Journal of Natural Sciences Research www.iiste.org
ISSN 2224-3186 (Paper) ISSN 2225-0921 (Online)
Vol.6, No.19, 2016

Assessment of Mahogany Leaf Powder and Cabofuran on Plant parasitic Nematode Infecting Okra (Albemuschus esculentus) in Northern and Sudan savanna of Nigeria

Jacob Madu* Fatima Mohemmed
Department of Crop Protection, Faculty of Agriculture, University of Maiduguri, Maiduguri, Nigeria

Hyerma Surhyel
Cereal Department, Lake Chad Research Institute Maiduguri, Nigeria

Subject Areas: Plant Science

Abstracts
A field study was conducted at Maiduguri and Lassa Northern and Guinea Savanna during 2013 cropping season to evaluate the use of mahogany (*Khaya senegalensis*) Leaf powders in comparison to carbufuran, and the varietal effect of of okra cultivars in the Management of plant parasitic nematode on okra *Abelmoschus esculentus* (L.) Moench). Split plot design was employed in which four okra cultivars (Alau, Utonkon, Eklemson, and Lady's finger) were in the main plot while the sub plot consisted of three treatments; Mahogany leaf Powder, applied at 1 ton /ha, Carbufuran, 3G 2.0 kg a.i and Control).The 7 treatment were replicated three times. Initial and final soil nematode population was determined using percentage change. Ducan Mutiple Range Test was also used to compare the treatment means (DMRT 0.05). Data was analyze using ANOVA Statistic 8.The result showed that, all the tested okra cultivars were slightly resistance to nematode genera identified. Under Utonkon, soil population of *Helicotylenchus* was suppressed by 87.3 %, *Hoplolaimus* by 51.0 %, each of the cultivars suppressed soil population of *Longidorus* by more than 50 %. Application of mahogany leaf powder at 1 ton/ha and carbufuran applied at 2.0 kg a.i /ha each reduces soil nematode population by more than 50 %. There was significant difference on root knot gall among cultivars in Maiduguri and Lassa, except combined data. Significant reduction in number of gall per root system among cultivars was obtained with Alau (90.33 %), and Utonkon (90.25 %) in Lassa. Highest number of gall was recorded from Eklemson in both Locations and combined data. Application of mahogany leaf powder each at 1 ton/ha, and carbufuran applied at 2.0 kg a.i / ha, significantly suppressed galling of okra roots in both locations and the combined data as compared with the control. Highest (92.58) reduction in number of galls per root system was obtained with Carbufuran in Lassa. Utonkon had the tallest plant height of (70.98) cm in Lassa followed by Eklemsom (60.70cm) in Maiduguri. Lady's finger had the tallest plant height of (71.95) cm in the combined analysis. Shortest plants were recorded from Alau (55.32cm) in Maiduguri and Eklemson (60.57cm) in Lassa. Lady's finger recorded the highest shoot weight in both locations while Eklemson recorded the lowest shoot weight in both locations. Alau had the highest root length (15.59cm) at Lassa. The result further showed that mahogany leaf powder each applied at 1ton / ha and carbufuran applied at 2.0 kg a.i / ha significantly increased okra root length ranging from 14.07 cm to 16.14 cm in comparison to non- amended (control) plot in Maiduguri. Alau produces the highest yield (11.45 t/ha). Lowest yield was obtained from Utonkon (9.02 t/ha). At Lassa, highest yield was obtained in Lady's finger. Amended plot with mahogany leaf powder each at 1ton / ha or Carbofuran applied at 2.0 kg a.i / ha, significantly produced higher fruit yield than the non-amended plot control plot in Maiduguri, Lassa and combined data. It is evident from the studies that use of plant leaf powder (Mahogany) could be recommended for farmers.
Keywords: Mahogany, okra, cabofuran and nematodes

Introduction

Okra, an herb of the family Malvacea originated from North Africa and widely spread in the tropics. The period of maturity of the plant varies, with the short variety taking 2-3 months and the long variety taken up to 6 months to ripen. The leaves and immature fruits are sticky, and used as vegetables in making soups either fresh or dry. However it is very susceptible to many pests and diseases among which is root-knot nematode Meloidogyne species (Ogbuji, 1981; Dupriez and Deleener, 1989).

Okra *Abelmoschus esculentus L.* (Moench), is grown mainly for its edible immature pods, but in most African countrie, young leaves and mature fruits are consumed as a vegetable. The pods grow rapidly, being ready for harvest in about 50 - 60 days after planting (Olasantan and Bello, 2003). Plant parasitic nematodes are cosmopolitan, ubiquitous and insidious microscopic soil borne disease pests that cause damage to most, if not all crops growing in tropics and sub-tropics. They are potentially a serious constrained to crop productivity (Sikora, 2000). Some species of plant parasitic nematode are known to transmit virus disease in plant; examples of these nematodes are *Xiphenema*, *Longidorus,* and *Paralongidorous*, which cause economic

damage than any other single group of plant parasitic nematode (Wilson, 1962)

2. Materials and Methods

2.1 Experimental Sites

The experiment was conducted in two locations. At the Teaching and Research Farm, Department of Crop Production, University of Maiduguri (11 15' N and 13' 51 E), Sudan Savanna belt of Nigeria, and Lassa Town, in Askira/Uba Local Government area of Borno State, (11 15' N and 11 30' E) in the Northern Guinea Savanna belt of Nigeria.

2.2 Experimental Design.

The experiment was carried out in a split plot design, with four okra cultivars (Alau, Utonko, Eklemson, and lady's finger) as main plot treatments, while, Mahogany leaf powder at 1 ton / ha, Carbofuran 3G at 2.0 kg a.i / ha, and Control were formed as sub - plot treatment. Each treatment was replicated three times. The experimental area measured 54.5m x 16m, giving a gross area of 872m^2. Each main plot measured 16mx4m and the sub plots measured 4m x 4m, and 1m alley between the replications. The populations of plant-parasitic nematodes for each plot were determined before treatment. Initial population (pi) level of nematode was determine by taking three core samples with soil auger to a depth of 20cm from the top soil in a zig zag manner and bulked. The bulked sample for each plot was thoroughly mixed and 250cm^3 sub samples were taken for nematode extraction, using the Whitehead and Hemming (1965) tray method. All data collected were subjected to analysis of variances appropriate to split plot design and means were compared using DMRT.

3. Results and Discussion

Tables 1 and 2 show the effect of okra cultivars, and mahogany leaf powder applied at 1 ton / ha, and carbofuran applied at 2.0 kg a.i /ha on soil nematode population. All the tested okra cultivars suppressed population of all nematode genera identified, except Alau where the population of microbivorous species increased by 241.1 %. Under Utonkon, soil population of *Helicotylenchus* was suppressed by 87.3 %, *Hoplolaimus* by 51.0 % and microbivorous species by 56.8 % (Table 1). Results presented in Table 2 show that each of the cultivars suppress soil population of *Longidorus* by more than 50 % and microbivorous species by 70.0 %. Carbofuran applied at 2.0 kg a.i/ha each reduces soil nematode population by more than 50 % in relation to control in Maiduguri (Table 1). The microbivorous species suffered reduction of 78.4 %, 56.8 %, and 63.0 % under the same treatment. Mahogany leaf powder applied at 1 ton /ha suppressed soil population of *Helicotylenchus* by 46.0 %, and *Hoplolaimus* by 46.5 %. However all the treatments had a suppressive effect in relation to non - amended soil. A similar finding was shared by Akhtar (2000) that many neem preparations, including leaves, oil cakes, have been tested for their nematicidal activity Gommer and Barker., (1998) and Chiwood, (2002) further explained that many nematicidal compounds have been isolated and identified from plants, however, only small number of plants known to contain such compounds has been used as soil amendment for nematode control in commercial field.

The results presented in Table 3 show that, there was significant difference ($P \leq 0.05$) in root knot gall among some cultivars in both Maiduguri and Lassa, except combined data. Significant reduction in number of gall per root system among cultivars was obtained with Alau (90.33 %), and Utonkon (90.25 %) in Lassa. The highest number of gall was recorded from Eklemson in both Locations and combined data (Table 3). Application of mahogany leaf powder at 1 ton/ha, and carbufuran applied at 2.0 kg a.i / ha, significantly ($P \leq 0.05$) suppressed galling of okra roots in both locations and the combined data in relation to control (Table 3). Highest reduction in number of galls per root system was obtained with Carbufuran (92.58 %) in Lassa. Similar trend was also observed in the combined analysis. Increase in root gall was recorded from non-amended plot (control) in both locations (Table 4). Reduction in indentified nematode population observed in this study could have been direct effect of Neem leaf powder, which is attributed to some of the chemical constituents particularly, azadirachtin, salannin, thionemone, nimbine and nimbidin (Devakumar *et al*., 1986)

The results further show that there was no significant ($p \geq 0.05$) difference among cultivars in Maiduguri, and the combined data except in Lassa (Table 5). Eklemson had the longest root length of 13.80cm in Maiduguri and the combined data (14.51cm). Alau had the longest root length (15.59cm) at Lassa but was not significantly ($p \geq 0.05$) different from Eklemson. The Table further showed that, Mahogany leaf powder applied at 1ton / ha and carbofuran applied at 2.0 kg a.i / ha significantly increased okra root length ranging from 14.07 cm to 16.14 cm in comparison to non - amended plot (control) in Maiduguri, with a similar trend at Lassa and combined data (Table 5). The result therefore, establishes the nematicidal potential of mahogany leaf powder obtained in the Pioneer work by Bunt (1975), which explained that the extracts rendered the roots of a susceptible plant highly unfavorable to the root-knot nematode, as a result of which there is poor penetration and later reduction in the biological activities of the nematodes, such as feeding and reproduction or both. Amended plot with either neem, mahogany leaf powder each at 1ton / ha or carbofuran applied at 2.0 kg a.i / ha,

significantly produced higher fruit yield than the non - amended plot (control) in Maiduguri, Lassa and combined data (Table 6).

Table 1: Effect of Amending Nematode infested Soil with, Mahogany leaf Powder and Carbofuran on Nematode Population during 2013cropping season in Maiduguri

Treatments	*Helicotylenchus* Initial population (No)	*Helicotylenchus* Final population (No)	*Helicotylenchus* Percentage Change	*Hoplolaimus* Initial population (No)	*Hoplolaimus* Final population (No)	*Hoplolaimus* Percentage Change	Microbivorous Initial population (No)	Microbivorous Final population (No)	Microbivorous Percentage change
Treatment (A) Alau	23.2	10.5	-54.7	24.5	14.6	-40.4	08.5	29.0	+241.1
Utonkon	18.9	2. 4	-87.3	19.6	9.6	-51.0	18.3	7. 9	-56.8
Eklemson	39.3	19. 5	-50.3	12.1	6.3	-47.9	16.4	11.6	-29.2
Lady's finger	26.4	16.9	-35.9	18.7	3.3	-82.3	20.6	11.3	-45.1
Treatments(B)									
Mahogany	34.1	18.4	-46.0	12.9	6.9	-46.5	23.7	16.6	-29.9
Carbufuran	21.5	9. 2	-57.2	16.4	4. 6	-71.9	25. 5	5.5	-78.4
Control	17.8	19.2	+11.2	25.6	29. 6	+15.6	35.24	39.9	+13.2

Values are means of three replicates
+ = increase
- = decrease
No: = number of nematode

Table 2: Effect of Amending Nematode Infested Soil with Mahogany leaf powder and Carbufuran on Nematode Population during 2013 cropping season in Lassa

Treatments	*Meloidogyne* Initial population (No)	*Meloidogyne* Final population (No)	*Meloidogyne* Percentage Change	*Longidorous* Initial population (No)	*Longidorous* Final population (No)	*Longidorous* Percentage change	Microbivorous Initial population (No)	Microbivorous Final population (No)	Microbivorous Percentage change
Treatment(A)									
Alau	15.11	14.2	-6.0	38.2	16.4	-57.0	14.7	4.4	-70.0
Utonkon	13.6	11.7	-13.9	20.5	7.7	-62.4	23.2	16.2	-30.1
Eklemson	14.3	10.4	-27.2	18.8	12,0	-36.1	18.3	9.1	-50.2
Lady's finger	9.9	9.1	-8.0	12.4	4.1	-66.9	29.4	26.4	-10.2
Treatment(B)									
Mahogany	14.6	9,2	-36.9	14.1	16.3	+15.6	39.7	29,5	-25.6
Carbufuran	11.3	3.8	-66.3	19.1	08.2	-58.1	15.3	7.13	-86.5
Control	7.1	21.1	+197.1	16.5	23.5	+42.4	3.14	16.8	+15.8

Values are means of three replicates
+ = increase
- = decrease
No= number of nematode

Table 3: Effect of amending Nematode infested Soil with Mahogany Leaf Powder and Carbofuran on Okra Root Knot Gall during 2013 Cropping Season in Maiduguri and Lassa

	Root knot gall		
Treatments	**Maiduguri**	**Lassa**	**Combined**
Cultivar (A)			
Alau	17.83[a]	9.67[b]	13.75[a]
Utonkon	16.00[a]	9.75[b]	12.87[a]
Eklemson	18.83[a]	14.67[a]	16.75[a]
Lady's finger	12.42[b]	14.33[a]	13.37[a]
(SE ±)	3.911	3.741	3.152
Treatment (B)			
Mahogany (1 ton /ha)	13.58[b]	11.00[b]	12.29[b]
Carbofuran 2.0 a.i k g/ ha	11.92[b]	7.42[b]	9.67[b]
Control	27.00[a]	21.17[a]	24.08[a]
SE(±)	3.772	3.166	2.805
AxB	*	*	*

Values are mean of three replicates
Mean within column followed by similar letter are not significantly different at, $P \leq 0.05$ using DMRT test

Table 4: Effect of Amending Nematode Infested Soil with Mahogany Leaf Powder and Carbufuran on Fresh Okra Shoot Height During 2013 Cropping Season in Maiduguri and Lassa

	Shoot height (cm)		
	Locations		
Treatments	**Maiduguri**	**Lassa**	**Combined**
Cultivar (A)			
Alau	55.32[a]	69.19[a]	62.25[a]
Utonkon	63.35[a]	70.98[a]	67.16[a]
Eklemson	60.70[a]	60.57[a]	60.64[a]
Lady's finger	65.13[a]	69.00[a]	71.95[a]
SE (±)	6.310	6.955	7.443
Treatment (B)			
Mahogany	71.84[a]	73.29[b]	72.56[b]
Carbufuran	68.92[b]	77.81[a]	72.9
Control	26.45[c]	41.73[c]	40.69[a]
SE (±)	5.942	6.668	5.448

Values are mean of replicates
Means within column followed by similar(s) letter are not significantly different at $P \leq 0.05$ using DMRT test.

Table 5: Effect of Amending Nematode infested Soil with Mahogany Leaf Powder and Carbofuran on Okra Fresh Root length during 2013 cropping Season in Maiduguri and Lassa

	Fresh Root length (cm)		
	Locations		
Treatments	**Maiduguri**	**Lassa**	**Combined**
Cultivar (A)			
Alau	12.13[a]	15.59[a]	13.86[a]
Utonkon	12.85[a]	14.33[b]	13.59[a]
Eklemson	13.80[a]	15.23[a]	14.51[a]
Lady's finger	12.35[a]	12.94[b]	12.64[a]
(SE ±)	1.243	1.006	0.832
Treatment (B)			
Mahogany	14.07[b]	15.37[c]	14.72[c]
Carbofuran	15.2[b]	15.82[b]	15.52[b]
Control	5.79[a]	9.78[a]	7.78[a]
(SE ±)	1.229	1.926	1.408
A x B	*	*	*

Values are are mean of replicates

Table 6: Effect of Amending Nematode infested Soil with Mahogany Leaf Powder and Carbofuran on Fresh Okra Fruit yield during 2013 cropping season in Maiduguri and Lassa

	Fruit yield (ton/ha)		
	Locations		
Cultivar/treatment t/h	**Maiduguri**	**Lassa**	**Combined**
Cultivar (A)			
Alau	11.45[a]	12.8[a]	12.13[a]
Utonkon	9.02[a]	12.4[a]	10.53[a]
Eklemson	9.12[a]	11.74[a]	10.43[a]
Lady's finger	9.56[a]	12.89[a]	11.23[a]
(SE ±)	1.392	0.828	0.750
Treatment (B)			
Mahogany	11.23[a]	14.44[a]	12.84[a]
Carbofuran 2.0 a.i kg / ha	11.75[a]	15.00[a]	13.38[a]
Control	5.33[b]	6.29[b]	5.81[b]
SE(±)	1.271	1.024	0.85
Interaction A x B	*	*	*

Values are mean of three replicates
Means within column followed by similar letter are not significantly different at, $P \leq 0.05$ using DMRT test

4. Conclusion and recommendation

From the results of this study, it can be concluded that the use of neem leaf powder and mahogany leaf powder each applied at 1 ton / ha could be suitable for soil amendment against soil plant parasitic nematode as okra cultivars treated with neem leaf powder and mahogany leaf powder had less root knot gall compared to control. The application of neem and mahogany leaf powder had shown positive effect on soil population of plant parasitic nematode, fruit yield and growth parameters of okra cultivars. The application of the amendment had also succeeded in boosting resistance to okra plant cultivars against plant parasitic nematode.

It is evident that organic amendments can play a role in managing plant parasitic nematodes in high value crops, and it can also be used for sustainable nematode pest management under field conditions particularly, as soil amendment that have additional advantage of improving soil fertility. The effectiveness of organic amendment could be assigned to the enhancement of soil microbial population and the chemical by - product from the decomposition of the amendment. The suppressive effect of neem leaf powder in controlling nematode could be attributed to its constituent compounds especially azadiratin.

From the study, it can be concluded therefore that, mahogany leaf powder may contain some active substances which are deleterious or harmful to nematodes and hence it could be used as a nematicides. In this regard, farmers may be encouraged to use the leaf either by mixing it with the soil through proper tilling method, or by applying it directly on the susceptible crops. There is also need to identify and isolate the specific active ingredients present in the plant. Application of neem product like leaf powder could be used again soil plant parasitic nematodes either as amendment or extract in a field infested by plant parasitic nematodes. Farmers may also be encourage to use all the tested okra cultivars especially Eklemson.

References

Obguji, R. O. and Okonkwo, J. C (1981). Influences of soil P.H on reproduction of *Meloidogyne incognita Nigeria Journal of Plant Protection*

Dupriez, H. and Deleener, P.H. (1989). Life land Africa Garden and orchad growing vegetables and Fruit, Macmillan Publisher Ltd. London pp 262-264.

Olasantan, F. O., and Bello, N. J. (2003). Optimum sowing dates for okra *(Abelmoschus esculentus)* in monoculture and mixtures with contrasting cassava *(Manihot esculenta)* during the rainy season in south western Nigeria *Journal of Agricultural Science, Cambridge*

Sikora, A. R. and Grco, N. (2000). Nematode parasite of food legumes in: Luc, plant parasitic nematode in sub tropical and tropical Agriculture A.B. International pp197-198.

Akhtar, M. and Mahmood, I. (2000). Control of Plant Parasitic Nematode with neem and some plant by bare root dip treatment. *Nematologica Journal of Mediterranean* 21:89-92.

Bunt, J.A. (1975). Effect and mode of action of systemic nematicides. Meded lanbd. Hogesch. Wageningen .73: 1-17.

Whithead, A. G. and Hemming, J. R. (1965). Comparism of some qualitative method extracting small vermiform nematode from soil. Annals of applied Biology.