 5% between treatments	51.6	13.7	20.9	14.5	15.8	10.1	5.1	12.8	7.33	5.44		
L.S.D. at 5% between doses	74.9	24.3	19.1	10.4	43.7	13.9	22.6	13.9	4.10	4.66		

Tylen = *Tylenchorhynchus* spp., Mel = *Meloidogyne javanica*. Tri = *Trichoderus* spp., Aph = *Aphelenchus* spp., Aphel = *Aphelenchoides* spp.
prat = *Pratylenchus* spp., Rot = *Rotylenchus* spp., Xiphi = *Xiphinema* spp.

plots followed by basamid, olive oil cake and systemic nematicides compared to untreated control.

Improvement in the physical properties of soil for growing *Eucalyptus* seedlings was obtained by mixing sand, peat moss, compound fertilizer and fish meal (5). It is possible to state that the use of olive oil cake also provides more advantages over nematicides by improving physical structure and water holding capacity of the soil and providing nourishment to plants upon decomposition in addition to its toxic property against nematodes.

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مكافحة الديدان الثعبانية الممرضة للنبات على شتلات العنب بواسطة المبيدات النيماتودية المختلطة وبقايا عصر الزيتون «الفيتورا»

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المستخلص

أجريت دراسة لمعرفة تأثير المبيدات النيماتودية المختلفة وبقايا عصر الزيتون «الفيتورا» على تجمعات الديدان الثعبانية المتطفلة على النبات، وكذلك على نمو شتلات العنب في المشتل. المبيدات المتطايرة: بروميد الميثيل والبازاميد وجدت فعالة بدرجة عالية جداً في التقليل من أعداد الديدان الثعبانية مما ساعد في زيادة نمو النبات، أما المبيدات الحبيبية: ڤايديت، نيماكيور وتيميك وكذلك بقايا عصر الزيتون «الفيتورا» فكانت متساوية التأثير في التقليل من أعداد الديدان الثعبانية إلى الحد الذي لا يتسبب عنده ضرر اقتصادي، بالإضافة إلى زيادة نمو النبات.

علاوة على ذلك، فإن بقايا عصر الزيتون «الفيتورا» توفر مزايا أخرى عن المبيدات مثل تحسين التركيب الطبيعي للتربة وسعة شدها للماء وتوفر عناصر غذائية للنبات نتيجة لتحللها، بالإضافة إلى خاصية تأثيرها السام على الديدان الثعبانية.