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Evaluation of Some Medicinal Plant Oils and A Nematicide for Controlling Virus- Transmitted Nematode and Other Nematodes on Table Grapes

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UNDER FIELD conditions, this research focused on the association of certain plant parasitic nematodes with eighteen cultivars of table grape and on controlling of three nematodes viz., *Rotylenchulus reniformis*; *Tylenchulus semipenetrans* and *Xiphinema americanum* by two medicinal plant oils and a nematicide. Association of *Rotylenchulus reniformis*; *Tylenchulus semipenetrans* and *Xiphinema americanum* is showed that, on the basis of, reproduction factor the different cultivars were classified as susceptible or highly susceptible. When using control methods, soil drench treatment reduced the population density of *Rotylenchulus reniformis*; *Tylenchulus semipenetrans* and *Xiphinema americanum* higher than foliar treatment and the combined treatment between foliar and soil drench gave the best results in controlling the mentioned nematodes higher than those in the single treatment. Neem oil treatment, to some extent, gave higher nematode and virus reduction more than jojoba oil. Virus vector nematodes of species is responsible for vectoring several important virus diseases to grapevine (*Vitis vinifera*). *Arabis mosaic virus* (ArMV) *Nepovrus; Grapevine fanleaf virus* (GFLV) *Nepovrus; Peach rosette mosaic virus* (PeRMV) *Nepovrus*; *Prunus necrotic ring spot virus* (PNRSV)*Ilarvirus* and *Tomato ring spot virus* (TomRSV) *Nepovrus* were detected in naturally infested grapevine plants growing in the Horticulture Institute Experimental Station Giza Governorate. it is very difficult to eradicate nematodes completely from the invested vineyards. Therefore, nematicides must be used periodically. As such it can be stated that combined application (Foliar spraying and soil drench) of jojoba or neem oils were the highest the safe best treatments compared with Oxamyl 24% L was the lowest safe, in addition to, they achieved the best yield and its components as well as the best physical properties of bunches, improved the chemical characteristics of berries and ensured the best vegetative growth parameters in comparison with control.

Keywords: Control, Medicinal plant oils, Plant Parasitic nematodes, PeRMV, *Nepovrus*, DAS-ELISA, Table grapes.

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Grape, *vitis vinifera* has been reported to be infected with certain nematode species of which *Tylenchulus semipentrans* and *Xiphinema* spp (Raski and Schmitt, 1972 and Amal *et al.*,2007). Also, Moussa *et al.* (1983) reported that *Meloidogyne*, *Rotylenchulus* and *Xiphinema* were recorded from five governorates in Egypt. These nematodes are not considered to be common pests in vineyards, although they have been identified as vectors of some uncommon grapevine viruses in Europe (Taylor & Brown 1976 and Trudgill *et al.*, 1983) and North America (Gilmer and Uyemoto, 1972 ; Gonsalves 1980 and Krake *et al.*, 1999). Controlling of the nematode has received attention to minimize damage to grapevine plants. Chemicals have efficiently been used for a long time. However, hazards resulting from such chemicals encourage scientists to search for biotic alternatives. Some investigators controlled plants parasitic by using oils of some essential plants. Some investigators controlled this pest by using oils of some essential and medicinal plants (Abd –Elgawad & Omer, 1995, Khurma *et al.*, 1997, Amin, 1999 and El-Nagdi , 2005). Also, some substances such as jojoba leaf extracts (Abd – Aziz *et al.*, 1996), oil cake and leaf and seed extracts of castor (Akhtar & Mahmood, 1993 and Youssef & Amin, 1997) were used. El-Nagdi and Mansour (2003) tested two products containing oils of jojoba [*Simmondsia chinensis (Link*)] and castor (*Ricinus communis L.*) for controlling the root–knot nematode, *Meloidogyne incognita* infecting sugar beet . No information in the literature about the use of plant oils to control nematodes and virus on grapevines.

This research aimed to studying the association of some plant parasitic nematodes and virus diseases in the most common grapevine cultivars and in continuation of a line of thinking aiming at replacing the use of hazardous chemical pesticide by environmentally friendly biocontrol agents. Also this research investigate association of plant parasitic nematodes associated with certain grapevine cultivars and testing two commercial products containing oils of jojoba and neem for controlling certain plant-parasitic nematodes and viral disease infesting some cultivars of table grapes.

Material and Methods

Main screening and materials sampling

This investigation was carried out at the orchard of Horticulture Research Institute, Agricultural Research Center, Giza governorate. Seventeen cultivars of Grapevine (*Vitis vinifera* cvs: Romy Ahmer; Black Rose; Baltem Eswed; Matroh Eswed; Cardinal; Crimson seedless; Christmas Rose; Delight ; Early superior ; Feista ; Flame seedless ; Oxotic; Perlette; Red Globe ; Ribier ; Superior and Tokay) leaves showing virus and virus like symptoms (mosaic, malformation, vein banding, colorotic or yellowness and vein clearing of leaves) were sampled from Giza Governorate during the growing season (April – May 2006).Obtained samples including leaves of grapevines, roots and soil samples from plant rhizosphere were collected with an auger from 30-60 cm deep, stored in refrigerator and using to extract and evaluate population of nematodes.

On the other hand the Horticulture studies extended for two successive seasons (2006 and 2007) for susceptible to nematode and virus cultivars viz.,; Superior, Flame Seedless and Crimson Seedless grapevines. The vines were 12-years-old, grown in a loamy clay soil, spaced at 2 X 2.5 meters apart and irrigated by the drainage system, trellised by the "Y" shape system. The vines were cane pruned in Superior and Crimson Seedless with 60 buds/vine, while spur pruned in Flame Seedless with a load of 40 buds/vine at the third week of January.

Investigation on the resistance of some grape table cultivars to viruses and nematode

Resistance was evaluated by registering the severity of leaf symptoms as well as by measuring the virus concentration and systemic virus spread. The infections rates, severity of symptoms on leaves, virus concentration in the leaves is to be investigated and measured over the course of 2 years. The severity of the symptoms can be visually evaluated by different scores (Kegler and Hatmann 1998):

1= no symptoms.
2= mild symptoms.
3= normal symptoms.
4= sever symptoms.
5= very sever symptoms, including necroses.

A disease index (DI) can then be calculated with these scores:

$DI= (n_1m_1+n_2m_2+ n_3m_3+....n_n m_n)/N \times m \times 100$

n = number of damaged leaves.

$m_1 - m_5$= grade of damaging (Scores)

N = number of leaves

m = maximal damaging

Serological assays using DAS-ELISA technique

Quantative resistance of trees and Serological reaction

Leaves and leaf blades of tested hosts were examined serologically to identify viruses infecting grape trees using commercial kits supplied by SANOFI (Sante Animale, Paris, France). Double –antibody sandwich ELISA (DAS- ELISA) for ArMV; GFLV; PeRMV; PNRSV and TomRSV at a dilution of 1:500 confirmed the identification of the viruses under study. Recording the absorbencies at 405 nm was performed on using Dynatech Immunoassay MR 7000. Samples with an absorbency of at least twice than the healthy controls were considered as a positive for the presence of virus infection.

Field experiment

Association of plant parasitic nematodes and some viruses associated with certain grapevine cultivars

In vineyard cultivated with seventeen grapevines (*Vitis vinifera* cvs. Romy Ahmer; Black Rose; BaltemEswed; Matroh Eswed; Cardinal; Crimson seedless;

Christmas Rose; Delight; Early superior; Feista; Flame Seedless; Oxotic; Perlette; Red Globe; Ribier; Superior and Tokay). The soil was infested with certain plant parasitic nematodes. For estimating susceptibility of these cultivars to viruses and nematodes infection, leaves, soil and root samples were collected for each cultivar. An aliquot of 200g soil from each cultivar was processed for nematode analysis by sieving and decanting methods (Barker, 1985). An aliquot five grams root from each cultivar was incubated for a week to extract nematodes. The leaves samples were collected from each side of the same trees tested as compound sample and transferred in ice-box to the laboratory for virus detection. Five viruses (ArMV; GFLV; PeRMV, PNRSV and TomRSV) were counted as No. of infected trees/No. of total tested ones (apparently healthy) and the severity of symptoms degree .

Control methods

The efficacy of the two medicinal plant viz., jojoba (*Simmondsia chinensis* Link) and neem (*Azadirachta indica*) commercial seed oils in comparison with the nematicide oxamyl 24% L was determined against plant parasitic nematodes associated with the most susceptible cultivars.

The treatments were

Jojoba oil at the concentration 0.2% (Equivalent to 2 L / feddan) was applied as liquid formulations (2 ml / vine) Ashour (2008)Analysis of the Jojoba oil by GC] and GC/MS techniques revealed that; Egyptian Jojoba oil is composed of Eicosenyl oleate (C-38, 7%), Eicosenyl eicosenoate (C-40, 30%), Docosenyl eicosenoate (C-42, 52%), Eicosenyl docosenoate (C-42, 9%) and Docosenyl docosenoate (C-44, 2%). Structures of the isolated components were determined by 1D, 2D-NMR.

Neem oil at the concentration 0.2 % (Equivalent to 2 L / feddan) was applied as liquid formulations (2 ml / vine) Francesca(2009) neem oil is obtained from the seeds of the tree *Azadirachta indica*. Its chemical composition is very complex, being rich in terpenoids and limonoids, as well as volatile sulphur modified compounds.

Oxamyl 24 % L at the rate of 3 ml / vine (Equivalent to 3 L / feddan). Chemical name: methyl Ń, Ń-dimethyl-N-(methylcarbamol)oxy)-1- thiooxamidate.

Untreated control.

The above treatments were applied as foliar spray and soil drench as single or in combination treatments. One month after the first application the same rates applied.

To determine the efficacy of the treated materials on the population of nematode, soil and root samples of grapevines cultivars, *i.e.* (Crimson seedless, Flame Seedless and superior) were sampled at 60 cm depth beneath tree canopy once before the treatments application (March, 2006) as zero days, after that all treatments with their rates were applied and sampled for two times (30 and 90 days after application).The nematode population in an aliquot of 200 g soil was extracted by sieving and decanting technique (Barker, 1985). Roots were gently washed and an aliquot of 5 g roots from each sample were incubated in Petri dish at the laboratory temperature (25±5 Ċ) for 7 days. The nematode populations were counted according to the method described by Southey (1970). The effect of application of different methods and types of treatments on soil suppessiveness to nematode population (in soil and roots) was calculated as a nematode reduction (%) according to Henderson and Tilton formula (Puntener, 1981).

Nematode reduction (%) = 1- (PTA/PTB X PCB/PCA) X100

Where:

PTA= Population in the treated vines after application.

PTB=Population in the treated vines before application.

PCB=Population in the check vines before application.

PCA= Population in the check vines after application.

Horticultural parameters adopted to evaluate the tested control treatments

Yield and physical characteristics of bunches

Yield/vine (kg) was determined as number of bunches/vine X average bunch weight (g).

Representative random samples of 6 bunches/vine were harvested at maturity. The following characteristics were determined: average bunch weight (g) and bunch width and length (cm).

Chemical characteristics of berries

Berry Total soluble solids in berry juice (T.S.S.) (%) by hand refractometer and total titratable acidity as tartaric acid (%) (A.O.A.C. 1985). Hence TSS /acid ratio and total anthocyanin of the berry skin (mg/g fresh weight) according to Husia *et al.* (1965) were calculated.

Morphological and chemical characteristics of vegetative growth

At growth cessation, the following morphological and chemical determinations were carried out on 4 shoots / the considered vine:

Average shoots length (cm).

Average leaf area (cm^2) of the apical 5^{th} and 6^{th} leaves using a planimeter.

Leaf Pigments content: (chlorophyll A, B and carotene) (mg/g fresh weight) of the 5^{th} and the 6^{th} leaves (Westein, 1957).

Statistical analysis

The complete randomized block design was adopted for the experiment. The statistical analysis of the present data was carried out according to Snedecor and Cochran (1972). Averages were compared using the new L.S.D. values at 5% level. Percentages were transformed by the equation prior to the statistical analysis and thereafter percentages were presented with statistical letters.

Results

Association of plant parasitic nematodes associated with certain grapevine cultivars

Association of *Rotylenchulus reniformis*; *Tylenchulus semipenetrans* and *Xiphinema americanum* is shown in Table 1. On the basis of reproduction factor the different cultivars were classified as R ≥ 1 = susceptible or R ≥ 2 = highly susceptible. As for *Rotylenchulus reniformis*, Black Rose; Early superior; Romy Ahmer ; Flame Seedless; Crimson seedless and Superior were classified as susceptible. As for *Tylenchulus semipenetrans*, Feista; Perlette; Black Rose;; Ribier; Early superior; Baltem Eswed, Crimson seedless; Christmas Rose; Romy Ahmer and Superior were considered as susceptible, whereas flame seedless was highly susceptible. At the same trend for *Xiphinema americanum,* Feista; Romy Ahmer ; Black Rose; Christmas Rose; Early superior; Delight; Tokay and Flame Seedless were susceptible whereas Crimson seedless and Superior was classified as highly susceptible.

TABLE 1. Susceptibility of certain grapevine cultivars against *Rotylenchulus reniformis*; *Tylenchulus semipenetrans* and *Xiphinema americanium* under field conditions.

Cultivars	*Rotylenchulus reniformis*			*Tylenchulus semipenetrans*			*Xiphinema americanium*		
	Nematode population / 200g soil & 5g root			Nematode population / 200g soil & 5g root			Nematode population / 200g soil		
	Intial (Pi)	Final (Pf)	R# (Pf/Pi)	Intial (Pi)	Final (Pf)	R (Pf/Pi)	Intial (Pi)	Final (Pf)	R (Pf/Pi)
Romy Ahmer	110	150	1.36	130	200	1.54	40	50	1.25
Black Rose	40	50	1.25	40	50	1.25	40	50	1.25
Baltem Eswed	-	-	-	120	160	1.33	-	-	-
Matroh Eswed	-	-	-	-	-	-	-	-	-
Cardinal	-	-	-	-	-	-	-	-	-
Crimson seedless	450	700	1.56	700	1000	1.43	100	200	2.00
Christmas Rose	-	-	-	170	260	1.53	80	100	1.25
Delight	-	-	-	-	-	-	30	40	1.33
Early superior	230	300	1.25	320	420	1.31	80	100	1.25
Feista	-	-	-	150	180	1.20	50	60	1.20
Flame Seedless	600	850	1.42	600	1300	2.20	260	300	1.50
Oxotic	-	-	-	-	-	-	-	-	-
Perlette	-	-	-	130	160	1.23	-	-	-
Red Globe	-	-	-	-	-	-	-	-	-
Ribier	-	-	-	40	50	1.25	-	-	-
Superior	500	950	1.90	750	1400	1.87	200	400	2.00
Tokay	-	-	-	-	-	-	50	70	1.40

\# R = Reproduction factor

On the other hand, the distribution of viruses (ArMV, GFLV, PeRMV, PNRSV and TomRSV) and the incidence of virus infection in eighteen grapevines cultivars is shown in Table 2 and Fig. 1. Severity of symptoms and virus concentration were recording the absorbencies at 405 nm. was performed on using ELISA reader. Samples with an absorbency of at least twice that the healthy controls were considered as a positive for the presence of virus these results are shown in Table 3. As for five viruses were detected in the field Romy Ahmer; Baltem Eswed; Matroh Eswed; Crimson seedless; Fiesta; Flame Seedless and Oxotic cultivars were considered as highly susceptible and (Severity of Symptoms from 5 to 3), whereas Delight and Perlette cultivars were no susceptible and no Symptoms occured.

TABLE 2. Nature frequencies of some grapevine viruses during 2 successive seasons.

Viruses / Cultivars	AMV	GFLV	PeRMV	PNRSV	TomRSV	Infection Frequencies rate
Romy Ahmer	18/20	12/20	5/20	7/20	3/20	45/20(225%)
Black Rose	6/20	8/20	2/20	0/20	0/20	16/20 (80%)
Baltem Eswed	1/20	4/20	0/20	2/20	2/20	9/20 (45%)
Matroh Eswed	3/20	6/20	0/20	2/20	2/20	13/20 (65%)
Cardinal	6/20	9/20	0/20	4/20	2/20	21/20 (105%)
Crimson seedless	4/20	12/20	2/20	0/20	1/20	19/20 (95%)
Christmas Rose	0/10	3/10	1/10	0/10	0/10	4/10 (40%)
Delight	0/10	2/10	0/10	1/10	2/10	5/10 (50%)
Early superior	2/20	5/20	2/20	2/20	0/20	11/20 (55%)
Feista	1/10	3/10	0/10	2/10	0/10	5/10 (50%)
Flame Seedless	4/20	8/20	5/20	2/20	2/20	21/20 (105%)
Oxotic	0/10	3/10	1/10	2/10	2/10	8/10 (80%)
Perlette	1/10	3/10	1/10	1/10	0/10	6/10 (60%)
Red Globe	0/10	3/10	0/10	0/10	0/10	3/10 (30%)
Ribier	1/10	3/10	1/10	1/10	2/10	8/10 (80%)
Superior	2/20	7/20	3/20	2/20	2/20	16/20(80%)
Tokay	0/10	3/10	0/10	2/10	2/10	7/10 (70%)
Total %	51/270 (18.9%)	97/270 (35.9%)	23/270 (8.5%)	30/270 (11.1%)	23/270 (8.5%)	

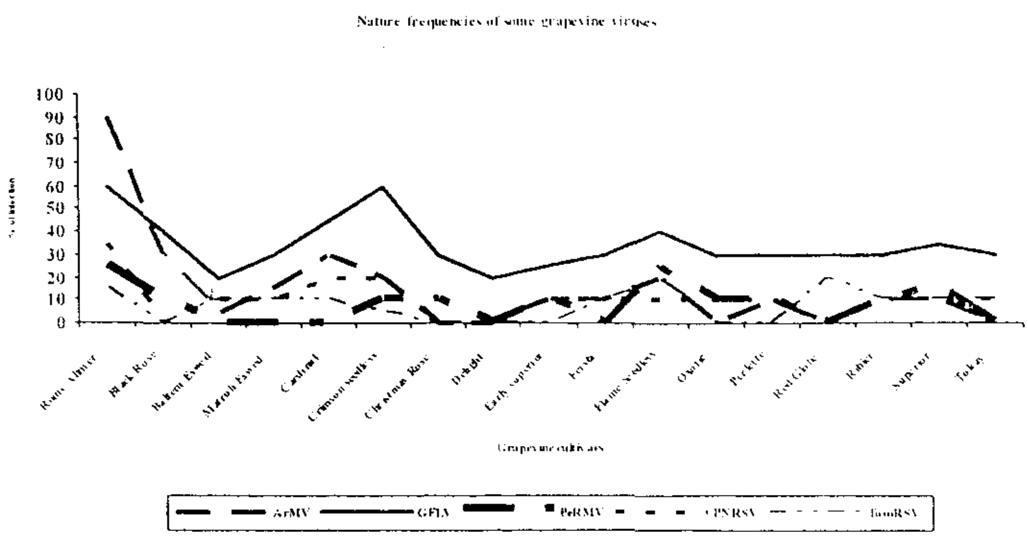

Fig. 1. Incidence of virus infection in some grapevines cultivars .

TABLE 3. Severity of symptoms and viruses concentrations(ELISA reading) in leaves of natural infection grapevines in the growing seasons (maximal values from 3 months).

Cultivars	S.S	ELISA reading at 405 nm				
		ArMV	GFLV	PeRMV	PNRSV	TomRSV
Romy Ahmer	5	+(0.816)	+(0.612)	+(0.721)	+(0.688)	+(0.412)
Black Rose	2	+(0.182)	+(0.242)	- (0.063)	- (0.068)	+(0.540)
Baltem Eswed	5	+(0.622)	+(0.480)	+(0.451)	+(0.730)	+(0.611)
Matroh Eswe	4	+(0.824)	+(0.558)	+(0.634)	+(0.380)	+(0.410)
Cardinal	2	+(0.166)	+(0.188)	- (0.065)	- (0.054)	+(0.035)
Crimson seedless	3	+(0.222)	+(0.218)	+(0432)	+(0.220)	+(0.378)
Christmas Rose	2	-(0.048)	-(0.0 60)	- (0.047	- (0.052)	-(0.050)
Delight	1	-(0.86)	-(0.056)	-(0.063)	- (0.051)	-(0.062)
Early superior	3	+(0.192)	+(0.438)	+(0.512)	- (0.714)	+(0.354)
Feista	2	-(0.211)	+(0.238)	-(0.073)	- (0.066)	- (0.064)
Flame Seedless	3	+(0.485)	+(0.485)	+(0.485)	- (0.485)	+(0.485)
Oxotic	3	+(0.512)	+(0.512)	+(0.512)	+(0.512)	+(0.512)
Perlette	2	-(0.068)	-(0.050)	-(0.053)	- (0.049)	-(0.068)
Red Globe	3	+(0.744)	+(0.863)	+(0.656)	- (0.066)	+(0.044)
Ribier	2	-(0.085)	+(0.197)	-(0.053)	-(0.052)	- (0.047)
Superior	3	+(0.285)	+(0.220)	+(0.178	-(0.049)	- (0.058)
Tokay	4	+(1.055)	+(0.566)	+(0.301)	- (0.744)	- (0.62)

S.S= Severity of symptoms:
1= no symptoms. 2= mild symptoms. 3= normal symptoms.
4= sever symptoms. 5= very sever symptoms
Negative control= (0.042: 0.64) Positive control= (0.426:0.620)
(+ Positive, - Negative) in ELISA test absorbance value at 405 nm. .

Control methods

The population densities of *Rotylenchulus reniformis*; *Tylenchulus semipenetrans* and *Xiphinema americanum* as affected by method of management are illustrated in Table (4, 5 and 6). In general, soil drench treatment reduced the population density of *Rotylenchulus reniformis*; *Tylenchulus semipenetrans* and *Xiphinema americanum* higher than foliar treatment. Also, The combined treatment between foliar and soil drench gave the best results in controlling the mentioned nematodes higher than those in the single treatment.

Neem oil treatment, in contrast, gave higher nematode reduction more than jojoba oil. Oxamyl treatment as foliar gave the best results in controlling the nematodes compared soil drench and the combined treatment, as it reduced the population density of the studied nematodes higher the single treatment of oxamyl as foliar or as soil drench.

After one month on grape cv. Superior, the highest reduction (74.6 %) of *R. reniformis* occurred in soil drench by jojoba oil but neem oil gave the best reduction (72.4%) by using the combined methods. As for, *T. semipenetrans*, the highest reduction (68.2%) occurred by using jojoba oil as foliar spray but the highest reduction by using neem oil was 70.2%. As for, *Xiphinema americanum* the highest reduction (56.0 %) occurred by using soil drench. At the same trend the neem oil caused the highest nematode reduction (63.0%).

At the harvest time of the same cultivar (Table 2, 3, and 4), the combined treatment of jojoba oil as foliar spray and soil drench gave the best results for controlling *R. reniformis* (86.8%), *T. semipenetrans* (72.1%) and *Xiphinema americanum* (80%) as illustrated in Table (2, 3 and 4). As for neem oil, as combined methods (foliar spray and soil drench) for *R. reniformis* and *Xiphinema americanum*.

TABLE 4. Effect of two medicinal plant oils and a nematicide on *Rotylenchulus reniformis* juveniles in soil and roots of three cultivars grapevines.

Treatments/ cultivars	*Rotylenchulus reniformis* / 200g soil & 5g roots								
	Superior			Flame seedless			Crimson seedless		
	*Pi	One month	At harvest	Pi	One month	At harvest	Pi	One month	At harvest
Jojoba oil									
foliar spraying	900	320 (70.1)	240 (82.4)	640	400 (45.6)	310 (66.0)	650	400 (50.2)	300 (59.4)
soil drench	760	230 (74.6)	230 (80.0)	700	450 (44.1)	360 (65.0)	700	330 (61.8)	¿40 (69.8)
foliar spraying + soil drench	900	290 (72.9)	180 (86.8)	680	310 (60.3)	210 (79.0)	740	290 (68.3)	190 (77.4)
Neem oil									
foliar spraying	650	280 (64.8)	250 (74.6)	820	380 (59.7)	290 (75.9)	780	410 (57.4)	280 (68.4)
soil drench	760	280 (63.2)	240 (79.2)	780	370 (58.7)	340 (70.4)	700	300 (65.3)	270 (66.1)
foliar spraying + soil drench	700	230 (72.4)	210 (80.2)	780	350 (60.9)	280 (75.6)	780	300 (66.3)	210 (74.3)
Oxamyl 24% L									
foliar spraying	1000	270 (77.3)	300 (80.2)	700	360 (55.3)	320 (68.9)	780	380 (60.5)	240 (72.9)
soil drench	880	250 (76.1)	220 (83.5)	860	400 (59.5)	300 (76.3)	740	330 (63.9)	180 (78.6)
foliar spraying + soil drench	740	230 (73.9)	190 (83.1)	860	220 (77.7)	270 (78.7)	700	270 (68.8)	180 (77.4)
Untreated (Control)	890	1060	1350	810	930	1200	760	940	1070

Data are average of six replicates. * Pi = initial nematode population.

Figures in parenthesis indicate percentage nematode reduction according to (Puntener, 1981).

TABLE 5. Effect of two medicinal plant oils and a nematicide on *Tylenchulus semipenetrans* juveniles in soil and roots of three cultivars grapevines.

Treatments	*Tylenchulus semipenetrans* / 200g soil & 5g roots								
	Superior			Flame seedless			Crimson seedless		
	Initial (Pi)	One month	At harvest	Initial (Pi)	One month	At harvest	Initial (Pi)	One month	At harvest
Jojoba oil									
Foliar spraying	1150	420 (68.2)	470 (64.9)	980	460 (61.0)	380 (71.3)	1110	680 (50.4)	290 (80.7)
soil drench	920	360 (65.9)	330 (69.2)	1020	560 (54.4)	330 (76.1)	930	480 (58.2)	240 (80.9)
Foliarspraying + soil drench	1110	430 (66.3)	360 (72.1)	860	540 (47.9)	330 (71.6)	1020	440 (65.1)	270 (80.4)
Neem oil									
foliar spraying	880	380 (62.4)	300 (70.7)	860	440 (57.5)	310 (73.3)	820	400 (60.5)	330 (70.2)
Soil drench	950	380 (65.2)	290 (73.7)	1020	490 (52.7)	360 (69.0)	1120	420 (69.6)	290 (80.8)
Foliar spraying + soil drench	760	260 (70.2)	260 (70.6)	780	410 (66.6)	320 (76.8)	780	350 (63.7)	240 (77.2)
Oxamil 24% L									
Foliar spraying	1120	330 (74.4)	340 (73.9)	1110	560 (58.1)	400 (73.3)	840	480 (53.7)	370 (67.4)
Soil drench	1080	340 (72.6)	340 (72.9)	900	430 (60.3)	360 (70.4)	950	440 (62.5)	320 (75.1)
foliar spraying + soil drench	960	250 (77.9)	340 (77.6)	940	420 (62.9)	320 (74.8)	1060	400 (69.4)	320 (77.7)
Untreated (Control)	1240	1420	1450	1080	1300	1450	1200	1480	1620

Data are average of six replicates. * Pi = initial nematode population.

Figures in parenthesis indicate percentage nematode reduction according to (Puntener, 1981).

As for grape cv. Flam seedless, after one month, jojoba and neem oils gave the best results for controlling *R. reniformis* by using foliar spray + soil drench as they were 60.3 and 60.9%; respectively. As for *T. semipenetrans*, jojoba oil foliar spray caused the highest reduction (61%) but the neem oil induced the best result (66.6 %) as combined methods compared to oxamyl (62.9%). As for *X. americanum*, soil drench by using jojoba or neem oil gave the best results (57 and 55%; respectively).

At harvest, jojoba and neem oils gave the best results (79 and 75.6 %) for controlling *R. reniformis*. As for *T. semipenetrans*, jojoba oil as combined gave the best results (72.1%) but neem oil caused the best results as soil drench (73.7). As for *X. americanum*, neem and jojoba oil as single achieved the best results as soil drench, 74 and 73 %; respectively.

TABLE 6. Effect of two medicinal plant oils and a nematicide on *Xiphinema americanum* juveniles in soil of three cultivars grapevines.

Treatments	*Xiphinema americanum* / 200 g soil								
	Superior			Flame seedless			Crimson seedless		
	Pi	One month	At harvest	Pi	One month	At harvest	Pi	One month	At harvest
Jojoba oil									
foliar spraying	400	220 (51)	160 (66)	380	200 (50)	140 (68)	280	160 (50)	120 (64)
soil drench	360	180 (56)	140 (67)	400	180 (57)	120 (74)	300	120 (65)	80 (78)
foliar spraying + soil drench	380	200 (47)	110 (76)	430	150 (54)	100 (65)	340	90 (77)	80 (80)
Neem oil									
foliar spraying	300	190 (56)	120 (66)	450	220 (54)	180 (65)	320	180 (51)	140 (64)
soil drench	380	160 (63)	110 (76)	420	200 (55)	130 (73)	300	140 (59)	100 (72)
foliar spraying + soil drench	400	180 (60)	100 (79)	380	180 (55)	120 (73)	310	120 (66)	80 (79)
Oxamyl 24% L									
foliar spraying	280	140 (62)	120 (64)	300	170 (46)	100 (71)	280	160 (50)	120 (79)
soil drench	380	160 (63)	100 (78)	420	120 (73)	90 (81)	320	120 (67)	100 (74)
foliar spraying + soil drench	360	150 (63)	100 (77)	380	120 (70)	80 (82)	260	80 (73)	80 (74)
Untreated (Control)	320	360	380	400	420	460	300	340	360

Regarding grape cv. Crimson seedless, after one month, jojoba and neem oils gave the best results for controlling *R. reniformis* by using foliar spray + soil drench as the percentages reduction were 68.3 % and 66.3%; respectively. As for, *T. semipenetrans*, highest reduction (69.6%) occurred by using jojoba oil as foliar spray + soil drench but neem oil caused the best result (65.1%) as soil drench. As for, *Xiphinema americanum* the highest reduction (77 %) occurred by using jojoba oil as foliar spray + soil drench. By the same method the neem oil caused (66%) nematode reduction; respectively.

At harvest, jojoba and neem oils as combined method (foliar spray + soil drench) gave the best results (77.4 and 74.3 %); respectively for controlling *R. reniformis*. As for *T. semipenetrans*, jojoba and neem oils as soil drench gave the best results (80.9% and 80.8%); respectively. As for *X. americanum*, neem and jojoba oils as combined method achieved the best results as soil drench, 79 and 80 %; respectively.

TABLE 7. Effect of two medicinal plant oils and a nematicide on three cultivars grapevines. (Crimson Flame and Superior) to (ArMV, GFLV, PRMV, PNRSV and TomRSV).

Cultivars	Viruses	Oxamyl 1		Oxamyl 2		Oxamyl 3		Jojoba Oil 1		Jojoba oil 2		Jojoba oil 3		Neem Oil 1		Neem Oil 2		Neem Oil 3	
		I/H	R.%	I/H	R.%	I/H	R. %	I/H	R%	I/H	R%	I/H	R.%	I/H	R%	I/H	R%	I/H	R.%
Crimson	ArMV	4	0	4	0	4	0	3	5	3	5	2	10	3	5	2	5	2	10
	GFLV	12	0	7	0	7	0	11	5	11	5	9	15	9	15	9	15	6	50
	PeRMV	2	0	2	0	2	0	1	5	1	5	2	0	2	0	1	5	1	5
	PNRSV	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TomRSV	1	0	1	0	1	0	0	5	0	5	0	5	0	5	0	5	1	0
Flame	ArMV	4	0	4	0	4	0	3	5	3	5	2	10	2	10	2	10	2	10
	GFLV	8	0	8	0	8	0	7	5	7	5	6	10	6	10	6	10	5	15
	PRMV	5	0	5	0	5	0	5	0	5	0	5	0	4	5	4	10	4	10
	PNRSV	2	0	2	0	2	0	2	0	2	0	2	0	2	0	1	5	1	10
	TomRSV	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0
Superior	ArMV	2	0	2	0	2	0	2	0	2	0	2	0	0	10	0	10	0	10
	GFLV	7	0	5	10	4	15	6	5	6	5	4	15	4	15	2	25	2	25
	PRMV	3	0	2	10	2	0	3	0	3	0	2	10	2	10	2	10	2	10
	PNRSV	2	0	0	10	2	0	2	0	2	0	0	10	0	10	0	10	0	10
	TomRSV	2	0	1	5	1	0	2	0	2	0	0	10	0	10	0	10	0	10

I/H= Infected trees / Healthy trees (20 trees).
R.%= Reduction percentage (compared with Untreated and the results before treatment).
Oxamyl1= Foliar spraying   Oxamyl 2=Soil drench   Oxamyl 3= Foliar spraying and Soil drench
Jojoba 1= Foliar spraying   Jojoba 2 = Soil drench   Jojoba 3= Foliar spraying and Soil drench
Neam 1= Foliar spraying   Neam 2= Soil drench   Neam 3= Foliar spraying and Soil **drench**

Yield and physical characteristics of bunches

Yield was significantly increased by medicinal plant oils or a nematicide application compared to control (Table 8). Jojoba oil applied as combined resulted in the highest values followed by neem oil followed by oxamyl24% L, while control was the lowest one in this respect in both seasons for the three cultivars under study. The highest yield/vine (kg) was obtained by flame seedless cv. (11.5 & 12.45) while the lowest yield was obtained by control,.(2.0 & 2.84)for superior, (2.25 & 2.80) for flame seedless and (2.93& 2.70) for crimson in the two seasons respectively.

As for bunch weight(g), it was positively affected by the used treatments in a similar manner to that of yield per vine. Flame seedless cv. gave the highest bunch weight (575.2 & 590) while superior cv. also gave the lowest bunch weight (150.7 & 200.3) in the two seasons.

With respect to bunch dimensions, bunch length only was increased by all the used treatments compared to control in both seasons for the three cultivars under study. Flame seedless cv. gave the highest bunch length (25.2 & 25.3 cm) while flame seedless and superior cvs. Were nearly similar values in the lowest bunch length (14.2 & 15.0 cm) and (14.4 & 14.0 cm) respectively in the two seasons. Effect of treatments on bunch width was statistically insignificant.

TABLE 8. Effect of two medicinal plant oils and a nematicide on Yield and bunch physicall characteristics of Superior, Flame Seedless and Crimson Seedless grapevine.

Treatments	Suprior				Flame seedless				Crimson			
	Yield/ vine (Kg)	Bunch weight (gm)	Bunch. Length (cm)	Bunch width (cm)	Yield/ vine (Kg)	Bunch weight (gm)	Bunch. Length (cm)	Bunch width (cm)	Yield/ vine (Kg)	Bunch weight (gm)	Bunch. Length (cm)	Bunch width (cm)
First season												
Oxamyl-Foliar spraying)	3.74	234.3	16.1	12.0	4.20	300.1	17.3	16.6	4.80	300.7	17.0	15.0
Oxamyl -Soil drench	5.00	294.1	17.0	12.6	5.80	365.3	21.1	18.3	6.12	340.5	18.8	16.0
Oxamyl (Two applied)	5.92	329.0	19.2	12.7	8.55	450.0	23.0	20.0	7.68	400.2	19.8	17.8
Jojoba (Foliar spraying)	4.46	279.2	17.3	12.5	5.60	350.3	20.2	17.4	5.44	320.3	19.0	16.0
Jojoba (Soil drench	5.76	320.3	19.4	12.7	7.20	400.3	22.1	19.2	7.13	375.2	19.0	17.1
Jojoba (Two applied)	8.91	469.0	20.4	12.8	11.50	575.2	25.2	22.0	8.60	430.0	20.3	18.0
Neam (Foliar spraying)	4.30	269.1	16.2	12.0	5.28	330.5	19.3	17.1	5.12	320.1	18.9	16.0
Neam -Soil drench	5.27	310.5	18.1	12.7	6.75	375.1	21.2	19.1	6.30	350.3	19.0	16.8
Neam (Two applied)	6.90	363.2	19.5	12.7	10.26	540.0	23.3	20.1	8.40	420.6	20.1	18.0
Control	2.00	150.7	14.2	11.9	2.25	250.7	14.4	15.8	2.93	225.9	16.7	13.7
New LSD at (0.05)	**1.41**	**11.2**	**1.5**	**N.S.**	**1.20**	**9.5**	**1.4**	**N.S.**	**1.18**	**9.9**	**1.2**	**N.S.**
Second season												
Oxamyl (Foliar spraying)	4.11	240.1	17.0	13.0	4.65	310.4	17.4	17.0	5.04	315.1	17.1	15.2
Oxamyl (Soil drench	5.45	301.3	18.1	13.1	6.54	280.0	21.3	19.1	6.41	350.4	19.0	16.1
Oxamyl (Two applied)	6.53	340.0	20.3	13.5	9.20	460.3	23.2	21.0	8.20	410.6	20.1	17.0
Jojoba (Foliar spraying)	5.02	295.2	18.2	13.0	6.48	360.1	20.4	18.1	5.96	335.2	19.0	16.0
Jojoba (Soil drench	6.18	325.1	20.2	13.1	7.79	410.2	22.5	20.0	7.80	390.1	19.7	16.3
Jojoba (Two applied)	9.75	490.4	20.4	13.0	12.45	590.0	25.3	22.3	9.03	445.3	20.3	18.1
Neam (Foliar spraying)	4.62	280.3	17.3	13.2	6.07	357.4	19.2	18.1	5.28	320.5	18.5	15.4
Neam -Soil drench	5.64	315.0	19.0	13.3	7.41	390.1	21.1	19.6	6.44	370.4	19.2	16.2
Neam (Two applied)	7.60	280.2	19.9	13.6	11.12	545.3	23.4	20.9	8.74	425.2	20.2	17.5
Control	2.84	200.3	15.0	12.0	2.80	280.0	14.0	15.2	2.70	230.5	16.2	13.5
New LSD at (0.05)	**1.53**	**10.0**	**1.1**	**N.S.**	**1.01**	**10.2**	**1.3**	**N.S.**	**2.11**	**8.5**	**1.1**	**N.S.**

Chemical characteristics of berries

With regard to chemical characteristics of berries, all applied materials either medicinal plant oils or a nematicide applied as compined resulted in the highest significant TSS% of the juice, TSS/acid ratio and least acidity % of the juice as compared to control in both seasons for the three cultivars under study (Table 9). The values of T.S.S (%i) ranged from (12.3 to 17.8) & (13.2 to18.8%) for superior, from(14.0 to 20.0) & (14.1 to 20.7%)for flame seedless and from (13.0 to19.1) & (14.2 to 20.2)for crimson in two seasons respectively, while the values of T.S.S/acid ratio ranged from(12.2 to 21.4)&(13.3 to 23.5)for superior, from(21.9 to 50.0) & (23.5 to 59.1) for flame seedless and from (17.3 to 42.4) & (16.7 to 36.1) for crimson in the two seasons respectively, on the other hand, the values of acidity (%) ranged from(0.83 to1.01) & (0.80 to 0.99) for superior, from(0.40 to 0.64) & (0.35 to 0.60) for flame seedless and from(0.45 to 0.75) & (0.56 to 0.85)for crimson in the three cultivars in both seasons.The highest values of acidity were obtained from control treatment.

TABLE 9. Effect of two medicinal plant oils and a nematicide on Chemical characteristics of berries of Superior, Flame Seedless and Crimson Seedless grapevine.

Treatments	Suprior			Flame seedless			Crimson		
	First season								
	T.S.S %	Acidity %	T.S.S/ acid ratio	T.S.S %	Acidity %	T.S.S/ acid ratio	T.S.S %	Acidity %	T.S.S/ acid ratio
Oxamyl (Foliar spraying)	13.9	1.00	13.9	15.1	0.57	26.5	14.9	0.67	22.2
Oxamyl (Soil drench)	15.0	0.92	16.3	16.3	0.47	34.7	16.1	0.58	27.8
Oxamyl (Two applied)	16.5	0.85	19.4	18.4	0.43	42.8	18.1	0.53	34.2
Jojoba (Foliar spraying)	14.2	0.95	14.9	15.3	0.52	29.4	15.1	0.60	25.2
Jojoba (Soil drench)	16.0	0.87	18.4	17.5	0.47	37.2	17.3	0.57	30.4
Jojoba (Two applied)	17.8	0.83	21.4	20.0	0.40	50.0	19.1	0.45	42.4
Neam (Foliar spraying)	14.0	0.97	14.4	15.4	0.59	26.1	15.0	0.63	23.8
Neam (Soil drench)	15.8	0.89	17.8	16.7	0.47	35.5	16.3	0.57	28.6
Neam (Two applied)	17.0	0.84	20.2	18.5	0.39	47.4	18.2	0.46	39.6
Control	12.3	1.01	12.2	14.0	0.64	21.9	13.0	0.75	17.3
New LSD at (0.05)	**0.7**	**0.02**	**3.2**	**0.3**	**0.04**	**2.1**	**0.3**	**0.07**	**1.6**
	Second season								
Oxamyl (Foliar spraying)	14.8	0.97	15.3	16.0	0.51	31.4	16.0	0.77	20.8
Oxamyl (Soil drench)	15.9	0.91	17.5	17.2	0.42	41.0	17.3	0.67	25.8
Oxamyl (Two applied)	17.4	0.83	21.0	19.4	0.37	52.4	19.2	0.64	30.0
Jojoba (Foliar spraying)	15.1	0.93	16.2	16.2	0.45	36.0	16.3	0.71	23.0
Jojoba (Soil drench)	16.9	0.85	19.9	17.4	0.41	42.4	18.5	0.67	27.6
Jojoba (Two applied)	18.8	0.80	23.5	20.7	0.35	59.1	20.2	0.56	36.1
Neam (Foliar spraying)	14.9	0.93	16.0	16.3	0.53	30.8	16.1	0.74	21.8
Neam (Soil drench)	16.9	0.85	19.9	17.6	0.41	42.9	17.5	0.66	26.5
Neam (Two applied)	18.0	0.81	22.2	19.4	0.33	58.8	19.4	0.55	35.3
Control	13.2	0.99	13.3	14.1	0.60	23.5	14.2	0.85	16.7
New LSD at (0.05)	**0.6**	**0.01**	**2.4**	**0.2**	**0.03**	**2.0**	**0.2**	**0.08**	**2.2**

Anthocyanin content of berry skin for Flame Seedless and Crimson Seedless were higher for jojoba, neem oils and a nematicide application compared to control in both seasons (Table 10). The highest values (0.90 & 1.21 mg/g F.W.) for flame seedless and (0.93 & 1.15 mg/g F.W.) for crimson were obtained from Jojoba (twice applied) in both seasons respectively, while, the lowest values (0.62 and 0.85 mg/g F.W.) for flame seedless and (0.57 & 0.61 mg/g F.W.) for crimson in both seasons were obtained from control. Oxymal (foliar spraying) was equally to control in the two cultivars in the first season only.

TABLE 10. Effect of two medicinal plant oils and a nematicide on berries Anthocyanine pigments of Flame Seedless and Crimson Seedless grapevine.

Treatment	Anthocyanine mg/g F. W.	
	Flame seedless	Crimson seedless
	First season	
Oxamyl (Foliar spraying)	0.62	0.57
Oxamyl (Soil drench)	0.66	0.72
Oxamyl (Two applied)	0.77	0.81
Jojoba (Foliar spraying)	0.65	0.66
Jojoba (Soil drench)	0.74	0.78
Jojoba z (Two applied)	0.90	0.93
Neam (Foliar spraying)	0.64	0.62
Neam (Soil drench)	0.72	0.76
Neam (Two applied)	0.84	0.84
Control	0.62	0.57
New LSD at (0.05)	**0.66**	**0.72**
	Second season	
Oxamyl (Foliar spraying)	0.93	0.77
Oxamyl (Soil drench)	0.97	0.92
Oxamyl (Two applied)	1.00	1.02
Jojoba (Foliar spraying)	0.95	0.88
Jojoba (Soil drench)	1.05	0.98
Jojoba (Two applied)	1.21	1.15
Neam (Foliar spraying)	0.96	0.84
Neam (Soil drench)	1.05	0.96
Neam (Two applied)	1.16	1.06
Control	0.85	0.61
New LSD at (0.05)	**0.04**	**0.03**

Morphological and chemical characteristics of vegetative growth

Data in Table 11 show that the highest values of vegetative growth parameters (expressed as shoot length and leaf area) responded positively to the combined application of jojoba or neem oils or Oxamyl 24% L as compared to control was found to have the lowest ones of this respect in both seasons for the three cultivars under study. The values of shoot length(cm) ranged from (140.2 to 210.2) & (141.4 to 215.1) for superior, from (140.3 to 200.3) & (143.2 to 210.2) for flame seedless and from (110.2 to 175.4) & (115.3 to 187.4) for crimson in both seasons. Meanwhile the values of leaf area (cm^2) ranged from (100.7 to 178.8) & (105.3 to 195.1) for superior, from (144.8 to 209.7) & (150.4 to 207) for flame seedless and from (103.6 to 164.2) & (100.3 to 176)for crimson in both seasons respectively.

TABLE 11. Effect of two medicinal plant oils and a nematicides on Morphological characteristics of vegetative growth of Superior, Flame Seedless and Crimson Seedles.

Treatments	Suprior		Flame seedless		Crimson	
	First season					
	Shoot length cm	**Leaf area cm^2**	**Shoot length cm**	**Leaf area cm^2**	**Shoot length cm**	**Leaf area cm^2**
Oxamyl (Foliar spraying)	160.3	111.7	155.1	166.7	130.3	120.8
Oxamyl (Soil drench)	180.1	123.2	170.3	177.4	145.1	138.7
Oxamyl (Two applied)	205.4	166.1	195.2	205.8	170.2	154.8
Jojoba (Foliar spraying)	175.2	125.1	165.0	181.4	140.2	142.1
Jojoba (Soil drench)	193.1	130.6	185.1	190.8	160.3	147.5
Jojoba (Two applied)	210.2	178.8	200.3	209.7	175.4	164.2
Neam (Foliar spraying)	170.1	118.0	160.4	168.0	135.2	131.8
Neam (Soil drench)	180.4	121.8	169.1	174.6	145.1	137.6
Neam (Two applied)	200.3	158.3	189.2	193.3	164.3	150.5
Control	140.2	100.7	140.3	144.8	110.2	103.6
New LSD at (0.05)	**6.1**	**4.5**	**2.8**	**2.5**	**6.1**	**3.2**
	Second season					
Oxamyl (Foliar spraying)	165.1	131.7	160.4	167.8	140.2	110.1
Oxamyl (Soil drench)	186.0	143.2	180.1	179.1	154.3	138.3
Oxamyl (Two applied)	209.3	195.1	205.4	205.0	181.1	176.0
Jojoba (Foliar spraying)	181.4	145.3	175.2	184.2	150.3	140.2
Jojoba (Soil drench)	196.4	151.1	193.1	193.4	163.1	147.3
Jojoba (Two applied)	215.1	185.4	210.2	207.0	187.4	155.1
Neam (Foliar spraying)	176.0	140.3	170.1	170.2	148.8	131.3
Neam (Soil drench)	186.3	144.8	180.3	176.0	158.2	138.6
Neam (Two applied)	207.2	168.1	200.4	195.1	173.4	150.4
Control	141.4	105.3	143.2	150.4	115.3	100.3
New LSD at (0.05)	**5.2**	**6.3**	**3.0**	**2.8**	**5.5**	**2.8**

The effect of the conducted treatments on leaf pigments was significantly evident only with chlorophyll A. This effect was attributed to the twice application of jojoba or neem oils or Oxamyl 24%L (a nematicide) as compared to control in both seasons for the three cultivars under study (Table 12).The values of chlorophyll A (mg/g F.W.) ranged from (0.39 to0.54)&(0.58to 0.74) for superior, from (0.35 to 0.63) & (0.45 to 0.82) for flame seedless and from (0.25 to 0.40) & (0.27 to 0.49) for crimson in the two seasons respectively.

TABLE 12. Effect of two medicinal plant oils and a nematicides on Leaf photosynthetic pigments of Superior, Flame Seedless and Crimson Seedless grapevines .

Treatments	Suprior			Flame seedless			Crimson		
	First season								
	Chl. (A) Mg/g	Chl. (B) Mg/g	Carotin Mg/g	Chl. (A) Mg/g	Chl. (B) Mg/g	Carot. Mg/g	Chl. (A) Mg/g	Chl. (B) Mg/g	Carotin Mg/g
Oxamyl (Foliar spraying)	0.40	0.21	0.20	0.41	0.21	0,21	0.32	0.18	0.19
Oxamyl (Soil drench)	0.44	0.22	0.21	0.50	0.22	0.24	0.36	0.20	0.21
Oxamyl (Two applied)	0.54	0.26	0.25	0.63	0.24	0.30	0.40	0.23	0.24
Jojoba (Foliar spraying)	0.44	0.23	0.22	0.52	0.22	0.26	0.37	0.21	0.22
Jojoba (Soil drench)	0.45	0.24	0.22	0.60	0.23	0.28	0.38	0.22	0.23
Jojoba (Two applied)	0.53	0.25	0.24	0.62	0.24	0.29	0.38	0.24	0.24
Neam (Foliar spraying)	0.40	0.21	0.20	0.51	0.21	0.22	0.35	0.19	0.20
Neam (Soil drench)	0.41	0.21	0.21	0.50	0.21	0.23	0.36	0.19	0.21
Neam (Two applied)	0.53	0.24	0.22	0.61	0.23	0.29	0.38	0.22	0.23
Control	0.39	0.20	0.18	0.35	0.18	0.20	0.25	0.17	0.18
New LSD at (0.05)	**0.10**	N.S.	N.S.	**0.11**	N.S.	N.S.	**0.05**	N.S.	N.S.
	Second season								
Oxamyl (Foliar spraying)	0.61	0.20	0.21	0.63	0.21	0.22	0.42	0.19	0.20
Oxamyl (Soil drench)	0.62	0.23	0.22	0.72	0.23	0.24	0.45	0.20	0.21
Oxamyl (Two applied)	0.74	0.28	0.25	0.73	0.25	0.29	0.48	0.22	0.23
Jojoba (Foliar spraying)	0.64	0.24	0.23	0.71	0.23	0.27	0.47	0.21	0.22
Jojoba (Soil drench)	0.65	0.26	0.23	0.80	0.24	0.29	0.48	0.21	0.23
Jojoba (Two applied)	0.72	0.27	0.25	0.82	0.25	0.29	0.49	0.22	0.24
Neam (Foliar spraying)	0.60	0.22	0.21	0.71	0.20	0.23	0.45	0.19	0.20
Neam (Soil drench)	0.62	0.23	0.22	0.72	0.20	0.24	0.47	0.20	0.21
Neam (Two applied)	0.73	0.25	0.23	0.83	0.21	0.29	0.48	0.22	0.23
Control	0.58	0.20	0.18	0.45	0.19	0.21	0.27	0.18	0.19
New LSD at (0.05)	**0.11**	N.S.	N.S.	**0.16**	N.S.	N.S.	**0.03**	N.S.	N.S.

Economical justification on two medicinal oils and a nematicide compared with control (No applied)

It can be shown from the data presented in (Table 13) that combined application (Foliar spraying and soil drench) of jojoba or neem oils (as the best treatments and the highest safe) gave the maximum net profit followed by oxamyl 24% L (a nematicide) (as the lowest safe) while, control recorded that the lowest in productivity in both seasons for the three cultivars. The moderate rise in the cost of production / feddan in these materials is economically justified in view of the higher price of the yield in these materials.

In conclusion, it is very difficult to eradicate nematodes and virus completely from the invested vineyards. Therefore, nematicides must be used periodically. As such it can be stated that twice application (Foliar spraying and soil drench) of jojoba or neem oils which are considered more safety materials compared with oxamyl 24% (a nematicide) which is considered the lowest safety material, in addition to, they achieved the best yield and its components as well as the best physical properties of bunches, improved the physical and chemical characteristics of berries and ensured the best vegetative growth parameters in comparison with control.

TABLE 13. Economical justification on some natural extracts and chemical compounds compared with control.

Treatments	Suprior				Flame seedless				Crimson			
	First season											
	Control	Neam	Jojoba	Oxamyl	Control	Neam	Jojoba	Oxamyl	Control	Neam	Jojoba	Oxamyl
Material (Litre)	6	6	6	---	6	6	6	---	6	6	6	---
Price of the material (L.E.)	720	180	300	---	720	180	300	---	720	180	300	---
Labours cost (L.E.)	100	100	100	---	100	100	100	---	100	100	100	---
Cost of cultural practices (L.E.)	900	900	900	900	900	900	900	900	900	900	900	900
Total cost (L.E.)	1720	1180	1300	900	1720	1180	1300	900	1720	1180	1300	900
Increase of the total cost over control (L.E.)	820	280	400	---	820	280	400	---	820	280	400	---
Yield (Kg)	4973	7484	5796	1680	7182	9660	8618	1890	6451	7224	7056	2461
Increase of the yield over control (Kg)	3293	5804	4116	---	5292	7770	6728	---	3990	4763	4595	---
Yield (L.E.)	3978	5988	4637	1344	5746	7728	6895	1512	5161	5779	5645	1969
Price of increase in yield over control (L.E.)	2634	4644	3293	---	4234	6216	5383	---	3192	3810	3676	---
The net profit (L.E.)	2258	4808	3337	444	4026	6548	5595	612	3441	4599	4345	1069
The net profit (L.E.) over control (L.E.)	1814	4364	2893	---	3414	5936	4983	---	2372	3530	3276	---

Discussion

The present results indicate that *Rotylenchulus reniformis*, *Tylenchulus semipenetrans* and *Xiphinema americanum* were found to be associated with grapevine in Egypt. Their association and population density are governed by different grapevine cultivars under study. These results agree with those of Moussa *et al.* (1983) and Al-Sayed *et al.* (2001).

Also, two commercial products containing jojoba and neem medicinal oils were effective in managing *Rotylenchulus reniformis*; *Tylenchulus semipenetrans* and *Xiphinema americanum* in soil and roots of three cultivars of grapevines. These results agree by Akhtar & Mahmood (1993), Abd-El-gawad & Omar (1995), El-Nagdi & Mansour (2003) and El-Nagdi (2005). The nematicidal effect of the tested oils may possibly be attributed to their high contents of certain nematicidal compounds such as oxygenated compounds which are characterized by both their lipophitic properties which enable them to dissolve the cytoplasmic membrane of nematode cells and their functional groups interfering with the nematode enzyme protein structure (Knoblock *et al.*, 1989). In addition, some of the recent hypotheses concerning mechanisms of action of plant oils include denaturing and degrading of enzyme action, and interference with electron flow in the respiratory chain or with adenosine diphosphate phosphorylation (Konstantopoulou *et al.*, 1994).

As for the characteristics of berries, utilization of medicinal oils (jojoba oil or neem oil) and a nematicide (oxamyl 24% L) increased T.S.S & T.S.S/acid ratio, while depressed acidity compared to control. This may be due to addition of oil extract or oxamyl improved the absorption of water and elements from soil and this reflects on bunch quality, yield and increased T.S.S & T.S.S/acid ratio (Nicol *et al.*, 1999).

Briefly, the obtained results revealed that growth vigor (shoot length – leaf area) were clearly affected by studied nematodes and virus which reduced the shoot length by reducing the inter node length as a result of nematodes injury to the roots(Anwar 1986)and improved these criteria by using two medicinal oils and a nematicide. This results agree with (Akopyan 1987, Melakeberhan & Ferris 1989 and Kesba 1999).

The effect of nematode injury on leaf photosynthetic pigments might be due to the lower ability of injured roots to absorb enough quantities of such elements as nitrogen, zinc, iron and magnesium, necessary for pigments synthesis. Literature reports on the effect of nematode infection on leaf pigments are very rare. However, the obtained results agreement with Melakeberhan and Ferris (1989).

Serological tests, such as ELISA provide rapid and convenient methods for the identification and estimation of plant viruses in leaves (Clark & Adams, 1977; Ramsdell *et al.*, 1979; Németh, 1986 and Esmenjaud *et al.*, 1993).

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تقييم استخدام بعض الزيوت النباتية والمبيد النيماتودي لمكافحة النيماتودا الخنجرية الناقلة للفيروس على بعض أصناف العنب

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أجرى هذا البحث تحت ظروف الحقل لمعرفة ارتباط بعض أنواع النيماتودا نباتيا والفيروسات النمتشرة علي سبعة عشر صنفا من عنب المائدة ومكافحة أهم أنواع النيماتودا المتطفلة أو المرتبطة بتربة وجذور عنب المائدة وكذلك أهم الفيروسات النباتية علي ثلاث أصناف من العنب (السوبيريور، الفليم سيدلس، الكريمسون سيدلس) وتأثير ذلك علي الإنتاج كما ونوعا والتكلفة الاقتصادية.

تم إجراء التجربة خلال موسمى (٢٠٠٦، ٢٠٠٧) على كرمات عمرها إثنتا عشر عاما مزروعة فى تربة طينية طميية تروى بنظام الرى السطحى ، على مسافات ٢x٢,٥ متر تحت نظام التدعيم شكل Y. وقد تم تقليم كرمات عنب السوبيريور والكريمسون سيدلس بالتقليم القصبى مع ترك ٦٠ عين/كرمة بينما عنب الفليم سيدلس تم تقليمها بالتقليم الكردونى مع ترك ٤٠ عين/كرمة وذلك فى الأسبوع الثالث من يناير. وتم إجراء المعاملات باستخدام زيت الجوجوبا (٥٪) وزيت النيم (٢٪) بالمقارنة بالمبيد النيماتودا أوكساميل ٢٤٪ سائل وهذه المركبات السابقة تم إضافتها اما رش ورقى أو إضافة للتربة أو كلاهما في بداية موسم النمو (مارس ٢٠٠٦). وبناء علي نتائج التجربة اعتبرت بعض الأصناف حساسة وبعضها شديد الحساسية بإصابتها بثلاث أنواع من النيماتودا المنتشرة بالمزرعة وهي *Rotylenchulus reniformis*; *Tylenchulus semipenetrans* and *Xiphinema americanum* وعلاقتها بنقل الأمراض الفيروسية. وأيضا أظهرت النتائج أن أصناف العنب منتشر عليها ٥ أنواع من الفيروسات النباتية بأستخدام أختبار الأليزا وهى الورقة المروحية فى العنب و التبقع الحلقى للأشجار حجرية النواةوالتبقع الحلقى فى الطماطم و الأرابيس موزايك فيروس و فيروس تقزم وموزايك الخوخ وذلك على ١٧ صنف من أصناف العنب المنزرعة فى مزرعة معهد البساتين التابعة لمركز البحوث الزراعية بالجيزة وبالتالى تم التعرف على أكثر هذه الأمراض إنتشارا وأكثر الأصناف حساسية وفقا للأصابة الطبيعية. وأشارت النتائج الى أن أكثر الأمراض الفيروسية إنتشارا هو فيروس الورقة المروحية فى العنب وأكثر الأصناف أصابة بالأمرا ض الفيروسية هو صنف الرومى الأحمر. وقد أشارت نتائج الدراسة أن زيت النيم عند استخدام (معاملة رش ورقي + معاملة التربة) هو أكثر تأثير علي أنواع النيماتودا السابقة بالمقارنة بزيت الجوجوبا. كما أشارت نتائج الدراسة إلى أن إضافة الزيوت النباتية "زيت الجوجوبا" أو " زيت النيم" (رش ورقى وإضافة للتربة) وتمثل المعاملات الأكثر أمنا أفضل مقارنة بالمبيد النيماتودي " أوكساميل ٢٤٪ سائل " الأقل أمنا بالاضافة إلى ذلك قد أعطت أعلى محصول و تحسين الصفات الكيماوية للحبات و أفضل نمو خضرى مقارنة بالكنترول.

الكلمات الدالة : المكافحة ، زيوت نباتية ، النيماتودا المتطفلة نباتيا، الفيروسات النباتية ، أختبار الاليزا ، عنب المائدة.