

IMPACT OF FIVE PLANT EXTRACTS ALONE AND IN COMBINATION WITH OXAMYL ON *Rotylenchulus reniformis* INFECTING TOMATO.

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ABSTRACT

The effect of root dip-treatment with aqueous leaf extracts of pomegranate, *Punica granatum*; olive, *Olea euroba*; castor, *Ricinus communis*; Mango, *Mangifera indica* and peach, *Prunus persica* either alone or integrated with Oxamyl were carried out under greenhouse conditions to compare their effectiveness against *R. reniformis* infecting tomato cv. Strain-B₃ as well as plant growth response. Results illustrated that most treatments proved to be more effective in improving tomato plant growth to certain extent, exceeded that of nematode alone (2.63). *R. communis* integrated with Oxamyl treatment proved to be the best in promoting the fresh weight of the whole plant followed by *R. communis* alone, *P. granatum* + Oxamyl and then *M. indica* plus Oxamyl treatment. Their percentages of increase were 63.56 %, 63.14 %, 55.08 % and 54.66 %, respectively. All treatments showed significant reduction in total number of reniform nematode in soil and roots of tomato with rate of nematode build-up ranged from 0.180 for Oxamyl to 0.256 for *P. persica*. Egg-masses numbers of *R. reniformis* on tomato plant were significantly reduced in all treatments as compared with nematode alone.

Keywords: Tomato (*Lycopersicon esculentum*), pomegranate, olive, castor, Mango, peach, plant extracts, Oxamyl, *R. reniformis*.

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill) is one of the major vegetable crops cultivated in Egypt. The reniform nematode, *Rotylenchulus reniformis* (Linford & Oliveira) has been recognized as a major soil nematode pest that causing serious injury to tomato in temperate and tropical regions.

Chemical control of *R. reniformis* has successfully limited the influence of this nematode below damaging levels (Reddy & Khan, 1982; Lawrence *et al.*, 1990 and Sipes *et al.*, 1992). However, due to the environmental pollution caused by applying nematicides and according to the resulted hazards, efforts have been devoted to create new methods for nematode management. Biological control using extracts of medicinal, ornamental or wild plants have been reported to be toxic to many plant parasitic nematodes (Ponte, 1988; Bansode & Kurundkar, 1989; Dash & Padhi, 1990; Siddiqui & Husain, 1990; Mojumder & Mishra, 1991-a,b; Anver & Alam, 1992; Hassan, 1992; Salawu, 1992; Hashim, 1993; El-Shalaby, 1994 and Khalil, 1996, 2000). On the other hand, previous research had demonstrated the effectiveness of root dip treatment with plant extracts on nematode management (Husain *et al.*, 1984; Siddiqui & Alam, 1988; Akhtar & Alam, 1990; Abid & Maqbool, 1991 and Khalil, 1996). However, no available

information has concerned the effect of root dip treatment with plant extracts integrated with nematicides on reniform nematode management.

Therefore, the present study was carried out to determine the effect of bare root dip treatment with certain plant extracts singly or integrated with Oxamyl on tomato infecting with *R. reniformis*, and its rate of reproduction under greenhouse conditions.

MATERIALS AND METHODS

Preparation of aqueous leaf extracts:

Fresh leaves of five ornamental and fruit plants were collected and transferred to nematology laboratory for extraction. The tested plants were pomegranate, *Punica granatum*; olive, *Olea euroba*; castor, *Ricinus communis*; mango, *Mangifera indica* and peach, *Prunus persica*.

Standard leaf extracts were prepared by crushing and dissolving 20 g of leaves in 100 ml distilled water separately using mortar and pestle. The result solution was then centrifuged at 5000 rpm for five minutes. The supernatant was filtered through a layer of muslin cloth, and dilution of 5 % was prepared from each standard.

Roots of tomato seedlings (*Lycopersicon esculentum*, Mill) cv. strain-B3 at 45 days old were washed free from soil with distilled water and dipped separately for 30 minutes in the previous aqueous leaf extracts. Tomato seedlings were then transplanted in 10-cm d. plastic pots containing 250 g steam sterilized sandy loam soil (1:1). Vydate (Oxamyl) as nematicide was also used alone at the recommended dose (0.03 gm) or integrated with plant extracts at its half recommended dose. All components were added consequently. Simultaneously, following the application of plant extracts alone or in combination with Oxamyl pots were inoculated with 2000 4th stage larvae (immature female) of *R. reniformis*. Inocula were obtained from a pure culture of *R. reniformis* propagated on pigeon pea, *Cajanus spp.* in greenhouse conditions. Inoculated seedlings free of extracts or Oxamyl were served as control. Pots neither treated with nematodes nor extracts were also included.

Treatments were as follows:

- | | |
|---------------------------------------|------------------------------|
| 1- N + pomegranate, | 2- N + pomegranate + Oxamyl, |
| 3- N + olive, | 4- N + olive + Oxamyl, |
| 5- N + castor, | 6- N + castor + Oxamyl, |
| 7- N + mango, | 8- N + mango + Oxamyl, |
| 9- N + peach, | 10- N + peach + Oxamyl, |
| 11- N + Oxamyl, | 12- N alone (control), and |
| 13- Plant free of N or any treatment. | |

Each treatment was replicated four times. Pots were randomly arranged on a greenhouse bench at 28 ± 5 °C. Plants were received water as needed. After forty five days from inoculation plants were harvested. Data dealing with length and fresh weights of shoot and root were recorded. Shoot dry weights were also measured. Vermiform stages of *R. reniformis* were extracted from soil by sieving and modified Baerman technique (Goodey, 1957). Roots were stained in hot acid fuchsin in lactic acid and examined for number of nematodes stages, and egg-masses. Data were also subjected to analysis of variance (ANOVA) (Gomez and Gomez, 1984) and means were

compared by Duncan's multiple-range test (Duncan, 1955). This work was undertaken in the greenhouse of Tag El-ez, Research Station, Tag El-ez, Temai El-Amdeed, Dakahlia Governorate, Egypt.

RESULTS AND DISCUSSION

Data in Table (1) represented the effect of root dip-treatment with aqueous leaf extracts of *P. granatum*, *O. euroba*, *R. communis*, *M. indica* and *P. persica* either alone or integrated with Oxamyl on plant growth response of tomato cv. Strain-B3 infected with *R. reniformis*. It is evident that most treatments proved to be more effective in improving tomato plant growth to certain extent, exceeded that of nematode alone.

Concerning fresh weight of the whole tomato plant as affected by *R. reniformis* infection, a high percentage of increase was recorded with concomitant treatments using two components tested as compared with nematode or any component alone.

R. communis integrated with Oxamyl treatment proved to be the best in improving the fresh weight of the whole tomato plant followed by *R. communis* alone, *P. granatum* + Oxamyl and then *M. indica* plus Oxamyl treatment. The percentages of increase were 63.56 %, 63.14 %, 55.08 % and 54.66 %, respectively. Similar results was noticed with shoot dry weight with values of 80.00 %, 76.67%, 66.67% and 66.67%, respectively (Table 1). However, significant difference for those plant growth parameter was also noticed between most treatments as compared with nematode alone (Table 1).

Data presented in Table (2) indicated that all treatments showed significant reduction in total number of reniform nematode in soil and roots of tomato plant with rate of nematode build-up ranged from 0.180 for Oxamyl to 0.256 for *P. persica*. However, non significant differences were obtained between most treatments.

Moreover, the highest reduction in nematode population density was achieved with Oxamyl (88.14 %) followed by the concomitant application of *R. communis* plus Oxamyl (88.05%) with rate of nematode build-up 0.182. However, *P. persica* treatment gave the least value of nematode population density reduction (83.17 %), with the highest rate of nematode build-up (0.256).

It is worth to note that concomitant application using two components, especially the treatment of castor plus Oxamyl showed better reduction in nematode population densities than single application.

Concerning egg-masses numbers of *R. reniformis* on tomato plant a significant suppression was obtained by all treatments as compared with nematode alone (Table 2).

From the previous results it can be concluded that most treatments improved tomato growth as well as suppressed nematode population. *R. communis* either singly or integrated with Oxamyl that performed the best in improving plant growth of tomato as well as suppressing nematode population.

Table (1): Influence of five plant extracts singly or in combination with Oxamyl on the growth of tomato, cv. Strain-B₃ infected with *R. reniformis* under greenhouse conditions at 28± 5 °C.

Treatments	Plant growth response*									
	Length (cm)		Fresh weight (g)		Fresh Wt. of the whole plant (g)	increase %	Shoot dry* weight (g)	Increase* %		
	Shoot	Root	Shoot	Root						
<i>P. granatum</i>	17.92 de	10.93 be	2.79 abc	0.80 cd	3.59	52.12	0.48 cde	60.00		
<i>P. granatum</i> + Oxamyl	18.08 de	11.08 b	2.84 ab	0.82 cd	3.66	55.08	0.50 abc	66.67		
<i>O. euroba</i>	17.75 def	10.77 bc	2.66 cde	0.75 de	3.41	44.49	0.45 de	50.00		
<i>O. euroba</i> + Oxamyl	17.95 de	10.82 bc	2.74 bcd	0.75 de	3.49	47.88	0.47 cde	56.67		
<i>R. communis</i>	18.85 bc	12.07 a	2.82 ab	1.03 a	3.85	63.14	0.53 ab	76.67		
<i>R. communis</i> + Oxamyl	19.95 a	12.48 a	2.93 a	0.93 b	3.86	63.56	0.54 a	80.00		
<i>M. indica</i>	18.50 cd	11.82 a	2.78 bc	0.84 c	3.62	53.39	0.49 bcd	63.33		
<i>M. indica</i> + Oxamyl	19.38 ab	12.10 a	2.81 ab	0.84 c	3.65	54.66	0.50 abc	66.67		
<i>P. persica</i>	17.30 ef	10.07 d	2.51 f	0.70 e	3.21	36.02	0.45 de	50.00		
<i>P. persica</i> + Oxamyl	17.38 ef	10.25 cd	2.57 ef	0.71 e	3.28	38.98	0.47 cde	56.67		
Oxamyl	17.08 f	10.43 bcd	2.58 ef	0.82 cd	3.40	44.07	0.43 e	43.33		
Nematode alone	14.88 g	9.25 e	1.74 g	0.62 f	2.36		0.30 f			
Plant free of nematode	17.85 def	10.57 bcd	2.63 def	0.77 cde	3.40	44.07	0.45 de	50.00		

* Each value presented the mean of four replicates.
Means in each column followed by the same letter did not differ at < 0.50 according to Duncan's multiple-range test.

Table (2): Rate of build-up and egg-masses numbers of *R. reniformis* infecting tomato, cv. Strain-B₃, as affected by certain plant extracts singly or in combination with Oxamyl under greenhouse conditions 28± 5 °C.

Treatments	Nematode population in *				Total	Rate of build-up	Reduction %	Egg-masses*
	Soil	Root		Females				
		Developmental stage						
<i>P. granatum</i>	445.00 bc	21.50 b	21.00 b	485.00 b	0.243	84.05	7.50 bcd	
<i>P. granatum</i> + Oxamyl	405.00 bcd	18.50 bed	19.00 b	442.50 bc	0.221	85.44	6.75 bcde	
<i>O. euroba</i>	452.50 b	21.25 bc	20.00 b	493.80 b	0.247	83.76	8.25 bc	
<i>O. euroba</i> + Oxamyl	437.50 bc	19.75 bc	19.25 b	476.50 b	0.238	84.33	7.50 bcd	
<i>R. communis</i>	422.50 bcd	16.25 bcd	13.50 c	452.30 bc	0.226	85.12	6.00 cde	
<i>R. communis</i> + Oxamyl	342.50 cd	12.00 d	8.75 d	363.30 c	0.182	88.05	4.25 e	
<i>M. indica</i>	422.50 bcd	18.50 bcd	17.00 bc	458.00 bc	0.229	84.93	6.50 bcde	
<i>M. indica</i> + Oxamyl	377.50 bcd	14.25 bcd	13.00 c	404.80 bc	0.202	86.68	5.25 de	
<i>P. persica</i>	470.00 b	21.00 bc	20.50 b	511.50 b	0.256	83.17	9.00 b	
<i>P. persica</i> + Oxamyl	472.50 b	18.25 bcd	17.25 bc	508.00 b	0.254	83.29	8.00 bcd	
Oxamyl	330.00 d	14.00 cd	16.50 bc	360.50 c	0.180	88.14	5.50 cde	
Nematode alone	2875.00 a	84.25 a	80.75 a	3040.00 a	1.520	0.00	25.75 a	

* Each value presented the mean of four replicates.

Means in each column followed by the same letter did not differ at < 0.50 according to Duncan's multiple-range test.

These results support the findings of Siddiqui and Alam (1988) who stated that the root galling and population of *R. reniformis* on tomato and aubergine were gradually decreased as the concentration of extracts or root duration increased. Results of Akhtar and Alam (1990) in respect to castor on root-knot infecting tomato support also the present findings. These findings are also in agreement with those of Khalil (1996) who found that bare root dip treatment of tomato resulted significant reduction in *R. reniformis* wherever in soil or root as the concentration of oleander or periwinkle and clerodendron increase.

In conclusion, the effectiveness of bare root dip treatment with such plant extracts alone or in combination with Oxamyl in suppressing nematode population of *R. reniformis* as well as improving tomato growth indicated their promise use as a tool in nematode management.

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مدى تأثير خمس مستخلصات نباتية بمفردها أو مخلوطة مع مبيد الأوكساميل على النيماطودا الكلوية "روتيلنكيولس رينوفورمس" التي تصيب نباتات الطماطم.

أشرف السعيد محمد خليل

معهد بحوث أمراض النباتات - مركز البحوث الزراعية - الجيزة

استخدمت المستخلصات النباتية للزيتون والخروع والمانجو والخوخ منفردة أو مخلوطة مع مبيد الأوكساميل عند نصف الجرعة الموصى بها لدراسة مدى قدرة تأثيرها على تعداد النيماطودا الكلوية التي تصيب بادران الطماطم صنف استرين - 3 وكذا مدى تأثيرها على حالة نمو النبات تحت ظروف الصوبة عند درجة حرارة 28 ± 5 مئوية. وقد أسفرت النتائج عن الآتي:-

- أن معظم المعاملات حققت تحسنا ملحوظا في نمو نباتات الطماطم بالمقارنة بمعاملة النيماطودا فقط (٢,٣٦).

- لقد سجلت معاملة الخروع والمبيد معا أعلى نسبة زيادة في الوزن الكلي للنبات عن النباتات المصابة بالنيماطودا فقط (الكنترول) (٦٣,٥٦%) يليها معاملة الخروع فقط (٦٣,١٤%) ومعاملة الزمان والمبيد معا (٨٨,٠٨%) ثم معاملة المانجو والمبيد معا (٥٤,٦٦%).

- أن جميع المعاملات سجلت إنخفاضا معنويا في تعداد النيماطودا الكلي وذلك بمعدل تكاثر للنيماطودا يتراوح ما بين (٠,١٨٠) لمعاملة المبيد فقط إلى (٠,٢٥٦) لمعاملة الخوخ بمفردها.

- لقد حققت جميع المعاملات إنخفاضا معنويا في تعداد كتل البيض.