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Evaluation of the effect of some pesticides for the control of root-knot nematode (*Meloidogyne* spp) on *Telfairia occidentalis*

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ABSTRACT

An experiment was carried out to investigate the effect of some pesticides in the control of Root-knot nematode (Meloidogyne spp) on Telfairia occidentalis. The experiment was located at the green house of the College of Crop and Soil Sciences, Michael Okpara University of Agriculture Umudike, Abia State, Nigeria. The pot experiment consisted of six treatments replicated five times and laid out in Completely Randomized Design (CRD). Each pot was inoculated with 2000 nematode eggs. The treatments used included Termidust, Worm Force, Carbofuran and Basudyne. Nematode alone and Uninoculated pots (No nematode) were used as control. Data were collected on the individual plants on number of galls, nematode eggs in the root, nematode larva in the soil, plant height, fresh weight of shoots, number of leaves, length of root and fresh weight of root. Results obtained showed that the number of galls, eggs in the roots and nematode larva in soil were drastically reduced as a result of the treatments application. However, no significant differences ($P<0.05$) were observed 8 weeks after on the number of leaves, fresh weight of root (g) and length of roots. Generally, Termidust and Basudyne performed better than the other treatments and they could replace Carbofuran which farmers always apply.

Key words: *Meloidogyne* spp, Pesticides, *Telfairia occidentalis*

INTRODUCTION

Telfairia occidentalis commonly known as fluted pumpkin is a leafy vegetable which belongs to the family *Cucurbitaceae*. It originated from the South Eastern Nigeria and it is widely distributed among the Igbo speaking people particularly around Imo State, Nigeria (Esiaba, 2000; Akoroda, 2001; Burkul, 2004), where it has the widest diversity. It is a crop of commercial importance. Nigeria, Ghana, Serra Leone are the major producers of *Telfairia occidentalis*. The seeds can be eaten by boiling and for egusi soup (Schippers, 2002; Grubben and Denton, 2004). Leaves are spirally arranged, 3-5.5cm long while female flowers are solitary in leaf axils (Grubben and Denton, 2004). It is a herb climbing by coiled, often branched tendrils to a height of over 20m. The root system ratify the top surface of the soil and stem is angular glabrous and fibrous when old. Nutritionally *Telfairia occidentalis* has been considered an “oil seed” and is high in oil (30%). Shoots of *Telfairia occidentalis* contain high levels of potassium (39%) and iron (35%) while seeds are composed of 27% crude protein and 53% fat. The leaves contain a high amount of antioxidants and hepatic-protective and antimicrobial properties. The young shoots and leaves of the female plant are the main ingredients of a Nigerian soup. The large (up to 5cm) dark-red seed is rich in fat (45.0) and protein (20.0) and can be eaten whole, ground into powder for any kind of soup or made into a fermented porridge (Odiaka, 2001).

Telfairia occidentalis is highly susceptible to root knot nematodes (*Meloidogyne* spp*)* (Jiskani, 2004). Root-knot nematode has been reported to be a limiting factor to the production of *Telfairia occidentalis* in Nigeria. The yield loss is associated with conspicuous galls that disrupt water and nutrient uptake (Jiskani, 2004). When this happens, the roots of the *Telfairia occidentalis* becomes weak. The generalized symptom of nematode attack on crop can be grouped into those that occur below the soil (below ground symptoms) and those that affect the shoot system (above ground symptoms). According to Ononuju (1999) the following constitute the above ground symptoms; stunted growth, yellowing of leaves, crinkling, curling and twisting of leaves. While below ground symptoms includes; bushy roots, brown lesions, spots or streak on the roots, typical root gall or knots of the roots, suppression of root growth and presence of tiny cyst on roots. The use of nematicides have been the major option for the control of plant-parasitic nematode. Farah (2002) reported that nematicides are fast in action as well as effective in controlling agricultural pests. Most farmers have relied on the application of Carbofuran.

The objective of this study is to determine the effect of four (4) pesticides Termidust, Worm force, Carbofuran, and Basudyne in the control of Root-knot nematode attacking *Telfairia occidentalis*.

MATERIALS AND METHODS

Experimental Location

The experiment was in an open space beside the green house of the College of Crop and Soil Sciences, Michael Okpara University of Agriculture Umudike, Abia State, Nigeria.

Experimental Design

The experiment was arranged in a completely randomized design in open field platform using plastic pots with six treatments replicated five times including the control.

Source of *Telfairia occidentalis* seeds

The seeds were obtained from the local market in Abia State.

Preparation of nematode inoculum

Eggs of root-knot nematode were extracted from heavily galled roots of *Basella alba* (Cylon spinach) using Hussey and Barker (1973) method. A calculated suspension containing about two thousand (2000) eggs were used as inoculum.

Planting of seeds

Telfairia occidentalis was sown one seed per hole in plastic pots containing 10kg mixture of sterilized sandy loam soil.

Inoculation of nematode eggs to the plant

The nematode eggs were used to inoculate the soil around the plant three weeks after germination.

Treatment application

Four (4) different types of nematicides (Termidust, Worm force, Carbofuran and Basudyne) were applied in the soil at recommended rate (3g/ai) the same day inoculation was done. The treatments were replicated five times as indicated below:

T1= Nematode + Termidust
T2= Nematode + Worm force
T3= Nematode + Carbofuran
T4= Nematode + Basudyne
T5= No Nematode
T6 = Nematode alone

Data collection and statistical analysis

The study was terminated 3 months after and the following parameters were collected on individual plants: Number of galls, population of nematode eggs in the root, population of nematode in the soil, plant height, fresh weight of shoots, number of leaves, length of root and fresh weight of root.

The data collected were analyzed using the Analysis of Variance (ANOVA) and means where separated using 5% probability level.

RESULTS

Table 1: Effect of the Treatments on plant height of *Telferia occidentalis* at 8 and 12 weeks after application

Treatments	Average plant height (cm)	
	At 8 weeks	At 12 weeks
Nematode + Termidust	22.86	68.70
Nematode + Worm Force	20.04	51.00
Nematode + Carbofuran	21.90	46.80
Nematode + Basudyne	26.16	49.00
No Nematode	23.60	59.00
Nematode alone	16.53	44.80
$LSD_{(0.05)}$	2.28	13.58

Effect of the pesticides on plant height at 8 and 12 weeks after treatment application is shown in Table1. Significant differences were observed between the treatments including the control at 8^{th} weeks and between uninoculated (no nematode) and nematode alone at 12^{th} weeks. At 8^{th} weeks after treatment application, Basudyne treated plants recorded highest significant (26.16cm) plant height while the least (16.53cm) was from nematode alone. At 12^{th} weeks after treatment application, uninoculated plants had the highest (59.00cm) but not significantly different from other treatments except nematode alone (44.80cm).

Table 2: Effect of the Treatments on the number of leaves of *Telferia occidentalis* at 8 and 12 weeks after application

Treatments	Average number of leaves	
	At 8 weeks	At 12 weeks
Nematode + Termidust	17.00	16.40
Nematode + Worm Force	17.20	15.00
Nematode + Carbofuran	15.60	14.20
Nematode + Basudyne	19.00	15.80
No Nematode	15.00	13.60
Nematode alone	10.20	6.40
$LSD_{(0.05)}$	NS	2.68

Where NS means no significant difference or non significant difference

Table 2 indicates the effect of the treatments on number of leaves at 8 and 12 weeks after treatment. At 8^{th} week, plants treated with Basudyne had the highest number of leaves (19.00) followed by the plant treated with Worm Force (17.20) and Termidust (17.00) respectively but were not significantly different from other treatments. At 12 weeks, plant treated with Termidust had the highest number of leaves (16.40) which did not differ significantly from the other treatments except plants treat with nematode alone (6.40).

Table 3: Effect of the treatments on fresh weight of root, length of root and fresh weight of shoot

Treatments	Fresh weight of root (g)	Length of root (cm)	Fresh weight of shoot (g)
Nematode + Termidust	57.26	28.44	39.60
Nematode + Worm Force	55.66	33.76	46.96
Nematode + Carbofuran	36.36	27.68	35.84
Nematode + Basudyne	28.88	27.72	18.30
No Nematode	45.80	31.16	42.14
Nematode alone	43.82	26.30	18.10
$LSD_{(0.05)}$	NS	NS	10.84

Where NS means no significant difference or non significant difference

Table 3 presents the effect of the treatments on fresh weight of root, length of root and fresh weight of shoot. In fresh weight of root, plants treated with Termidust had highest weight (57.26g) followed by the plants treated with Worm Force (55.66g). However significant differences were not observed among the treatments. Plants treated with Worm Force had the highest length of root (33.76g) followed by the plants with no nematode (31.16cm) but no significant difference was recorded among the treatments. On fresh weight of shoot, plants treated with Worm Force recorded highest (46.96g) followed by the plant treated with no nematode (42.14g) which did not differ significantly except for the plants treated with Basudyne (18.30g) and nematode alone (18.10g).

Table 4: Effect of the treatments on number of galls, eggs in root and nematode larva in soil

Treatments	Number of galls	Population of nematode eggs in root	Population of nematodes in soil
Nematode + Termidust	0.20	180.00	0.00
Nematode + Worm Force	0.60	120.00	360.00
Nematode + Carbofuran	1.20	320.00	360.00
Nematode + Basudyne	0.80	260.00	120.00
No Nematode	0.00	0.00	0.00
Nematode alone	4.00	760.00	720.00
$LSD_{(0.05)}$	1.13	235.97	202.63

Table 4 shows the effect of treatments on number of galls, eggs in root and nematode larva in soil. Significant differences were observed among the treatments. Nematode alone treated plants produced the highest number of galls (4.00) while Termidust recorded the least (0.20). On number of eggs in the root, nematode alone again recorded the highest number of eggs (760.00) while Worm Force recorded the least (120.00). Significant difference existed between the treatments and nematode alone. Similarly nematode alone treat plants also recorded the highest number of nematode larva in soil (720.00). However Termidust treated plants achieved complete control (0.00) in nematode larva in soil. In all the 3 parameters uninoculated plants produced no number of galls (0.00), no number of nematode eggs in the root (0.00) and nematode larva in the soil (0.00).

DISCUSSION

The devastating effects of plant parasitic nematode (*Meloidogyne* spp.) on the production and yield of *Telfairia occidentalis* is the greatest challenge farmers' face. The rapid decline in yield of agricultural crops such as *Telfairia occidentalis* is attributed to its high susceptibility to plant parasitic nematode (Sasser, 2005). The result indicated non-significant differences in number of leaves at 8 weeks, fresh weight of root and length of root; the level of eggs in the root and nematode larva in soil may have affected the fresh weight of shoot. This is in agreement with the findings of Traunfed (2003) who reported that nematode feeding stimulates the increase in the number of eggs and larva in both soil and root. The presence of galls in the root prevents adequate water and nutrient uptake resulting in stunted growth, unthrifty plants and reduced yield.

Growth reductions in crops such as *Telfairia occidentalis* due to nematode vary depending on the population density of the nematodes, level of cultivar susceptibility and environmental conditions to which the host is subjected to (Ononuju and Fawole, 2000). The severity of symptoms depends on the host, the nematode and the age at which the plant was affected. The result could also be affected by other disease caused by many other pathogens and abiotic disorder (Widmer *et al*., 2006).

Plant-parasitic nematodes are known to be involved in disease complex and can cause complete crop failure under severe infestation. Also the infestation of the crop by *Podagica* spp may have contributed to the general reduction in height and number of leaves of the crops by perforating and eating up the leaves, thereby reducing the photosynthetic area of the plant. The high number of galls, eggs in the root and nematode larva in the soil recorded in the plant treated with nematode alone which was significantly different from other treatment is an indication that *Telfairia occidentalis* is susceptible to root-knot nematode. But the use of the pesticides proved to be the most effective by recording lesser amount of galls, eggs in the root and nematode larva.

CONCLUSION

The result from this work indicated that all the treatments used reduced or suppressed the population of plant-parasitic nematode in the infested soil.

Plant-parasitic nematodes spread slowly, persist in the soil for long period of time and management by chemical means is effective. Generally, Termidust and Basudyne performed better than the other treatments and they could replace Carbofuran which farmers always apply.

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