

A REVIEW OF EXPERIMENTS ON NEMATODE CONTROL WITH ETHOPROP (PROPHOS); PHENAMIPHOS AND CARBOFURAN IN FRENCH-SPEAKING WEST AFRICA [UNA REVISION DE LOS EXPERIMENTOS EN LOS PAISES QUE HABLEN FRANCES AL OESTE DE AFRICA SOBRE CONTROL DE NEMATODOS CON ETHOPROP (PROPHOS), PHENAMIPHOS Y CARBOFURAN]. A. Vilardebo and R. Guerout, IRFA/GERDAT, B. P. 5035, 34032 Montpellier Cedex, France and P. O. Box 1740, Abidjan, Ivory Coast.

ABSTRACT

The new granular nematicides phenamiphos, ethoprop and carbofuran have been evaluated in a series of experiments in West Africa. Recommendations are that phenamiphos (3g a. i.), ethoprop (4.5g a. i.) and carbofuran (3g a. i. except in Cameroon) should be applied to 1m² around each plant 3 times per yr at intervals determined by the distribution of rainfall. Granular nematicides have been found to be more effective than DBCP and to improve production; however, the main disadvantage is that the new products are very expensive.

INTRODUCTION

Banana cultivations throughout the world are heavily infected by nematodes, the worst being *Radopholus similis*. In 1954 trials were started using different chemical compounds to control these infestations. The best one appeared to be DBCP which was widely used by growers in Africa during the 1960's. A complete change occurred with the appearance of new nematicides whose properties and activities are completely different. Phenamiphos, ethoprop (prophos) and carbofuran have been recommended for control of banana nematodes following our results and those from other banana growing areas (1, 2, 3, 4, 5, 12).

This paper consolidates the results of numerous trials made in Africa (Ivory Coast, Cameroon and Madagascar) in which doses, time and frequency of application and area of spread of granules around the plants were investigated. This work involved cooperation of the Institute's banana agronomists and these workers are associated in its presentation.

MATERIALS AND METHODS

Observations on nematode infections, plant development and yield were taken in all experiments. Experimental plots were of 40-50 plants, treatments were replicated 5 times and experimental designs were of complete or incomplete randomized blocks. In all experiments, chemical treatments were compared with a control and a standard which was either the recommended rate of DBCP or phenamiphos. All trials started from planting and lasted 3 - 4 years (3 or 4 crop cycles).

Nematodes were extracted from roots using a maceration and sieving technique. Roots were sampled at monthly intervals from 25% of the plant population, sampling was rotated so that roots were not taken from the same plant more than once every 4 mos.

Records were made of plant height, girth, date of flowering, bunch weights, numbers of hands per bunch and size of individual fruits.

RESULTS AND CONCLUSIONS

An indication of yield improvements with ethoprop and phenamiphos is

illustrated in Table 1. Other aspects of nematicide application are considered below.

Area of application - Earlier results had indicated that nematode infection was greatest in the few cm of roots close to the plant and decreased rapidly at greater distances from it. In a trial comparing the treatment of areas 1 and 2 m² around the plants, greater yields were obtained with the greater area of treatment but the improved yield did not justify using twice the quantity of chemical. As a result, the recommended practice is to apply the granules over 1 m² on an area roughly 40 cm in width around the mat (parent plant and suckers) (8, 11). Because of the localized method of treatment and the variation in number of plants/ha, it is more meaningful to express the dose of granular nematicide in g a.i./plant.

Dosage - The minimum quantity of phenamiphos per application was found to be 3 g (7). For ethoprop 4.5 g was best; however, this chemical was less efficient under unfavourable conditions and results were also more affected by type of soil than with phenamiphos. Work with carbofuran began at a later date. In the Ivory Coast it is recommended at a dosage of 3 g a.i./plant but on the volcanic soils of the Cameroon 3.5 g a.i. carbofuran was less efficient in controlling nematodes than 2.5 g phenamiphos.

Frequency and timing of applications - In an early trial twice yearly applications of phenamiphos and ethoprop at 5 g a.i. were found not to give sufficient control (6); better control was achieved with 3 applications of 3 g a.i. (9). The period of application depends on the climate, especially rainfall. Soil conditions

Table 1. Weight of bunches and production in some nematicide trials in the Ivory Coast and Cameroon.

Treatment	bunch weights (kg)		production MT/ha	
	1st cycle	2nd cycle	1st cycle	2nd cycle
Phenamiphos	26.8	28.1	52	—
DBCP	22.5	16.3	43	—
Untreated	17.3	12.6	21	—
(b) Cameroon — <u>Trial 1</u>				
Phenamiphos	22.3	26.0	47	55
Ethoprop	21.1	25.5	45	52
Untreated	18.2	21.8	35	38
	<u>Trial 2</u>			
Phenamiphos	—	25.0	—	47
Untreated	—	22.4	—	39
	<u>Trial 3</u>			
Phenamiphos	—	26.0	—	58
Untreated	—	21.7	—	40

at the time of treatment are less critical when applying granular nematicides than when injecting DBCP; however, treatments were not made during the wettest times of the year when the chemicals would be rapidly leached; neither were they applied during the dry season when they would not be properly incorporated in the soil. The absence of chemical applications during these times is not important because such climatic conditions are unfavourable to nematodes. Following studies of annual rainfall patterns and population trends in relation to climate and the physiological development of the plant (10) the following application schedules are suggested: Cameroon - rains last from March to November (peak in August) apply chemicals in early April, July and late September; Ivory Coast - rains last from late March to mid-July and mid-September to late November apply chemicals in Mid-April, mid-July and early November; Martinique and Guadeloupe where the seasons are irregular applications should be made in early April, mid-July and early December.

RESUMEN

Los nuevos nematicidas granulados phenamiphos, ethoprop y carbofuran fueron evaluados en una serie de experimentos al oeste de Africa. Recomendaciones son que phenamiphos (3 g i.a.), ethoprop (4.5 g i.a.) y carbofuran (3 g i.a. excepto en Cameroon) tienen que aplicarse en 1 m² alrededor de cada planta tres veces/año con intervalos determinado para la distribución de lluvias. Nematicidas granulados fueron más efectivos que DBCP y con mejor incremento el producción sin embargo, una de las desventajas es que los nuevos productos son muy caros.

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NEMATODE SPECIES IN WEST AFRICA, MADAGASCAR AND REUNION, WITH SOME COMMENTS ON THEIR BIOLOGY [DIFERENTE ESPECIES DE NEMATODOS EN EL OESTE DEL AFRICA: MADAGASCAR Y LA REUNION CON COMENTARIOS SOBRE SU BIOLOGIA]. A. Vilardebo and R. Guerout, IRFA/GERDAT, B. P. 5035, 34032 Montpellier Cedex, France and P. O. Box 1740, Abidjan, Ivory Coast.

Of all the nematode species found in West Africa, Madagascar and Reunion, the most serious economic threat is *Radopholus similis*. It is widespread in all banana plantations, with the exception of the experimental plots established near Kaedi (Mauritania). In the Ivory Coast and Cameroon, as many as 160,000 *R. similis* have been counted in 100 g of roots. Peaks of 80,000 to 100,000 are