EFFECTS OF POST-PLANTING APPLICATIONS OF THE NEMATICIDE DBCP TO PLANTAIN [EFECTOS DE LA APLICACION POST-SIEMBRA DE DBCP EN PLATANOS].

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ABSTRACT

DBCP as Nemagon 75 o/o EC was applied at rates of 9.3, 24.4 and 39.9 litres per hectare to 18 week old "Horse" plantains *(Musa acuminata* x *balbisiana* AAB) once, or initially and 10 months later. Two and six months after applying the nematicide, treated plants had made more vigorous growth than untreated plants. A greater proportion of plants receiving DBCP treatments bore bunches than untreated plants in the parent and first ratoon crops. Furthermore, treated plants bore heavier bunches than untreated plants. In both crops there were substantially more plants that toppled or were blown over among the untreated than among DBCP treated plants. All-round, the highest dosage rate repeated, gave the most promising results. Control of nematodes is necessary for successful plantain production.

INTRODUCTION

In Jamaica, several large-scale investigations of the plant-parasitic nematodes associated with banana, *Musa acuminata* (AAA), and methods for their control have been made (3,5). Certainly, similar efforts have not been made for plantain, *Musa acuminata* x *balbisiana* (AAB), possibly due to banana being the more important export crop and the feeling that the data obtained for banana should be applicable to plantain. The parasitic nematodes most frequently associated with plantains in Jamaica are among those shown to parasitize banana namely, *Radopholus similis, Helicotylenchus multicinctus, Rotylenchulus reniformis* and *Meloidogyne* spp. (2). In addition, *Pratylenchus* sp., *Criconemoides* sp., *Longidorus* sp. and *Xiphinema* sp. have been found associated with plantain roots.

Where nematode control is practised for plantain in Jamaica, the recommendations followed are those given for banana (1,4,6,7). However, many growers do not follow a comprehensive programme of nematode control in plantain or banana. It is suspected that the scarce effort made to prevent nematode damage results in the slow growth, high incidences of plants falling or being blown over, low yields and poor performance of ratoon crops general in plantain production in Jamaica. Nematodes have in fact been shown to be responsible for loss and rapid decline of plantain plants in crops after the parent crop (9).

In 1970, a trial was started at Western Potosi, St. Thomas, Jamaica, to determine the dosage rate and intervals between post-planting applications of the nematicide 1,2 - dibromo-3-chloropropane (DBCP) that would most effectively reduce plant-parasitic nematode populations in and about plantain roots, improve plant growth and production while decreasing plant loss.

MATERIALS AND METHODS

The experimental field was of predominantly clay soil and had previously been planted to coconut, then sugarcane. In March 1970, "Horse" plantain suckers which had been pared then dipped in a 0.5 percent solution of DBCP in water (4), were planted out on 3 metre by 3 metre squares.

The initial applications of DBCP as Nemagon 75 percent emulsifiable concentrate were made about 18 weeks after the suckers were planted. Germination had been good, missing plants had been replaced and plants were nearly one metre high. There were seven treatments (Nemagon 75 o/o EC at 9.3, 24.4 or 39.9 litres per hectare initially and not again, these dosages initially and 10 months later and control plants) replicated three times in a randomised complete block design. There were 25 plants in each plot, five rows of five plants, the peripheral 16 being guard plants and the enclosed nine being experimental plants. A hand injector was used to make eight injections of the required dosage of DBCP to the soil at 15 to 20 centimetres depth around each plant in a plot at 45 to 50 centimetres distance from the pseudostem.

Immediately prior to the initial DBCP applications and two months and six months after, measures of height to the angle between the two topmost leaves and girth at 60 centimetres a-

bove soil level were made on each experimental plant in each plot. Immediately prior to the initial DBCP applications and at quarterly intervals thereafter, samples of root and adjacent soil were taken from the experimental plants in each plot and examined for nematode content. Counts were made at regular intervals of plants of the parent and ratoon crops that had toppled or been blown over. Bunches produced by experimental plants were weighed immediately after they were harvested. The trial was prematurely terminated in February 1972.

RESULTS

Growth responses of plantains to DBCP treatments: Two months and six months after treating 18 week old plantain plants with DBCP, treated plants had made more substantial increases in height and girth than untreated plants, the increases being greater the higher the dosage rate of DBCP (Table 1). The highest dosages caused statistically significant increases in height and girth over those shown by control plants at both periods.

Effects of DBCP treatment on production of bunches and extent of toppling and/or blowdown: In the parent and first ratoon crops, more plants in plots receiving DBCP treatments bore bunches than control plants (Table 2). In the parent crop, the heaviest dosage repeated resulted in a significantly greater number of plants bearing bunches compared with the control plants as did all three repeat treatments in the first ratoon crop. Except for one treatment in each of the parent and first ratoon crops, treated plants bore heavier bunches than contol plants, with those produced by plants of the parent crop getting the highest dosage twice, being significantly heavier.

Thirteen percent of control plants in the parent crop toppled or were blown over (Table 2). Four to eight percent of plants in three DBCP treatments were lost; there was no loss in the other three treatments. In the first ratoon crop, four of the DBCP treatments caused a significantly lower degree of plant loss compared with the control treatment and the treatment of 9.3 litres per hectare once.

Effect of DBCP treatments on nematode population levels: Soil and root samples taken from all plots just before the first DBCP treatments were made contained *R. reniformis*, *H. multicinctus* and *Meloidogyne* sp. all in low numbers. Four months later, these nematodes were found in higher numbers in soil and root samples from all plots

Table I. Height and girth percent increases two months and six months after treating 18-week old plantain plants of the parent crop with DBCP at three different dosage rates.

Dosage rates of Nemagon 75 o/o EC	Percent increases[a] in height two months and six months after applying the nematicide		Percent increases[a] in girth two months and six months after applying the nematicide.	
	Two months	Six months	Two months	Six months
Control - no DBCP	58	95	54	68
9.3 litres per hectare	71	110	63	82
24.4 litres per hectare	72	110	67	89
39.9 litres per hectare	94[b]	146[b]	97[b]	116[b]

[a]For each treatment, figures express the average percentage increase after the given period over the average measurements made on 18-week old plants immediately prior to the initial DBCP application.

[b]Significantly greater than the control at the 5 o/o level.

Table 2. Effects of different dosage rates of DBCP applied once or twice on bunch production, bunch weight and plant loss due to toppling and/or blowdown of plantain plants of the parent and first ratoon crops.

Dosage rate of Nemagon 75% EC in litres per hectare	PARENT CROP			FIRST RATOON CROP		
	Percentage of plants that bore a bunch	Average bunch weight in kilograms	Percentage of lost plants	Percentage of plants that bore a bunch	Average bunch weight in kilograms	Percentage of lost plants
Control - no DBCP	67	5.45	13	16	6.05	56
9.3 initially	89	5.23	4	28	6.59	56
24.4 initially	93	6.50	-	27	5.82	41
39.9 initially	85	6.50	4	35	7.45	15[b]
9.3 initially and 10 months later	84	6.27	8	43[a]	6.40	22[b]
24.4 initially and 10 months later	94	6.05	-	39[a]	6.40	17[b]
39.9 initially and 10 months later	100[a]	6.68[a]	-	53[a]	6.78	17[b]

[a]Significantly greater than the control at the 5% level.

[b]Significantly greater than the control and treatment of 9.3 litres per hectare initially at the 5% level.

while *R. similis* was found in high numbers in soil and roots from the control plots and in roots of plants from two DBCP treatments (9.3 and 24.4 litres per hectare). Subsequently, these four nematode genera were found, generally in high numbers, in soil and roots from all plots. Throughout the experiment, *Longidorus* sp. was found in soil and *Pratylenchus* sp. in soil and roots from all plots, generally in low numbers. The control plots never appeared to harbour higher populations of nematodes than the treated plots.

DISCUSSION

Better results were obtained where applications of DBCP were repeated than from single applications. Overall, the highest dosage repeated gave best results. Plants treated with DBCP grew more vigorously and were more productive with regard to bunch numbers and size than untreated plants. Two or three months prior to termination of the experiment, heavy winds blew over most of the plantains on land adjacent to the experimental area. The experimental area was also affected but there is evidence of DBCP treated plants showing resistance to being blown over and to toppling suggesting that these plants had better root systems providing better anchorage.

Generally, "Horse" plantains bear bunches which weigh in excess of 10 kilograms. Underfertilization and periodic lapses in efficient weed control are thought to be among the reasons why the plants in this experiment bore bunches smaller than normal.

It has been demonstrated here and elsewhere (9) that certain plant-parasitic nematode species are important limiting factores to growth and production of plantain plants and contribute largely to decline and loss of plants in ratoon crops. Adequate control of nematodes is imperative if this crop is to be grown successfully. It has been argued (8) that at present there is virtually no alternative to soil fumigation to control plant nematodes especially in tropical areas where they are more virulent. The authors tend to agree that the use of chemicals, whether non-phytotoxic fumigant materials or systemic compounds, is the only recourse at this time for satisfactorily controlling plant-parasitic nematodes attacking plantains.

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RESUMEN

Plantas de plátano Hartón *(Musa acuminata* x *balbisiana* AAB) fueron tratadas con DBCP 75 o/o CE a razón de 9.3, 24.4 y 39.9 l/Ha a las 18 semanas de edad y 10 meses después del pri-

mer tratamiento. A los 2 y a los 6 meses después de aplicar el nematicida las plantas tratadas mostraron un crecimiento más vigoroso que las plantas testigo. En las plantas "madres" y en las plantas "hijas" tratadas hubo una mayor proporción de racimos que en las plantas no tratadas y estos racimos tenían mayor peso. En las plantas no tratadas hubo un mayor número de plantas caídas en relación con las plantas tratadas en ambas generaciones. La dosis más alta dió los mejores resultados. El control de los nematodos fitoparásitos es necesario para la exitosa producción de plátanos.

SOME OBSERVATIONS ON THE RED-RING NEMATODE *(RHADINAPHELENCHUS COCOPHILUS* COBB) IN THE STATES OF GUERRERO AND OAXACA, MEXICO [ALGUNAS OBSERVACIONES EN EL NEMATODO DEL ANILLO ROJO *(RHADINAPHELENCHUS COCOPHILUS* COBB) EN LOS ESTADOS DE GUERRERO Y OAXACA, MEXICO] N. Marban Mendoza. Instituto de Biología, UNAM, México.

Red ring disease of coconut plam *(Cocos nucifera)* caused by *Rhadinaphelenchus cocophilus* is a serious problem in Mexico which has been studied mostly in the States of Veracruz, Tabasco and Colima. Very few studies have been carried out in the Guerrero-Oaxaca region in spite of the fact Guerrero is the largest producer of copra in Mexico. Approximately 60,000 hectares of coconut palm are cultivated in Guerrero and 3,000 - 4,000 in Oaxaca.

The present study was undertaken on the red ring disease problem in these two states in 1971-72. The first study took place between November and December, 1971, and January and February, 1972, at the following localities along the region known as "Costa Grande" in the state of Guerrero: Coyuca de Benitez, Tecpan de Galeana, and Petatlan (39, 104 and 200 Kms northwest of Acapulco). At each locality three areas of approximately 10 Ha each and of equal agronomic characteristics were selected. Four palms all less than 12 years old were randomly selected from every hectare in each 10-hectare sample area. Thus 120 palms were studied in each of the 3 geographical localities. Both stems and roots of the selected palms were examined for presence or absence of the red ring nematode. Only five palms in the locality of Tecpan de Galeana were found to be infected.

A wider sampling was made in Feb-Mar, 1972, throughout different plantations in the same three localities. This time only those palms were studied which showed redring disease symptoms and/or presence of the palm weevil, *Rhynchophorus palmarum* (L.), vector of *R. cocophilus.* From this sampling the following results were obtained: Coyaca de Benitez 3 isolated foci of red-ring nematode infestations and 2 palms infested with palm weevils; Tecpan de Galeana, 4 foci of red-ring nematode and two cases of palm weevils; Petatlan, 2 foci of red-ring nematode and two cases of weevils. In every case there was only a low incidence of the disease, i.e. 1-3 palms in each focus.

In the locality of Tecpan de Galeana during the month of November, 1971 (dry season), field collections of the palm weevil and *Rhina barbirrostris* (L.) took place by the use of light traps with such attractants as a piece of pineapple, orange, or banana in various stages of ripeness and also fermented pieces of palm stems. A total of 32 weevils were collected: 20 being *R. barbirrostris* and 12 being *R. palmarum.*

None of the specimens of *R. barbirrostris* were found to be contaminated either internally or externally by the red-ring nematode. Eight of the twelve palm weevils were found contaminated internally by an average of 52 red ring nematodes per specimen. In one specimen nematodes were found externally.

The second study took place between July and August, 1972 (rainy season), in the localities of San Marcos and Marquelia (72 and 135 Kms southeast of Acapulco) along the region known as "Costa Chica" in the state of Guerrero and in Pinotepa Nacional (245 Kms southeast of Acapulco) in the neighboring state of Oaxaca. At this latter locality the study took place at the Colonia Ruiz Cortines plantation about 28 Kms southwest of Pinotepa Nacional.

After going through different palm orchards in each locality looking for diseased palms, five isolated foci of low incidence were found in San Marcos and four isolated foci of low incidence