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ASSESSING *CHROMOLEANA ODORATA* AS A TRAP CROP FOR THE CULTURAL CONTROL OF NEMATODES

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ABSTRACT
Chromolaena odorata was assessed under laboratory conditions as a possible trap crop for cultural control of plant nematodes. The fine sieve extraction technique was used to extract the plant parasitic nematodes from soil, leaf and root samples of Chromolaena odorata, Different nematode genera were observed and counted. They include Meloidogyne spp 168 (38.7%), Paratylenchus spp 75 (17.2%), Hopolaimus spp 43 (9.9%), Rotylenchus spp 24 (5.5%), Paralongidorus spp 33 (7.6%), Radopholus spp 25 (5.8%), Naccobus spp 28 (6.5%), Helicotylenchus spp 38 (8.8%). Meloidogyne spp occurred most among the nematodes found in Chromolaena odorata. The study revealed that Chromolaena odorata is susceptible to nematode attacks and is therefore a potential trap crop for nematode attack (Meloidogyne spp). Further studies on trials of more probable crops are suggested in order to have a broader pool of trap crops for cultural control of plant parasitic nematodes.

Key words, *Chromolaena odorata , Meloidogyne spp,* nematode

INTRODUCTION
The menace caused by plant parasitic nematodes in crop production and integrated pest management (IPM) systems must be addressed if agriculture is to meet the world demands for increasing food and fiber production. On a worldwide basis, annual crop losses due to nematode damage have been estimated to average 12.3 percent (Sasser and Freckman, 1987), amounting to some US$77 million annually. The data available indicate that similar losses occur in the Near East (Maqbool *et al*., 1988; Saxen *et al*., 1988). For example, estimated losses for vegetable crops due to nematode-related disease complexes in Egypt amounted to some 15 percent in 1986, with losses for field crops ranging from 5 to 20 percent (Eissa, 1988). Nevertheless, the subtle nematode symptoms and signs are often confused with nutrient deficiencies and other maladies, resulting in nematodes being overlooked by agricultural scientists as well as growers.

A wide range of cultural practices have varying levels of efficacy in nematode management. These include clean planting stock, crop rotation, inter- and intra-cropping, cover/trap crops, soil amendments, fallow, time of planting/harvesting, and general farm hygiene and culture. Such non-chemical tactics are especially important for low-value crops. (Brown, 1987).

Trap crops and antagonistic plants are useful for reducing nematode populations as well as conserving soil and often improving soil texture (Nusbaum and Ferris, 1973; Trivedi and Barker, 1986).

Chromolaena odorata

Description: *Chromolaena odorata* is a big bushy **herb** or **subshrub** with long rambling but not twining branches. The **stems** are terete, pubescent, its **leaves** are opposite, flaccid-membranous, velvety-pubescent, deltoid-ovate, acute, 3-nerved, and very coarsely toothed. Each margin has 1-5 teeth, or entire in youngest leaves; the base is obtuse or subtruncate but shortly decurrent. Petiole is slender, and 1-1.5 cm long, the blade mostly 5-12 cm long, 3-6 cm wide (Kriticos *et al*., 2005).

Fig. 1: Pictorial view of *Chromolaena odorata*

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Habitat and Ecology: *Chromolaena odorata* grows in many soil types but prefers well-drained soils. It does not tolerate shade and thrives well in open areas (Ecoport), forming dense stands which prevent establishment of other species, both due to competition and allelopathic effects. It requires disturbance to become established (Kriticos *et al*., 2005). When dry, it is a flashy fuel which promotes wildland fires.

Chromolaena odorata is an opportunistic weed generally confined to forest edges and clearings. It can form dense thickets in disturbed areas and may prevent recruitment of native plant species, thereby delaying successional processes. Dense infestations can increase the intensity and frequency of fire, leading to further changes in the structure and composition of native plant communities. *C. odorata* has the potential to colonise tropical and sub-tropical areas where annual rainfall exceeds 1000 mm per annum. In its native habitat, the plant thrives in tropical rainforest clarings and river flats, appearing early in the successional stage, rapidly establishing dense thickets and then gradually disappears as the rainforest canopy closes over. *C. odorata* can grow on most soils but prefers well-drained sites and will not grow in water-logged or saline soils (Kluge and Zachariades, 2006). Tree clearing for agriculture and other development appears to facilitate spread of the plant, which is quick to colonise roadsides, forest edges, plantations and pastures. An agricultural district, where original rainforest cover has been fragmented into small reserves and corridors, is particularly vulnerable to invasion." (Csurhes & Edwards, 1998) "Croplands and neglected pastures, forest margins and disturbed rainforests; in well-drained soils" (Waterhouse & Mitchell, 1998).

Propagation: *C. odorata* is propagated by wind-dispersed seeds. Seeds also cling to hair, clothing and shoes. The tiny seeds can occur as a contaminant in imported seed or on vehicles and machinery (Kriticos *et al*., 2005). Vehicle traffic can spread the seed along roads. Can propagate vegetatively from stem and root fragments. (Waterhouse & Mitchell, 1998; pp. 23-24)

MATERIALS AND METHODS

Field Work

C. odorata samples were selected randomly from three farms, the selected plants were uprooted, the roots and rhizosphere collected in labelled polythene bags and transported to the laboratory for analysis.

Laboratory Work – Extraction of Nematodes

Twenty grams of the soil around the roots of the selected crops from the three (3) selected farm were weighed, then mixed with 10ml of water to form a suspension. The mixture was passed through a 20µm sieve into a small container filled with water (the sieve was placed carefully not to make contact with the water in the small container). It was allowed to settle over-night. After which the sieve was carefully removed, the supernatant water was decanted, and the sediment transferred into a clean bottle and fixed with formaldehyde. It was then viewed on a slide covered with a cover slide under a microscope (x10 objective) for identification of plant parasitic nematodes.

This same method was used in extracting plant parasitic nematodes from the roots and leaves after the roots and leaves had been washed.

RESULT

The following pictures are different genera of plant parasitic nematodes that were seen in the samples

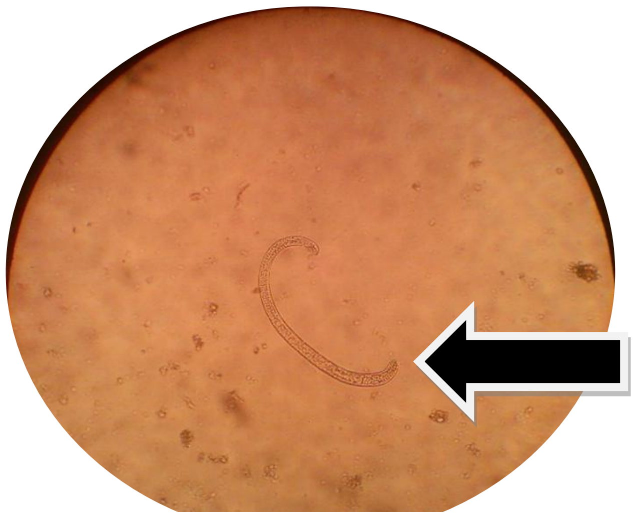

Plate 1.Helicotylenchus spp (x10 objective)

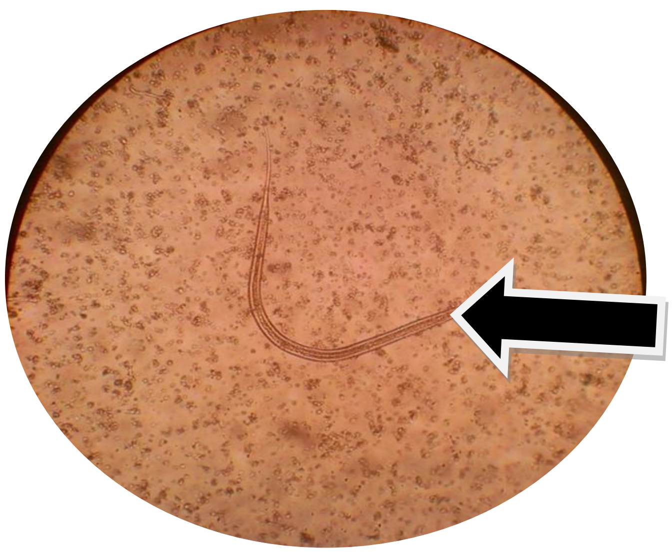

Plate 2.Meloidogyne spp (x10 objective)

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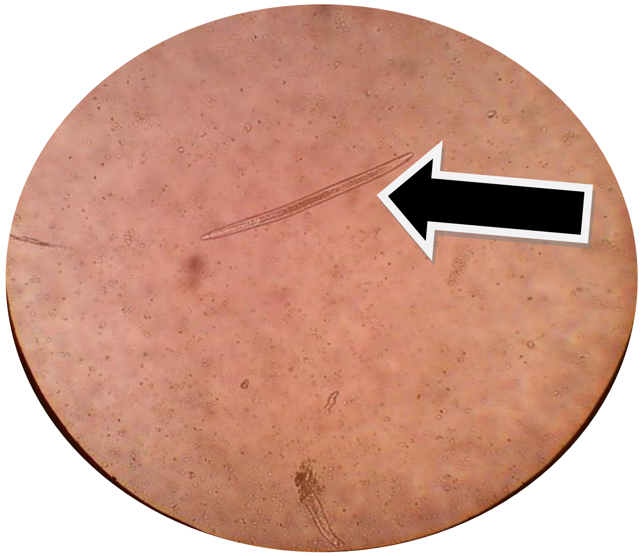

Plate 3.Paralongidorus spp (x10 objective)

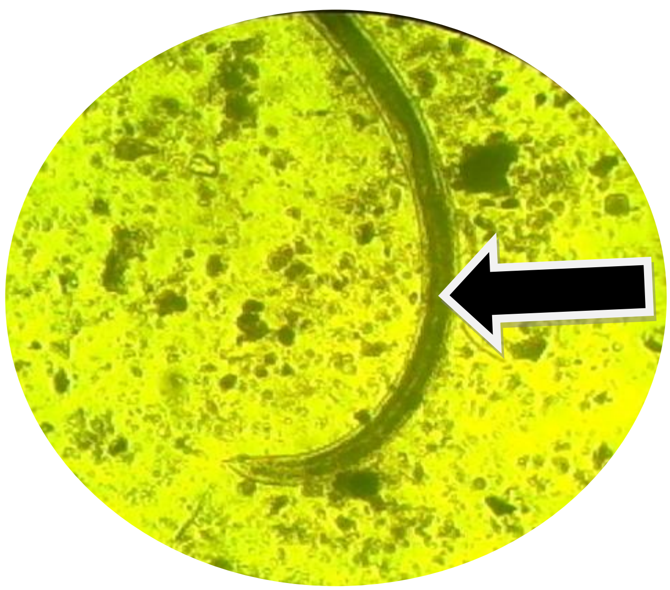

Plate 4. Rotylenchus spp anterior (x10 objective)

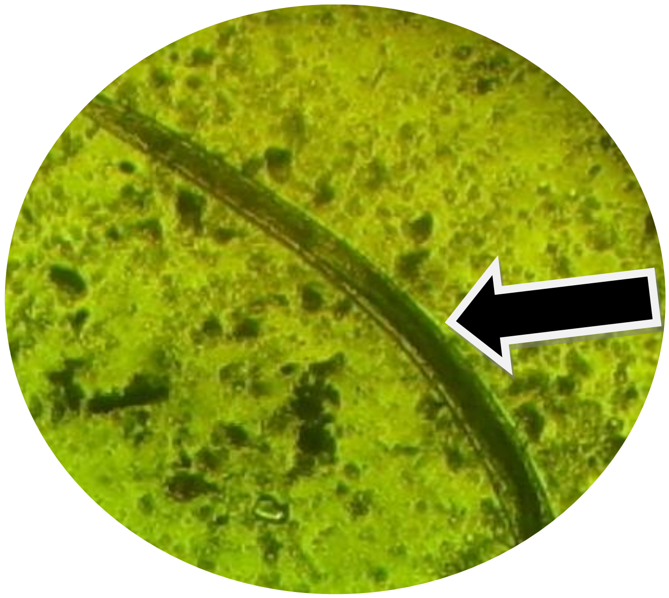

Plate 5. Rotylenchus spp posterior (x10 objective)

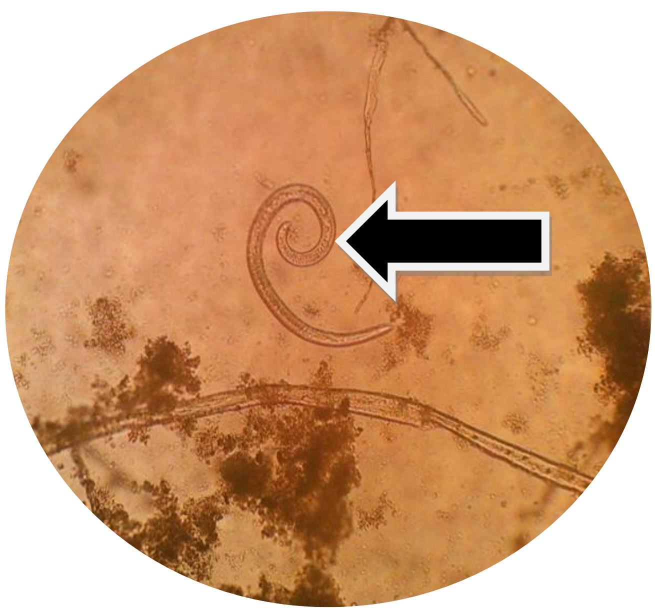

Plate 6. Paratylenchus spp (female) (x10 objective)

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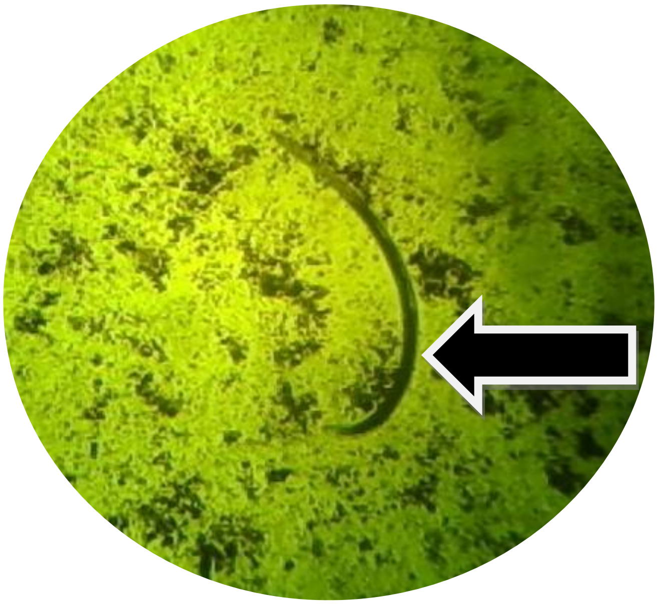

Plate 7. Hoplolaimus spp (x10 objective)

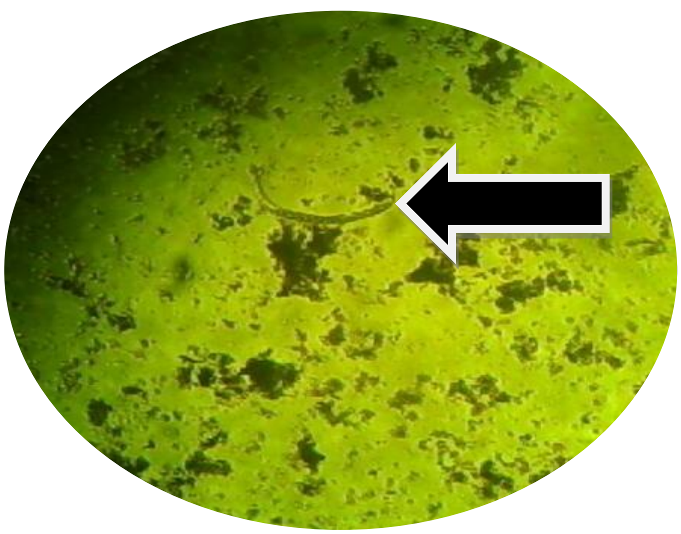

Plate 8. Radopholus spp (x10 objective)

Table 1: Distribution table of Nematodes species found in the soil, root and leaf samples of *Chromolaena odorata.*

Nematode	Soil				Root				Leaf				Total	Average
Genera	M	F	J	E	M	F	J	E	M	F	J	E		(x10ml)
Meloidogyne	20	30	38	10	11	23	29	7	-	-	-	-	168	1680
Paratylenchus	8	15	22	-	-	13	17	-	-	-	-	-	75	750
Hoplolaimus	-	18	8	-	-	11	6	-	-	-	-	-	43	430
Helicotylenchus	4	12	6	-	-	10	6	-	-	-	-	-	38	380
Rotylenchus	-	6	12	-	-	2	4	-	-	-	-	-	24	240
Paralongidorus	-	8	10	-	2	4	9	-	-	-	-	-	33	330
Radopholus	-	10	8	-	-	-	7	-	-	-	-	-	25	250
Naccobus	-	-	-	-	-	-	-	-	6	10	12	-	28	280
TOTAL													**434**	**4340**

Key: M –Male
F - Female
J - Juvenile
E - Egg

DISCUSSION

In this study, various species of nematodes (egg, juveniles, adults) had their highest prevalence in the roots and soils samples of *Chromolaena odorata* except for *Naccobus spp* which had no female and juveniles in the soil and root samples but was found in the leaf samples this may be attributed to the fact that the species commonly attacks leafy parts of some plants (OEPP and EPPO, 1990). *C. odorata* has the potential to be used as a trap crop for the cultural control of Root-Knot nematodes (*Meloidogyne spp.)* Looking at the result, *Chromolaena odorata* had more of *Meloidogyne spp* in the various samples, followed by *Paratylenchus spp.* This work therefore suggest that *C. odorata* can be used as trap crop for the control of root knot nematodes in areas where root knot nematodes attacks poses great threat to agricultural productivity.

This study suggests that *C.odorata* should be planted first to trap the nematodes in the soil, after maturity and afterwards properly disposed before the proper planting season begins, so as to reduce the initial population of *Melodogyne spp* (root knot nematode) below the threshold level.

Several practices have been recommended to reduce the population of plant parasitic nematode and their impact on crops (McSorley and Dickson, 1995). Currently nematode management considerations include crop rotation of less susceptible crops or resistant varieties, cultural and tillage practices, use of transplants, and pre-plant nematicide treatments (Rodriguez-Kabana *et al*., 1992**)**. Where practical, these practices are generally integrated into the summer or winter 'off-season' cropping sequence in temperate countries. It should be recognized that not all land management and cultural control practices are equally effective in controlling plant parasitic nematodes and varying degrees of nematode control should be expected. These methods, unlike other chemical methods, tend to reduce nematode populations gradually through time. Farm specific conditions, such as soil type, temperature, moisture, can be very important in determining whether different cultural practices can be effectively utilized for nematode management.

In localities where land availability permits, the use of cover crops, especially plants

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that serve as trap crops or other suppressive effects on nematode populations, should be considered. Carefully selected cover crops may serve as living mulches and provide multiple pest control (National Academy of Sciences, 1991). The present study shows that *C. odorata* is susceptible to nematode attacks. Hence a potential trap crop for cultural control of *Meloidogyne spp* attacks. Awareness is needed for cultural control method to be adopted and practised since it is less expensive, effective and not harmful to humans.

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