ABAMECTIN (AVERMECTIN) EFFECT IN THE SUPPRESSION OF EGGS AND JUVENILES OF *Meloidogyne incognita* IN SUSPENSION

EFEITO DA ABAMECTINA (AVERMECTINA) NA SUPRESSÃO DE OVOS E JUVENIS DE Meloidogyne incognita EM SUSPENSÃO

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Abstract

The nematodes have been a important pest in many crops around the world. Therefore, the aim of this work was to evaluate the suppressive capacity of abamectin on eggs and juveniles of *Meloidogyne incognita*. For this, an inoculum was prepared with eggs and juveniles of this nematode from tomato plants. The experiment consisted of 4 treatments with abamectin and a control treatment. These samples remained on the laboratory stand until they were inoculated on seedlings of tomato cv. Santa Cruz Kada, in plots, with 8 repetitions, and distributed in a random stand in the greenhouse design. Four thousand nematode eggs and juveniles per plant were inoculated, seven days after transplanting the seedlings to pots. After 81 days of inoculation seedling pots were opened and the treatments were evaluated by Gall Index (GI) and Reproduction Factor (RF). The results showed that all the treatments with abamectin were suppressive on the nematodes.

Keywords: Nematode, Chemical Control.

Resumo

Os nematoides têm sido importantes pragas das culturas no mundo. Assim, foi objetivo deste trabalho avaliar a capacidade supressiva da abamectina em inóculo de ovos e juvenis de *Meloidogyne incognita*. Para isso foi preparado um inóculo com ovos e juvenis do nematoide proveniente de plantas de tomateiro. Foram avaliados no experimento, 4 tratamentos com abamectina e um tratamento testemunha. Estes permaneceram na bancada do laboratório até serem inoculados nas mudas de tomateiro cv. Santa Cruz Kada, em vasos, com 8 repetições e distribuídos num delineamento inteiramente casualizado na bancada da casa de vegetação. Foram inoculados 4 mil ovos e juvenis do nematoide por planta, sete dias após o transplantio das mudas para os vasos. Após 81 dias da inoculação das mudas os vasos foram abertos e os tratamentos foram avaliados pelo Índice de Galha (IG) e pelo Fator de Reprodução (FR). Os resultados mostraram que todos os tratamentos com abamectina foram eficazes nas supressão do inóculo do nematoide.

Palavras-chave: Nematoide, Controle químico.

INTRODUCTION

The specimes of *Meloidogyne* have caused serious damages in crops, notedly those ones that demand the use of irrigation tecnology.

The Knot-root nematode, and its serious damages caused in many fields are known by the farmers, in the intensive one, such as vegetables production or cultivated in protected environments. According to Sasser (1979), *M. incognita* is the specime of higher geografic distribution in the world.

The resulting symptomas of the fitonematodes atack, can be noticed in the affected roots, or also in the aereal parts of the plants. In the first case, it can be mentioned the bad formations, such as galls, shortage of secundary roots, crakings, and others. In the second case, there are leavies spots, misgrown plants in the Field, chlorosis, and others symptomas, such as nutritional defficience, withered plants in the hot days, and less producution (SBN, 2012).

The use of sintetical and toxic chemicals to these organisms, or that modofify the development of the plants have increased the crop production, mainly in the modern agriculture (SIPES; SHIMITT, 1998). The abamectin is a vermifuge and its efficiency on combat on

nematodes is will kown (SASSER et al., 1982; BECKER, 1999; SILVA et al., 2004; HIGAKI; FASKE & STARR, 2006; ARAUJO, 2012; KUBO et al., 2012, QIAO, et al. 2012; BORTOLINI et al., 2013; GONÇALVES JÚNIOR, et al., 2013, SHAVER, et al., 2016; SAAD, et al., 2017; RODRIGUES, H.C.S. et al., 2017).

The hight use of irrigation system, such as localized irrigation in perenial or green house crops, permits the use of chemigation with nematicides or biological products on the control of the nematode populatons in the infested areas. In this case, the wet bulb formed, due to the application of water locally allows that the nematicide, in the proper concentration, controls the nematodes in this spot. The main effect of abamectin on nematodes is the contact effect.

Thus, the aim of this work was to assess the different concentration of the abamectin in water, on eggs and juvenils of *M. incognita* suppression.

MATERIAL AND METHODS

The experiment was conducted in the green house of the Shunji Nishimura Fundation, in Pompeia/SP, using plots with the thecnic of one plot (0.5L) inside another larger (5.0L) to minimize enviromental changes. All the plots received sterileized soil composed by 49% of coarse sand, 49% of Clay soil, and 2% of organic matter. These plots also were covered with mulch, and they received dayly irrigation of 300 mL per plot.

Seedlings of tomato, cv. Santa Cruz Kada, were produced to the assay and the inoculum of *M. incognita* was produced from a kown population of this nematode in tomato.

The inoculum was separeted in Five beakers which received the treataments of abamectin: 0.0 mL/L (T0 - control), 0.5 mL/L (T1), 1.0 mL/L (T2), 1.5 mL/L (T3) e 2.0 mL/L (T4) of the comercial product (c.p.), with 18 g of abamectin concentration. These plots remained in the stand of the laboratory for 24 hours, agited every 2 hours. After that, these inoculums (treataments) were used to infection of the seedlings of tomato in the plots. The random Schedule was repited 8 times, and the distributed on the stand in the greenhouse. Four thousand eggs and juvenils were inoculated per plant, using na automatic pipette, seven days after the transplanting of the seedlings to the plots.

After 70 days of inoculation, the plants were separated per treataments. The aereal of the plants were cut, and the roots were separated from the soil in corrent water very carefully to not damage the roots, and galls, untill cleaning them completely. Next, the pictures of the roots of the treataments were taken, and the roots were placed in plastic bags, identified, and

stored into the refrigerator. Finally, ther roots were analized individualy, and classified about Gall Index (GI), such as Hartman e Sasser (1985), and the Reproduction Factor (RF) was determineted, according to the equation:

RF = Fp/Ip, were:

RF – Reproduction Factor;

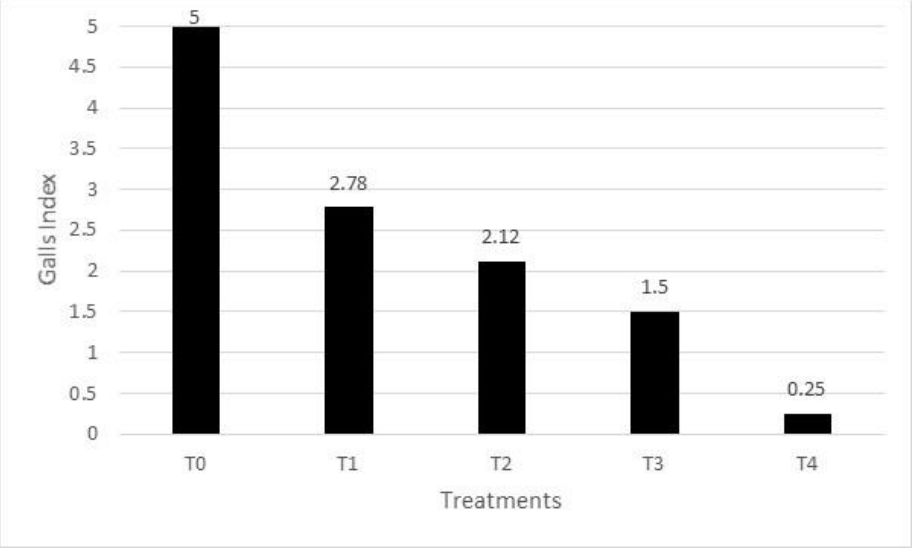
Fp – Final population of nematodes extracted from the roots of each treatament;

Ip – Initial population inoculed per treatament.

The results among the treataments were analyzed for both methods, and the avareges were compared to the Tukey test at 5% of significance, using the SISVAR software (FERREIRA, 2011).

RESULTS AND DISCUSSION

To both factors, GI (Picture 1) and RF (Table 1) the analized of variance showed significative differences (P<0.05) among the tested treataments. All the treataments with abamectin significantly differed from the control treatament, showing a good eficacy of this product on nematode suppression, since the lower concentration (0.5 mL/L of comercial product or 9 mg/L of abamectin).



Picture 1. Avareges of Galls Index (GI) among the treataments with comercial product (c.p.) of abamectin, and control teratament. T0 – control treatament; T1 – 0.5 ml/L; T2 – 1.0 mL/L; T3 – 1.5 mL/L; T4 – 2.0 mL/L c.p. concentration. The avareges followed by the same latter do not differ in the Tukey Test (P<0.05). Variance Coeficient (VC)=20.69%; Minimal Significative Difference (MSD)=1.22.

Table 1. Avarege of final population (*Fp*) of eggs and juvenils of *Meloidogyne incognita*, obtened after the processing of the roots, and avareges of Reproduction Factor (RF) in the treataments tested.

Treatments	**Avareges of the obtened *Fp***	**Avareges of RF**
T0	86,275	21.568 a*
T1	848.5	0.212 b
T2	302.5	0.075 b
T3	414.5	0.103 b
T4	32	0.008 b
VC	-	24.7%
MSD	-	5.24

*The avareges followed by the same latter do not differ in the Tukey test (P<0.05);
VC – Variance Coeficient;
MSD – Minimal Significative Difference.
T0 – control treatament; T1 – 0.5 ml/L; T2 – 1.0 mL/L; T3 – 1.5 mL/L; T4 – 2.0 mL/L c.p. concentration

Considering GI, the treatamet 4 was significantly different of the other treataments with abamectin. The treatament 3 also was significantly different of the treatament 1, and these were similar to the treatament 2. However, In the RF, all the treataments with abamectin were significantly similar to each other.

In fact, the GI method, which is easier to do but is more subjective, because it depends on the avaliator experience to get the results. It uses a Bill sacle to get the experimental data (HARTMAN; SASSER, 1985). The RF method is, in this point, less subjective that GI, because it depends on the physical extraction of the nematodes from the roots, during the laboratorial process. Thus, it was concluded in this experiment, that the lower concentration of abamectin (0.5 mL p.c./L) was enough to nematode suppression in the samples. This information can be proved with the visual analysis of the roots among the treataments, that it is showed in the Picture 2. In this Picture com be seen that the roots with abamectin treatament are very developed, and without galls compared to the control treatament, which has less development, and shows many galls in the roots. Indeed, similar result was showed by Silva et al. (2004) where the abamectin treataments with appear concentratiton caused the imobility, and death of juvenils of *M. incognita*.

With these results, and considering the localized irrigation volume of 12.000 L of water for hectare in perenal crop, such as coffee plantation, concentration of 108 g of abamenctin or 6 L of the comercial product mentioned in this study, will be enough to suppression of

nematodes in the umidy bulb. However, this suposition needs more studies, and Field evaluation, beacuse of the envaironment changes can be found in the Field conditions.

Picture 2. Roots of tomato plants inoculed with suspension of eggs and juvenils of *Meloidogyne incognita* treated or not with abamectin product. T0 is the control treatament, without abamectin; T1=0.5 mL/L, T2=1.0 mL/L, T3=1.5 mL/L, and T4=2.0 mL/L of the comercial product with abamectin.

CONCLUSION

This study had the suppression effect on the nematode inoculum by abamectin product in all the tested concentration.

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