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EFFECTS OF SIAM WEED *CHROMOLAENA ODORATA* ON PLANT PARASITIC NEMATODES OF TOMATOES (*SOLANUM LYCOPERSICUM*)

***Nyong A., & Nworgu, C.O.**
Department of Animal and Environmental Biology, University of Port Harcourt, P.M.B. 5323, Choba, Rivers State, Nigeria

***Corresponding Author (Email):** adeinbiarinyong@yahoo.com

Abstract
As a result of the damage caused by plant parasitic nematodes in tomato production, a study to ascertain the effect of *Chromolaena odorata* against the nematode of "Derica" was carried out at the University of Port Harcourt. Plant such as *C. odorata* was assessed under field assay. This was carried out over 3 months. The undisturbed fields were assessed to determine nematode population. Dried and powdered leaves of *C. odorata* were administered as organic amendments at 100ml. These were observed over 90 days. However, both soil and root samples were assessed at an interval of 30 days for nematode multiplication. Growth parameters which include height (cm), the weight of root (g), girth (cm), fruit number and weight (g) were also assessed within the 30 days intervals. Data were analysed using Descriptive statistics and ANOVA at a 5% significance level. "Derica" showed susceptibility to *Trichodorus* and *Aphelenchoides* spp. for the treatment. Soil nematodes recovered from both untreated and treated fields showed no significant difference ($p > 0.05$) for the cultivar. "Derica" cultivar recorded no significance in height and girth throughout the period under study ($P< 0.05$). The application of the extract *C. odorata* enhanced the production of the fruits. Also, the symptoms of nematode infectivity for treated crops were less than the control. However, results from the "Derica" field showed that treatments are not significant ($p> 5\%$) for gall formation and weights of the roots, though the result showed symptoms of nematode infectivity.

Keywords: Nematode, *Chromolaena odorata*, Derica, Management.

Introduction

Tomato (*Solanum lycopersicum*) is an important and broadly consumed vegetable in Nigeria; it generates income for both Nigeria and Africa as a whole. It is recognized as the most popular vegetable worldwide (Jensen, et al., 2010). Tomato is susceptible to plant parasitic nematodes (Siddiqui, 1988b). Among the pest-attacking vegetables, plant parasitic nematode (PPN) is the most recognized pest of tomato in subtropical regions including Nigeria (Sikora et al., 2005). Soil inhabiting nematode pests had been identified as a major constraint limiting the growth and yield of tomatoes in Nigeria (Olabiyi, 2004). Chemical control of PPN remains the most effective control measure but with some serious constraints. Chemical nematicides are very toxic to mammals and have residual effects on farm produce. Application of soil amendment in the form of plant extracts into the soil, in an attempt to suppress plant disease, could serve as a viable potential alternative. Root and leaf extracts of *Chromolaena odorata* are among the few plant extracts known to be useful against nematode pests in Nigeria (Olabiyi & Gwazah, 2001). They contain bioactive compounds that have nematicidal properties against *M. incognita* (Fatoki &Fawole, 2000; Odeyemi &Adewale, 2011). *C. odorata* is highly rich in phytates and tannins, with few alkaloids,

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flavonoids (flavanones, flavonols, flavones) and cyanogenic glycosides (Igbo et al., 2009). It is on this premise therefore, the study investigated the nematicidal potentials of *Chromolaena odorata* extracts on nematodes of tomatoes.

Materials and Method

This research was undertaken in the Abuja Campus of the University of Port Harcourt, Latitude 4053 25 and 4054 35N and Longitude 6054 25 and 60 55 55E. The university falls within the humid region known to have two seasons; dry season (November to March) and wet season (April to October). The monthly mean maximum and minimum temperature range from 28°c to 33°c and 17°c to 24°c respectively.

This work was exclusively conducted under field conditions in a completely randomized block design (CRBD). Sixty (60) soil samples were collected randomly and kept in properly labelled polythene bags and were transferred to the Parasitology laboratory, University of Port Harcourt to ascertain the initial nematode population. A piece of land in the University of Port Harcourt was harrowed into 12 beds. Fresh green leaves of *C. odorata* were obtained within the University of Port Harcourt premises and air-dried for a month and thereafter blended into powder (Olabiyi and Oyedumadu, 2008). The extract was sieved and the filtrate was thereafter used.

The tomato seed (Derica) used for this experiment was obtained from Agritropic Vegetable seeds for Nigeria.
A proper combination of loamy topsoil was heat-sterilized at 55^0C for 45 minutes (Desaeger, 2000). The sterilized soil was used for the nursery. The seeds were planted on the sterilized soil land and later transferred into the screen house. The plants were frequently watered. The seeds were allowed to grow for four weeks after germination before transplanting was done to the field as described by Greensill, (1976). Group one (1) comprising thirty (30) tomato plants had twenty-five (25) treated with *Chromolaena odorata* while five (5) served as control. The plants were equally treated with 5000ml of the powder of bionematicides, exempting the control. A total of 5kg of powdered extract was used for the experiment. The extracts were applied at 100ml/plant at four weeks post-planting period. The data attained from this study were analyzed using a one-way analysis of variance. Descriptive statistics such as charts, mean and standard deviation (SD) were applied also.

Results

Fifty-five (55) nematodes belonging to seven (7) families were recovered from the undisturbed site. They include; *Meloidogyn*e spp., *Ditylenchus* spp., *Pratylenchus* spp., *Xiphinema* spp., *Rotylenchus* spp., *Tylenchorhynchus* spp., *Longidorus* spp., *Hoplolaimus* spp., *Trichodorus* spp. and *Aphelenchoides*. spp. However, at 90 days after application of organic amendment with *C. odorata* 60(100%) nematodes recovered were as follows; Meloidogyne spp., *Tylenchorhynchus* spp., *Longidorus* spp., *Trichodorus* spp. and *Aphelenchoides* spp. (Table 1) \. Plant height and girths were comparatively higher than the control except at 30 days where the plant height and control had no difference (Table 2). The galls and root weight of Derica treated with the extract of C. odorata wasn't much compared to the control (Table 3). In the "Derica" field, *C. odorata* treated plants had a total number of 23 fruits and the control plants produced 1 fruit (Fig.1).

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Table 1: Soil Nematode Fauna Population in the rhizosphere of the two accessions at 90 days after exposure to botanical extract

Nematode species	Pre-treatment assessment (%)	Treatment with *C. odorata* Derica (%)
***Meloidogyne* spp.**	21 (38)	12(20)
***Ditylenchus* spp.**	10(18)	0(0)
***Pratylenchus* spp.**	8(15)	0(0)
***Xiphinema* spp.**	1(2)	0(0)
***Rotylenchus* spp.**	4(7)	0(0)
***Tylenchorhynchus* spp.**	4(7)	13(22)
***Longidorus* spp.**	3(6)	12(20)
***Hoplolaimus* spp.**	4(7)	0(0)
***Trichodorus* spp.**	0(0)	10(17)
***Aphelenchoides*spp.**	0(0)	13(22)
Total (%)	55(100)	60(100)

Table 2: Differences in the effect of bionematicide (Derica).

	30 Days		60 Days		90 Days	
Treatment (s)	**Height**	**Girth**	**Height**	**Girth**	**Height**	**Girth**
C. odorata	18.28 ± 1.25[a]	1.83 ± 0.17[a]	45.56 ± 20.12[a]	5.39 ± 1.94[a]	45.56 ± 10.94[a]	3.74 ± 1.04[a]
Control	18.40 ± 2.27[a]	1.79 ± 0.39[a]	31.80 ± 29.04[a]	4.69 ± 4.27[a]	20.80 ± 30.39[a]	1.74 ± 3.03[a]

NB: Row means ± standard deviation with the different alphabet is significant at 5%.

Table 3: Differences in the symptoms of nematode infectivity between treatments.

Treatment (s)	Derica	
	Galls	Root Weight
C. odorata	5.88 ± 3.08[a]	1.84 ± 1.07[a]
Control	14.50 ± 22.11[a]	2.30 ± 3.19[a]

NB: Row means ± standard deviation with the different alphabet is significant at 5%.

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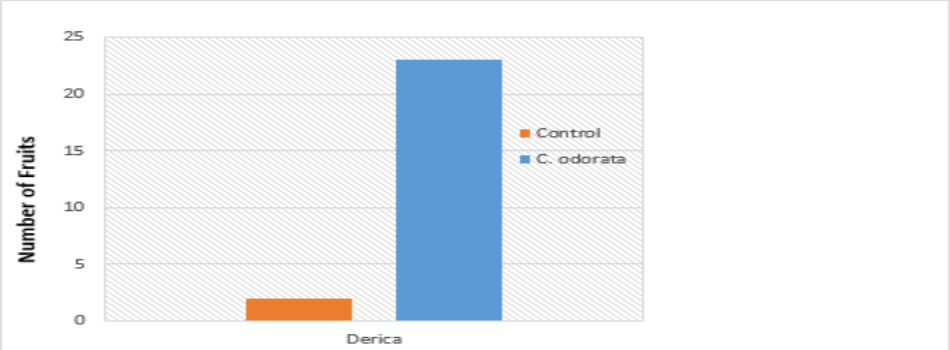

Fig. 1 Reproductive Ability of Crops (Number of Fruits)

Discussion

The result gathered in this study showed that the abundance of nematodes in the undisturbed site was more than in the amended soil. The application of the extract of *C. odorata* on the "Derica" plant resulted in the mortality of *Meloidogyne* spp., *Ditylenchus* spp., *Pratylenchus* spp., *Xiphinema* spp. and *Rotylenchus* spp. This occurrence is consistent with other plants like neem and moringa extracts that were used to control tomato pests and diseases Culver et al. (2012). This could be a result of the nematicidal properties of these plant materials. Also, it was observed that the population of the nematodes; *Tylenchorhynchus* spp. and *Longidorus* spp. multiplied after the use of *C. odorata*. This study agrees with that of Schosser et al. (2006) who equally recorded an increase in soil nematodes after the treatment of three plants with *T. diversifolia* and *C. odorata*. This result was also similar to the previous study done by Imafidor and Nzeako, (2007) who ascertained that the existence and presence of nematode vermiform in the rhizosphere and root of tomato cultivar gradually increased *M. javanica* population. This could be a result of the initiation of the feeding site and larvae invasion of the root (Goverse, 2000). It could also be that the effect of the extracts could be gradually depleting. “Derica” showed susceptibility to *Trichodorus* spp. and *Aphelenchoides* spp. Results obtained on the effect of the *C. odorata* extract on plant height showed no significant ($p>0.05$) difference. Plants treated with *C. odorata* had higher plant height when compared with the control, this is thought to be a result of the effect of nematicidal properties of the plant extract incorporated in the soil. Results obtained from the girth followed a similar trend. Results on the root weight showed that the control had higher root weight than the treated plants. This could be a result of gall formation. The result also showed that *C. odorata* affected tomato growth positively by increasing the fruit yield. The effect of *C. odorata* extract which prevented the attack of the nematodes by creating an unfavourable environment for the nematode activity, increased germination. The treated crop had more fruit yield than the control.

Conclusion

The introduction of the plant extract *C. odorata* had positive as well as increasing effects on the nematodes. The increasing demand for organic procedures makes *C. odorata* a potentially viable alternative to chemical nematicide for the control and management of PPN

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