

SCD Probiotics®

Case Study Summary – Biological Efficiency of SCD Bio Ag® Against Root-knot Nematodes in Tomatoes

Agriculture – Pathogen resistance (CSS-034-12)

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Industry: Agriculture
Application: Lab test against nematodes
Product: SCD Bio Ag

Highlight

- SCD Bio Ag may be used in combating tomato root-knot nematode [*Meloidogyne incognita* (Kofoid and White)] in greenhouses effectively at 2 L/da dose similar with 4 L/da and 3 L/da doses

Introduction

Root-knot nematodes (*Meloidogyne* spp.) are obligate parasite nematodes that have more than 90 species worldwide with a wide host set. Root-knot nematodes cause very significant losses in yield, particularly in vegetables and such damages are reported to be 42%-54% in tomatoes and 30%-60% in eggplants. Since root-knot nematodes have a wide host and are sensitive to nematodes, especially vegetables are cultivated in irrigated areas, implementation of cultural measures is very difficult. Therefore, albeit chemicals are widely applied for combating root-knot nematodes in vegetable cultivation, bio solutions have gained prominence in the recent years. Accordingly, this study researched the efficiency of SCD Bio Ag on the growth of root-knot nematodes (*Meloidogyne* spp.) conducted in-vitro as a pot test. The test researched the effect of the biological solution SCD Bio Ag on the growth tomato root-knot nematode (*Meloidogyne* spp.) when applied at doses such as 2 L, 3 L, and 4 L per decare (1/4 acre approximately).

Methodology

Prior to the test, greenhouse soil was physically prepared to a depth of 0-30 cm and cleaned of vegetal residues. Plots were irrigated, and it was assured that the product penetrated the soil at 15-20 cm depth. Later, by using the drip irrigation method, 2 ton/da (60 L water per plot) of the solution was administered to the soil.



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As per the random blocks test design, 6 characters (4 dose of the testing product + 1 nematicide product + 1 control) were used in 4 recurrences on $6 \times 5 \text{ m} = 30 \text{ m}^2$ (square meter) plots. A sanitary belt of 1.5 m was kept between plots and around the testing area. Doses were administered on decare per solution (and surface disinfection was applied). Disinfection at the test was applied as a single application. One month later, Melis cultivar tomato seedlings were planted in the greenhouse. Eight months after inventory, Zeck scale* was applied on knots of roots from 20 plants uprooted randomly in the middle parts of each plot. Abbott formula** was applied to index values obtained and percentage effect of the products was found.

The *in vitro* test was conducted in a culture chamber at the Biological Control Research Station with 25°C temperature and 70% humidity. Prior to the test, the soil to be used was mixed as composed of 80 units of sand, 19 units of garden soil, and 1 unit of organic material and autoclaved at 120 minutes at 121°C. Approximately 1000 g of soil was filled in cultivation pots. M59 tomato seedlings recorded sensitive to root-knot nematodes were transplanted to pots. It researched the effect of the biological solution SCD Bio Ag at 2000 mL/da, 3000 mL/da, 4000 mL/da doses on root knot formation of tomatoes. The test was set with 11 characters, i.e. QL Agri 5000 ml/da, MACS01-D (30 ml/da), Majore nema 1500 ml/da, Majore nema 3000 ml/da, thyme oil (1000 ml/da), thyme water (4000 ml/da), pumpkin seed (1000 ml/da), and control and on 4 recurrences. All characters were applied to the tomato plant at the prescribed dose on the date June 5, 2012 and 2000 root-knot nematodes first phase larvae were inoculated to each pot.

Results

SCD Bio Ag solution had an average percentage effect of 78.44, 87.74, 91.11, and 91.70 of the doses 1000, 1500, 2000, and 2500 ml/da respectively, on tomato root-knot nematodes (Table I in the next page). Nematicide product Inferno, on the other hand, had an average percentage effect of 92.73 at 1500 ml/da dose. Statistical analysis has formed three separate groups and SCD Bio Ag solution was placed in the third and last group per effect at a dose of 1000 ml/da, whereas it was in the second group at a 1500 ml/da dose. On the other hand, SCD Bio Ag solution at 2000 ml/da to 2500 ml/da doses was placed in the first group along with the nematicide product Inferno's 1500 ml/da dose.

*Zeck-scale, a form of assessment identifying root-knot infection. Rate of 0 means a healthy plant root system without infection and 10 means a destroyed plant with a destroyed root system.

**Abbott's formula, a formula to adjust for mortality not associated with insecticide treatment such as the natural mortality in an untreated control group, or mortality occurring from a blank spray used as a check.

Table I: Root-knot Nematode (*M. incognita*) Root-knot Index and Effects of Different Doses on Tomatoes.

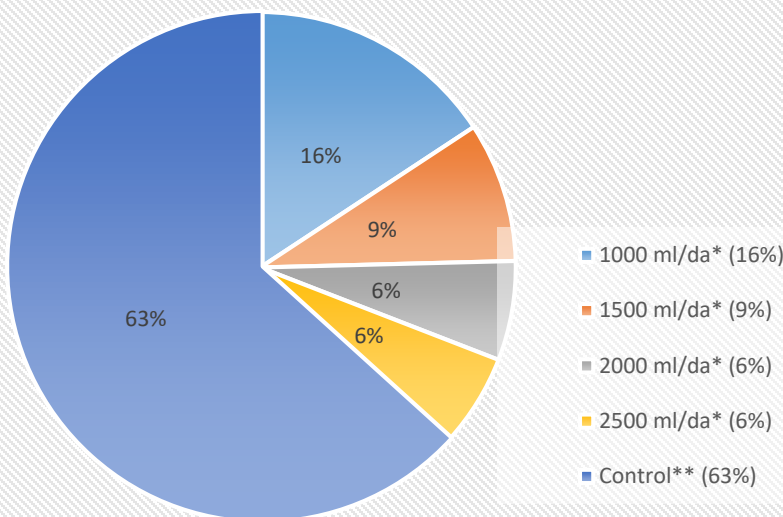
Products and doses	Tech	Root-knot index	Effect rate (%)
SCD Bio Ag (1000 mL/da)	1	2,15	69,29
	2	1,50	77,94
	3	1,55	70,19
	4	0,20	96,33
	Ave.	1,35	78,44 (c)
SCD Bio Ag (1500 mL/da)	1	0,65	90,71
	2	1,35	80,15
	3	0,70	86,54
	4	0,35	93,58
	Ave.	0,76	87,74 (b)
SCD Bio Ag (2000 mL/da)	1	0,20	97,14
	2	1,05	84,56
	3	0,85	83,65
	4	0,05	99,08
	Ave.	0,54	91,11 (a)
SCD Bio Ag (2500 mL/da)	1	0,30	95,71
	2	0,75	88,97
	3	0,50	90,38
	4	0,45	91,74
	Ave.	0,50	91,70 (a)
*Inferno (1500 mL/da)	1	0,35	95,00
	2	0,35	94,85
	3	0,65	87,50
	4	0,35	93,58
	Ave.	0,43	92,73 (a)
Control	1	6,15	
	2	5,75	
	3	5,65	
	4	4,15	
	Ave.	5,43	

* Nematicide product

SCD Bio Ag solution had average treatment effects of 78.44%, 87.74%, 91.11% and 91.70% of the doses 1000 ml/da, 1500 ml/da, 2000 ml/da and 2500 ml/da respectively, on tomato Root-knot nematodes (Figure 1).



Rates of Nematode Contamination



*The plots that SCD Bio Ag was applied at various doses

**The control plot was irrigated with only water

In the study conducted as a pot test, the impact on root-knot nematodes root knot formations of the biological solution with the substance SCD Bio Ag at 2000 ml/da, 3000 ml/da, 4000 ml/da doses with QL Agri 5000 ml/da, MACS01-D (30 ml/da), Majore nema 1500 ml/da, Majore nema 3000 ml/da, thyme oil (1000 ml/da), thyme water (4000 ml/da), and pumpkin seed (1000 ml/da) was examined. Root knot formation index values of application used at the test are given in Table II.

Table II: Test applications index values.

Applications	Average index value*
SCD Bio Ag (2000 mL/da)	1,75 a
SCD Bio Ag (3000 mL/da)	1,75 a
SCD Bio Ag (4000 mL/da)	2,50 a
QL Agri (5000 mL/da)	4,75 ab
MACS01-D (30 mL/da)	5,50 be
Majore nema (1500 mL/da)	5,75 bed
Majore nema (3000 mL/da)	6,50 bed
Thyme oil (1000 mL/da)	6,00 cd
Thyme water (4000 mL/da)	7,25 d
Pumpkin seed oil (1000 mL/da)	8,25 e

*Rates with similar letters in the same column, according to the Duncan ($P < 0,05$) test, are identical.



Examining the Table II, even though with identical statistical significance, administration of SCD Bio Ag product at 2000 mL/da has been more efficient on formation of the root-knot nematodes at 3000 mL/da and 4000 mL/da, which has the same impact. It is established that SCD Bio Ag at all doses (2000 mL/da, 3000 mL/da, 4000 mL/da) has been far more efficient than other applications employed at the test. It was observed that Majore nema 1500 mL/da, Majore nema 3000 mL/da, thyme oil (1000 mL/da), thyme water (4000 mL/da), and pumpkin seed (1000 mL/da) applications have weak efficiency on the growth of root-knot nematodes, implying that they could provide weak protection to plants in field.

Given the statistical significance of the SCD Bio Ag product at 2 L/da dose has been identical with these at 4 L/da and 3 L/da doses, implying that the solution at all doses has the same efficiency on the growth of root-knot nematodes.

Conclusions

As a conclusion, given that the efficiency of SCD Bio Ag solution at 2 L/da dose has been identical with those at 4 L/da and 3 L/da doses concerning the growth of root-knot nematodes and average index values for all doses of administration statistically belong to the same group, the lowest dosage of the application (2 L/da) may be used at combating root-knot nematodes (*Meloidogyne* spp.). In other words, SCD Bio Ag doses lower than 2000 mL/da and 2500 mL/da that placed it in the same group with the nematicide product at 2000 mL/da dose, may be used in combating tomato root-knot nematode [*Meloidogyne incognita* (Kofoid and White)] in greenhouses.

