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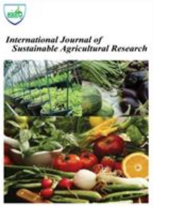

GROWING *JATROPHA CURCAS* AND *JATROPHA GOSSYPIIFOLIA* AS A INTERCULTURE WITH SUNFLOWER FOR CONTROL OF *MELOIDOGYNE JAVANICA* IN EGYPT

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ABSTRACT

The nematicidal potential of both Jatrophacurcas and Jatrophagossypiifoliaseedlings as ainterculture with sunflower cv. Giza 1 (1, 2, 3 and 4 plants per pot) againstMeloidogynejavanica was tested under a screenhouse conditions (30 ± 5 ºC) at the National Research Center, Egypt. The final population of nematodes and their rate of build up as well as the root gall index were significantly affected by the number of Jatropha plants when grown with sunflower together. There was a negative correlation between the number of Jatropha seedlings and the final population of nematode. The lowest nematode final population and rate of build up were determined at the highest number of Jatropha plants (4 plants per pot). The highest number of root gall index (4.7) was found on roots of sunflowergrown alone, while, the lowest numbers (0.8 and 1.3) were found in the roots of sunflower grown with four plants of Jatrophacurcas and Jatrophagossypiifolia; respectively. Effectiveness of Jatropha curcas was better against M. javanica than Jatropha gossypiifolia. This type of control is considered pollution-free, easy and inexpensive.

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Keywords: Control, *Meloidogyne javanica*, Intercropping, *jatropha curcas, Jatropha gossypiifolia*.

Contribution/ Originality

With the aim of releasing a greenhouse study which carried out at National Research Center, Egypt, this type of parasitic nematode control is considered pollution – free, easy and inexpensive than chemical nematicides. For this study seeds of *jatropha* species were obtained from Water Relations and Field Irrigation Department (WRFID), National Research Center,Cairo,Egypt. Hence, this paper is proved that *jatropha* plants may replace the chemical nematicides as eco friendly to environment and human.

1. INTRODUCTION

Within nature, man depends on plants in his food supply. Yet, a result of population increase, the equilibrium between human beings and their food supply is felt unsound. This encouraged scholarly thought to solve the problem. One traditional solution was to increase food via pest control (Abd-Elgawad, 2013). Plant-parasitic nematodes seriouly limit agricultural production in many countries especially developing ones. Egypt is not an exception. Root-knot nematodes have been recognized as the major limiting factor in agricultural production in many parts of the world. Effective and economical nematicides can provide growers with spectacular difference in growth and yield of crops through the effective control of nematodes and other soil pests. Nevertheless, general guidelines for recommending nematicidal dosages are not possible since application rates vary with climate, soil type and crop. Also, practical information about safe nematicides, their proper application equipment and method, and experiments with nematicides should always be updated and presented to growers. Using nematicides is economically justified when the value of the expected yield increase sufficiently exceeds the investment. But, these chemicals are costly, highly toxic and present some environmental problems (Adesiyan *et al.*, 1990).In fact; synthetic nematicides have been reported to contaminate underground water thereby posing serious hazards to man and animals (Alam and Jairjpuri, 1990). Alternatively, research has focused on antagonistic plants (Alam *et al.*, 1977; Yassin and Ismail, 1994; Javed *et al.*, 2008; Claudius *et al.*, 2010; Abdelnabby and Abdelrahman, 2012; Onyeke and Akueshi, 2012; Ismail, 2013).Several benefits may result from the identification of the specific antagonistic phytochemicals to plant nematodes, whether they occur in a field or a laboratory. These compounds can be developed for use as nematicides themselves, or they can serve as model compounds for the development of chemically synthesized derivatives with enhanced activity or environmental friendliness (Chitwood, 2002). In this regard, *Jatropha curcas* and *Jatropha gossypiifolia*, perennial plant belonging to Euphorbiaeae family considered economic plants as multipurpose plants, the plant is drought resistant and used as ornamental purpose, as an oil crop, for comotic industry, and used as a medicinal plants by using their seeds against constipation, the sap for wound healing and leaves as tea against malaria (Adebowale and Adedire, 2006; Hussein *et al.*, 2012; Taha *et al.*, 2013). Also, the by-products are press cake a good organic fertilizer and oil contains also insecticide (Gubitz *et al.*, 1999)

In addition, *Jatropha* plants have been found suppress the population of phytonematodes by releasing nematotoxins into the soil when used their plant extracts, powdery leaves, adding fresh leaves or grown with susceptible cropsas an interculture (Umeh and Ndana, 2010; Ugwouke *et al.*, 2011; Ganai *et al.*, 2013; Ismail and Hassabo, 2014). So,the present study was carried out to study the effect of different numbers of *Jatropha curcas* and *Jatropha gossypiifolia* plants as a mix-crop along with sunflower for control of *M. javanica* under a greenhouse conditions.

2. MATERIALS AND METHODS

Seedlings of sunflower cv. Giza 1- three week old grown in sterilized soil were transplanted singly to the center of 25 cm clay pots containing 3 kg sterilized sandy loam soil (1:1 w:w). Seven days after planting, the sunflower seedlings were inoculated with about 3000 freshly hatched juveniles of the root-knot nematode, *Meloidogyne javanica*. Three days after inoculation, one to four seedlings of 21 days old of both *Jatrophacurcas* and *Jatrophagossypiifolia* grown in sterilized soil were transplanted individually into the periphery of each pot with six replicates. Sunflower seedlings planted without *jatropha* plants served as check. All pots were arranged in a randomized complete block design under a greenhouse conditions at 30 ± 5 ºC. Sixty days after inoculation, plants were taken off; nematode counts were calculated. Nematode populations in soil were extracted by sieving and decanting technique (Barker, 1985). The nematodes from roots were extracted using the Young incubation method (Southey, 1970). Root-knot index was rated 1-5 scale (Sasser *et al.*, 1984). Also, the reproduction rate of the nematode was determined based on Oostenbrink (1966) as follows: final nematode population (P_f) / initial nematode population (P_i).

2.1. Statistical Analysis

The obtained data were analyzed statistically (Gomez and Gomez, 1984) by using the Fisher's Least Significant Differences (LSD).

3. RESULTS AND DISCUSSION

Tables 1 & 2 showed that the evaluated species of jatropha plants were found to be suppressive to *M. javanica* development and reproduction. Number of jatropha plants significantly reduced density of the nematode on roots, number of juveniles recorded from soil as well as root gall index. Accordingly, the nematode final populations and rate of build -up were greatly suppressed. Also, a positive correlation was found between number of both jatropha sepecies and % reduction in nematode final population as well as % reduction in root gall index caused by the root-knot nematode. So, application of 4 plants of jatropha caused the greatest reduction in the root gall index (83 % and 72% for *Jatropha curcas and Jatropha gossypiifolia*; respectively). However, there was a negative relation between the number of Jatropha plants and nematode final populations of the root-knot as well as their rate of build-up(Tables 1 & 2).

Really, this research reported that there was significant increase in the nematode final population and rate of build-up of *M.javanica* around sunflower grown alone, but, when jatropha seedlings grown as a interculture with sunflower (1-4 *Jatropha curcas* or *J. gossypiifolia* / pot) , the nematode final population and rate of build-up decreased. Also, the root gall index on sunflower was 4.7 when it grown alone, but declined to 0.6 and 1.3 when sunflower grown along with four plants of *Jatropha curcas and J. gossypiifolia*; respectively (Tables 1 & 2).

The reduction in the nematode final population and rate of build-up by growing *Jatropha curcas* or *J. gossypiifolia* was mainly attributed to the toxic nature of its root exudates. These findings are in agreement with those of Alam *et al.* (1977), Korayem and Osman (1992), Claudius *et al.* (2010) , Umeh and Ndana (2010), Onyeke and Akueshi (2012), and Ismail (2013). They found that there are several plants including *Jatropha curcas* or *J. gossypiifolia* which suppress the population of different plant parasitic nematodes by releasing nematotoxins into the soil , not phytotoxic to the plants , rather they caused increased plant growth.

Fassuliotis (1979) reported that there are two types of resistance. The first is the pre-infectional resistance, which operator before the nematode penetrates the surface of the roots. The second is the post-infectional resistance which is manifested after the nematode penetrates the plant tissues. The present data showed that jatropha plants have two types of resistance, in regard to, most of *M. javanica* larva – to some extend- failed to penetrate roots of sunflower when they grown with both *Jatrophacurcas* or *J. gossypiifolia* plants. Moreover,Umeh and Ndana (2010) has demonstrated that the root-knot nematode,*M.incognita* did not multiply onboth *Jatrophacurcas* or *J. gossypiifolia*. In general, nematicidal phytochemicals are safe for the environment (Chitwood, 2002). These substances include repellents, attractants, hatching stimulants or inhibitors and nematotoxicants, were formed in response to nematode presence (Chitwood, 2002). Present findings assume potential importance in developing plant-based natural nematicides for nematode control.

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Table-1. Influence of *Jartophacurcas* as a mix-crop with sunflower cv. Giza 1 on development and reproduction of *Meloidogynejavanica*

Treatments	Root-gall Index * (0-5)	Reduction %	Nematode counts **				
			In root	In soil	Total	Reduction %	Rate of build-up +
Sunflower alone (Control)	4.7	-	410	18234	18644	-	6.2
Sunflower + one plant of J. curcas	3.2	31.9	195	6530	6725	63.9	2.2
Sunflower + two plants of J. curcas	2.8	40.4	161	5632	5793	68.9	1.9
Sunflower + three plants of J. curcas	1.9	68.3	140	5121	5261	71.8	1.8
Sunflower + four plants of J. curcas	0.8	83.0	111	1987	2098	88.8	0.7
LSD 0.05	0.28	-	98	608.3	602.1	-	-
LSD 0.01	0.44	-	102	845.1	812.4	-	-

*Root gall index based on (Sasser *et al.*, 1984); 0 = no galls; 5 = 100 + galls per root. **Each value is mean of six replicates. + Rate of build-up = P_f / P_i, where P_f = final population, and P_i = initial population.

Table-2. Influence of *Jartophagossypiifolia* as a mix-crop with sunflower cv. Giza 1 on development and reproduction of *Meloidogynejavanica*

Treatments	Root-gall Index * (0-5)	Reduction %	Nematode counts **				
			In root	In soil	Total	Reduction %	Rate of build-up +
Sunflower alone (Control)	4.7	-	410	18234	18644	-	6.2
Sunflower + one plant of J. gossypiifolia	4.0	14.9	314	8450	8764	53.0	2.9
Sunflower + two plants of J. gossypiifolia	3.6	23.4	285	7321	7606	59.2	2.5
Sunflower + three plants of J. gossypiifolia	2.3	51.1	125	6544	6669	64.2	2.2
Sunflower + four plants of J. gossypiifolia	1.3	72.3	119	4763	4882	73.8	1.6
LSD 0.05	0.21	-	28.2	760	811	-	-
LSD 0.01	0.34	-	39.3	930	987	-	-

*Root gall index based on Sasser et al., 1984; 0 = no galls; 5 = 100 + galls per root. **Each value is mean of six replicates. + Rate of build-up = P_f / P_i, where P_f = final population, and P_i = initial population.