The relationship between plant parasitic nematodes of sugar beet and other soil fauna

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Rellitionships between plant parasitic nematodes of sugarbeet and other soil fauna The relationship among plant parasitic nematode, soil microorganisms and soil animals in sugarbeet fields as well as its effects on sugarbeet yields in the Ten-thousand faddans area, west Nubariya region, were the purpose of this study. The study involved the following topics : 1)Surveying of the soil arthropod and nematode fauna and microorganisms groups associated with sugarbeet fields at the Ten-thousand faddans, West Nubaryia,2)Field population dynamics of root-knot nematode, Meloidogyne incognita and its correlation with the growth stages of sugarbeet plant.3)Relationship between M incognita and soil microorganisms (soil bacteria and fungi).4)Relationship between M incognita and predacious soil mites.5)Interrelationship among plant parasitic nematode, M incognita, nematophagous fungus and predator nematode in the rhizosphere of sugarbeet plants. 6)Evaluation of some animal manures for mass production and as substrate carrier for nematophagous fungi. 7)Susceptibility of sugarbeet varieties to root-knot nematode, M incognita.of Mcomposed ed in two n, one in10.17 % of rely. Three the soil of ted about scorpiones 0.08 %,8) Relationship between initial population density incognita and sugarbeet yields. The obtained results can be summarized as follows : 1. The soil organisms in sugarbeet field at the Ten-thousand faddans area, West Nubanria: 1.1. Animal fauna: 1.1.1. Arthropod fauna : In the sugarbeet fields, the arthropod fauna about 13.84 % of the total soil animal fauna, and sho consecutive peaks during sugarbeet growing seas February and other in June. 1.1.1.1. Arachnida fauna:The arachnid fauna composed about 73.47 and the total arthropod fauna and animal fauna, respecti subclasses of the class Arachnida were recorded in sugarbeet fields. Numbers of subclass Acari constit 99.64 % of the total Arachnida. Aranea and Pseud were presented by very few specimens (0.22 anrespectively). 1.1.1.1.1.Acari fauna:The acari fauna composed about 73.25 % othe total arthropod fauna. Oribatid mites showed the highest percentage(66.55 %), while the Gamasidid and Actinedid mites constituted a small fraction of the total mites fauna (17.20 and 13.11 %, respectively). Acaridida mites were present in very small fraction(3.15 %). The minimal and the maximal monthly means occurred in November and in June, respectively.1.1.1.1.2. Araneae and Pseudoscorpions : Subclasses Araneae (order: Araneida) andpseudoscorpions (order: Pseudoscorpionida) were presented by few specimens and did not exceed 0.17 and 0.06 % of the total arthropod fauna (0.023 and 0.008 % of total animal fauna. 1.1.1.2. Insect fauna:The insect fauna comprised 25.98 % of the total arthropod fauna. The Coleoptera, Dermaptera, Diptera, Hemiptera, Homoptera Hymenoptera, Isoptera, Lepidoptera, Orthoptera, Thysanoptera and others were represented with few nembers and composed about 15.62 % of the total insect fauna. However, Collembola constituted 84.38 %. It’s numbers increased to their maximal in January after that decreased gradually from February to be low in June. 1.1.1.3. Other arthropod fauna : Other arthropoda, class Myriopoda (orders, Pauropoda and Diplopoda) and class Grustacea (order, Isoptera), were presented by 0.19 and 0.36 % of the total arthropod; and 0.03 and 0.05 % of animal fauna pronounced, respectively . 1.1.2. Annelida and Mollusca fauna:Annelida and Mollusca as soil animal fauna were at very low fractions of 0.004 and 0.002 % of the total soil animal fauna, respectively. 1.1.3.Nematode fauna :Nematode fauna in constituted about 86.15 % of the total animal fauna. The Tylenchida formed 68.75 % of the totalnematode fauna. Maximal monthly mean of nematode fauna was noticed in April, and the minimal occurred in

November. 1.1.4. MiGnthly variations of predators (arthropod and nematode fauna) in sugarbeet field at cheTen-thousand faddans area, West Nu baryia: 1.1.4.1. Predator arthropod fauna : The predator arthropod fauna were abundant only in April and June with population densities of 76.15 X 103 animal /m2 and 180.14 X 103 animal /m2, respectively. 1.1.4.1.1.Predator mites:Predator mite species could be arranged in a descending order according to their relative abundance as follows: U misella, C. malaccensis, Cunaxa sp., M monchaolska, A. messer, P. major and G. domesticus. Predator mites composed about 74. % and 23.58 % of the total predator arthropod and animal fauna, respectiveV 1.1.4.1.2.Predator insects :Collembolan predator insect, Onychiurus armatus increased gradually from November till March and reached their abundance in April after that decreased gradually till June.The predator arthropod fauna were abundant in two periods during growing season, the first from November till April and the second from May till June. 1.1.4.2. Predator nematode fauna:The predator nematodes more than 68.0 % of the predator animal fauna. Mononchus truncates, Mylonchulus hawaiiansis and Diplogaster sp. conistituted a large fraction of the total predator nematode fauna (37.92, 27.50 and 23.75 %, in respect) , while the species, Rhabditus axei was noticed in a small fraction (10.83 %). The minimal monthly mean of each nematode species and total nematodes was found in November. While, the maximal occurred in June .The total predator animal fauna was gradually increased from November till June. 2. Plant parasitic nematodes associated with sugarbeet in the Ten-thousand faddans area, West Nubaryia: 2.1. Species of plant parasitic nematodes : Seven species of plant parasitic nematodes following order Tylenchida were found to be associated with sugarbeet plants, these species were; Helicotylenchus dihystera, Macroposthonia. (Criconemoides) sp., Meloidogyne incognita, Meloidogyne javanica, Pratylenchus sp., Rotylenchulus reniformis, and Tylenchorhynchus sp. 2.2.Occurrence rate and absolute density:The root-knot nematodes (Meloidogyne spp.) were found in high occurrence rate. The nematode species could be arranged in descending order according to their absolute densities as follows; M. incognita (49.65%), R. reniformis (17.82 %), H. dihystera (11.95%), Tylenchorhynchus sp. (9.47%), Pratylenchus sp. (6.19%), M javanica (4.81%) and Macroposthonia sp. (0.11%).2.3.Monthly fluctuation and population densities throughout the growing season:Generally population density of each nematode species H. dihystera sp., M incognita, M javanica, Pratylenchus sp., R. reniformis and Tylenchorhynchus sp. began to increase from December till March and attained the high peak in April where soil temperature was 19° C, then gradually declined till June at 27° C of soil temperature. Nematode species, Macroposthonia sp. was absent from November till February and recorded the lowest density in March, April, May, and June sampling monthswith an average of 0.89, 1.49, 1.27 and 0.94 X 103/m2 soil, respectively. 2.4.”Importance ”and” Prominence” values : The root-knot nematode, M incognita was dominatespecies and had the highest ”Importance and Prominence values” in sugarbeet fields 3. Field population dynamics of Meloidogyne incognita at different growth stages of sugarbeet plant:The numbers of juvenile of M incognita larvae in soil, total stages in root system and final population of M incognita nematode progressively increased as plants advanced towards maturity and reached its maximum value at 180 days after sowing, then decreased at the growth stage of 210 days after sowing, then its decreased due to water-holding of plant for increasing sugar content in sugarbeet roots. Egg-masses number progressively increased as plant advanced towards maturity and reached its maximum number at 210 days stage (Maturity stage). 4. Relationship between soil microorganisms and root-knot nematode, Meloidogyne incognita 4.1. Bacterial and fungal isolates: 4.1.1. Fungal isolates : Isolated fungi were purified and identified into ten species, Aspergillus niger, A. humicola, A. flavus, A. parasticus, Penecillum frequentals, P. nigricans, P. spinulosum, Trichoderma herzianum, 7’. viride and Verticillium chlamydosporium. 4.1.2. Bacterial isolates : Isolated bacteria were purified and identified into seven species, Arthrobacter sp., Bacillus cereus, B. subtilis, Corynebacterium sp., Pseudomonas fluorescens, Serratia odorifera and Streptomyces sp. 4.2. Effects of soil fungi and bacteria on MeloidoRyne incognita population and productivity of sugarbeet : 4.2.1. Soil fungi : 4.2.1.1 Bioassay test:Nematicidal activity of the different fungal filtrates tested against M incognita juvenile larvae could be arranged in a descending order as follows: A. niger (97.25% mortality), T harzianum (97.25%), T viride (94.75%), A. falvus (94.50%), V. chlamydosporium (86.50%), A. parasiticus (78.50%), P.nigricans (77.0%), A. humicola (73.0%), P.

frequentals (70.25%) and P. spinulosum (66.25%). 4.2.1.2. Greenhouse test : Inoculation of sugarbeet with V. chlamydosporium, A. niger and T. harzianum (separetly) showed significantly suppressed to M incognita (numbers of galls, females and egg-masses as well as reproduction rate in root, and umber of juvenile larvae in soil).And showed better enhancem nt in plant growth and juice quality as well as sugar yield. 4.2.2. Soil bacteria ; 4.2.2.1. Bioassay test:The toxicity of bacterial filtrates tested against M incognita juvenile larvae could be arranged in a descending order as follows: The bacterial filtrates of B. cereus, S. odorifera, P. fulorescens and Streptomyces sp. were the most effective filtrates and occurred mortality percentage more than 50%. 4.2.2.2. Greenhouse test :The tested soil bacteria (B. cereus, S. odorifera. P. fluorescens and Streptomyces sp. demonstrated ematicidal activities..Since they caused relatively high mortalityrate to the tested juvenile larvae of M incognita.Best results in plant growth, quality characters as well as sugar yield of sugarbeet were obtained in pots receiving S. odorifera.4.3. Effects of soil mites on Meloidogyne incognita population and growth response of sugarbeet root: 4.3.1. Bioassay test :Seven predacious soil mites extracted from sugarbeet fields were evaluated to their predacious activity on immature stages of the M incignita under laboratory conditions (namely, Amblyseius messor, Cheyletus molaccensis, Cumaxa sp., Glycyphagus domesticus, Macrocheles monchaolska, Platyseius major and Uropoda misella (Berlese).The highest predation rate on juvenile larvae was achieved by C. malaccensis. However, the mite species, M monchaolska was ranked the first in predation of both juvenile larvae and egg-masses.Treatment of a mixed together soil mites resulted in a significant reduction in all damage parameters of galls, larvae, females and egg-masses numbers/root and juvenile larvae in soil/pot compared with C. malaccensis only. 4.3.2. Greenhouse test : The highest increase in root weight (75.0%) was obtained by treatment of mixed together mites followed by M monchaolska (71.8%), then C. malaccensis treatment (40.0%).5.Interrelationship among the plant parasitic nematode, Meloidogyne incognita, nemtophagous fungus, Arthrobotrys conoides and predator nematode, Diplogaster sp. in the rhizosphere of sugaebeet plants:The density of A. conoides significantly increased in the presence of predator nematode, Diplogaster sp. or M incognita by 18.9 or 24.0 %, respectively. In turn, A. conoides significantly suppressed the development of the plant parasitic nematode, M incognita by 94.7 % and significantly decreased population density of Diplogaster sp. by 23.7 %, A. conoides developed more abundantly in the presence of the plant parasitic nematode, M. incognita than the predator nematode, Diplogaster sp. in the rhizosphere of sugarbeet plants. 6.Evaluation of some animal manures for mass production of six nematode- parasitic fungi and related effects on the Meloidogyne incognita infecting sugarbeet plants: 6.1.Laboratory test:Broiler chicken, layer chicken and cow manures are better alternatives to wheat grain medium for the mass production of the fungi, F. solani, T. harzianum and V. chlamydosporium, however, the broiler and layer chicken manures only are for mass production of fungus P. nigricans. 6.2.greenhouse test : The fungi, F. solani, T. viride and V. chlamydosporium on layer chicken manure as carrier substrate reduced sugarbeet galling caused by M incognita by 80.6, 91.3 and 95.0 %, respectively compared with check. Also, the reduction percentage of the mentioned tested nematophagous fungi when added on both layer chicken and broiler chicken manures were (207.5 — 349.5 %) and (115.0 — 213.2 %), respectively higher than on wheat grains.The highest percentage of colonized egg masses was obtained by V. chlamydosporium fungus when introduced on layer and broiler chicken manures; however, the lowest percentage was obtained by F. solani when added on cow manure or on wheat grains. 7.Susceptibility of sugarbeet varieties to Meloidogyne incognita:The evaluation studies of twenty-one varieties of sugarbeet for their susceptibility or resistance to M incognita under field and greenhouse conditions, cleared that varieties, Emma (Monogerm), Kawemira (Polygerm), Marathon (Monogerm) and Sultan (Polygerm) were the most resistant. 8.Relationship between initial population density of Meloidogyne incognita and sugarbeet yields :from the data it can be concluded that M incognita larvae attack sugarbeet plants resulting in decreasing in root and sugar yields. The yield loss % proportion to the initial population density of this nematode at planting time, generally, the rate of decrease or loss % in sugar yield was greater than in the root yield Tolerance limit for var. Chems variety (Polygerm)according to calculations was at Pi = 48.0 larvae of M incognita per 250 gm soil.It can be concluded that some soil organisms, especially Cheletus malaccensis, and Macrocheles monchaolska mites, Verticillium chlamydosporium, Aspergillus niger and Trichoderma harzianum fungi and Bacillus cereus, Serratia oderifera and Pseudomonas fluorescens bacteria gave pronounced nematode elimination and plant growth promotion , and could be used safely as biocontrol agent in integrated root-knot nematodes management programs to protect the environment, human and animal health from chemical compounds dangerous reaching to safety and high agriculture production according to GAP* recommendations.