Yield response of yellow yam (*Dioscorea cayenensis*) after disenfesting planting material of *Pratylenchus coffeae*[1]/

Resumen. En Jamaica se encuentran varios nematodos dañinos asociados al ñame (*Dioscorea* spp.); sin embargo solo se ha encontrado el *Pratylenchus coffeae* infectando el ñame amarillo (*D. cayenensis*) afectado por la pudrición seca, llamada "quemazón". La pudrición seca puede estar asociada con herida del tallo y del primordio radical; si la herida es severa, en algunos casos la germinación y el vigor de la planta pueden verse seriamente afectados.

En un experimento se obtuvieron plantas provenientes de trozos de ñame desinfestados de *P. coffeae* por inmersión durante 30 minutos en una solución de 2 000 ppm de Oxamyl o por 45 minutos en agua a 45°C. Los rendimientos con estos tratamientos fueron, respectivamente, 36% y 23% superiores y produjeron tubérculos con menos nivel de "quemazón" que los obtenidos de plantas provenientes de tubérculos no desinfestados. Los resultados sugieren que los agricultures deberían usar, para siembra material con baja incidencia de "quemazón". Se recomienda establecer una dependencia cuya inmediata responsabilidad sea desinfestar el material de ñame que se vaya a usar para la siembra; eventualmente se encargaría de suministrar semilla "limpia".

Yams (*Dioscorea* spp) have traditionally constituted the staple root crop in the Jamaican diet. The yellow yam (*D. cayenensis*) is the most popular variety and in 1978 constituted 33% of total yam production of 164 500 tons. Between 1970 and 1979, average tuber yield of yellow yam ranged from 10.8 to 12.8 tons/ha which is considerably below the yield potential of this cultivar.

In Jamaica, several parasitic nematodes are associated with yam plants in the field (5, 6). *Pratylenchus coffeae, Scutellonema bradys* and *Hoplolaimus* sp. are involved in the etiology of a dry rot of yam tubers (2, 3, 4, 7, 8, 10). *P. coffeae*, considered to be the most noxious of the nematodes affecting yams (7, 8), is the only nematode found infesting yellow yam tubers which are affected by the dry rot, called "burning" in Jamaica. This condition is characterised by cracking in the skin underlaid by a brown, corky rot in the storage tissues (3, 10). This rot progresses deeper into the yam tissues following harvest and prior to planting or consumption and is generally more pronounced towards the stem end of yam tubers. When a yellow yam tuber is harvested, the stem end ("head") is cut off and retained for planting and the remainder consumed. On heavily "burnt" heads, stem primordia appear to be damaged or destroyed by the dry rot resulting in such heads not sprouting or vines growing from them being less thrifty than those from less affected heads. The term "less affected" is used as a yellow yam tuber which was not infested by *P. coffeae* and affected to some extent by the dry rot. It has never been observed by the senior author.

When yam tubers affected by the dry rot were disinfested in previous investigations, populations of the invading nematode were reduced and development of the dry rot suppressed. There was a high incidence of sprouting and vines were more vigorous than those from untreated yams (2, 3, 4, 6, 7, 8).

This trial was conducted to investigate qualitative and quantitative yield response after disinfesting yellow yam planting material of *P. coffeae*.

Materials and methods

This trial was carried out at the Allsides Pilot Development Project (1, 9, 11, 12, 13), on recently-terraced plots which had been cropped for two successive years to yellow yam. Recently-harvested yellow yam planting material showing distinct symptoms of the nematode-related dry rot was used. Examination of random samples from the selected heads showed them to be infested with *P. coffeae* (avg. 400/10 gm peeling). The following treatments were used: 1) no treatment (control); 2) heads dipped for 45 min. in water at 45C and 3) heads dipped for 30 min. in a 2000 ppm solution of Oxamyl (Methyl N'N'-dimethyl-N-(methylcarbamoyl)oxy)-1-thiooxamidate).

Six days after being dipped, the heads were planted, 12 per plot, 0.67 m apart into two continuous mounds 1.5 m apart giving a plant density of 10 000/ha. The three treatments were replicated three times in a randomised complete block design. The soil, an Ultisol classified locally as Wire Fence Clay Loam, Map No. 32, is highly acidic (pH 4.9), and levels of available N, P and K are medium, low and very low respectively.

Cultural practices were those normally followed at Allsides. Weeds were controlled manually. Plants were supplied with a mixture of 200, 300 and 150 kg/ha of N, P_2O_5 and K_2O respectively divided equally at planting and at 16 and 25 weeks thereafter.

Forty weeks after planting, counts were made of *P. coffeae* in soil from each plot. At 43 weeks when the plots were harvested, every tuber was rated for the nematode-related dry rot on a 1 – 5 scale where 1 = 1-20%, 2 = 21 - 40%, 3 = 41-60%, 4 = 61-80% and 5 = 81-100% of the tuber's surface having the dry rot. The weightsof heads (the top portion of the harvested

1 Part of studies conducted jointly by the Plant Protection Division, Ministry of Agriculture (MINAG), Jamaica and the Inter-American Institute for Co-operation on Agriculture (IICA), at Allsides, Trelawny on the Project titled "Hillside Farming Development Project".

Table 1. Quantitative and qualitative yields of yellow yam (*Dioscorea cayenensis*) tubers harvested 43 weeks after planting *Pratylenchus coffeae*-infested planting pieces (heads) or infested heads disinfested by hot water or nematicide dips.

Treatment	Levels of dry rot on tubers[3]	Wt. of table yams harvested from 36 plants (kg)	Wt. of heads harvested from 36 plants (kg)	Total wt. of tubers harvested from 36 plants (kg)	Wt. of yams harvested per kg planted (kg)	Calculated gross yields (tons/ha)
Untreated heads	2.6	58.0	46.8	104.8	3.82	29.1
Hot water-dipped[1] heads	2.2	75.1	54.6	129.7	4.95	36.0
Oxamyl-dipped[2] heads	2.0	91.1	51.7	142.8	5.05	39.7
LSD 5%	–	2.8	–	5.2	–	–

1. Heads dipped for 45 min. in water at 45C.

2. Heads dipped for 30 min. in a 2 000 ppm solution of Oxamyl.

3. Tubers rated for the nematode-related dry rot on a 1 - 5 scale where 1 = 1-20%, 2 = 21-40%, 4 = 61-80% and 5 = 81-100% of the tuber's surface having the dry rot.

tuber which is retained for planting) and table yams (the rest of the tuber) were taken separately. Counts were made of *P. coffeae* in the skin of harvested tubers.

Results and discussion

There was 100% germination of heads and every plant produced a tuber. Presented in Table 1 are the tuber yields and levels of dry rot for the different treatments. Tubers borne by plants growing from heads disinfested by Oxamyl or hot water showed lower levels of the nematode-related dry rot than tubers borne by plants from untreated heads. Plants from disinfested heads produced greater quantitative yields of heads and significantly greater weights of table yams than those from untreated heads. Overall, plants from disinfested heads bore significantly greater weights of tubers than plants from undisinfested heads. Substantially higher numbers of *P. coffeae* were found in the skin of tubers borne by plants arising from untreated heads but three weeks before harvest, there was no difference between treatments in the numbers of this nematode in the soil from plots (Table 2).

Results from this trial confirm previous findings that disinfesting yellow yam planting material of *P. coffeae*, the most noxious of the nematodes affecting *Dioscorea* spp, will result in significantly

Table 2. Numbers of *Pratylenchus coffeae* in soil and in the skin (peeling) of yellow yam (*Dioscorea cayenensis*) tubers harvested from plots in which nematode-infested planting pieces (heads) or infested heads disinfested by hot water or nematicide dips were planted.

Treatment	No. *P. coffeae*/100 cc soil at 40 weeks	No. *P. coffeae*/10 gm tuber skin at harvest (43 weeks)
Untreated heads	27	48
Hot water-dipped[1] heads	29	2
Oxamyl-dipped[2] heads	13	5

1. Heads dipped for 45 min. in water at 45C.
2. Heads dipped for 30 min. in a 2 000 ppm solution of Oxamyl.

increased tuber yields (7, 8). Disinfesting heads with hot water or Oxamyl resulted in increased quantitative yields of 23% and 36% respectively. Disinfesting yam heads can be costly (estimated at over $ 100 per ton for Oxamyl treatment of yellow yam heads) but the high initial expenditure is easily recovered from the increased yields (estimated to result in revenue exceeding $ 600 from each ton of planted yellow yam heads).

Tubers borne by plants arising from disinfested heads showed less of the nematode-related dry rot than those from plants growing from untreated heads. It has been observed in an on-going trial that plants growing from yellow yam heads with low levels of the *P. coffeae* related dry rot sprouted earlier and are more vigorous than plants growing from heavily dry rotted heads. It appears that levels of *P. coffeae* infestation and dry rotting of yellow yam heads have a direct bearing on the performance of plants arising from such heads. Any treatment that will reduce populations of an invading nematode and levels of the dry rotting of yam planting material should therefore be beneficial.

Recommendations

It is recommended that growers should use yellow yam planting material with the least evidence of the dry rot. However, in Jamaica, yams are always infested with noxious nematodes and those involved in the dry rot, especially *P. coffeae*, are ubiquitous. In any event, good yam planting material is generally unavailable and costly, and growers are generally forced to plant what they have or can obtain. Given this situation, it would be beneficial to the yam industry if an agency were established to see to the disinfestation of available planting material in the first instance and eventually be responsible for providing "clean" planting material. In this context, it is hoped that the Ministry of Agriculture would take the necessary steps which would assure increased production of this staple food crop.

Abstract

Several noxious nematodes are associated with yams (*Dioscorea* spp.) in Jamaica but *Pratylenchus coffeae* is the only one found infesting yellow yam (*D. cayenensis*) tubers affected by a dry rot called "burning". The dry rot appears to be associated with injury to stem and root primordial and in cases where the injury is severe germination and plant vigour are seriously impaired.

Plants growing from yellow yam heads disinfested of *P. coffeae* by dipping for 30 min in a 2 000 ppm solution of Oxamyl or for 45 min in water at 45°C produced 36% and 23% greater quantitative yields of tubers which showed lower levels of the nematode-related dry rot than tubers borne by plants arising from undisinfested heads. Results suggest that growers should use yellow yam planting material with the least evidence of the dry rot. It is recommended that an agency be established whose immediate responsibility would be to disinfest available yam planting material and eventually be responsible for providing "clean" planting material.

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Behaviour of ^{14}C-metalaxyl in Brazilian soils.

Resumo. Estudou-se em laboratório o comportamento do ^{14}C-metalaxyl em três tipos de solos brasileiros (Gley Húmico, Latossolo Roxo e Latossolo Vermelho Escuro). O ^{14}C-metalaxyl apresenta alta mobilidade nas três cromatografias de solo e baixos coeficientes de sorção, mesmo em solos com alto teor de matéria orgânica (Gley Húmico e Latossolo Roxo) e foi persistente nos três solos pelo período estudado de 8 meses. A degradação do metalaxyl no solo Latossolo Roxo correspondeu após esse tempo à 29%, representada por um metabolito nao identificado detectado pela cromatografia em camada delgada. A população bacteriana foi maior no Latossolo Roxo e provavelmente associada à esse processo de degradação

Metalaxyl is a new systemic fungicide (CGA 48988) (DL-methyl-N (2, 6-dimethyl-phenyl) -N-(2-methoxyacetyl) alaninate) with specific activity against pathogens belonging to the order Peronosporales (1, 2, 6, 7). The systemic activity of metalaxyl in azalea by applying it to the soil has been demonstrated (1). The structure of systemic fungicides applied to the soil can be altered by chemical breakdown process and by action of the microorganisms. Also uptake of fungicides by plants from the soil can be very inefficient if there is a tight adsorption of the fungicide to the soil.

The purpose of this investigation was to obtain information on the behaviour of this new compound when applied to samples of Brazilian soils.

Materials and methods

Chemicals

Metalaxyl WP 25 was provided by Ciba Geigy, Brazil and ^{14}C-metalaxyl by Ciba Geigy, Basel, Switzerland. The ^{14}C-metalaxyl uniformly ring labelled had a specific activity of 46.5 μCi/mg.

Soils

The three soil types used, consisted of Humic Gley, Red Latosol and Dark Red Latosol, differing in their properties (Table 1). Ten gram samples of each dried soil were added to wide necked screw capped jars, followed by addition of water to 2/3 field capacity. A week after, 1.0 ml of a mixture of ^{14}C-ring labelled metalaxyl (140.000 dpm/ml) and unlabelled metalaxyl (10 ppm) in acetone, was added on each soil sample. During the test, water was added periodically to maintain the moisture content of the soil. This was achieved by monthly quantity of distilled water to attain the desired soil water content. Duplicate samples of each soil were incubated at 20 – 25°C and the entire flasks content were extracted at monthly intervals over an 8-month period.

Extraction of ^{14}C-metalaxyl

Each sample was extracted with 50 ml of methanol, by shaking the mixture for 4 hr. When necessary a sequence of two extractions with methanol was realized. The soil was separated by

Table 1. Properties of the soils

Soil Type	Organic matter (%)	Clay (%)	Sand (%)	pH	Microbial population after 8 months (g of soil) 10^3 Bacteria	Fungi
Humic Gley	4.3	32	57	5.7	34	4.7
Red Latosol	3.8	7.72	62	5.3	136.7	6.7
Dark Red Latosol	2.0	63	24	4.8	11.4	7.7