EFFECT OF *MELOIDOGYNE INCOGNITA* INOCULUM LEVELS ON SOME DATE-PALM CULTIVAR SEEDLINGS

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Abstract

Studies on the influence of different inoculum levels of *Meloidogyne incognita* infecting date-palm cvs. Zaghlool, Deglet Noor and Samani. Results revealed that nematode final population was positively correlated with the initials used. However, the rates of nematode build-up decreased by increasing the inoculum levels. Data showed that of each cultivar growth was as indicated by length and weight of both shoots and roots affected by increasing inoculum levels tested according to rate of cultivar susceptibility.

Key words: date-palm cultivar seedlings, inoculum levels, *Meloidogyne incognita*

INTRODUCTION

Date-palm, *Phoenix dactylifera* L., is a crop of dry subtropical zones. In Egypt, there are 11 million date-palm trees grown in about 860.083 Feddan. Egyptian date productivity is about 101.7 kg/tree in 2005 (Anonymous, 2006). Date-palm trees are economically and socially important especially in the Arab world where they are considered an essential part of tradition of the people.

Numerous nematode pests have been reported to attack the date-palm roots, some of them are more important and cause considerable damage to the plants especially in their early stages (Eissa *et al.*, 1998 a&b). The root-knot nematodes, *Meloidogyne* spp., are considered the serious date-palm nematode pests. They are endoparaditic form capable of reproducing not only on date-palm trees but also on a wide variety of host plants. In USA, Buhrer *et al.*, 1933, Jensen, 1961, Lehman ,1991 found *Meloidogyne javanica* infecting roots of *Phoenix dactylifera* L. Lamberti and Greco (1977) studied the pathogenic effect of 3 populations of *Meloidogyne incognita* from Algeria. Eissa *et al.*, (1979) Found that *Meloidogyne* spp. associated with date palm in Saudia Arabia. In Libya, El-Zarug *et al.* (1986). Carpenter (1988) listed *Meloidogyne arenaria, M. hapla, M. javanica* and *M. incognita* in association with date-palm plantation.

In Egypt, Oteifa *et al.* (1970) stated that *Meloidogyne arenaria* and *M. javanica* were fair parasites on date-palm, on the other hand, *Meloidogyne incognita* and *M. incognita acrita* were good parasites. Kheir *et al.*, (1982), Youssef & Eissa (1994) and El-Nagdi (1997) found that *M. incognita* is the predominant species on date palm.

MATERIALS AND METHODS

a-Influence of different inoculum levels of *M. incognita* on Zaghlool, Deglet Noor and Samani cultivars

Date-palm seeds cvs Zaghlool, Deglet Noor (Tunisian source) and Samani were prepared and planted as previously mentioned. Four different inoculum levels of *M. incognita* were introduced to the 4-weeks-old seedlings of each cultivar grown in 20 cm depth clay pots. The inoculum levels were 0, 50, 500 and 5000 newly hatched *M. incognita* larvae/plant. For each inoculum level four replicates were planted. Inoculation was made by pipetting the proper aliquot into three holes around the root system of each seedling. All pots were kept in a greenhouse at 30±5°C in a complete randomized block design and agronomically treated the same. After four months from inoculation time, the experiment was terminated and plants were uprooted and data on plant growth criteria and nematode populations were determined.

b. Bioassay of nematode and plant growth

At the end of each experiment, the soil of each pot was soaked in a plastic pan half-filled with water. The plants were taken off and the roots were washed and cleaned from the adhering soil particles. The soil-water suspension was quantitatively processed for nematode extraction by a means of centrifugal-floatation technique (Jenkins, 1964). Number of juveniles was determined from each pot under a light microscope using a Hawksley counting slide. After weighing and measuring roots of each plant roots were cut off and stained by acid fuchsin lactophenol (Franklin and Goodey, 1949). Numbers of galls (G), developing larva stages (D.S.), females (F) and egg-laying females (E.F.) per root system were estimated. Rate of build-up was calculated according to the following formulae (Oostenbrink, 1966):

$$\text{Rate of build-up (R.B.)} = \frac{\text{Total final counts of nematodes in root and soil } (P_F)}{\text{Initial count of nematodes used for inoculation } (P_i)} \times 100$$

RESULTS

Population build-up and reproduction of *Meloidogyne incognita* on three date-palm cultivars as influenced by initial population levels

In this study, initial populations of approximately, 0, 50, 500 and 5000 newly-hatched larvae of *M. incognita* were used to inoculate the three date-palm cultivars, Zaghlool, Deglet Noor and Samani. Results showed that the number of final developmental stages and egg-laying females in three cultivars were positively correlated with the initial population level (Table 1). Also, number of larvae in the soil increased on cultivar Zaghlool with each increase in the initial population up to the level 500/plant after which it decreased. Soil population on the two other cultivars increased gradually with the increase in initial population. Moreover, final population was generally less than that of the initial with these two cultivars.

On the contrary, the rates of nematode population build-up on all cultivars were negatively correlated with the increased initial population. In this respect, the rate of build-up was always at its maximum with lowest initial inoculum (50/plant). After which it decrease gradually.

Effect of inoculum levels of *Meloidogyne incognita* on date-palm growth

a. Growth response of Zaghlool cultivar as influenced by different *M. incognita* inoculum levels

Data in plant growth obtained from the inoculum level experiment, based on length and weight of both shoots and roots were recorded. It is obvious from Table (2) that the growth of the infected plants was greatly affected by the nematode infection. The growth parameters of both shoot and root of plants in all nematode-inoculated treatments were less than those of non-inoculated ones. Statistically the number of leaves and root dry weights of all inoculated plants were significantly ($P < 0.05$ and 0.01, respectively) affected. On the other hand, no significant differences in shoot/root lengths and shoot dry weights between all nematode treated plants. Percent growth reduction was positively correlated with inoculum levels (Table 2).

b. Growth response of Deglet Noor cultivar as influenced by different *M. incognita* inoculum levels

Plant growth response of Deglet Noor to the different inoculum levels of *M. incognita* was also estimated (Table 3). Data revealed that nematode infection caused significant reduction ($P = 0.05$) in shoot length at inoculum levels of 50 and 5000 larvae/plant. Significant reduction ($P = 0.05$) in shoot dry weight was recorded at

inoculum level of 500 larvae/plant. Also, significant reduction was attained in root length at 50 and 5000 larvae/plant. On the other hand, no significant differences were recorded between treatments in number of leaves or root dry weight. The reduction in dry weight of both shoot and root, to some extent, was proportional to the inoculum level. However, the highest percentage of reduction in such growth parameters was significantly obtained by using 500 larvae/plant.

c. Growth response of Samani cultivar as influenced by different *M. incognita* inoculum levels

The influence of the previously mentioned inoculum levels of M. incognita on the growth criteria of Samani cultivar was also determined (Table 4). It is clearly noticed that the nematode infection suppressed both shoot and root growth of the plants. However, significant growth differences could be noticed between treated and untreated control plants. The decrease in shoot dry weight caused at inoculum levels of 50, 500 and 5000 larvae/plant. The rate of growth reduction though not significant was greatly correlated with the initial inoculum level used.

DISCUSSION

Initial population density is an important factor affecting nematode development and reproduction. There was a positive correlation between initial population and final population of root-knot nematode (*M. incognita*) on date-palm cvs. Zaghlool, Deglet Noor and Samani. Namely, as the nematode initial population increased, the final population increased, but the rate of nematode reproduction decreased gradually. Therefore, the rate of nematode population increase is not always positively correlated with the initial population density which confirms previous results (Lamberti & Greco, 1977). This may be attributed to over crowding of nematodes on a given feeding site.

With respect to plant growth response as influenced by the initial population, the obtained results indicated, in general, that all used levels of the root-knot nematode (*M. incognita*) on date-palm cvs. Zaghlool, Deglet Noor and Samani exhibited a reduction in plant growth parameters which was proportional to the inoculum level.

Table 1. Population development of *Meloidogyne incognita* on date-palm cultivars as influenced by initial population

Cultivars	Pi	Pf				Rate of build-up Pf/Pi
		Developmental stages	Egg-laying females	No. of larvae in soil	Total	
Zaghlool	50	17	17	313	347	6.9
	500	39	48	1583	1670	3.3
	5000	58	50	608	716	0.14
Deglet Noor	50	13	19	30	62	1.20
	500	34	20	146	200	0.4
	5000	31	30	558	619	0.12
Samani	50	11	9	0	20	0.4
	500	14	13	105	132	0.3
	5000	13	11	185	209	0.04

* Average of four replicates.

Table 2. Plant growth of date-palm cv. Zaghlool as influenced by different *Meloidogyne incognita* inoculum's levels

Inoculum's	No. of leaves	Shoot				Root			
		Length (cm)	Reduction %	Dry weight (gm)	Reduction %	Length (cm)	Reduction %	Dry weight (gm)	Reduction %
0	5.5	19.2	-	5.1	-	56	-	4.1	-
50	4.5	18	6.25	4.4	13.7	40	28.2	2.9	29.2
500	4.5	17.5	8.85	4.2	17.6	43.2	22.8	2.7	34.1
5000	5	17.7	7.81	4.02	21.17	45.3	19.11	2.3	43.9
L.S.D. at 5%		0.96	N.S. -		N.S. -		N.S. -	0.88 -	
L.S.D. at 1%		1.34	N.S. -		N.S. -		N.S. -	1.24 -	

* Average of four replicates.

Table 3.Plant growth of date-palm cv. Deglet Noor as influenced by different *Meloidogyne incognita* inoculum's levels

Inoculum's	No. of leaves	Shoot				Root			
		Length (cm)	Reduction %	Dry weight (gm)	Reduction %	Length (cm)	Reduction %	Dry weight (gm)	Reduction %
0	5	20.7	-	5.55	-	76.3	-	2.37	-
50	4	17.7	14.4	5.55	-	68.3	10.2	1.85	21.9
500	4	18.3	11.6	5.17	6.85	71.5	6.3	1.62	31.6
5000	4	17.2	16.9	5.45	1.8	64.7	15.2	2.2	7.2
L.S.D. at 5%		N.S.	3.00 -	0.36 -		7.55 -		N.S. -	
L.S.D. at 1%		N.S.	N.S. -	N.S. -		10.60 -		N.S.	

* Average of four replicates.

Table 4. Plant growth of date-palm cv. Samani as influenced by different Meloidogyne incognita inoculum's levels.

Inoculum's	No. of leaves	Shoot				Root			
		Length (cm)	Reduction %	Dry weight (gm)	Reduction %	Length (cm)	Reduction %	Dry weight (gm)	Reduction %
0	5.3	21	-	6.4	-	83	-	2.55	-
50	5.3	20.5	2.4	6.3	1.6	82.7	0.04	2.55	0
500	5	19.7	6.2	5.7	10.9	75	9.6	2.35	7.8
5000	5	20.2	3.8	5.6	12.5	72.9	12.2	2.23	12.5
L.S.D. at 5%		N.S.	N.S. -	0.48	-		N.S. -		N.S. -
L.S.D. at 1%		N.S.	N.S. -	0.67	-		N.S. -		N.S. -

* Average of four replicates.

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تأثير مستويات عدوي مختلفة لبادرات بعض أصناف نخيل البلح بأفة نيماتودا تعقد الجذور *ميلودجين أنكوجنيتا*

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تم دراسة تأثير مستويات عدوي مختلفة من نيماتودا تعقد الجذور *ميلودجين أنكوجنيتا* علي تطور وتكاثر هذة النيماتودا علي ثلاث أصناف من بادرات نخيل البلح (زغلول-دقلة نور-سماني). وكذلك دراسة تأثير هذة المستويات علي النمو الخضري والجذري لبادرات نخيل البلح.

فقد أظهرت دراسة تأثير المستويات العدوي المختلفة علي بادرات نخيل البلح أن الكثافة النهائية بالعدوي ليرقات نيماتودا تعقد الجذور تقل بزيادة كثافة العدوي.وكذلك كثافات نيماتودا تعقد الجذور المستخدمة أثرت علي النمو الخضري للبادرات متمثلا في خفض الأوزان الجافة والأطوال للنمو الخضري والجذري وكذلك عدد الأوراق وذلك طبقا لحساسية الصنف المختبر.

الكلمات الدالة: أصناف نخيل البلح،مستويات عدوي ، نيماتودا تعقد الجذور