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APPLICATION OF SOME BIOAGENTS AND OXAMYL IN CONTROLLING *MELOIDOGYNE INCOGNITA, HELICOTYLENCHUS EXALLUS* AND *CRICONEMOIDES* SPP. INFESTING BANANA CV. WILLIAMS

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ABSTRACT:

Under field conditions, the tested bioagents viz. Nemaless, B.t. NRC 60, Promot and Abamectin as well Oxamyl as a nematicide, had a negative correlation with the development and reproduction of *Meloidogyne incognita*, *Helicotylenchus exallus* and *Creconemoides* spp. in both two seasons. The influence of the previous four bio-agents and Oxamyl on the fruit production measurements of banana cv. Williams infested with three plant parasitic nematode was studied. All treatments signmificantly ($P \leq 0.05$) affected the bunch weight, numbers of hands and fingers per hand. Significant ($P \leq 0.05$) increase over control in bunch weight, number of hands and fingers per hand were obtained by B.t. NRC 60 followed by Abamectin, Oxamyl, Promot and Nemaless in the first season, but Abamectin, B.t. NRC 60, Promot , Oxamyl and Nemaless in the second season.

INTRODUCTION:

In Egypt, the cultivated banana area is 59,651 feddans but the fruiting area equals 50,711 producing 870,880 tons with an average 17.17 tons per feddan (Anonymous, 2003). Many factors are contributing to reduce banana yield. Among factors limiting banana production, are the pathogenic nema-todes as the environmental conditions are in favour to their reproduction and build-up. *Meloidogyne* sp. *R. reni-formis* Linford and *Helicotylenchus spp*are receiving the greatest attention because of their damage and wide spread occurrence in banana plantations (Eissa *et al*., 2003 a & b).The management of these pests by using chemical nema-ticides is not recommended because of risks to humans and the environment. Thus, alternative control strategy and technology is needed. In this respect, most demonstrations of effective control methods involved bioagents such as fungi, bacteria and other biocides Molina and Davide (1986), Generalao and Davide (1995), Daneel *et al*., (1998) and Esnard *et al*.,(1998) have found that some *Penicillium* sp. *Paecilomyces* sp. and *Bacillus* sp. respectively showed high activities as nematicidal against *M. incognita* on banana plants. The injection by abamectin at 0.1 ml in banana pseudostem was effective in controlling *M. javanica, R. similis and M. incognita* (Jansson and Rabatin 1997, 1998; De-Jager and daneel, 1998; El-Nagdi, 2001). Finally, Jansson and Rabatin (1998) determined the potential of two avermectin compounds viz. abamectin and emamectin benzoat for controlling *M.javanica and R. similis* on "Cavendish" banana by three methods (Foliar spray; root dip and pseudostem injection).They found that foliar

applications of both avermectins to banana were not effective for controlling any of the nematodes evaluated. Root dip of banana was moderately effective for controlling *R. similis*. However, injections (1 m1) of avermectins into banana pseudostems were effective for controlling *M.javanica* and *R. similis*, and were comparable to control achieved with a conventional systemic nematicide fenamiphos. The objectives of this work was to elucidate the efficacy of some bioagents and Oxamyl on poly-specific nematode community in banana cv. Williams-planted soil during two successive seasons.

MATERIALS AND METHODS:

Under field conditions, some commercial bioagents viz. Nemaless, B.t. NRC60; Promot and Vapcomic (a.i. abamectin) as biocides and Vydate (Oxamyl 24% L) as chemical nematicide were evaluated to elucidate their efficiency against the major parasitic nematodes coinhabiting banana rhizosphere cv. Williams. A randomized block experiment was conducted on four year old plants grown on a loamy sand soil at 2.5 x 2.5 m a part located at El-Katta village, Giza Governorate.

The experiment was conducted twice throughout two successive seasons. In the first season, an experimental area was irrigated by drip irrigation with six replicates per treatment. However, in the second season, an experimental area was irrigated by flooding system with the same replicates per treatment.

The collected soil and root samples of the experimental area were firstly examined before adding the treatments and found highly infested with a polyspecific nematode community viz. *Meloidogyne incognita, Helicotylenchus exallus* and *Criconemoides sp*. and other genera but of lower densities.The various treatments including Oxamyl were applied as follows:

Treatments	Dose/hill	Number of applications	Month of application	Application method
Nemaless	50 ml	twice	April and July	soil application
Nemaless	100 ml	twice	April and July	soil application
B.t. NRC 60	30 gm	once	April	soil application
B.t. NRC 60	15 gm	twice	April and July	soil application
Promot	5 gm	once	April	soil application
Promot	2.5 gm	twice	April and July	soil application
Abamectin	1 ml + 9 ml water	once	April	Injection
Abamectin	1 ml + 9 ml water	twice	April and July	inside the pseudostem
Abamectin	2 ml + 8 ml water	once	April	Injection
Abamectin	2 ml + 8 ml water	twice	April and July	inside the pseudostem
Oxamyl 24% L	15 ml	once	April	Pour in plant top
Oxamyl 24% L	15 ml	twice	April and July	soil application
Control untreated	-	-	-	-

As for the injection method, two concentrations of Vapcomic as biocide (1 ml abamectin a.i. + 9 ml tap water) and (2 ml abamectin a.i. + 8 ml tap water) were prepared and injected as two treatments immediately with 10 ml disposable syringe into the center of the plant pseudostem at a distance about 25 cm below the first leaf axil at 45 angle down wards then, wait 15-20 seconds before withdrawal of the empty syringe. Then, a plaster tape was stuck above the injection pore for retention of the biocide within plant. Soil and root samples of each treatment were obtained on 45 days intervals after the application time throughout April to July, then the samples were collected at monthly intervals from July to October for two successive seasons. Soil and root samples were taken once before the treatment application and sampled four times after treatments at 30 cm distance from plant pseudo-stem and 20 cm depth beneath soil surface. The nematode populations and yield components of banana viz. bunch weight (B.W.), number of fruit hands per bunch (N.H.) and number of fingers per fruit hand (N.F.H.) were recorded. Percentages of nematode reduction in either soil or root (% efficacy) were estimated by using Handerson and Tilton formula reported by Puntener, 1981 as follows:

$$\left(1 - \frac{\text{population in the treated trees after application}}{\text{population in the treated trees before application}} \times \frac{\text{population in the check trees before application}}{\text{population in the check trees after application}}\right) \times 100$$

Data were statistically analyzed according to Duncan's multiple range test.

RESULTS:

Efficiency of some bioagents and Oxamyl on polyspecific nematode community in banana cv. Williams planted soil during two successive seasons. The spatial distribution of the nematode population was so aggregated that when the statistical analysis was carried out on the real nematode numbers, significant ($P \leq 0.05$) differences appeared between the replicates of the same treatments (data of statistical analysis on real numbers are not presented). Therefore, data were log transformed before carrying out the statistical analysis (Tables 1-5). The results indicated that all the tested materials
reduced to varying levels, the nematode population densities in soil and roots (Tables 1-5).

Number of juveniles (J2) of *M. incognita* in banana soil: It was noticed that the highest percentages of reduction in the number of juveniles of ***M. incognita*** in soil were 94.9, 94.75, 94.73, 94.39 and 94.31% for Abamectin (2ml in April), Abamectin (1ml in April + 1 ml in July), Promot (2.5g in April + 2.5g in July), Oxamyl (15ml in April + 15ml in July) and B.t. NRC 60 (15g in April + 15g in July) respectively after 45 days from application of these materials in the first season (Table 1). Nevertheless, such highest percentages were 95.41, 95.29, 94.94, 94.37 and 94.12% after 45 days in the second season for Abamectin (1ml in April), Nemaless (100ml in April + 100ml in July), B.t. NRC 60 (30 g in April), Promot (5g in April) and B.t. NRC 60 (15g in April

+15g in July) respectively (Table-1). After 90 days, the percentages of reduction in the second stage juveniles of *M. incognita* in soil were 95.86, 95.46, 93.64, 93.54 and 93.45% for Abamectin (1ml in April + 1ml in July), Oxamyl (15ml in April + 15 ml in July), Abamectin (2 ml in April), Promot (5g in April) and Oxamyl (5ml in April) respectively during the first season. However, these percentages were 98.25, 95.89, 95.42, 94.74 and 93.69% for Abamectin (I ml in April + 1 ml in July) B.t. NRC 60 (15 g in April + 15 g in July), B.t. NRC 60 (30 g in April), Nemaless (100 ml in April + 100 ml in July) and Oxamyl (5 ml in April) respectively in the second season. After 120 days, such percentages were 96.98, 96.28, 96.17, 96.09, 95.09 and 95.01% for B.t. NRC 60 (15 g in April + 15 g in July), B.t. NRC 60 (30 g in April), Abamectin (1 ml in April + 1 ml in July), Promot (5 gm in April), Nemaless (50 ml in April + 50 ml in July) and Nemaless (100 ml in April + 100 ml in July) respectively in the first season but were 96.89, 96.88, 96.51, and 96.33% for Abamectin (1ml in April), Abamectin (1 ml in April + 1ml in July), Promot (5 gm in April) and B.t. NRC 60 (15 gm in April + 15 gm in July); respectively in the second season. Finally, After 150 days the percentages of reduction in the juveniles were 97.81 and 97.49% for B.t. NRC 60 (15 gm in April + 15 gm in July) and Oxamyl (15 ml in April + 15 ml in July); respectively in the first season, but were 96.38, 95.74% for Abamectin (2ml in April) and promote (5gm in April); respectively in the second season (Table 1).

Number of juveniles (J2) of *M. incognita* in banana roots: The percentages of reduction of newly hatched juveniles of root -knot nematode per 5 gm roots were 90.31, 89.45, 88.82 and 88.59% for Oxamyl (5 ml in April), B.t. NRC 60 (15 gm in April + 15 gm in July), Abamectin (1 ml in April + 1 ml in July) and Oxamyl (15 ml in April + 15 ml in July); respectively after 45 day from the addition of these tested materials in the first season, but were 95.11, 94.27, 92.52 and 89.84% for Abamectin (2 ml in April + 2ml in July), Oxamyl (15 ml in April + 15 ml in July), Abamectin (2 ml in April) and Promot (2.5g in April + 2.5g in July) respectively in the second season (Table 2). After 90 days, the percentages of reduction in J2 of *M. incognita* in roots were 92.33, 91.08, 90.45 and 89.03% for Oxamyl (15 ml in April + 15 ml in July), Abamectin (2 ml in April), Abamectin(1 ml in April) and B.t. NRC 60 (15 gm in April + 15gm in July) respectively during the first year, and were 96.93, 96.42, 96.32 and 93.85% for B.t. NRC 60 (15gm in April + 15gm in July), Abamectin (1ml in April + 1ml in July), B.t. NRC 60 (30g in April) and Abamectin (1.0 ml in April) respectively in the second year (Table-2). After 120 and 150 days, the percentages of reduction were 92.63 and 97.50% for Abamectin (2ml in April +2ml in July) and Abamectin (2ml in April) in the first season and were 96.95 and 98.48% for Abamectin (1ml in April) and B.t. NRC 60 (30gm in April) respectively in the second season (Table 2).

Number of galls of *M. incognita:* The highest percentages of reduction in the number of galls of *M. incognita* were 65.81% (Abamectin, 2ml in April + 2ml in July) 75.51% (Abamectin, 1ml in April) 78.58 % (Abamectin, 2ml in

April + 2 ml in July) and 89.12% (Abamectin, 2 ml in April + 2ml in July) respectively after 45, 90, 120 and 150 days during the first season, but were 58.33% (Promot, 5 gm in April), 73.34 % (Abamectin, 1 ml in April), 76.47 % for (Abamectin, B.t. NRC 60 and Promot) and 80.95% for promot, B.t. NRC 60 and Abamectin respectively in the second season (Table 3).

Number of spiral nematode *Helicotylenchus exallus:* The highest percentages of reduction in the larval numbers of spiral nematode, *H.exallus* were 95.81 % for Promot (2.5 gm in April + 2.5 gm in July), 97.37 % for Oxamyl (15 ml in April + 15 ml in July), 99.05 % for Nemaless (100 ml in April + 100 ml in July) and 97.82% for Nemaless (50 ml in April+ 50 ml in July); respectively after 45, 90, 120 and 150 days in the first season, but were 96.50 % (Abamectin, 1 ml in April), 95.83 % (Abamectin, 2 ml in April), 95.43 % (B.t. NRC 60, 15 gm in April + 15 g m in July) and 90.46 % (Abamectin 2ml in April) after 45,90,120and 150days respectively in the second season (Table 4).

Number of the ring nematode *Criconemoides* sp.: The percentages reduction in the number of ring nematode, *Criconemoides* sp. were 85.91% and 89.58% for Promot (2.5gm in April + 2.5gm in July), 92.48% and 92.71 % for B.t. NRC 60 (15gm in April + 15gm in July) after 45, 90, 120 and 150 days respectively in the first year, but were 100 %, 96.80% for Abamectin (2 ml in April), 96.69 % and 94.45 for B.t. NRC 60 (30 gm in April), after 45, 90, 120, and 150 days; respectively during the second year (Table 5).

Yield production measurements of banana cv. Williams: The influence of four bioagents and Oxamyl on the fruit production measurements of banana cv. Williams infested with three plant parasitic nema-todes was presented in Table-6. Significant ($P \leq 0.05$) increase over control in bunch weight was obtained by B.t. NRC 60 (15gm in April + 15gm in July), B.t. NRC 60 (30 gm in April), Abamectin (2ml in April), Abamectin (2 ml in April + 2ml in July), Abamectin (2m1 in April), Abamectin (2ml in April + 2ml in July), Abmectin (l ml in April + l ml in July), Abamectin (l ml in April), Oxamyl (15ml in April + 15 ml in July), Oxamyl (5 ml in April), Promot (5 gm in April), Nemaless (100 ml in April + 100 ml in July) and Nemaless (50ml in April + 50ml in July) in the first season, bunch weight increase were also obtained by Abamectin (2ml in April), Abamectin (lml in April + l ml in July), Promot (2.5gm in April + 2.5 gm in July),Abamectin (2ml in April +2 ml in July), Abamectin (lml in April), Oxamyl (5ml in April), B.t. NRC 60 (30 gm in April), B.t. NRC 60 (15gm in April + 15gm in July), Oxamyl (15ml in April + 15 ml in July), Promot (5gm in April), Nemaless (100ml in April + 100 ml in July) and Nemaless (50ml in April + 50ml in July) in the second season (Table 6).Number of hands per bunch were increased by treatment of B.t. NRC 60 (30 gm in April), B.t. NRC 60 (15 gm in April + 15 gm in July), followed by Oxamyl (15ml in April + 15ml in July), Abamectin (2ml in April), Abamectin (2ml in April + 2ml in July), Abamectin (lml in April + lml in July), Promot (2.5 gm in April + 2.5gm in July), Promot (5ml in April),

Abamectin (lml in April), Nemaless (100ml in April + 100ml in July) and Nemaless (50 ml in April + 50 ml in July)in a descending order for the first season, whereas in the second season such a descending order was Abamectin (2ml in April) followed by Abamectin (lml in April + lml in July), Abamectin (lml in April), B.t. NRC 60 (30gm in April), B.t. NRC 60 (15gm in April + 15gm in July), Abamectin (2ml in April + 2ml in July), Oxamyl (15ml in April + 15ml in July), Oxamyl (5gm in April), Promot(2.5gm in April + 2.5gm in July), Promot (5gm in April), Nemaless (100ml in April + 100 ml in July) and Nemaless (50ml in April + 50 ml in July). Significant (P=0.05) increase over untreated control in number of fingers per hand was obtained by treatment of Abamectin, B.t. NRC 60, Oxamly, Promot and Nemaless in two successive seasons.

Moreover, average of the two seasons for the recorded data were significantly ($P \leq 0.05$) increased over the untreated control in the above-mentioned fruit measurements (Table 6).

DISCUSSION:

With respect to the tested bioagents under field conditions viz. Nemaless, B.t. NRC 60, Promot, Abamectin and systemic nematicide viz oxamyl, had a negative correlation with the development and reproduction of *Meloidogyne incognita* on banana cv. Williams. This was indicated by the lower population density of J2 of *M. incognita* in both soil and roots, egg masses and galls and consequently the rate of nematode build-up and this coincided with improvement in plant growth and an increase in fruit production parameters in the field. These findings are in agreement with those of El-Sherif *et al*., (1994), Ali (1996), Ali and Kamal (1998) and Ismail and Hasabo (2000) who found that liquid cultures of some bacteria species including *Serratia sp.* (the major component of the biocide Nemaless) or its filtrates inhibited egg hatching and juvenile survival of three plant parasitic nematodes on other hosts. The effect of these bacteria may be attributed to the accumulation of nema-toxic metabolites of these bioagents in soil. These metabolites may have a direct lethal effect on nematodes (Dicklow *et al*., 1993), or have some physiological and/or behavioral effects such as disorder of neuromuscular junctions, or through suppression of hatching, movement, capabilities of feeding and or invasion to host tissue (Mishra *et al*., 1987 and Kluepfel *et al*., 1993). Volatile compounds, fatty acids, hydrogen sulfide, enzymes, hormones, alcohol and phenolic compounds are among the bacterial metabolites implicated in the control of plant parasitic nematodes **(**Mishra *et al.,* 1987). Such products may be toxic to nematode directly or they indirectly suppress nematode population by modifying the rhizosphere environment and /or nematode vitality.

The data revealed that *Bacillus thuringiensis* was found to reduce the number of nematode second stage juveniles, other developmental stages, egg masses and galls and consequently the rate of nematode build-up of *M. incognita*. These results are in agreement with those obtained by Ignoffo and Dropkin (1977), Abd-El-Gawad (1995), Ismail and Fadel (1999) and El-Nagdi (2001) who reported that

the application of *B. thuringiensis* under laboratory, green house or field conditions significantly suppressed popula- tions of several species of plant parasitic nematodes. The bacterial exotoxin is not a contact poison and must be ingested by the target organism to inhibit RNA synthesis (Sebesta and Horska, 1968). The mode of action of B.t. toxins i.e., inhibition of protein and nucleic acid synthesis (Sebesta *et al.,* 1969) was generally sufficient to indicate that this toxin will have a wide spectrum of activity against many living organisms. Moreover, many investigators reported that the endotoxin proteins of *B. thuringiensis* are active against *lepidopteran*, *dipteran* and *coleopteran* larvae, protozoan pathogens, nematodes and mites (Ellar *et al.* 1985; Feitelson *et al.* 1992; Denolf *et.al.* 1993; Salama *et.al.* 1995; Lidia *et al.* 1996; Fadel and Sabour 1998 and Ismail and Fadel, 1999).

This study concluded that *Trichoderma koninigii* and *T. harzianum* (the major components of Promot) were found to reduce population densities of nematode second stage juveniles, other developmental stages, egg masses and galls and consequently the rate of nematode build-up of *M. incognita.* These findings are in agreement with those of Ali and Barakat (1991), Ali *et al*., (1994), Noweer (1997) and Ismail and El-Nagdi (2005) who found that the culture filtrate in *Trichoderma harzianum* had toxic effect on *M. incognita* jureniles and inhibited the egg hatch to varying degrees. *T. viride* and *T. harzianum are* of fungi group which produce toxic metabolites to nematodes (Mankau, 1980). Moreover, the findings on the effect of abamectin as pseudostem plant injection are in agreement with those of Jutsum (1988) and El-Nagdi (2001) who found that injection of avermectin into stem of tomato and banana were effective against *M.incognita* and Jansson and Rabatin, (1997 and 1998) and De-Jager and Dannel (1998) on banana against *M. javanica* and *R. similis.*

Banana top treatment as invented technique would save the amount of treated product, reduce treatment cost, prevent any undesirable effect, soil and ground water pollution if any and strict application to the contaminated patch (El-Nagdi, 2001).

Banana injection technique under field conditions is recorded here for the first time, however it was reported earlier under greenhouse conditions (Jansson and Rabatin, 1997 and 1998 and De-Jager and Dannel, 1998 and El-Nagdi, 2001). This technique has also the same privilege of the banana top treatment.

Table -1: Influence of some bioagents and Oxamyl in controlling *Meloidogyne incognita* in soil planted with banana cv.Williams under field conditions.

Treatment type and dose	First season					Second season					Average				
	Log.(Initial population +1)	45*	90	120	150	Log.(Initial population +1)	45*	90	120	150	Log.(Initial population +1)	45	90	120	150
Soil application (m1 or gm/ hole):															
1-Nemaless 50m1 in April +	3.19 a**	2.53 b	2.19 bc	1.95 bc	2.04 b	2.66 a	2.27 ab	1.15 a	1.26 b	1.78 a	2.92 a	2.40 b	1.67 b	1.60 b	1.91 b
50 m1 in July		(81.33)*	(92.40)	(95.09)	(96.85)		(91.49)	(91.64)	(91.36)	(90.43)					
2-Nemaless 100m1 in April +	3.12 a	2.14 cd	2.19 bc	1.90 bcd	1.95 bc	2.72 a	1.80ab cd	1.38 a	1.46 b	1.48 a	2.92 a	1.97 cd	1.78 b	1.68 b	1.72 bc
100m1 in July		(91.60)	(91.26)	(95.01)	(96.44)		(95.29)	(93.74)	(95.84)	(92.56)					
3-Promot 5gm in Apr	3.08 a	1.97 ef	2.07 cd	1.85 cd	1.90 bcd	2.70 a	1.52 cd	1.25 a	1.03 b	1.40 a	2.89 a	1.74 cde	1.66 b	1.44 b	1.65 bc
		(93.20)	(93.54)	(96.09)	(96.58)		(93.73)	(90.17)	(96.51)	(95.74)					
4-Promot 2.5gm in April +	3.04 a	1.87 fg	2.10 cd	1.84 cd	1.87 cd	2.58 a	1.40 cd	1.04 a	1.09 b	1.58 a	2.81ab c	1.63 de	1.57 b	1.47 b	1.72 bc
2.5gm in Jul		(94.73)	(92.49)	(94.57)	(95.94)		(94.37)	(91.98)	(95.06)	(94.49)					
5-B.t.NRC 60 30gm in April	3.01 a	2.06 dF	2.01 cd	1.66 e	1.86 cd	2.56 a	1.41 cd	1.29 a	1.03 b	1.20 a	2.78ab c	1.74 cde	1.65 b	1.35 b	1.53 bc
		(89.80)	(90.22)	(96.28)	(96.61)		(94.94)	(95.42)	(94.62)	(91.78)					
6-B.t.NRC 60 15gm in April+	3.05 a	1.90 fg	2.00 cd	1.62 e	1.63 cde	2.64 a	1.54 cd	1.31 a	1.16 b	1.15 a	2.85ab	1.72 cde	1.65 b	1.39 b	1.39 bc
15 gm in July		(94.31)	(92.54)	(96.98)	(97.81)		(94.12)	(95.89)	(96.33)	(92.57)					
7-Oxamyl 15m1 in April+	2.86 a	2.21 c	2.50 b	2.02 b	2.04 b	2.59 a	1.85ab cd	2.06 a	1.36 b	1.78 a	2.73bc	2.03 c	2.28 a	1.69 b	1.91 b
(24%L) 15 m1 in July		(94.39)	(95.46)	(95.60)	(97.49)		(90.72)	(93.82)	(94.13)	(93.11)					
Injection into plant pseudostem															
8-Abamectin 1m1 in Ap	3.03 a	1.92 fg	2.04 cd	1.85 cd	1.77 de	2.62 a	1.13 d	1.08 a	0.94 b	0.88 a	2.83ab	1.52 e	1.56 b	1.40 b	1.32 c
		(93.30)	(93.83)	(93.95)	(96.87)		(95.41)	(91.42)	(96.89)	(93.16)					
9-Abamectin	3.03 a	1.87 fg	1.79 d	1.75 de	1.80 cde	2.65 a	1.64 bcd	0.91 a	1.36 b	0.98 a	2.84ab	1.75cde	1.35 b	1.55 b	1.39 bc

1m1in Apr+ 1m1 in July		(94.75)	(95.86)	(96.17)	(96.77)		(89.08)	(98.25)	(96.88)	(94.16)					
10-bamectin 2m1 in Apr	3.02 a	1.76 g	1.96 cd	1.97 bc	1.85 cd	2.60 a	1.35 cd	0.83 a	1.04 b	1.40 a	2.81ab c	1.56 e	1.39 b	1.51 b	1.62 bc
		(94.90)	(93.64)	(92.26)	(96.08)		(93.66)	(91.33)	(92.45)	(96.38)					
11-bamectin 2m1in April+ 2m1in July	3.01 a	1.83 fg	1.96 cd	1.67 e	1.74 de	2.65 a	1.90 abc	1.09 a	0.95 b	1.55 a	2.83ab	1.86cde	1.52 b	1.31 b	1.64 bc
		(87.52)	(90.63)	(90.68)	(93.54)		(79.79)	(89.16)	(91.03)	(88.31)					
Pour over plant top		(93.23)	(93.45)	(94.09)	(96.97)		(87.12)	(94.69)	(93.31)	(92.23)					
12-Oxamyl (24%L) 5m1inApril	2.83 a	1.87 fg	2.06 cd	1.83 cd	1.87 cd	2.55 a	1.68ab cd	1.42 a	1.11 b	1.46 a	2.69 c	1.78 cde	1.74 b	1.47 b	1.62 bc
Check	3.06 a	3.10 a	2.84 a	3.12 a	3.16 a	2.60 a	2.37 a	2.22 a	2.72 a	2.24 a	2.83 ab	2.73 a	2.53 a	2.92 a	2.70 a

*Sampling date (days) after treatment application, **Means followed by the same letter, in each column, are not different statistically according to Duncan's multiple range test ($P \leq 0.05$). Figures in parenthesis indicate percentage nematode reduction in soil [% efficiency according to Handerson and Tilton, formula=(1-Population in the treated plot after application X Population in the check plot before application) X100 (as in Puntener, 1981)], Population in the treated plot before application Population in the check plot after application

Table-2: Influence of some bioagents and Oxamyl in controlling *M. incognita* within roots of banana cv.Williams under field conditions.

Treatment type and dose	First season					Second season					Average				
	Log. (Initial population+ 1)	45*	90	120	150	Log.(Initial population+ 1)	45*	90	120	150	Log.(Initial population +1)	45	90	120	150
Soil application(m1 orgm/hole):															
1- Nemaless 50 m1 in April +50m1 in July	2.50bc**	2.12 b (71.72)	2.02 b (82.40)	2.15 b (83.98)	1.88 b (90.10)	2.31 a	1.13 a (87.99)	1.37 abc (89.88)	1.10 b (93.89)	1.92 ab (88.82)	2.41abc	1.62 bc	1.69bc	1.62 b	1.90 b
2- Nemaless 100 m1 in April +100m1 in July	2.70 a	1.94 b (87.27)	2.13 b (85.11)	1.95 c (90.83)	1.95 b (92.76)	2.23 a	1.73 a (55.33)	1.20 bc (87.55)	1.13 b (92.29)	1.50 b (86.49)	2.46 a	1.83 b	1.67bc	1.54 b	1.72bc
3- Promot 5 gm in April 5 gm in July	2.58 abc	1.90 b (84.67)	2.01 b (81.24)	1.94 c (87.40)	1.92 b (91.01)	1.94 a	1.25 a (70.57)	1.65 ab (69.25)	1.10 b (90.51)	1.02 bc (94.67)	2.26 c	1.57 bc	1.87 b	1.52 b	1.47cd
4- Promot 2.5 gm in April + 2.5 gm in July	2.60 abc	1.90 b (85.86)	2.08 b (84.17)	1.91 c (89.64)	1.89 b (92.22)	2.24 a	0.85 a (89.84)	0.61 bc (93.27)	1.40 b (90.69)	0.89 bc (95.01)	2.42 ab	1.37 bc	1.35bc	1.66 b	1.39 bcd
5-B.t.NRC 60 30 gm in April 30 gm in July	2.56 abc	2.03 b (79.70)	1.98 b (85.56)	1.84 cd (89.69)	1.80 b (92.88)	2.20 a	1.60 a (81.48)	0.51 c (96.32)	1.02 b (94.05)	0.28 c (98.48)	2.38abc	1.81 bc	1.25 c	1.43 b	1.04 d
6-B.t.NRC 60 15 gm in April+ 15 gm in July	2.61 abc	1.80 b (89.45)	1.91 b (89.03)	1.85 cd (90.88)	1.85 b (92.89)	2.14 a	1.15 a (82.17)	0.49 c (96.63)	0.84 b (96.29)	1.06 bc (94.58)	2.38abc	1.47 bc	1.20 c	1.35 b	1.45 cd
7- Oxamyl 15 m1 in April + (24%L) 15 m1 in July	2.56 abc	1.98 b (88.59)	1.90 b (92.33)	1.70 d (91.11)	1.67 bc (96.29)	2.07 a	1.07 a (94.27)	1.24 bc (92.09)	1.30 b (84.79)	1.04 bc (93.54)	2.32 bc	1.52 bc	1.57 bc	1.50 b	1.35 cd
Injection into plant pseudostem :															
8-Abamectin 1m1 in April 1m1 in July	2.50 bc	1.92 b (86.58)	1.81 b (90.45)	1.80 cd (90.15)	1.62 bc (94.69)	2.12 a	1.36 a (79.81)	0.76 bc (93.85)	0.64 b (96.95)	1.12 bc (94.86)	2.31 bc	1.59 bc	1.29 c	1.22 b	1.37cd
9-Abamectin	2.61 bc	1.85 b	1.77 b	1.80 cd	1.68 bc	2.17 a	0.67 a	1.03 bc	1.23 b	0.91 bc	2.39 abc	1.26 c	1.40	1.51 b	1.29

1m1 in April+ 1m1 in July		(88.82)	(87.51)	(91.66)	(97.20)		(81.75)	(96.42)	(95.59)	(84.77)			bc		cd
10-Abamectin 2m1 in April 1m1 in July	2.46 c	1.78 b (87.09)	1.75 b (91.08)	1.89 c (87.03)	1.71 b (97.50)	2.13 a	0.73 a (92.52)	1.07 bc (89.38)	1.02 b (93.13)	1.09 bc (93.43)	2.30 bc	1.25 c	1.41 bc	1.45 b	1.40 cd
11-Abamectin 2m1 in April+ 2m1inJuly	2.59 abc	1.83 b (85.82)	1.98 b (88.46)	1.70 d (92.63)	1.27 d (94.97)	2.03 a	0.85 a (95.11)	0.28 c (80.56)	0.83 b (89.07)	1.27 bc (93.99)	2.31 abc	1.34 bc	1.13 c	1.31 b	1.27 cd
Pour over plant top:		(90.31)	(88.80)	(87.94)	(95.10)		(71.27)	(86.64)	(89.75)	(79.47)					
12-Oxamyl (24%L) 5m1 in April	2.46 c	1.22 c	1.79 b	1.83 cd	1.34 cd	2.07 a	1.42 a	1.13 bc	1.10 b	1.65 ab	2.27 c	1.32 bc	1.46 bc	1.46 b	1.49 bcd
Check	2.66 ab	2.82 a	2.91 a	2.93 a	3.02 a	2.06 a	2.19 a	2.36 a	2.44 a	2.57 a	2.36 abc	2.50 a	2.64 a	2.68 a	2.79 a

*Sampling date (days) after treatment application. **Means followed by the same letter, in each column, are not different statistically according to Duncan's multiple range test ($P \leq 0.05$). Figures in parenthesis indicate percentage nematode reduction in soil [% efficiency according to Handerson and Tilton formula=(1-Population in the treated plot after application X Population in the check plot before application) X100 (as in Puntener, 1981)]. Population in the treated plot before application Population in the check plot after application

Table-3: Influence of some bioagents and Oxamyl in controlling *M. incognita* galls on banana cv.Williams under field conditions.

Treatment type and dose	First season					Second season					Average				
	Log. (Initial population+1)	45*	90	120	150	Log. (Initial population+1)	45*	90	120	150	Log. (Initial population+1)	45	90	120	150
Soil application(m 1 orgm/hole):															
1- Nemaless 50m1 in April + 0ml in July	0.88 a**	0.86 bc (31.43)	0.88 bc (42.86)	0.65 b (71.42)	0.69 b (72.79)	1.04 a	0.81 b (50.00)	0.81 b (60.00)	0.78 b (70.59)	0.77 b (76.19)	0.96 a	0.83 bc	0.84 b	0.72 b	0.73 b
2- Nemaless 100 m1 in April +0ml in July	0.95 a	0.88 bc (30.00)	0.83 bc (57.14)	0.69 b (75.00)	0.71 b (80.95)	1.06 a	0.83 b (50.76)	0.63 c (68.48)	0.76 b (70.59)	0.76 bc (71.86)	1.00 a	0.85 b	0.73 cde	0.73 b	0.74 b
3- Promot 5gm in April	0.92 a	0.93 b (20.00)	0.89 b (50.00)	0.75 b (75.00)	0.73 b (80.95)	1.03 a	0.69 b (58.33)	0.72 bc (73.33)	0.72 b (76.47)	0.72 bcd (80.95)	0.97 a	0.81 bcd	0.80 bc	0.74 b	0.73 bc
4- Promot 2.5 gm in April + 2.5g in July	0.88 a	0.73 de (42.86)	0.69 cd (59.18)	0.57 b (78.57)	0.61 bc (83.67)	1.04 a	0.87 b (31.06)	0.75 bc (60.16)	0.69 b (76.47)	0.72 bcd (77.49)	0.96 a	0.80bcde	0.72 cde	0.63 b	0.66 bcd
5-B.t.NRC 60 30gm in April	0.93 a	0.79 cd (50.00)	0.77 cd (64.29)	0.69 b (75.09)	0.66 b (80.95)	1.13 a	0.85 b (50.00)	0.73 bc (66.67)	0.69 b (76.47)	0.69 cd (80.95)	1.03 a	0.82 bcd	0.75 cd	0.69 b	0.67 bcd
6-B.t.NRC 60 15gm in April + 15g in July	0.93 a	0.73 de (50.00)	0.77 cd (64.29)	0.70 b (75.00)	0.70 b (80.95)	1.09 a	0.79 b (40.91)	0.72 bc (60.61)	0.70 b (76.47)	0.76 bc (71.86)	1.01 a	0.76bcde	0.74 cde	0.70 b	0.73 b
7- Oxamyl 15m1in April +15nl in July (24%L)	0.89 a	0.63 e (60.00)	0.66 de (71.43)	0.70 b (75.00)	0.61 bc (80.95)	1.09 a	0.81 b (40.91)	0.68 bc (68.48)	0.70 b (70.59)	0.68 d (71.86)	0.99 a	0.72 de	0.67 de	0.70 b	0.64 bcd
Injection into plant pseudostem :															
8- Abamectin 1m1 in April	0.88 a	0.66 e (54.29)	0.61 e (75.51)	0.64 b (71.43)	0.64 b (78.23)	1.03 a	0.84 b (50.00)	0.71 bc (73.34)	0.69 b (76.47)	0.68 d (80.95)	0.95 a	0.75bcde	0.66 e	0.66 b	0.66 bcd

9- Abamectin 1m1 in April+ 1m1 in July	0.94 a	0.67 e (60.00)	0.70 de (71.43)	0.65 b (75.00)	0.60 bc (85.71)	1.05 a	0.81 b (50.76)	0.71 bc (68.48)	0.74 b (76.47)	0.74 bcd (77.49)	0.99 a	0.74 cde	0.70 de	0.69 b	0.67 bcd
10- Abamectin 2m1 in April	0.91 a	0.66 e (54.29)	0.67 de (67.35)	0.64 b (71.43)	0.67 b (78.23)	1.05 a	0.85 b (50.00)	0.69 bc (73.33)	0.72 b (70.59)	0.73 bcd (76.19)	0.98 a	0.75bcde	0.68 de	0.68 b	0.70 bc
11- Abamectin 2m1 in April+ 2m1 in July	0.93 a	0.66 e (65.71)	0.66 de (67.35)	0.69 b (78.58)	0.54 bc (89.12)	1.07 a	0.78 b (45.83)	0.68 bc (71.11)	0.69 b (74.51)	0.66 d (79.37)	1.00 a	0.72 de	0.67 de	0.70 b	0.60 cd
Pour over plant top:		(60.00)	(67.35)	(71.43)	(78.23)		(25.00)	(67.41)	(70.59)	(76.72)					
12-Oxamyl (24%L) 5m1 in April	0.91 a	0.67 e	0.67 de	0.64 b	0.39 c	1.07 a	0.72 b	0.68 bc	0.73 b	0.74 bcd	0.99 a	0.69 e	0.67 de	0.68 b	0.56 d
Check	0.94 a	1.03 a	1.17 a	1.06 a	1.23 a	1.10 a	1.12 a	1.18 a	1.25 a	1.33 a	1.02 a	1.07 a	1.18 a	1.16 a	1.28 a

*Sampling date (days) after treatment application. **Means followed by the same letter, in each column, are not different statistically according to Duncan's multiple range test ($P \leq 0.05$). Figures in parenthesis indicate percentage nematode reduction in soil [% efficiency according to Handerson and Tilton, formula=(1-Population in the treated plot after application X Population in the check plot before application) X100 (as in Puntener, 1981)]. Population in the treated plot before application Population in the check plot after application

Table-4: Influence of some bioagents and Oxamyl in controlling *Helicotylenchus exallus* in field soil planted with banana cv.Williams.

Treatment type and dose	First season					Second season					Average				
	Log. (Initial population+1)	45*	90	120	150	Log. (Initial population+1)	45*	90	120	150	Log. (Initial population+1)	45	90	120	150
Soil application(m1 orgm/hole):															
1- Nemaless 50 m1 in April + 50 m1 in July	2.17 a**	0.89 a (92.86)	1.02 b (92.11)	0.71 b (97.63)	0.70 b (97.82)	2.14 a	1.29 ab (81.63)	1.62 a (75.23)	1.58 a (73.46)	1.59 ab (60.93)	2.16 a	1.09 b	1.32 ab	1.15 b	1.15 b
2- Nemaless 100 m1 in April + 100 m1 in July	2.02 a	1.08 a (90.02)	0.87 b (93.55)	0.35 b (99.05)	0.82 b (93.46)	2.02 a	0.52 bc (95.82)	0.57 b (95.30)	0.79 b (93.96)	1.02 bc (78.69)	2.02 a	0.80 b	0.72 b	0.57 c	0.92 bc
3- Promot 5 gm in April	1.99 a	0.80 a (91.25)	0.77 b (95.47)	0.83 b (95.86)	0.58 b (97.62)	2.09 a	0.87 bc (69.80)	0.81 b (92.28)	0.64 b (92.11)	0.86 bc (87.52)	2.04 a	0.83 b	0.79 b	0.73 c	0.72 bc
4- Promot 2.5 gm in April + 2.5 gm in July	1.67 a	0.55 a (95.81)	0.68 b (96.52)	0.63 b (97.02)	0.44 b (97.80)	2.15 a	0.77 bc (91.99)	0.73 b (93.14)	0.76 b (92.28)	1.03 bc (83.66)	1.91 a	0.66 b	0.70 b	0.69 c	0.74 bc
5-B.t.NRC 60 30 gm in April	1.24 a	0.84 a (83.52)	0.73 b (92.42)	0.57 b (95.12)	0.53 b (95.51)	2.00 a	0.37 c (96.03)	0.67 b (89.49)	0.39 b (94.63)	0.65 c (87.87)	1.62 a	0.61 b	0.70 b	0.48 c	0.59 bc
6-B.t.NRC 60 15 gm in April+ 15 gm in July	1.80 a	0.69 a (92.17)	0.96 b (88.84)	0.50 b (97.13)	0.46 b (97.36)	1.97 a	0.39 bc (95.78)	0.55 b (95.13)	0.52 b (95.43)	0.82 c (87.62)	1.88 a	0.54 b	0.75 b	0.51 c	0.64 bc
7- Oxamyl 15 m1 in April+ (24%L) 15 m1 in July	1.29 a	0.56 a (92.09)	0.68 b (97.37)	0.62 b (97.29)	0.74 b (96.89)	1.82 a	0.65 bc (92.41)	0.54 b (92.69)	0.74 b (90.86)	0.91 bc (83.49)	1.55 a	0.60 b	0.61 b	0.68 c	0.82 bc
Injection into plant pseudostem:															
8- Abamectin 1m1 in April	1.32 a	0.71 a (92.42)	0.67 b (94.77)	0.76 b (93.08)	0.66 b (96.46)	2.05 a	0.37 c (96.50)	0.59 b (93.27)	0.40 b (95.27)	0.57 c (90.37)	1.68 a	0.53 b	0.63 b	0.58 c	0.62 c
9- Abamectin 1m1 in April+	1.62 a	0.77 a (93.02)	0.61 b (93.48)	0.53 b (95.52)	0.67 b (97.61)	2.01 a	0.62 bc (91.84)	0.62 b (92.14)	0.79 b (93.12)	0.88 bc (65.59)	1.82 a	0.69 b	0.61 b	0.66 c	0.78 bc

1m1 in July															
10- Abamectin 2m1 in April	1.57 a	0.90 a (89.18)	0.91 b (92.53)	0.82 b (93.85)	0.72 b (95.76)	1.95 a	0.68 bc (89.60)	0.52 b (95.83)	0.72 b (92.49)	0.76 c (90.46)	1.76 a	0.79 b	0.72 b	0.77 c	0.74 bc
11- Abamectin 2m1 in April+ 2m1 in July	1.58 a	0.70 a (92.96)	0.71 b (94.15)	0.73 b (95.70)	0.53 b (95.25)	1.98 a	0.47 bc (88.38)	0.63 b (94.72)	0.56 b (90.84)	1.26 abc (74.14)	1.78 a	0.59 b	0.67 b	0.64 c	0.89 bc
Pour over plant top:		(94.05)	(95.89)	(96.48)	(97.41)		(89.63)	(92.74)	(94.89)	(79.24)					
12-Oxamyl (24%L) 5m1 in April	1.61 a	0.66 a	0.65 b	0.60 b	0.55 b	2.03 a	0.66 bc	0.59 b	0.53 b	0.96 c	1.82 a	0.66 b	0.62 b	0.56 c	0.72 bc
Check	1.59 a	1.78 a	2.11 a	2.07 a	2.13 a		2.00 a	2.03 a	1.97 a	1.92 a	1.80 a	1.89 a	2.07 a	2.02 a	2.03 a

*Sampling date (days) after treatment application. **Means followed by the same letter, in each column, are not different statistically according to Duncan's multiple range test ($P \leq 0.05$). Figures in parenthesis indicate percentage nematode reduction in soil [% efficiency according to Handerson and Tilton formula=(1-Population in the treated plot after application X Population in the check plot before application) X100 (as in Puntener, 1981)]. Population in the treated plot before application
Population in the check plot after application

Table-5: Influence of some bioagents and Oxamyl in controlling *Criconemoides* spp. in field soil planted with banana cv.Williams.

Treatment type and dose	First season					Second season					Average				
	Log. (Initial population+1)	45*	90	120	150	Log.(Initial population+1)	45*	90	120	150	Log.(Initial population+1)	45	90	120	150
Soil application(m1 orgm/hole):															
1- Nemaless 50 m1 in April +50 m1 in July	0.95 a**	0.78 a (73.16)	0.60 a (88.09)	0.74 b (79.87)	0.68 b (84.80)	1.55 a	0.79 a (82.78)	0.94 bc (81.43)	0.81 bc (80.27)	0.51 a (89.99)	1.25 a	0.78 b	0.77 a	0.77 bc	0.59 b
2- Nemaless 100 m1 in April + 100 m1 in July	1.15 a	0.79 a (70.33)	0.87 a (63.15)	0.52 b (87.64)	0.53 b (85.60)	1.65 a	0.61 a (92.35)	0.83 bcd (83.79)	0.52 bc (92.82)	0.55 a (88.79)	1.40 a	0.70 b	0.85 a	0.52 bc	0.54 b
3- Promot 5 gm in April	1.15 a	0.81 a (63.44)	0.94 a (70.27)	0.79 b (82.23)	0.77 b (85.21)	1.73 a	0.17 a (97.85)	0.56 bcd (93.35)	0.79 bc (89.91)	0.56 a (92.11)	1.44 a	0.49 b	0.75 a	0.79 bc	0.66 b
4- Promot 2.5 gm in April +2.5 gm in July	1.23 a	0.55 a (85.91)	0.53 a (89.58)	0.44 b (92.17)	0.44 b (92.40)	1.66 a	0.71 a (80.53)	1.15 ab (77.54)	0.74 bc (88.77)	0.56 a (89.73)	1.45 a	0.63 b	0.84 a	0.59 bc	0.50 b
5-B.t.NRC 60 30 gm in April	1.09 a	0.83 a (61.35)	0.67 a (60.00)	0.71 b (83.89)	0.76 b (84.37)	1.59 a	0.84 a (77.04)	0.84 bcd (79.74)	0.17 c (96.64)	0.34 a (94.45)	1.34 a	0.83 b	0.76 a	0.44 c	0.55 b
6-B.t.NRC 60 15 gm in April+15 gm in July	0.80 a	0.50 a (77.45)	0.75 a (60.00)	0.43 b (92.48)	0.43 b (92.71)	1.68 a	1.12 a (73.29)	0.77 bcd (86.35)	0.34 bc (96.05)	0.51 a (83.82)	1.24 a	0.81 b	0.76 a	0.39 c	0.47 b
7- Oxamyl 15 ml in April+(24%L) 15 m1 in July	0.91 a	0.56 a (75.34)	0.54 a (81.25)	0.50 b (85.32)	0.50 b (91.45)	1.07 a	0.70 a (84.50)	0.74 bcd (93.80)	0.54 bc (79.01)	0.39 a (85.58)	0.99 a	0.63 b	0.64 a	0.52 bc	0.45 b
Injection into plant pseudostem :															
8-Abamectin 1m1 in April	1.11 a	0.72 a (68.29)	0.87 a (71.88)	0.91 b (70.64)	0.80 b (80.06)	1.68 a	0.84 a (81.34)	0.76 bcd (88.60)	0.53 bc (93.27)	0.34 a (89.49)	1.39 a	0.78 b	0.81 a	0.72 bc	0.57 b
9-Abamectin 1m1 in April+ 1m1 in July	1.27 a	0.70 a (76.27)	0.64 a (84.21)	0.38 b (85.17)	0.38 b (90.40)	1.60 a	0.62 a (82.22)	0.18 d (92.16)	0.98 ab (83.33)	0.58 a (93.02)	1.44 a	0.66 b	0.41 a	0.68 bc	0.48 b
10-Abamectin 2m1 in April	1.11 a	0.74 a (71.01)	1.00 a (68.57)	0.86 b (75.84)	0.78 b (84.37)	1.58 a	0.00 a (100.00)	0.17 d (96.80)	1.01 ab (76.21)	0.57 a (86.72)	1.34 a	0.37 b	0.58 a	0.94 b	0.67 b
11-Abamectin 2m1 in April+ 2m1 in July	1.38 a	0.70 a (77.45)	0.67 a (82.86)	0.55 b (83.89)	0.55 b (89.57)	1.31 a	0.61 a (66.83)	0.37 cd (77.49)	0.72 bc (85.65)	0.34 a (86.65)	1.35 a	0.66 b	0.52 a	0.63 bc	0.44 b

Pour over plant top:		(79.77)	(79.49)	(83.14)	(81.29)		(66.83)	(77.49)	(83.26)	(78.64)					
12-Oxamyl (24%L) 5m1 in April	1.17 a	0.69 a	0.83 a	0.79 b	0.95 b	1.26 a	0.71 a	0.83 bcd	0.73 bc	0.60 a	1.22 a	0.70 b	0.83 a	0.76 bc	0.77 b
Check	1.54 a	1.51 a	1.56 a	1.59 a	1.59 b	1.31 a	1.38 a	1.70 a	1.57 a	1.42 a	1.43 a	1.44 a	1.63 a	1.58 a	1.51 a

*Sampling date (days) after treatment application. **Means followed by the same letter, in each column, are not different statistically according to Duncan's multiple range test ($P \leq 0.05$). Figures in parenthesis indicate percentage nematode reduction in soil [% efficiency according to Handerson and Tilton formula=(1-Population in the treated plot after application X Population in the check plot before application) X100 (as in Puntener, 1981)]. Population in the treated plot before application Population in the check plot after application

Table-6: Average of fruit measurements for «Williams» banana plant treated by some biogents and Oxamyl.

Treatment type and dose	First season			Second season			Average		
	Bunch Weight kg)	No of hands	No.of Fingers/hand	Bunch Weight (kg)	No.of hands	No. of Fingers/hand	Bunch Weight (kg)	No.of hands	No. of Fingers/hand
Soil application(m1 orgm/hole):									
1- Nemaless 50 m1 in April +50 m1 in July	31.67 e*	12.83 c	18.67 c	16.33 de	6.83 e	13.83 d	24.00 d	9.83 d	16.25 d
2- Nemaless 100 m1 in April +100 m1 in July	33.33 bc	13.67 bc	19.17 bc	17.83 cd	8.33 d	16.33 c	25.58 cd	11.00 c	17.25 c
3-Promot 5gm in April	35.50 ab	14.50 ab	20.67 ab	19.17 c	8.83 cd	17.33 bc	27.33 bc	11.67 bc	19.00 bc
4- Promot 2.5 gm in April +2.5 gm in July	37.50 a	15.00 ab	21.17 ab	23.17 ab	9.33 bcd	17.83 bc	30.33 a	12.17 ab	19.50 ab
5-B.t.NRC 60 30 gm in April	37.50 a	15.33 a	21.12 ab	22.00 b	10.00 abc	19.33 ab	29.75 a	12.67 a	20.25 ab
6-B.t.NRC 60 15 gm in April+ 15 gm in July	38.00 a	15.33 a	21.33 a	21.67 b	10.00 abc	19.67 ab	29.83 a	12.67 a	20.25 ab
7- Oxamyl 15 m1 in April+(24%L) 15m1 in July	37.17 ab	15.17 a	21.17 ab	19.50 bcd	9.50 bcd	19.50 ab	29.75 a	12.33 ab	20.33 ab
Injection into plant pseudostem :									
8- Abamectin 1m1 in April	33.83 ab	14.83 ab	20.67 ab	23.00 ab	9.83 abc	19.67 ab	29.42 ab	12.33 ab	20.17ab
9- Abamectin 1m1 in April+1m1 in July	36.67 av	15.00 ab	21.00 ab	24.00 ab	10.50 ab	21.00 a	30.33 a	12.75 a	21.00 a
10- Abamectin 2m1 in April	37.50 a	15.17 a	21.17ab	25.33 a	11.00 a	20.33 a	31.42 a	13.08 a	20.75 a
11- Abamectin 2m1 in April+2m1 in July	37.17 ab	15.17 a	20.83ab	23.67 ab	9.66 bc	20.33 a	30.42 a	12.42 ab	20.58 a
Pour over plant top:									
12-Oxamyl (24%L) 5m1 in April	35.83 ab	14.83 ab	20.33 abc	22.67 b	9.50 bcd	18.67 ab	29.25ab	12.17 ab	19.50 ab
Check	25.83 d	10.00 d	15.83 d	15.17 e	6.33 e	13.50 d	20.50 e	8.16 e	14.67 e

*Means followed by the same letter, in each column, are not statistically different according to Duncan's multiple range test ($P \leq 0.05$).

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