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Influence of Neem-fortified cocoa pod husks soil amendment on *Meloidogyne incognita* in cocoa.

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ABSTRACT: An investigation was undertaken to assess the effect of Neem-fortified Cocoa pod husks soil amendment against the root-knot disease caused by *Meloidogyne ingonita* on cacao seedlings, *Theobroma cacao* L. cv. F_3 Amazon. Cocoa pod husks (CPH), combined use of Neem leaves and CPH, and Neem seeds plus CPH decreased the number of juveniles and galling due to *Meloidogyne incognita*. The greatest decrease was obtained with Neem seed-fortified cocoa pod husks with a corresponding increase in the plant growth.

Key words: Root-knot nematode, cacao seedlings, soil amendment, neem.

Introduction

Nematodes, especially *Meloidogyne incognita* have been implicated as being pathogenic on cacao seedlings resulting in failure of seedlings to establish on the field (Caveness, 1967; Afolami, 1981; Afolami and Caveness, 1983). The damage could be die-back, wilt, chlorotic symptoms, stunted shoot, galling of the root or complete death of the seedlings (Asare-Nyako and Owusu, 1979; Afolami and Ojo, 1984). Organic amendments that are generally used for increasing agricultural productivity have been shown to have a suppressive effect on plant parasitic nematodes (Alam, 1976; Owino *et al*., 1993; Mehta *et al*., 1994). An earlier investigation with cocoa pod husks (CPH) soil amendment shows substantial reductions in the incidence of nematode infection (Egunjobi and Larinde, 1975; Egunjobi, 1977; 1985). Neem (*Azadirachta indica* A. Juss.) has been reported to have nematicidal effect (Mojumder *et al*., 2002). This experiment was, therefore, carried out to ascertain the effect of neem-fortified cocoa pod husks soil amendment in the control of root-knot disease of cocoa.

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Materials and Methods

The materials used for the experiment include 13,900kg/ha each of partially decomposed cocoa pod husks (CPH), Neem seed plus CPH (1:1) and Neem leaves plus CPH (1:1) were incorporated into field soil contained in 5 litre experimental pots. Soil in which 20kgN/ha of inorganic fertilizer, N.P.K. 15:15:15 was added 4 weeks after planting formed another treatment, while the soil without the amendment served as control. All pots were planted each with three seeds of cacao cv. F_3 Amazon four weeks incorporation. The seedlings were reduced to one per pot and these were inoculated with 5,000 ± 25 juveniles plus eggs of *Meloidogyne incognita* extracted from a culture maintained on *Celosia argentia* using sodium hypochlorite method (Hussey and Barker, 1973). The treatments were completely randomized with six replications per treatment and were kept moist by watering thrice per week. The plant growth parameters viz., plant height, stem girth, number of leaves and leaf area were recorded fortnightly throughout the experiment. The experiment was terminated 26 weeks after planting and shoot and root dry weights and galling incidence assessed. The number of juveniles per 250cm^3 of soil was determined (Whitehead and Hemming, 1965) and eggs were extracted from 10g of root sub-samples from each pot (Hussey and Barker, 1973). Analyses of variance were carried out and the means compared using the least significance difference (LSD).

Results and Discussion

The data on galling incidence and nematode populations indicated that Neem seed – fortified CPH was the most effective soil amendment leading to reduction of the population densities and galling incidence of the nematode (Table 1). Neem leaves-fortified CPH was the next followed by CPH alone. Application of inorganic fertilizer actually reduced the galling incidence and nematode population density compared to the control, but is not effective compared to the CPH treatments. There were significant increases in the plant height of the plants with soil amendments. Other growth parameters were also significantly improved (Table 1).

Reduction in population densities of plant parasitic nematodes in response to application of organic amendments have been reported in many studies (Muller and Gooch, 1982; Rodriguez-Kabana, 1986; Trivedi and Barker, 1986). Practical use depends on a large and readily available supply of these materials. Since cocoa pod husks, neem seeds and leaves are readily available and assessable to poor farmers in Nigeria, the use will possibly reduce the current level of frustration faced by cocoa farmers in establishment and rehabilitation of cocoa farms. Neem-fortified cocoa pod husks will be useful as an agricultural soil amendment thereby improving plant performance, water-holding capacity and controlling the infestation of root-knot nematode in cocoa.

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Table 1: Effects of Neem-fortified cocoa pod husks on the development of root-knot infection, population densities and plant growth in cocoa.

Treatment	Galls per root system	Nematodes in 250g soil	Nematodes in g^{-1} root	Plant height (cm)	Stem girth (cm)	Leaf area (cm^2)	Number of leaves	Dry shoot weight (g)	Dry root weight (g)
Cocoa pod husk (CPH)	8c	959c	14c	59.25a	0.98b	100.21c	20.67c	21.32c	3.30a
CPH + Neem leaves	5d	524d	11d	56.35c	1.40a	102.52b	21.67b	22.40b	3.24b
CPH + Neem seeds	3e	321e	8e	57.78b	1.39a	102.61a	22.12a	22.89a	3.22b
Inorganic fertilizer (NPK)	12b	3,202b	27b	48.43d	0.72c	93.14d	20.19d	18.26d	2.81c
Control	23a	7,785a	52a	39.10e	0.68c	86.15e	20.18d	15.86e	2.62d

Means followed by the same letter in the same column are not significantly different (P = 0.05).

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