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SURVEY OF PLANT PARASITIC NEMATODES GENERA ASSOCIATED WITH SUGAR BEET PLANTATIONS IN DAKAHLIA GOVERNORATE.

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ABSTRACT

A survey of plant parasitic nematodes genera associated with the rhizosphere of seven sugarbeet cvs. Kawemira, Monte-bionco, Deprez-poly N, Sultan, Nejama, Athos-poly and Farida grown at five counties of Dakhlia governorate (Egypt) was carried out during the sugar beet growing season 2007/2008/2009. Nine nematode genera were recorded in the surveyed sugar beet fields. Based on their frequency of occurrence , these genera can be arranged in ascending order as follows : *Meloidogyne* (J2) (22.6%) , *Trichodorus* (19.8%), *Hirschmanniella* (13.4%), *Helicotylenchus* (10.4%), *Tylenchus* (6.5%), *Pratylenchus* (4.7%), *Dorylaimus* (3.4%), *Rotylenchulus* (1.7%), and *Tylenchorhynchus* (1.3%). Among the seven true nematode genera recorded, *Meloidogyne* and *Trichodorus* seemed to be the major pest of sugar beet plantations in this work. Meanwhile , clay soil with 413 out of 700 soil samples examined encountered the highest number of nematode genera (7) followed by loamy (5) and clay loam (4) .
Keywords: Survey nematodes genera, sugar beet cultivars, *Meloidogyne* spp.Loamy.

INTRODUCTION

Sugar beet (*Beta vulgaris* L.) is an important arable crop, traditionally used for sugar extraction all over the world . Plant parasitic nematodes are considered as one of the most important plant pathogens, since these organisms play a detectable role in limiting the productivity of such economic agriculture crops i.e. sugarbeet. Its total cultivated area reached 131.2 thousands feddans with an average 20.49 tons /Feddan* of sugarbeet tubers in the season of 2003 in Egypt, where it is grown in all type of soils especially , in newly reclaimed sand areas such as El- Hamoal Barrary , West Nubaruia , and Al- Bostan regions . Sugarbeet plants are subjected to be attacked by several plant parasitic nematodes in many countries . In Egypt **,** several researches carried out a survey work in sugarbeet prouducting areas and recorded the presence of nine nematode namely *Criconemoides , Ditylenchus myceliophagus ,Helicotylenchus dihystera, Heterodera* sp*. , Hoplolaimus* sp*. , Meloidogyne incognita and M. javanica , Paratylenchus* sp*., Rotylenchulus reniformis and Tylenchus* spp . in different localities i.e. El-Hamoul Barary and west Nubaria . Nematode genera *, Meloidogyne* and *Rotylenchulus* were dominantly found in all the examined fields with high population densities (Ibrahim, 1982 , Oteifa and El-Gindi, 1982 and Abd El-Massih , 1985 and Maareg *et.al.,*1988 and Maareg and Hassanein ,1999

In recent years, sugar beet is becoming an important crop in Egypt for supporting the expansion of Egyptian sugar industry, therefore efforts to protect the crop from the most destructive pests and diseases are crucial.

* Feddan = 4200m^2

Nematological survey is necessary in providing information on the probability and magnitude of crop losses due to nematode infection, especially with *Meloidogyne* spp. Their wide host range and favourable environmental conditions provoked suitable control measure to achieve reasonable results. However , information on such nematode genera associated with sugarbeet plantations in Dakahlia governorate is not complete. Therefore, the aim of the present work deals with surveying plant parasitic nematode genera associated with sugarbeet plantations within various counties of Dakahlia governorate.

MATERIALS AND METHODS

Survey of Plant Parasitic Nematodes Associated with Sugar beet Plants in Dakahlia Governorate:

A total of 700 soil samples were randomly collected from rhizosphere of sugar beet plants grown in five counties i.e Belkas, Bany-Ebaed, Dekernse, Mansoura, Sinbellawain of Dakahlia governorate during 2007/2008/2009 seasons. These soil samples represented seven sugar beet cultivars i.e. Kawemira, Monte-bionco, Deprez -poly N, Sultan, Nejama, Athos-poly and Farida . Samples were obtained by digging the soil to a depth of about 15-20 cm from the rhizosphere of the growing plants.Samples were also obtained at 30 days after seed germination . Soil samples of about one kg each were placed in plastic bags and sent directly to the nematology laboratory of Nematology Research Unit ,Agriculture Zoology Department, Faculty of Agriculture Mansoura University and kept in the refrigerator at 4c° until nematode extraction, Then , soil samples were thoroughly mixed and a volume of 250g soil was used to extract nematodes according to sieving and modified Baermann technique(Goodey,1957). Each soil sample was soaked in tap water for 20 minutes, then the mixture was agitated. Direct sieving through 60 and 325 mesh sieves was employed . Resulting suspension was transferred on a soft tissue papper fitted on the Baerman for separating active nematodes from soil particles (Goodey, 1957).After 48 hours ,water in the plate containing nematodes were transferred to a plastic cup. Identification of nematode genera in repeated aliquots (1ml each) in each soil sample was based on the morphological characters of the adult and larval forms according to Mai and Lyon (1975). The Hawksely counting slide under 10×40 magnification was used for determining the number of each nematode genus and recorded.

RESULTS AND DISCUSSION

Frequency of Occurrence and Population Density of Plant Parasitic Nematode Genera Associated with The Rhizosphere of Sugarbeet Plantations Grown in Certain Counties of Dakahlia Governorate.

Data in Table (1) show that nine nematode genera belonging to eight families were detected from the rhizosphere of sugarbeet plantations at the examined five counties .i.e. Belqas, Bany-Ebed, Dekerns, Sinbellawain and

Mansoura of Dakahlia governorate from where seventy composite soil samples were taken during the growing seasons of 2007/2008/2009. These genera were *Helicotylenchus* (Hoplolaimidae), *Hirschmanniella (Pratylenchidae), Meloidogyne* (Meloidogynidae), *Pratylenchus* (Pratylenchidae), *Rotylenchulus* (Hoplolaimidae), *Trichodorus (Trichodoridae), Tylenchoryhnchus* (Tylenchorhynchidae), *Dorylaimus* (Dorylaimidae) and *Tylenchus* (Tylenchidae).

Table (1): Frequency occurrence and population density of nematode genera associated with Sugarbeet plantations grown in certain counties of Dakahlia governorate.

Nematode genera	Occurrence of nematode genra per 250 g soil within each county of Dakahlia							
	Belqas *n=187	Sinbellawain *n=126	Bany-Ebaed *n=100	Dekerns *n=147	Mansour *a n=140	Total N=700	F.o. %	No of infested counties
True plant parasistes								
Helicotylenchus	3(61.39)	12(32.5)	11(29.81)	9(39.33)	8(62.63)	73	10.4	5
Hirschmanniella	25(87.68)	17(42.46)	6(30.83)	12(31.77)	34(96)	94	13.4	5
Meloidogyne(j2)	70(85.01)	24(42.82)	10(31.4)	18(29.41)	36(96.26)	158	22.6	5
Pratylenchus	23(82.13)	0	4(29.75)	0	6(75)	33	4.7	3
Rotylenchulus	0	8(29.5)	4(39.25)	0	0	12	1.7	2
Trichodorus	27(59.74)	28(37.83)	22(31.27)	21(32.28)	40(58.95)	139	19.8	5
Tylenchorhynchus	9(68.22)	0	0	0	0	9	1.3	1
Total	193	89	37	60	124			
Suspected plant parasistes								
Dorylaimus	18(54.27)	0	6(31.33)	0	0	24	3.4	2
Tylenchus	23(67.26)	0	8(31.62)	15(35.46)	0	46	6.5	3
Total	41	0	14	15	0			
Total occurrence	234	89		75	124			
Nematode genera/ county	8	5	8	5	5			

***n= number of soil samples.**
Number between parentheses represented the average of nematode population density per 250 g. soil.
***% F.O = (Number of samples containing a genus / number of collected samples) ×100**

Soil samples recovered from Belqas and Bany-Ebed county reveal the presence of six of the true plant parasitic nematode genera plus two of the suspected ones. These nematode genera were recorded to be: *Helicotylenchus*, *Hirschmanniella*, *Meloidogyne, Pratylenchus, Trichodorus, Dorylaimus*, *Tylenchus* plus *Tylenchorhynchus for* Belqas *and Rotylenchulus* for Bany-Ebed only. With respect to Belqas county,*Meloidogyne* , *Helicotylenchus* , *Trichodorus*, *Hirschmanniella*, *Pratylenchus* and *Tylenchus* genera seemed to be the most prevailing nematode pests as they occurred at the rates of 70, 33, 27, 25,23 and 23 times with percent occurrence of 37.4, 17.6,14.4, 13.36, 12.29 and 12.29%, respectively. Moreover, the nematode genera, *Dorylaimus,* and *Tylenchorhynchus* were less common as they occurred at the rate of 18 and 9 with percent occurrence of 9.6 and 4.8 %, respectively,. It was also evident that the rice root nematode, *Hirschmanniella* spp., the root-knot nematode, *Meloidogyne* spp., the root

lesion nematode, *Pratylenchus* spp., and the stubby root nematode, *Trichodorus* spp. were recorded with an average of 87.68, 85.01, 82.13 and 59.74 individuals per 250g. soil, respectively. Concerning Bany-Ebed county , *Trichodorus*, *Helicotylenchus*, *Meloidogyne* seemed to be the most prevailing nematode pests of the true plant parasitic nematodes as they occurred at rates of 22, 11, 10 and 6 times with an average of 31.27, 29.81.31.4 and 30.83 individuals per 250g. soil, respectively. The nematode genera, *Pratylenchus* and *Rotylenchulus* were less common as they occurred at the rates of 4 times for each with an average of 29.75 and 39.25 individuals per 250g. soil, respectively. Soil samples collected from Sinbellwain, and Mansoura reveal the presence of five of the true plant parasites and none of the suspected ones, however soil samples of Dekerns reveal four of the former and one of the latter. *Trichodorus , Meloidogyne and Hirschmanniella* genera seemed to be the most prevailing nematode pests on sugarbeet growing in Mansoura county as they occurred at the rates of 40, 36 and 34 times with an average of 58.9,96.26 and 96.0 individuals per 250g soil, respectively. **S**imilar trend was recorded for these three nematode pests i.e. *Trichodorus , Meloidogyne and Hirschmanniella* within the rizosphere of sugarbeet plants at Sinbellawain and Dekerns counties since they appeared to be the most prevailing nematode genera as they occurred at the rates of 28, 24 and 17 times with an average of 37.8, 42.8 and 42.5 individuals per 250g. soil, respectively for Sinbellawain county, whereas for Dekerns county these nematode genera occurred at the rates of 21, 18 and 12 times with an average of 32.28, 29.4 and 31.8 individuals per 250g. soil, respectively.

In general, among the seven true plant parasitic nematode genera, *Meloidogyne* and *Trichodorus* seemed to be the major pests as they occurred at rate of 158 and 139 times with percent occurrence of 22.8 and 19.8 % whereas, the nematode genera, *Helicotylenchus*, *Hirschmanniella and Pratylenchus* showed moderate distribution as they occurred at rates of 73, 94 and 33 times with percent occurrence of 14.4, 13.4 and 4.7%, respectively, while *Rotylenchulus* and *Tylenchorhynchus* had the lowest values of distribution as they occurred at rate of 12 and 9 times with percent occurrence of 1.7 and 1.3 % respectively.The two suspected plant parasitic nematode genera, i.e. *Dorylaimus* and *Tylenchus* proved to be of major importance as they occurred at rates of 24 and 46 times with percent occurrence of 3.4 and 6.5 %, respectively.Various counties of the surveyed area within Dakahlia governorate showed difference in the frequency occurrence of plant nematode genera (Table1), since their values were ranged from 5 to 9 genera, whereas the following counties localities, Belqas and Bany-Ebed, appeared to yield the highest number of nematode genera recorded with values of 8 genera, each Obviously, *Meloidogyne* and *Trichodorus* were the dominant true nematode genera recovered from the five counties studied, then *Pratylenchus* and *Tylenchus* that were present in the soil of 3 localities each , whereas, *Rotylenchulus* , *Dorylaimus,* and *Tylenchorhynchus* were only detected from soil of 2 and 1 localities, respectively (Table,1).

Regarding the seven hundred composite soil samples that were collected from the rhizosphere of sugarbeet plants, results in Table (2)

indicated that the sugarbeet plants cv.Farida encountered the nine of nematode genera recorded, followed by cv. Athos-poly (8), Sultan (7), Nejama (7) and Deprez-poly N (6), whereas sugarbeet cvs. Monte-bionco and Kawemira encountered the least number of nematode genera (5) each , respectively.. Data also reveal that the highest densities of nematode individuals per 250 g. soil averaged 80.52, 68.62 and 37.75 for the root-knot nematode, *Meloidogyne* spp., the root lesion nematode, *Pratylenchus* spp., and the stubby root nematode, *Trichodrous* spp. in the rhizosphere of sugarbeet plant cv. Deprez poly N , while an average of 103, 83.1 and 71.3 individuals were recorded for the reniform nematode,*Rotylenchulus* spp., the root lesion nematode, *Pratylenchus* spp. and the spiral nematode, *Helicotylenchulus* spp. in the rhizosphere of sugarbeet plant cv. Nejama , respectively. In conclusion, *Helicotylenchulus* and *Hirschmanniella* were the most prevailing nematode genera as they found in the rhizosphere of the seven surveyed sugarbeet cultivars, followed by *Pratylenchus* spp (6), *Rotylenchulus* spp., *Trichodrous* spp. and *Tylenchorhynchus* spp were recovered from the rhizosphere of five sugarbeet cultivars,but *Meloidogyne* spp was only found in the rhizosphere of four sugarbeet cultivars i.e. Deprez poly N, Athos- poly Monte-bionco and Farida, respectively (Table2) .

With regard to soil types i.e. clay, clay loam and loamy , the occurrence of plant nematode genera reveal that among the true plant parasitic nematodes, *Meloidogyne* (J2), *Trichodorus* , *Helicotylenchulus* and *Hirschmanniella* were abundant in their distribution in the three soil types surveyed as they occurred at rates of 142,99, 87 and 75 times with percent occurrence of 20.2, 14.1,12.4 and 10.7%, respectively (Table. 3). The nematode genera , *Pratylenchus , Tylenchorhynchus* and *Rotylenchulus* showed minor values at the rates of 15, 13 and 8 times with percentage occurrence of 2.1, 1.8 and 1.1 %, respectively.. The suspected parasitic nematode genera recovered i.e. *Dorylaimus and Tylenchus* showed considerable distribution as they occurred at rates of 22 and 24 times with percentage levels of 3.1 and 3.4%, respectively. Moreover, it was also evident that clay soil encountered the highest number of true nematode genera (7) with total occurrence of 255 times, followed by loamy(5) and clay loamy (4) soils with total occurrence of 124 and 60, respectively . where the nematode genera i.e. *Rotylenchulus*, *Tylenchorhynchus* and *Dorylaimus* were absent in those two soil types (Table.3).

Apparently , this work recorded the presence of 5 or 6 or 7 or 8 or 9 nematode genera associated with the rihzosphere of the sugarbeet Kawemira, Monte-bionco, Deprez-poly N, Sultan, Nejama, Athos-poly and Farida that were grown in five counties i.e. Belqas, Bany- Ebaed , Dekernse , Sinbellawin and Mansoura of Dakahlia governorate .

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As a whole, it is not surprising that the soil rhizosphere of sugarbeet revealed the presence of true plant parasitic nematode genera only that recovered from a total of 700 soil samples examined , especially, *Meloidogyne* and *Trichodorus* which seemed to be the major pest as its occurred at rate 158 and 139 times with percent occurrence of 22.8 and 19.8 % , whereas the nematode genera, *Helicotylenchulus*, *Hirschmanniella* and *Pratylenchulus* showed moderate distribution while *Rotylenchulus* and *Tylenchorhynchus* had the lowest values of distribution within the cultivated sugarbeet cultivars in such soil type in this study i.e. clay or clay loamy or loamy, since clay soil encountered the highest number of nematode genera (7) followed by loamy (5) and clay loamy (4) , respectively. This is expected since plant parasitic nematodes are generally in favour of light soils (Steiner,1950) . Meanwhile , results of the present investigation on nematological survey is in accordance with the findings of Maareg *et.al* (1988) and Maareg and Hassanien (1999) who recorded 10 or 9 true nematode genera associated with sugarbeet plants.

Table (3): Relative infestation of soil types by the various Sugarbeet plantations associated with plant parasitic nematodes.

Nematode genera	Soil type and number of samples (n)			Total n=700	Frequency occurrence %	No.of infested soil types
	Clay n=413	Clay loamy n=147	Loamy n=140			
True plant parasites:						
Helicotylenchus	42(49.52)	9(39.33)	36(62.63)	87	12.4	3
Hirschemanniella	49(55.53)	18(31.77)	8(96)	75	10.7	3
Meloidogyne	96(59.26)	12(29.41)	34(96.26)	142	20.2	3
Pratylenchus	9(50.33)	0	6(75)	15	2.1	2
Rotylenchulus	8(29.86)	0	0	8	1.1	1
Trichodorus	38(52.84)	21(32.28)	40(58.95)	99	14.1	3
Tylenchorhynchus	13(53.31)	0	0	13	1.8	1
Total	255	60	124			
Suspected plant parasites:						
Dorylaimus	22(52.77)	0	0	22	3.1	1
Tylenchus	9(75.22)	15(35.46)	0	24	3.4	2
Total	31	15	0			
Nematode genera per soil type	9	5	5			

REFERENCES

Abd El-Massih, M.I. (1985). Biological studies on major plant parasitic nematodes infecting sugar beet in Egypt. Ph. D. Thesis, Fac. Agric., Cairo Univ., 90 pp.

Goodey, J. B. (1957). Laboratory methods for work with plant and soil nematodes. Tech.Bull. No. 2 Min. Agric. Fish. Ed. London, 47pp.

Ibrahim, I.K.A. (1982). Species and races of root-knot nematodes and the relationships to economic host plants in Northern Egypt in proceedings of the Third Research and Planning Conference on Root-knot Nematode ;*Meloidogyne* spp. September 13-17, Coimbra, Portugal, pp. 66-84.

Maareg, M.F.; El-Deeb, M.H. and Ebieda, A.M. (1988). Susceptibility of ten sugarbeet cultivars to root-knot nematode, *Meloidogyne* spp. Alexandria Science Exchange, 9(3): 293-302.

Maareg, M.F.; Hassanein, M.A.; Allam, A.I. and Oteifa, B.A. (1998). Susceptibility of twenty six sugarbeet varieties to root-knot nematodes *Meloidogyne* spp. in newly reclaimed sandy soils of Al-Bostan region. Egypt J. of Agronematolo, 2(1): 111-125.

Maareg, M.F. and Hassanein, M.A. (1999). Survey and ecological studies on plant parasitic nematodes in the West of Nubariya in the effects of nematode on sugarbeet at Al-Bostan region. Project funded from National Council of Sugar Crops (NCSC). 51 pp.

Mai , W. F. and H. H. L. lyon(1975). Pictorial Key to genera of plant parasitic nematodes.Cornell Univ. Press, Ithaca, New York, 172 pp.

Oteifa, B.A. and El-Gindi, D.M. (1982). Relative susceptibility of certain commercially important cultivars to existing biotypes of *Meloidogyne incognita* and *M. javanica* in Nile-Delta, Egypt in proceeding of the 3rd Research and Planning. Conf. of Root-knot Nematodes, *Meloidogyne* spp. 13-17 September, 1982. Coimbra, Portugal. 66-84 pp.

Steiner, G. (1950). Plant Nematology in the Bureau of Plant Industry, Soil Agricultural Engineering. Pl. Dis. Reptr., 1950pp.

حصر لاجناس النيماتودا المصاحبة لزراعات بنجر السكر في محافظة الدقهلية

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تم إجراء حصر لأجناس النيماتودا المصاحبة للمجال الجذري لنباتات سبع أصناف من بنجر السكر وهم كوميرا – مونتبيانكو – دبرية – سلطان- نجما – أثوس – فريدا – المنزرعة في 5 مراكز لمحافظة الدقهلية (مصر) خلال مواسم زراعات بنجر السكر 2009/2008/2007.

أسفرت الدراسة عن تسجيل 9أجناس نيماتودا في حقول بنجر السكر في هذه الدراسة وهي حسب أهميتها تصاعديا بالنسبة لمعدل تواجدها (J2) *Meloidogyne* (22.6%) و *Trichodorus* (19.8%) و *Hirschmanniella* (13.4%) و *Helicotylenchus* (10.4%) و *Tylenchus* (6.5%) و *Pratylenchus* (4.7%) و *Dorylaimus* (3.4%) و *Rotylenchulus* (1.7%) و *Tylenchorhynchus* (1.3%).

كما او ضحت الدراسة ان جنس النيماتودا *Meloidogyne* و *Trichodorus* هما الافاتان الاساسيتان لزراعات بنجر السكر من السبع اجناس حقيقية التطفل المسجلة . وفي الوقت نفسه أن التربة الطمبية والتى أشتملت على 413 عينة من إجمالى سبعمائة عينة تم جمعها في هذه الدراسة إحتوت علي أعلي الاعداد من الاجناس النيماتودا المكتشفة وهم 9 أجناس يليها التربة الطينية (5 اجناس) ثم التربة الطمبية الطينية (4اجناس) فقط علي التوالي.

ملحوظة : هذا البحث مستخرج من رسالة المؤلف الثانى لدرجة الماجستير فى الحيوان الزراعى (نيماتودا)

قام بتحكيم البحث

أ. د/ فاطمه عبد المحسن مصطفى — كلية الزراعة – جامعة المنصورة
أ. د/ عبد المنعم ياسين الجندى — كلية الزراعه – جامعة القاهره

Table (2) Frequency occurrence and population density of nematode genera associated with certain sugarbeet cultivars grown in certain fields of Dakahlia governorate.

Nematode genera	Occurrence of nematode genera per 250 g soil in seven sugerbeet cultivars									
	Deprez-poly N n=100*	Athos-poly *n=100	Monte-bionco n=100*	Farida *n=100	Sultan *n=100	Nejama *n=100	Kawemira n= 100*	Total	F.o. %	No. of infested county
True plant parasistes										
Helicotylenchus	25(44.68)	9(60.33)	12(33.66)	17(44.17)	7(41)	12(71.33)	9(40.6)	91	13.0	7
Hirschemaniella	5(56)	24(86.95)	31(34.12)	6(38.83)	5(49.6)	12(39.91)	11(34.18)	94	13.2	7
Meloidogyne	17(80.52)	10(78.9)	10(41.4)	15(42.93)	0	0	0	52	7.4	4
Pratylenchus	8(68.62)	6(50.5)	0	4(31.25)	10(59.5)	43(83.11)	7(30.71)	78	11.1	6
Rotylenchulus	0	4(38.5)	0	2(31)	4(37.5)	8(103)	4(27.25)	22	3.1	5
Trichodorus	20(37.75)	10(54.8)	23(46.73)	14(36.28)	0	3(29)	0	70	10	5
Tylenchorhynchus	0	11(45.72)	0	3(56.66)	5(43.6)	26(50.76)	12(40.08)	57	8.1	5
Total	75	74	76	61	31	104	43			
Suspected plant parasistes										
Dorylaimus	0	0	2(31)	11(41.72)	11(36.8)	0	0	24	3.3	3
Tylenchus	7(41.28)	14(34.42)	0	10(37.9)	4(34.5)	1(42)	0	36	5.1	5
Total	7	14	2	21	15	1	0			
Total occurrence	82	88	78	82	46	105	43			
Nematode genera/ cultivar	6	8	5	9	7	7	5			

*** Number between parentheses showed the average of nematode population density per 250 g. soil**