

CHEMOTHERAPY OF *DIOSCOREA ALATA* FOR DISINFESTATION OF *SCUTELLONEMA BRADYS* [QUIMIOTERAPIA DE *DIOSCOREA ALATA* PARA LA DESINFECCION DE *SCUTELLONEMA BRADYS*]. T. Badra and Fields E. Caveness, International Institute of Tropical Agriculture, PMB 5320, Ibadan, Nigeria.

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### ABSTRACT

Steeping *Scutellonema bradys* infected yam seed pieces (*Dioscorea alata*) in 1,000 ppm aqueous solutions of nematicides, nitrogenous fertilizers or disinfectants for 30 minutes effectively controlled nematode infection and tuber damage. Shoot emergence from carbofuran, formalin and ammonium sulphate treated seed pieces was reduced 29, 29 and 14% respectively. Shoot emergence from D-D, oxamyl, calcium nitrate or calcium hypochlorite treated seed pieces was unimpaired. All mean weights of tubers produced from treated seed pieces were significantly greater ( $P=0.05$ ) than the untreated controls after 6 months' growth in the greenhouse. Formalin, carbofuran and D-D treated seed pieces produced the greatest yields. Untreated seed pieces had a reduced tuber growth, a high incidence of dry rot and high nematode populations. The data show that chemotherapy of yam seed pieces with formalin, carbofuran, D-D or nitrogenous fertilizers are highly beneficial and technically practical.

*Key Words:* nematode control, fumigants, systemic nematicides, roots and tubers.

### INTRODUCTION

The yam nematode, *Scutellonema bradys* (Steiner & Lehw, 1933) Andrassy, 1958, is a serious pest affecting yams in the field and in storage (5,6). The nematode persists in the tuber even after a long period of storage. Nematode feeding causes cell destruction which predisposes the tuber to the dry- and wet-rot storage diseases of yams (6,9). Symptoms of nematode damage to tubers have been described earlier (2,3,4,8,12,21).

Hot water steeps, nematicidal dips, disinfectants and ionizing radiation treatments have shown promise for the disinfestation of plant materials including potatoes and yam tubers (1,2,11,14,15,17).

The use of nematicides, mineral nitrogenous fertilizers and chemical disinfectants as chemotherapeutants against yam nematode infestation of tuber seed pieces is reported in this paper.

### MATERIALS AND METHODS

Seed pieces of the water yam, *Dioscorea alata* L., infected with *S. bradys* were used. Freshly cut pieces of 20 g each were steeped for 30 minutes in 1,000 ppm aqueous solutions of D-D, carbofuran, oxamyl, ammonium sulphate, calcium nitrate, calcium hypochlorite, formalin and water as a control. The seed pieces were drained and air dried before planting in sterilized sandy loam soil in 18-cm clay pots. A completely randomized design with seven replications was used. The plants were given routine greenhouse care and harvested after six months. At harvest, wet weights of shoots, roots and tubers were recorded.

Nematodes were extracted from 15 g samples of new tuber tissue using the modified

Table 1. Effects of nematicide, nitrogenous fertilizer and disinfectant steeping treatments on *Scutellonema bradys* infected *Dioscorea alata* tuber seed pieces.<sup>x</sup>

Treatment Y 1,000 ppm ai	Emergence %	Shoot Weight g	Root Weight g	Tuber Weight g	<i>S. bradys</i> /g tuber tissue
<b>Nematicides</b>					
Carbofuran 10% G	71	57.9 b	53.5 a	135.7 d	35 c
D-D 100% L	100	56.3 b	75.0 e	120.2 c	9 c
Oxamyl 10% G	100	51.1 b	65.4 c	89.4 b	13 c
<b>Nitrogenous fertilizers</b>					
Ammonium sulphate 20.5%N G	86	21.2 a	54.2 a	100.6 b	113 b
Calcium nitrate 16%N G	100	50.4 b	69.4 d	103.4 b	72 b
<b>Disinfectants</b>					
Calcium hypochlorite 32% P	100	50.0 b	56.1 a	103.6 b	90 b
Formalin 38% A	71	115.5 c	59.5 c	226.4 e	28 c
Water Control	100	29.6 a	68.1 d	55.9 a	540 a

<sup>x</sup> Means of seven replications. Values in each column not followed by the same letter differ significantly ( $P = 0.05$ ) according to Duncan's Multiple Range test.

<sup>y</sup> Formulation: A = aqueous, G = granular, L = liquid, P = powder.

Baermann technique (23) and concentrated by the settling-siphon method (10).

## RESULTS AND DISCUSSION

After six months' growth all treatments had significantly greater new tuber formation by weight over the control (Table 1). Mean weights were greatest in formalin, carbofuran and D-D treatments at 305, 143, 115%, respectively, over the control mean. *S. bradys* recovery from new tubers was significantly less from all treatments as compared to the control. Shoot emergence from carbofuran, formalin and ammonium sulphate teated seed pieces was reduced 29, 29, and 14% respectively. Final mean shoot weight was significantly greater than the control mean for all treatments except for ammonium sulphate. Mean root weights were generally less than the control mean except for the D-D treatment which was significantly greater.

These data agree with previous reports on the effectiveness of nematicides and disinfectants as chemical dips for nematode control in plant material (7, 11, 18, 22). The control effect shown by ammonium sulphate and calcium nitrate is apparently from the nematostatic action of ammonia which is known to affect the biology and parasitism processes of plant-parasitic nematodes (13, 16, 19, 20).

Tuber harvest weights show that yield increases from formalin, carbofuran and ammonium sulphate treatments significantly out yielded the control treatment regardless of emergence losses. Their performance offers the possibility of reduced *S. bradys* damage in the field and increased tuber keeping quality in storage if planted in soils free of the nematode or if controlled by a suitable rotation scheme.

The treatment procedure is relatively simple and rapid in comparison to the hot-water treatment and is relatively safe for tuber seed pieces and operators when the compounds are handled with due caution.

#### RESUMEN

La inmersión de tubérculos de semilla de ñame (*Dioscorea alata*) en soluciones acuosas con 1000 ppm de nematocidas, abonos nitrogenados, o desinfectantes, por 30 minutos dió un combate efectivo de *Scutellonema bradys* en los tubérculos y redujo daño a los mismos. El desarrollo de tallos de tubérculos de semilla tratados con carbofurán, formalina y sulfato de amonio fué reducido en un 29, 29 y 14% respectivamente pero los tratados con D-D, oxamyl, nitrato de calcio o hipoclorito de calcio no fueron afectados en la producción de tallos. Todos los pesos promedios de tubérculos producidos con semillas tratadas fueron significativamente superiores ( $p = 0.05$ ) a los producidos de semilla sin tratar después de 6 meses de crecimiento en el invernadero. Semillas tratadas con formalina, carbofurán y D-D dieron los rendimientos mayores. Los tubérculos para semilla sin tratar manifestaron un crecimiento reducido, alta incidencia de pudrición seca y altas poblaciones de nematodos. Los datos muestran que la quimioterapia de tubérculos de ñame para semilla con formalina, carbofurán, D-D, o abonos nitrogenados es muy beneficiosa y práctica.

*Claves: combate de nematodos, fumigantes, nematicidas sistémicos, raíces y tubérculos.*

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