PROJECT

Biological and chemical control of the vine weevil (Otiorhynchus sulcatus) (4102).

INTERNAL REPORT

TEST

Control of vine weevil larva in containers in tunnels Lienden 1991 (4102-05).

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PB - Boskoop
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SUMMARY
Vine weevil control in containers in tunnels
Lienden 1991.
Internal report 4102-05
Ir. R.W.H.M. van Tol

The agent chloropyrifos* (SusconGreen), at a rate of 375 kg/ha was not effective in the control of the larvae of the vine weevil. Chloropyrifos* (SusconGreen) at a rate of 750 kg/ha was reasonably effective but not as good as carbofuran. The poor effectiveness of this treatment in comparison with last year and with this year's tests in Boskoop and Horst can be explained by the way in which these granules are mixed into the soil. The plantlets with rootballs (from 0,3 litre pots) were not shaken out when potting with the treated soil, consequently the root system around the root collar did not contain any active substance. In contrast to the liquid agents and nematodes, which are poured around the stem afterwards, the granules cannot be effective there. Exactly the same thing happened with Metarhizium anisopliae* (BI01020) which was also mixed into the soil when potting (after 14 days pre-incubation) and could not penetrate the rootball, as a result of which this treatment did not work either. From analysis of the spore density in the soil after the harvest, it became evident that enough vital spores were present to obtain effective control. Furthermore this year, this fungus has worked well against beetle larvae in both Boskoop and in Lienden .

From these results it is clear how essential it is to get a sufficient amount of control agent in the entire rootball (especially at the root collar). For granular products like SusconGreen* and BIO1020* it is therefore essential to first shake out any rootball lacking the relevant granules and then to pot on with the treated soil.

Imidachlobrid* (Confidor), fonofos* (dyfonate) and carbofuran (Curater) are quite effective against the larvae of the vine weevil (Otiorhynchus sulcatus).

The Heterorhabditis megidis nematodes worked well against the larvae. This good result is not so strange considering the fact that the test plants were in a tunnel where the soil temperature is still high until late in the autumn.

The agents or treatments marked with * are not admissible for the purpose mentioned in the tree-nursery.

PURPOSE

Determination of the effectiveness of insecticides and biological control agents against the larva of the vine weevil in outside containers. The effect of three insecticides is compared with the recommended agent carbofuran (Curater liquid). Also the effectiveness of two populations of insect parasitic nematodes (Heterorhabditis megidis) and the insect pathogenic fungus Metarhizium anisopliae* is investigated.

The agents or treatments marked * are not admissible for this purpose in the tree-nursery.

EXPERIMENT DESIGN

Nine treatments were carried out, each with six test plants in parallel. As test plant Acer cappadocicum 'Rubrum' was used. The plants were inoculated three times, each time with 30 eggs per plant. This happened on 30 July, 16 August and 2 September 1991.

The treatments and doses given are listed in table 1. On 28 May 1991 the plants were potted on into five litre pots and placed in the tunnels according to a random scheme (basic information 1). The plants consisted of 1990 summer cuttings, potted on in 0,3 litre pots at the end of September 1990. Treatments D, E and F were also mixed into the soil. The soil of treatment F was mixed with BI01020 (1 gram per litre of soil) on 15 May and subsequently put away in the greenhouse until the potting date, 29 May. On 25 July and 29 November soil samples of treatment F were taken and sent to Bayer for determination of spore density in the soil.

Treatments B, C and J were carried out for the first time on 24 July 1991. These treatments were repeated on 9 September 1991. Treatments H and J were carried out for the 1st time on 3 October 1991 . On 28 October 1991 treatments H and J were applied for the second time. For the liquid agents and nematodes 25 ml injection liquid per plant was administered with a dispenser.

Table 1 - Treatments and dosages.

active substance	trade name	dosage	% a.i.	number
A. untreated				
B. carbofuran	Curater liquid	40,0 l/ha	20	2x
E. imidachlobrid*	Confidor	40,0 1/ha	20	2x
D. chloropyrifos*	SusconGreen	375 kg/ha	10	1x
E. chloropyrifos*	SusconGreen	750 kg/ha	10	1x
F. Metarhizium anisopliae*	BI01020	1 gram/l.	-	1x
G. Heterohabditis megidis	Nemasys H	40.000/l	-	2x
H. Heterohabditis megidis	Green Fly (HSH)	40.000/l	-	2x
J. fonofos*	Dyfonate liquid	40,0 l/ha	25	2x

%a.i. = percentage active substance; number = number of repeated applications

OBSERVATIONS

The plants were harvested on 5 and 6 December. The soil of each test plant was examined for the presence of larvae of the vine weevil. For each test plant the number of larvae found was noted. The root system of the test plants was also evaluated for insect damage. This was done by giving an evaluation mark (scale 0 to 5), whereby 0 indicated an undamaged root collar and 5 an entirely ringed root collar as a result of insect damage. The observations can be found in basic information 2.

RESULTS AND DISCUSSION

Table 2 shows a summary of the results. The number of larvae is an average taken over 4 parallels and is represented as number of larvae per plant. The same applies for the evaluation mark of the root system. The results were processed statistically using ANOVA (see basic information 3). The result of this processing has been included in the table. For the analysis of the number of larvae it was necessary to apply a transformation to the values. In this case the square root of the values was chosen.

Table 2 - Average number of larvae per plant and average evaluation mark for insect damage to the root collar per plant.

treatment	larvae	insect damage	stage
A. untreated	1,4 b	2,6 b	3,3
B. carbofuran	0,1 d	0,5 d	3,5
C. imidachlobrid*	0,2 cd	0,5 d	3,6
D. chloropyrifos (SuscGr.)*	1,5 b	2,3 bc	3,8
E. chloropyrifos (SuscGr.)*	0,5 c	2,0 bc	3,7
F. M. anisopliae (BI01020)*	2,1 a	4,4 a	3,2
G. H. megidis (Nemasys)	0,0 d	1,4 cd	3,0
H. H.megidis (Green Fly, HSH)	0,3 cd	0,8 d	3,7
J. fonofos*			

larvae=average number of larvae per plant; insect damage = damage to root collar (scale 0 to 5); The numbers in the table followed by the same character are not significantly different within a reliability of 95%; stage = average stage of the larvae (1 to 5).

The results of table 2 show the following:

1) of the chemical agents chloropyrifos* (SusconGreen) was not effective at the low concentration and reasonably effective at the high concentration. (D and E). Both fonofos* (Dyfonate) (J) and imidachlobrid* (Confidor) (C) were as effective as carbofuran (B).

2) Metarhizium anisopliae* (BI01020) (F) was not effective against the beetle larvae.

3) The nematode populations of Nemasys (G) and the Green Fly (H) are as effective as carbofuran against the beetle larvae.

PROVISIONAL CONCLUSION

The agent chloropyrifos* (SusconGreen), at a rate of 375 kg/ha was not effective for control of the larvae of the vine weevil. Chloropyrifos* (Suscon Green), at a rate of 750 kg/ha was reasonably effective, but not as good as carbofuran. The poor effectiveness of this agent in comparison with last year and with the tests of this year in Boskoop and Horst can be explained through the way in which these granules were mixed into the soil. Plantlets with rootballs (from 0,3 litre pots) were not shaken when being potted with the treated soil, as a result of which the root system around the root collar did not contain active substance. In contrast to the liquid agents and the nematodes which are poured in around the stem afterwards, the granulate cannot be effective here. Exactly the same happened with Metarhizium anisopliae* (BI01020) which was also mixed into the soil when being potted (after 14 days' pre-incubation) and could not penetrate the rootball, consequently this material was not effective either. From the analysis of spore density in the soil after the harvest it is clear that sufficient vital spores were present to be able to obtain good control. Furthermore this fungus worked well this year both in Boskoop and Lienden against the beetle larvae.

From these results it is evident how essential it is to get sufficient control agent in the entire rootball (especially near the root collar). For granular products like Suscon*Green and BI01020* it is therefore necessary to first shake out completely any rootball lacking the granules in question and then to pot with the treated soil.

Imidachlobrid* (Confidor), fonofos* (dyfonate) and carbofuran (Curater) are quite effective against the larvae of the vine weevil (Otiorhynchus sulcatus). For these agents the results correspond with the result of previous years, with the exception of imidachlobrid which has not been tested before.

The Heteorhabditis megidis nematodes have worked well against the larvae. This good result is not so strange considering the fact that the test plants were in a tunnel where the soil temperature is still high until late in the autumn. In October, on a sunny day, the soil temperature went up to nearly 20°C. Next year the plants will not be placed in a tunnel but outside in a container-field immediately after the winter.