PROJECT
Biological and chemical control of the black vine weevil (*Otiorhynchus sulcatus*)
(4102)

INTERNAL REPORT

EXPERIMENTS
Control of the larvae of the black vine weevil in pots and in the field - 1995/96
Boskoop 1996 (4102-40, 4102-41)

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Research Station for Nursery Stock - Boskoop
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SAMENVATTING

Bestrijding van de larven van de gegroefde lapsnuitkever in potten en in de vollegrond 1995/1996
Boskoop 1996
Intern verslag(en) 4102-40 en 4102-41
Auteur
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In potten geven beide standaardmiddelen (Curater vlb. en Asepta suSCon10) een goede bestrijding van de larven van de gegroefde lapsnuitkever (86 resp. 99% bestrijding). In de vollegrond is het standaardmiddel Curater vlb. niet effectief bij de bestrijding van de larven.

Het experimentele middel* geeft 100% bestrijding van de larven van de gegroefde lapsnuitkever in potten na een enkele toepassing van 25 g/ha (80% a.i.). In de vollegrond is het bestrijdingseffect afwezig.

Van de geteste aaltjesstammen geeft Larvanem (NI-H-F85) de beste bestrijding in potten (85%). Het product Nemasys H (UK-H-211) geeft maximaal 60% bestrijding. In de vollegrond zijn beide producten even effectief.

Verlaging van hoeveelheid toegediende aaltjes met 50% geeft doorgaans een aanzienlijke verlaging van het bestrijdingseffect in zowel pot- als veldproeven. Een verlaging van de huidige geadviseerde doses is aldus niet mogelijk.

De schimmel *Beauveria bassiana* in het product* geeft onvoldoende bestrijding van de larven.

Er is een duidelijk verschil in bestrijding gevonden bij toepassing van Nemasys H in verschillende gewassen. In *Cornus* resulteerde dit zelfs in geen significante bestrijding. De invloed van type en grootte van het wortelstelsel speelt waarschijnlijk een rol hierbij. Dit effect geldt waarschijnlijk bij meerdere aaltjessoorten en is nog in onderzoek.

De met * gecodeerde middelen zijn niet toegelaten in de boomkwekerij voor dit doel.

SUMMARY

Control of the larvae of the black vine weevil in pots and in the field 1995/1996.
Boskoop 1996
Internal report experiment(s) 4102-40 and 4102-41
Author
ir. R.W.H.M. van Tol

In pots both standard chemical applications (carbofuran lq. and chlorpyrifos (suSCon10) slow-release) are effective (86 resp. 99% control). In the field carbofuran lq. is not effective.

Code* is an effective chemical in pots. A single application at a concentration of 25 g/ha (80% a.i.) is giving 100% control. In the field there was no control with code* at any of the tested concentrations.

Of the tested nematode strains *Heterorhabditis* sp.(NWE)(NI-H-F85) was the most effective one in the pot trial. In the field both strains (HF85 and UK211) are equally effective at the standard application rate of 1.0x10E6 nematodes/m^2.

In the pot trial we found a clear dosis-mortality effect for the nematode strains HF85 and UK211. In the field we found this effect only for the strain UK211 and not for HF85. The results show that it is not advisable to reduce the advised application rates in practice.

The product Boverol* containing the fungus *Beauveria bassiana* is not effective for control of black vine weevil larvae.

The selections of *Heterorhabditis* sp. (NI-H-E87.3) are effective in the pot trial but not in the field. This strain is probably not an effective searcher for larvae in larger soil volumes. Although there are some differences between the selections of this strain they are not very clear. The F2 of this strain is showing the lowest efficacy in both trials.

There is a clear influence of plant species on the efficacy of the insect-parasitic nematode *Heterorhabditis* sp.(NWE)(UK-H-211) in the field. In *Cornus* this resulted in absence of control. The influence of root systems of plants on the efficacy of nematodes is in research.

The with * coded means or treatments are not registered in nursery stock for the purpose used in this research.

TRIAL 4102-40: CONTROL OF THE LARVAE OF THE BLACK VINE WEEVIL IN POTS.

MATERIAL AND METHODS

There are 13 treatments in 4 blocks with 8 plants per block. The plants were inoculated once with 20 eggs per plant. Normally we inoculate twice a year with eggs but egg production was too low in July/August to inoculate a second time. The plants were inoculated on 7 August 1995. As a test plant we used *Waldsteinia ternata.* The plants were potted in spring in one litre pots and placed in open boxes on the container field. The treatments were separated by non-treated plants. The border plants of the experiment were surrounded by non-treated plants to exclude the influence of heating the pot soil by direct sunlight on the side of the pots. The substrate used in the pots consisted of 55% pellets, 40% sphagnum-moss peat and 5% aeolian sand. The temperature of the soil in the pots was measured every 60 minutes with a Rologg NT1 temperature datalogger (see appendix).

Treatment 3 and 10 were performed during potting of the plants in spring 1995. The treatments 2, 4 and 5 were performed on 13 July 1995 for the first time and on 1 September 1995 treatment 2 and 5 were performed for a second time.

The treatments with nematodes (6,7,8 and 9) were performed on 22 September 1995 and treatment 11, 12 and 13 on 25 September 1995. The nematodes as well as the chemical treatments 2, 4 and 5 were applied in 25 ml water per pot.

Table 1 - Treatments pot experiment.

active ingredient	product name	company	dose	%ai#	number@
1. control	-	-	-	-	-
2. carbofuran	Curater Iq.	Bayer	37.5 l/ha	20	2x(28,35)
3. chlorpyrifos	suSCon10	Asepta	375 kg/ha	10	1x(16)
4. code*	EXP60720A	Rhone-Poulenc	25 g/ha	80	1x(28)
5. code*	EXP60720A	Rhone-Poulenc	25 g/ha	80	2x(28,35)
6. *H.* sp.(NWE)(UK-H-211)	Nemasys H	Brinkman	0.25 10^6/m^2	-	1x(38)
7. *H.* sp.(NWE)(UK-H-211)	Nemasys H	Brinkman	0.5 10^6/m^2	-	1x(38)
8. *H.* sp.(NI-H-F85)	Larvanem	Koppert	0.25 10^6/m^2	-	1x(38)
9. *H.* sp.(NI-H-F85)	Larvanem	Koppert	0.5 10^6/m^2	-	1x(38)
10. *Beauveria bassiana**	Boverol	-	0.5 g/l	?	1x(38)
11. *H.*sp.(NI-H-E87.3)(m)	-	IPO-DLO	0.5 10^6/m^2	-	1x(16)
12. *H.*sp.(NI-H-E87.3)(B5)	-	IPO-DLO	0.5 10^6/m^2	-	1x(38)
13. *H.*sp.(NI-H-E87.3)(F2)	-	IPO-DLO	0.5 10^6/m^2	-	1x(38)

%ai = percentage active ingredient

@ number = number of sprayings. Between parentheses the week number of treatment

The experiment ended in week 48 (november). The soil in each pot was searched for the presence of larvae. Of each larva the size was noted (five instars (L1 to L5) of the larvae and one pupal stage). The larvae were washed and put into a petri dish for a few days to see if any of the living larvae were infected.

The total number of larvae found and the number of L2, L3, L4 and L5 are noted in the database (see appendix) and used for statistic analysing. There were no pupae found. The data are analysed with ANOVA. The values are transformed to square root numbers before analysing.

RESULTS

The results are summarized in table 2. The number of larvae are an average of the 4 blocks and are shown in the table as number of larvae per plant. The results are statistically analysed with ANOVA. The results of this analysis are shown in table 2.

Table 2 - Mean number of larvae per plant (n) and percentage reduction compared to control in the pot experiment (4102-40).

behandeling	n	total%#	L2%#	L3%#	L4%#	L5%#
1. control	8.3	0 a	0 a	0 a	0 a	0 a
2. carbofuran	1.1	86.5 ef	69.2 ef	91.5 de	100 c	100 d
3. chloorpyrifos	0.06	99.3 g	100 g	100 e	100 c	90.4 cd
4. code1 *	0.0	100 g	100 g	100 e	100 c	100 d
5. code1 *	0.03	99.6 g	98.9 g	100 e	100 c	100 d
6. *H.* sp.(NWE)(UK-H-211)	6.1	27.3 b	27.5 b	16,0 ab	31.1 a	66.6 b
7. *H.* sp.(NWE)(UK-H-211)	3.4	59.5 c	58.2 de	58.5 c	59.0 b	71.3 bc
8. *H.* sp.(NWE)(NI-H-F85)	2.8	65.9 c	40.6 bc	72.3 c	91.8 c	71.3 bc
9. *H.* sp.(NWE)(NI-H-F85)	1.3	84.7 ef	75.8 ef	90.4 de	91.8 c	76.2 bcd
10. *B.bassiana*	5.4	34.8 b	51.7 de	31.9 b	0 a	80.9 bcd
11. *H.* sp.(NI-H-E87.3)(m)	1.0	88.4 f	81.3 f	87.2 d	96.8 c	100 d
12. *H.* sp.(NI-H-E87.3)(B5)	1.6	80.5 de	68.1 def	80.8 cd	95.1 c	90.4 cd
13. *H.* sp.(NI-H-E87.3)(F2)	2.5	70.0 cd	52.7 cd	63.8 c	96.7 c	95.3 d

\# percentage reduction based on number of larvae. Statistical results (letters behind figures) are based on square root transformation of number of larvae.
Numbers higher than n in the control (8.3) are set to 0% reduction.
The population in the control consisted for 34% of L2-larvae, 35% of L3-larvae, 23% of L4-larvae and 8% of L5-larvae.
Figures in the same column followed by the same letter are not statistically significantly different, with a 95% confidence limit.

As the graphs in appendix 1 show the temperature in the soil is average above 12°C until 20 october and drops than to lower temperatures.

The standard chemical treatment in pots with carbofuran (Curater Iq.) is giving good control this year (~85%). The new standard chlorpyrifos (Asepta suSCon10) is most successful (99% control).

code1 * (80% a.i.) was effective in the pot trial at both concentrations.

With the normal application of 0.5x10E6 nematodes/m^2 the tested strain *Heterorhabditis* sp.(NWE)(NI-H-F85) approved to be most effective (85% control) together with *Heterorhabditis* sp.(NI-H-E87.3) (m = 88% control, B5 = 81% control, F2 = 70% control) and followed by *Heterorhabditis* sp.(NWE)(UK-H-211) with 60% control. There is a clear dose-mortality effect found this year in the pot trial for both commercial strains (Nemasys H and Larvanem). Reducing the advised concentration of 0.5 million nematodes per m^2 by 50% reduces the efficacy with 20 to 30% and is therefore no good option for practical use.

The UK-strain of Nemasys H is giving moderate control results just like the last few years.

The fungus *B.bassiana* in the product Boverol* is not effective enough for control of the larvae (35% control).

TRIAL 4102-41: CONTROL OF THE LARVAE OF THE BLACK VINE WEEVIL IN THE FIELD

MATERIAL AND METHODS

There are 19 treatments in 3 blocks with 5 plants per block surrounded by 12 border plants. The plants were inoculated twice with 50 eggs per plant. The plants were inoculated on 31 july and 18 august 1996. As a test plant we used *Taxus baccata* (13 treatments), *Rhododendron* (2 treatments), *Thuja* (2 treatments) and *Cornus* (2 treatments). The plants were outplanted in spring. The temperature of the soil was measured every 60 minutes with a Rologg NT1 temperature datalogger (appendix 1: graphics).

The chemical aplications in treatments 2, 3, 4, 5 and 6 were performed on 13 july 1995 for the first time and on 1 september 1995 the treatments 2, 4 and 6 were performed for the second time.

The treatments with nematodes were performed on 22 september 1995 for treatment 7, 8, 12, 13, 15, 17 and 19 and on 25 september for treatment 9, 10 and 11 between 16.00 and 17.00 hour. The nematodes as well as the chemical treatments were applied in 3 litre water per m^2.

Table 3 - Treatments field experiment.

active ingredient $	commercial	dose	%ai#	number@
1. untreated	-	-	-	-
2. carbofuran	Curater Iq.	37,5 l/ha	20	2x(28,35)
3. code*	EXP60720 A	100 g/ha	80	1x(28)
4. code*	EXP60720 A	100 g/ha	80	1x(28,35)
5. code*	EXP60720 A	100 g/ha	80	1x(28)
6. code*	EXP60720 A	100 g/ha	80	1x(28,35)
7. *H.* sp.(NWE)(NI-H-F85)	Larvanem	10E6/m^2	-	1x(38)
8. *H.* sp.(NWE)(UK-H-211)	Nemasys H	10E6/m^2	-	1x(38)
9. *H.* sp.(NI-H-E87.3)(m)	-	10E6/m^2	-	1x(38)
10. *H.* sp.(NI-H-E87.3)(B5)	-	10E6/m^2	-	1x(38)
11. *H.* sp.(NI-H-E87.3)(F2)	-	10E6/m^2	-	1x(38)
12. *H.* sp.(NWE)(NI-H-F85)	Larvanem	500,000/m^2	-	1x(38)
13. *H.* sp.(NWE)(UK-H-211)	Nemasys H	500,000/m^2	-	1x(38)
14. untreated	-	-	-	-
15. *H.* sp.(NWE)(UK-H-211)	Nemasys H	10E6/m^2	-	1x(38)
16. untreated	-	-	-	-
17. *H.* sp.(NWE)(UK-H-211)	Nemasys H	10E6/m^2	-	1x(38)
18. untreated	-	-	-	-
19. *H.* sp.(NWE)(UK-H-211)	Nemasys H	10E6/m2	-	1x(38)

$ treatment 1 until 13 on *Taxus*; 14 and 15 on *Rhododendron*; 16 and 17 on *Thuja*; 18 and 19 on *Cornus*

%ai = percentage active ingredient

@ number = number of sprayings. Between parentheses the week number of treatment

The experiment ended in week 6 (february 1996). The rootball of each plant was searched for the presence of larvae. Of each larva the size was noted (five instars (L1 to L5) of the larvae and one pupal stage). The larvae were washed and put into a petri dish for a few days to see if any of the living larvae were infected.

The total number of larvae found and the number of L2, L3, L4 and L5 are noted in the database (see appendix) and used for statistic analysing. There were no L1 or pupae found. The data are analysed with ANOVA. The values are transformed to square root numbers before analysing.

Tabel 4 - Mean number of larvae per plant (n) and percentage reduction compared to control in the field experiment (4102-41).

behandeling	n	total %#	L2%#	L3%#	L4%#	L5%#
1. control	10.7	0 ab	0 abc	0 abc	0 ab	0 abc
2. carbofuran	8.4	21.7 bcde	42.8 bcde	45.6 cdef	17.1 abc	0 abc
3. code*	8.6	19.9 bc	46.5 cde	19.5 abcd	46.3 bcd	0 abc
4. code*	12.2	0 ab	0 abc	0 a	29.3 abcd	0 abc
5. code*	8.9	17.3 bc	0 abc	24.1 bcdef	34.1 bcd	18.1 abc
6. code*	15.4	0 a	0 a	0 ab	22.0 ab	0 a
7. NI-H-F85	4.9	54.6 e	46.5 bcde	52.1 ef	48.8 bcd	70.3 d
8. UK-H-211	5.0	53.4 de	85.6 e	47.9 def	58.5 d	34.1 bcd
9. NI-H-E87.3(m)	9.6	10.5 abc	10.7 abc	0 abcd	41.5 abcd	11.3 abc
10. NI-H-E87.3(B5)	6.6	38.5 cde	57.2 cde	50.2 def	53.6 cd	18.1 abc
11. NI-H-E87.3(F2)	10.5	1.9 ab	10.7 ab	26.1 abcde	0 a	0 ab
12. NI-H-F85	4.7	55.9 de	67.9 de	67.4 f	53.6 bcd	38.6 cd
13. UK-H-211	8.6	19.9 bc	39.6 bcd	21.8 abcde	61.0 d	0 ab
14. untreated	17.1	0 A	0 A	0 A	0 A	0 A
15. UK-H-211	3.6	79.0 B	87.3 B	80.2 B	67.8 B	82.1 B
16. untreated	15.4	0 A	0 A	0 A	0 A	0 A
17. UK-H-211	5.7	63.2 B	5.5 B	77.1 B	69.6 B	65.6 B
18. untreated	8.9	0 A	0 A	0 A	0 A	0 A
19. UK-H-211	6.7	24.1 A	0 A	0 A	0 A	25.9 A

percentage reduction based on number of larvae. Statistical results (letters behind figures) are based on square root transformation of number of larvae.
Numbers higher than n in the control (7.6) are set to 0% reduction.
The population in the control consisted for 17.4% of L2-larvae, 28.6% of L3-larvae 25.5% of L4-larvae and 27.3% of L5-larvae.

Figures in the same column followed by the same letter are not statistically significantly different, with a 95% confidence limit.

Treatment 1 to 13 are statistically analysed together; treatment 14 with 15, treatment 16 with 17 and treatment 18 with 19 are statistically analysed with each other

As the graphs in appendix 1 show the temperature in the soil is average above 12°C until 20 october and drops than to general lower temperatures.

The standard chemical treatment carbofuran is giving no significant reduction (~22%) compared with the untreated.

Code* (80% a.i.) was not effective.

With the normal application of 1.0x10E6 nematodes/m^2 the tested strains of *Heterorhabditis* sp.(NWE)(NI-H-F85 and UK-H-211) gave a moderate control of ~55%. Reducing the application rate to 0.5x10E6 nematodes/m^2 shows that the strain NI-H-F85 is giving the same efficacy as with the higher application rate. For the strain UK-H-211 this lower rate is resulting in no control.

The three selections of the strain NI-H-E87.3 are not effective enough in the field. Only the B5-strain is showing somoe moderate control.

In the treatments 13 to 19 we tested the influence of plant species on the efficacy of the biological treatment with nematodes. There is a clear effect found of the plant type on the efficacy of the strain UK-H-211 in the field. The highest control was found in *Rhododendron* (79%) followed by *Thuja* and *Taxus* (resp. 63 and 53% control). In *Cornus* there was no significant control (24%) found. The best explanation for these differences are probably the differences in type and or size of the root system. Measurements on the root systems and detail studies on the behaviour of nematodes under influence of roots are being studied at this moment.

GENERAL CONCLUSIONS

Code* is an effective chemical in pots. A single application at a concentration of 25 g/ha (80% a.i.) is giving 100% control. In the field there was no control with code* at any of the tested concentrations.

Of the tested nematode strains *Heterorhabditis* sp.(NWE)(NI-H-F85) was the most effective one in the pot trial. In the field both strains (HF85 and UK211) are equally effective at the standard application rate of 1.0x10E6 nematodes/m^2.

In the pot trial we found a clear dosis-mortality effect for the nematode strains HF85 and UK211. In the field we found this effect only for the strain UK211 and not for HF85. The results show that it is not advisable to reduce the advised application rates in practice.

The product Boverol* containing the fungus *Beauveria bassiana* is not effective for control of black vine weevil larvae.

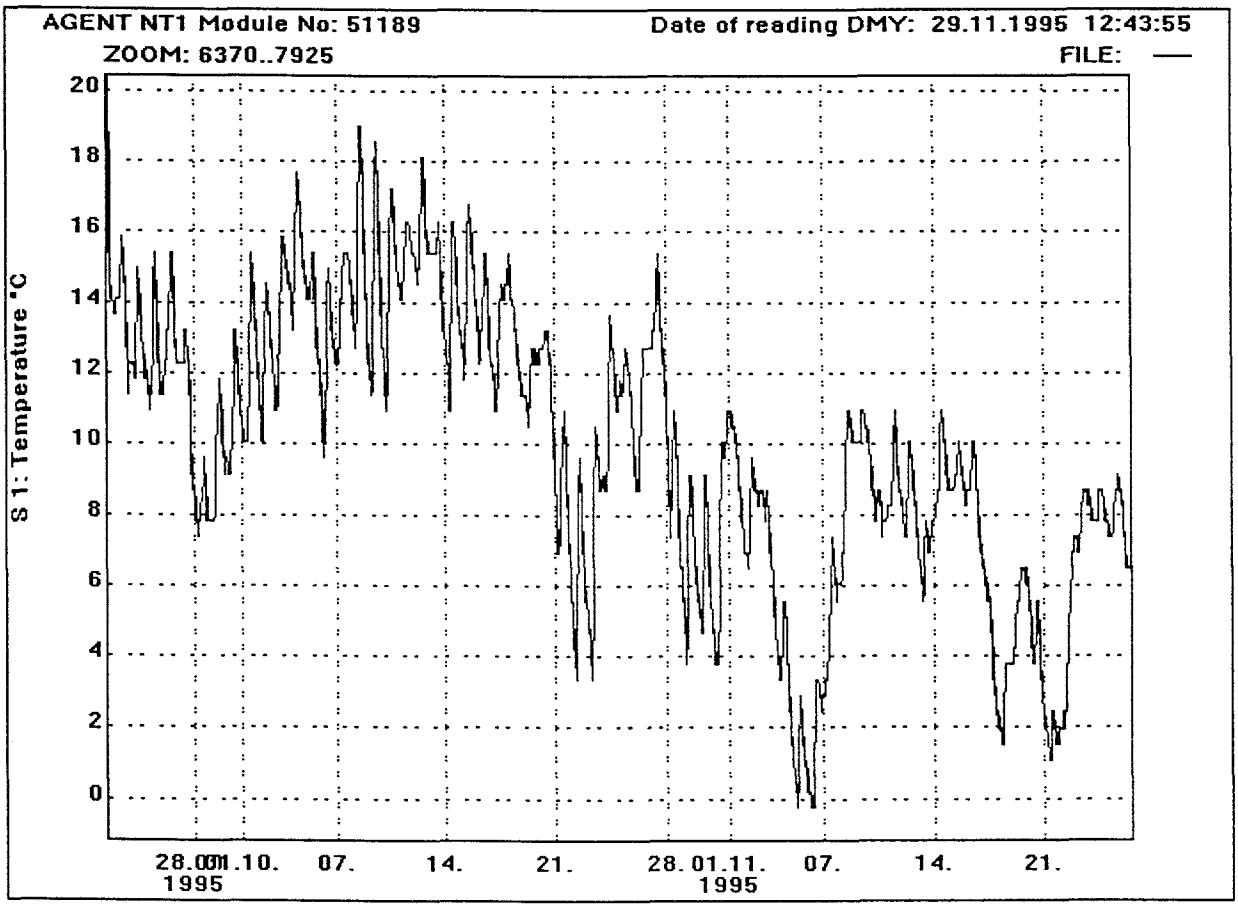
The selections of *Heterorhabditis* sp. (NI-H-E87.3) are effective in the pot trial but not in the field. This strain is probably not an effective searcher for larvae in larger soil volumes. Although there are some differences between the selections of this strain they are not very clear. The F2 of this strain is showing the lowest efficacy in both trials.

There is a clear influence of plant species on the efficacy of the insect-parasitic nematode *Heterorhabditis* sp.(NWE)(UK-H-211) in the field. In *Cornus* this resulted in absence of control. The influence of root systems of plants on the efficacy of nematodes is in research.

APPENDIX

- Graphics of the soil temperature in resp. pots and field
- Datafile with results

AGENT NT1: Module No: 51189
Programming info: soil temperature in pots 1995 (4102)
Evaluation info: Temperature in pots 1995 (4102)
temperature in pots after inoculation with nematodes 1995



AGENT NT1: Module No: 51666
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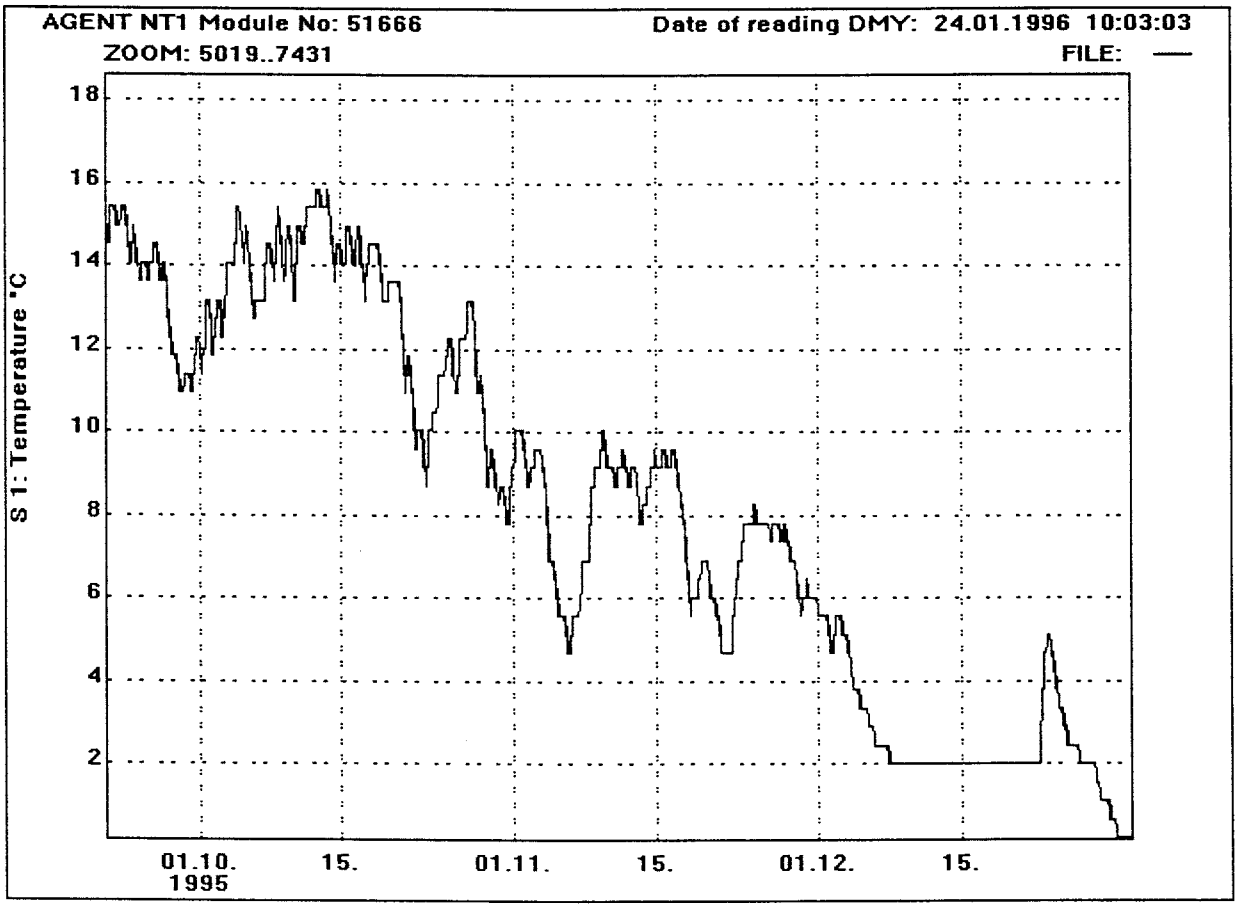
Evaluation info: soil temperature field 1995 (4102)
soil temperature field 1995 (4102)



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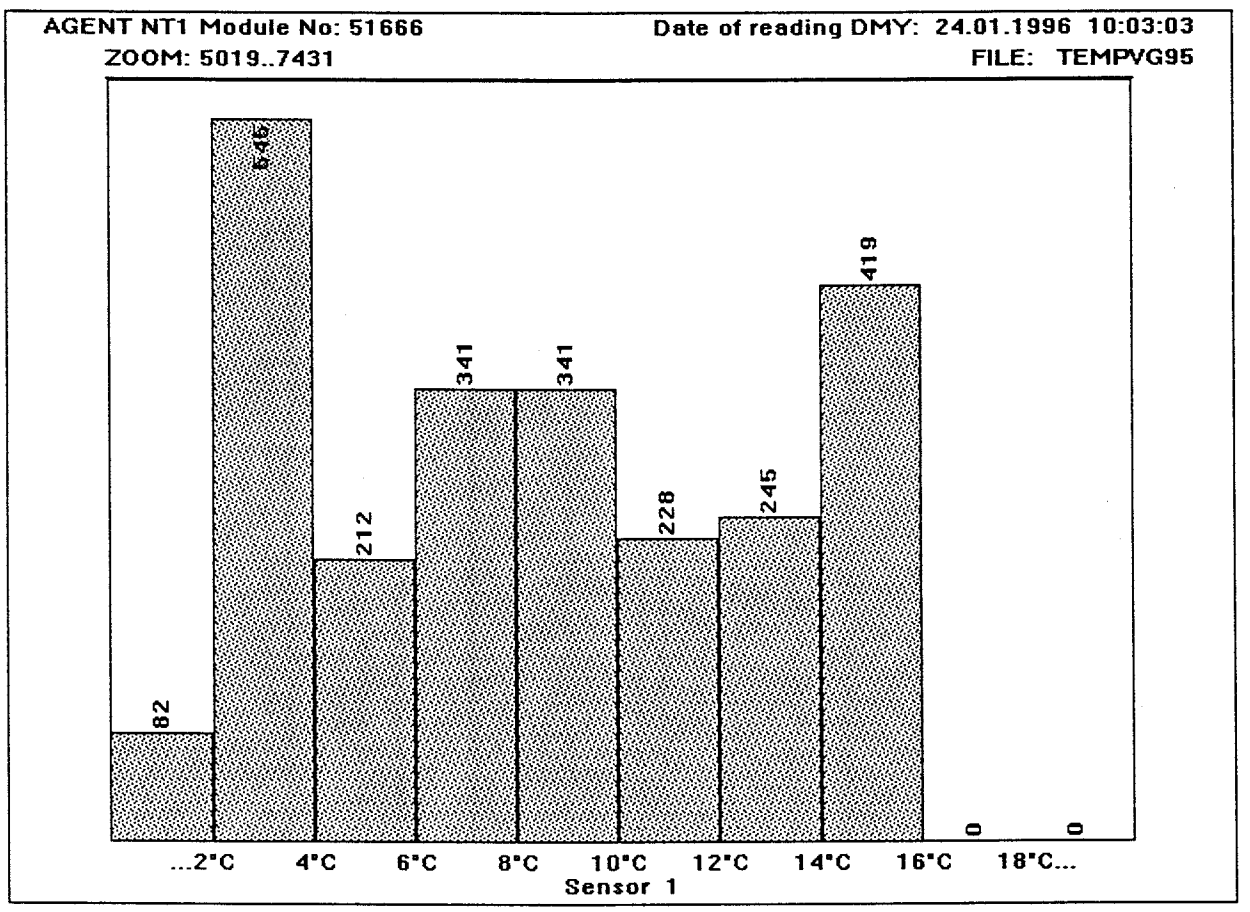

4102-40 CONTROL OF THE LARVAE OF THE BLACK VINE WEEVIL IN POTS OUTSIDE - 1995

beh = behandeling(treatment): 1 = untreated; 2 = carbofuran; 3 = chlorpyrifos(375kg/ha); 4 = code(1x)(25g/ha;80%a.i.); 5 = code(2x)(25g/ha;80%a.i.); 6 = UK-H-211 (0.25x10E6/m2); 7 = UK-H-211(0.5x10E6/m2); 8 = NI-H-F85(0.25x10E6/m2); 9 = NI-H-F85(0.5x10E6/m2); 10 = B.bassiana(Boverol;0.5g/l grond); 11 = NI-H-E87.3 (moederstam); 12 = NI-H-E87.3(B5); 13 = NI-H-E87.3(F2)

larv = total number of not infected larvae per pot
sta2 = 2nd instar larvae and smaller
sta3 = 3rd instar larvae
sta4 = 4th instar larvae
sta5 = 5th instar larvae

blok	beh	larv	sta2	sta3	sta4	sta5
1	1	0	0	0	0	0
1	1	15	2	6	6	1
1	1	10	2	4	3	1
1	1	6	2	3	0	1
1	1	1	0	0	0	1
1	1	6	3	2	1	0
1	1	5	3	2	0	0
1	1	16	4	8	4	0
1	2	0	0	0	0	0
1	2	11	7	4	0	0
1	2	2	2	0	0	0
1	2	5	4	1	0	0
1	2	1	1	0	0	0
1	2	2	2	0	0	0
1	2	1	1	0	0	0
1	2	0	0	0	0	0
1	3	0	0	0	0	0
1	3	0	0	0	0	0
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1	4	0	0	0	0	0
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1	4	0	0	0	0	0
1	5	0	0	0	0	0
1	5	0	0	0	0	0

1	5	0	0	0	0	0
1	5	0	0	0	0	0
1	5	0	0	0	0	0
1	5	0	0	0	0	0
1	5	0	0	0	0	0
1	5	0	0	0	0	0
1	6	9	1	4	3	1
1	6	0	0	0	0	0
1	6	3	3	0	0	0
1	6	2	0	2	0	0
1	6	10	5	4	0	1
1	6	5	3	2	0	0
1	6	17	8	6	3	0
1	6	10	2	7	1	0
1	7	5	1	0	4	0
1	7	0	0	0	0	0
1	7	0	0	0	0	0
1	7	1	1	0	0	0
1	7	1	0	0	1	0
1	7	6	1	1	4	0
1	7	0	0	0	0	0
1	7	4	4	0	0	0
1	8	6	2	4	0	0
1	8	5	3	2	0	0
1	8	8	3	1	0	4
1	8	0	0	0	0	0
1	8	2	2	0	0	0
1	8	9	9	0	0	0
1	8	2	1	1	0	0
1	8	3	3	0	0	0
1	9	4	0	0	0	4
1	9	1	0	0	0	1
1	9	3	3	0	0	0
1	9	0	0	0	0	0
1	9	3	0	1	2	0
1	9	0	0	0	0	0
1	9	5	3	1	1	0
1	9	6	3	3	0	0
1	10	7	2	4	1	0
1	10	7	0	5	1	1
1	10	0	0	0	0	0
1	10	0	0	0	0	0
1	10	1	0	1	0	0
1	10	10	5	4	1	0
1	10	9	4	5	0	0
1	10	0	0	0	0	0
1	11	0	0	0	0	0
1	11	3	2	1	0	0
1	11	4	4	0	0	0
1	11	3	1	2	0	0
1	11	0	0	0	0	0

1	11	0	0	0	0	0
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1	11	4	1	3	0	0
1	12	1	1	0	0	0
1	12	3	2	1	0	0
1	12	2	2	0	0	0
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1	12	3	2	1	0	0
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2	4	0	0	0	0	0
2	4	0	0	0	0	0
2	4	0	0	0	0	0

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2	5	0	0	0	0	0
2	5	0	0	0	0	0
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2	5	0	0	0	0	0
2	5	0	0	0	0	0
2	6	11	5	5	1	0
2	6	3	1	1	1	0
2	6	3	0	1	2	0
2	6	1	1	0	0	0
2	6	9	3	4	2	0
2	6	0	0	0	0	0
2	6	7	3	2	1	1
2	6	8	1	6	1	0
2	7	3	1	0	1	1
2	7	7	1	2	3	1
2	7	6	1	3	2	0
2	7	1	1	0	0	0
2	7	10	4	4	2	0
2	7	10	0	8	2	0
2	7	0	0	0	0	0
2	7	3	1	1	0	1
2	8	1	1	0	0	0
2	8	0	0	0	0	0
2	8	3	3	0	0	0
2	8	2	1	0	0	1
2	8	4	2	1	1	0
2	8	1	1	0	0	0
2	8	2	0	1	1	0
2	8	6	2	2	1	1
2	9	0	0	0	0	0
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2	9	0	0	0	0	0
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2	10	6	2	1	3	0
2	10	0	0	0	0	0
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2	10	12	0	8	4	0
2	10	9	0	1	7	1
2	10	17	1	4	11	1
2	10	12	0	6	6	0
2	11	0	0	0	0	0
2	11	0	0	0	0	0
2	11	0	0	0	0	0

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2	11	0	0	0	0	0
2	11	0	0	0	0	0
2	12	0	0	0	0	0
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3	1	6	1	2	3	0
3	1	15	3	7	5	0
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3	4	0	0	0	0	0
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3	4	0	0	0	0	0
3	4	0	0	0	0	0

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3	6	5	1	0	3	1
3	6	5	2	0	2	1
3	6	0	0	0	0	0
3	6	4	0	2	2	0
3	6	0	0	0	0	0
3	6	10	0	8	2	0
3	6	3	1	1	1	0
3	7	1	1	0	0	0
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3	8	5	4	1	0	0
3	8	4	1	3	0	0
3	8	6	2	4	0	0
3	8	1	1	0	0	0
3	8	3	3	0	0	0
3	8	0	0	0	0	0
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3	9	2	1	0	1	0
3	9	2	2	0	0	0
3	9	0	0	0	0	0
3	9	2	0	2	0	0
3	9	1	1	0	0	0
3	9	1	1	0	0	0
3	9	1	0	1	0	0
3	10	0	0	0	0	0
3	10	4	0	2	2	0
3	10	3	1	1	1	0
3	10	0	0	0	0	0
3	10	2	1	0	1	0
3	10	0	0	0	0	0
3	10	2	1	0	1	0
3	10	1	0	0	1	0
3	11	0	0	0	0	0

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3	11	3	1	2	0	0
3	11	0	0	0	0	0
3	11	0	0	0	0	0
3	11	0	0	0	0	0
3	11	2	0	0	2	0
3	11	0	0	0	0	0
3	12	0	0	0	0	0
3	12	0	0	0	0	0
3	12	0	0	0	0	0
3	12	1	1	0	0	0
3	12	0	0	0	0	0
3	12	0	0	0	0	0
3	12	0	0	0	0	0
3	12	0	0	0	0	0
3	13	7	3	4	0	0
3	13	6	5	1	0	0
3	13	2	2	0	0	0
3	13	7	3	3	1	0
3	13	2	0	2	0	0
3	13	0	0	0	0	0
3	13	4	1	3	0	0
3	13	3	3	0	0	0
4	1	13	4	3	2	4
4	1	9	4	2	3	0
4	1	9	2	6	1	0
4	1	13	4	5	2	2
4	1	8	5	3	0	0
4	1	3	2	1	0	0
4	1	15	7	3	3	2
4	1	17	3	2	6	6
4	2	1	1	0	0	0
4	2	2	1	1	0	0
4	2	4	3	1	0	0
4	2	1	1	0	0	0
4	2	1	1	0	0	0
4	2	3	3	0	0	0
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4	2	0	0	0	0	0
4	3	0	0	0	0	0
4	3	1	0	0	0	1
4	3	1	0	0	0	1
4	3	0	0	0	0	0
4	3	0	0	0	0	0
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4	4	0	0	0	0	0
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4	4	0	0	0	0	0

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4	5	0	0	0	0	0
4	5	0	0	0	0	0
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4	5	0	0	0	0	0
4	6	8	2	5	1	0
4	6	2	0	0	2	0
4	6	11	4	3	4	0
4	6	7	3	3	1	0
4	6	8	5	3	0	0
4	6	9	5	4	0	0
4	6	11	4	5	1	1
4	6	8	3	1	4	0
4	7	3	2	0	1	0
4	7	5	4	1	0	0
4	7	9	4	2	1	2
4	7	4	2	2	0	0
4	7	3	2	0	0	1
4	7	0	0	0	0	0
4	7	0	0	0	0	0
4	7	5	3	1	1	0
4	8	1	0	0	1	0
4	8	0	0	0	0	0
4	8	3	0	3	0	0
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4	10	14	10	3	1	0
4	10	10	1	2	7	0
4	10	11	7	3	1	0
4	10	6	2	3	1	0
4	10	6	2	2	2	0
4	10	8	1	2	5	0

4	10	2	2	0	0	0
4	11	0	0	0	0	0
4	11	5	3	2	0	0
4	11	0	0	0	0	0
4	11	1	1	0	0	0
4	11	0	0	0	0	0
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4	12	1	0	1	0	0
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4	12	0	0	0	0	0
4	12	0	0	0	0	0
4	12	3	2	1	0	0
4	12	4	2	2	0	0
4	12	2	2	0	0	0
4	12	5	0	1	2	2
4	13	15	8	6	1	0
4	13	4	4	0	0	0
4	13	1	1	0	0	0
4	13	0	0	0	0	0
4	13	0	0	0	0	0
4	13	0	0	0	0	0
4	13	1	0	0	0	1
4	13	4	1	3	0	0

:

4102-41 CONTROL OF THE LARVAE OF THE BLACK VINE WEEVIL IN THE FIELD - 1995/96

beh = behandeling(treatment): 1 = untreated; 2 = carbofuran; 3 = code, 1x(100g-(80%a.i.)/ha); 4 = code,2x(100g(80%a.i.)/ha); 5 = code,1x(50g(80%a.i.)/ha); 6 = code,2x(50g(80%a.i.)/ha); 7 = NL-H-F85(1.0); 8 = UK-H-211(1.0); 9 = NI-H-E87.3,moederstam; 10 = NI-H-E87.3,B5; 11 = canceled; 12 = canceled; 13 = NI-H-E87.3,F2; 14 = NL-H-F85(0.5); 15 = UK-H-211(0.5); 16 = untreated,Rhododendron; 17 = NI-H-F85(1.0),Rhododendron; 18 = untreated,Thuja; 19 = NI-H-F85(1.0),Thuja; 20 = untreated,Cornus; 21 = NI-H-F85(1.0),Cornus. Treatment 1-15 are performed with Taxus baccata as a test plant.

larv = number of not infected larvae per pot
sta1 = 1st instar larvae
sta2 = 2nd instar larvae
sta3 = 3rd instar larvae
sta4 = 4th instar larvae
sta5 = 5th instar larvae
pup = pupae

blok	beh	larv	sta1	sta2	sta3	sta4	sta5
1	1	6	1	0	4	1	0
1	1	6	0	1	2	0	3
1	1	6	0	2	0	4	0
1	1	7	0	0	4	0	3
1	1	8	1	1	1	4	1
1	2	6	0	0	1	3	2
1	2	0	0	0	0	0	0
1	2	5	0	1	3	0	1
1	2	8	2	2	2	1	1
1	2	6	1	1	1	2	1
1	3	2	0	0	2	0	0
1	3	3	1	0	1	0	1
1	3	6	0	3	1	0	2
1	3	2	1	0	1	0	0
1	3	8	0	1	6	0	1
1	4	8	1	3	2	1	1
1	4	4	0	1	2	1	0
1	4	1	0	0	0	0	1
1	4	11	0	5	3	3	0
1	4	11	0	2	6	2	1
1	5	6	1	1	1	3	0
1	5	6	1	2	0	1	2
1	5	17	1	7	5	3	1
1	5	10	0	1	4	4	1
1	5	25	1	12	9	0	3
1	6	9	1	2	2	2	2
1	6	25	3	7	9	4	2
1	6	4	0	1	2	1	0
1	6	18	1	9	5	1	2
1	6	32	3	11	13	3	2

```
1   7   18  0   2   10  2   4
1   7   7   1   2   1   1   2
1   7   5   0   0   2   2   1
1   7   5   1   2   0   1   1
1   7   0   0   0   0   0   0
1   8   4   0   2   1   1   0
1   8   0   0   0   0   0   0
1   8   0   0   0   0   0   0
1   8   4   0   0   0   1   3
1   8   3   0   0   2   1   0
1   9   7   0   1   1   3   2
1   9   5   0   1   0   1   3
1   9   11  0   2   4   2   3
1   9   24  2   2   16  0   4
1   9   9   1   2   3   1   2
1   10  2   0   0   1   1   0
1   10  1   0   1   0   0   0
1   10  3   2   0   0   0   1
1   10  1   0   0   0   0   1
1   10  5   1   1   1   1   1
"1  11  *   *   *   *   *   *
1   11  *   *   *   *   *   *
1   11  *   *   *   *   *   *
1   11  *   *   *   *   *   *
1   11  *   *   *   *   *   *
1   12  *   *   *   *   *   *
1   12  *   *   *   *   *   *
1   12  *   *   *   *   *   *
1   12  *   *   *   *   *   *
1   12  *   *   *   *   *   *"
1   13  10  0   1   3   2   4
1   13  17  0   1   4   6   6
1   13  3   0   0   0   1   2
1   13  9   0   1   2   5   1
1   13  11  1   2   2   3   3
1   14  6   0   1   2   1   2
1   14  3   0   0   3   0   0
1   14  1   0   0   0   1   0
1   14  2   0   0   1   1   0
1   14  8   0   3   1   3   1
1   15  1   0   0   1   0   0
1   15  5   0   1   2   1   1
1   15  8   0   1   4   0   3
1   15  1   0   0   0   0   1
1   15  4   0   1   1   1   1
1   16  8   0   1   2   3   2
1   16  4   0   0   3   0   1
1   16  10  0   0   3   4   3
1   16  11  0   1   4   5   1
1   16  3   0   0   0   2   1
1   17  3   0   0   2   1   0
```

1	17	5	0	2	1	1	1
1	17	7	0	0	2	1	4
1	17	2	0	0	1	1	0
1	17	0	0	0	0	0	0
1	18	22	0	3	6	5	8
1	18	14	0	2	3	3	6
1	18	7	0	0	0	1	6
1	18	27	0	6	3	5	13
1	18	16	0	1	5	5	5
1	19	7	0	1	1	1	4
1	19	9	0	5	1	1	2
1	19	8	1	3	0	1	3
1	19	6	0	1	0	1	4
1	19	6	0	2	2	1	1
1	20	14	0	0	0	0	14
1	20	10	0	0	0	0	10
1	20	6	0	0	0	0	6
1	20	14	0	0	0	0	14
1	20	3	0	0	0	0	3
1	21	13	0	0	0	0	13
1	21	12	0	0	0	0	12
1	21	6	0	1	1	0	4
1	21	13	0	0	0	0	13
1	21	13	0	0	0	1	12
2	1	16	0	2	6	3	5
2	1	2	0	1	1	0	0
2	1	10	0	4	0	4	2
2	1	17	0	8	4	4	1
2	1	9	0	1	5	3	0
2	2	11	0	1	3	2	5
2	2	19	2	3	4	6	4
2	2	22	1	4	3	2	12
2	2	17	0	3	2	5	7
2	2	8	0	0	0	4	4
2	3	8	0	1	4	2	1
2	3	7	1	2	1	1	2
2	3	8	0	0	3	1	4
2	3	9	0	0	2	1	6
2	3	9	0	1	3	2	3
2	4	3	0	1	2	0	0
2	4	7	0	0	3	0	4
2	4	8	1	2	2	2	1
2	4	9	2	0	4	1	2
2	4	4	0	2	1	1	0
2	5	11	0	0	6	0	5
2	5	3	0	1	2	0	0
2	5	5	0	0	0	3	2
2	5	10	0	3	0	4	3
2	5	8	0	1	1	4	2
2	6	10	1	1	5	2	1
2	6	20	0	2	3	6	9

```
2   6   13  0   4   3   1   5
2   6   49  0   5   5   5   34
2   6   15  0   3   4   1   7
2   7   9   0   1   3   4   1
2   7   3   0   1   0   1   1
2   7   2   0   0   0   0   2
2   7   5   0   1   2   2   0
2   7   6   0   1   1   4   0
2   8   10  0   1   5   0   4
2   8   11  0   0   3   4   4
2   8   6   0   0   2   2   2
2   8   4   0   0   0   1   3
2   8   6   1   0   4   0   1
2   9   17  1   1   8   2   5
2   9   6   0   3   3   0   0
2   9   7   0   0   4   2   1
2   9   6   1   1   1   1   2
2   9   24  2   8   4   4   6
2   10  15  0   0   3   3   9
2   10  15  0   3   4   3   5
2   10  13  5   2   3   2   1
2   10  7   1   1   3   1   1
2   10  5   0   2   1   1   1
"2  11  *   *   *   *   *   *
2   11  *   *   *   *   *   *
2   11  *   *   *   *   *   *
2   11  *   *   *   *   *   *
2   11  *   *   *   *   *   *
2   12  *   *   *   *   *   *
2   12  *   *   *   *   *   *
2   12  *   *   *   *   *   *
2   12  *   *   *   *   *   *
2   12  *   *   *   *   *   *"
2   13  9   0   1   2   3   3
2   13  3   0   1   1   0   1
2   13  15  1   2   2   6   4
2   13  10  0   5   0   2   3
2   13  11  1   1   2   2   5
2   14  0   0   0   0   0   0
2   14  5   0   2   0   2   1
2   14  6   0   2   1   3   0
2   14  6   0   0   3   2   1
2   14  12  0   1   2   2   7
2   15  11  1   0   2   1   7
2   15  15  0   2   4   3   6
2   15  8   0   1   2   0   5
2   15  17  0   1   1   2   13
2   15  16  0   0   4   2   10
2   16  23  0   0   14  7   2
2   16  19  0   2   3   3   11
2   16  60  4   17  17  9   13
```

2	16	26	0	5	7	7	7
2	16	25	0	4	9	7	5
2	17	1	0	0	0	1	0
2	17	1	0	0	0	0	1
2	17	2	0	0	0	2	0
2	17	2	0	0	1	1	0
2	17	6	0	0	2	2	2
2	18	7	0	0	1	2	4
2	18	30	0	0	5	7	18
2	18	26	0	0	3	1	22
2	18	16	0	2	2	4	8
2	18	15	0	0	3	2	10
2	19	2	0	1	1	0	0
2	19	2	0	0	1	1	0
2	19	3	0	1	1	1	0
2	19	1	0	0	0	1	0
2	19	1	0	0	0	0	1
2	20	7	0	0	0	0	7
2	20	17	0	0	0	0	17
2	20	19	0	0	0	0	19
2	20	12	0	0	0	0	12
2	20	13	0	0	0	1	12
2	21	8	0	0	0	0	8
2	21	2	0	0	0	0	2
2	21	3	0	0	0	0	3
2	21	3	0	0	0	0	3
2	21	4	0	0	0	0	4
3	1	21	0	2	2	8	9
3	1	11	0	1	4	0	6
3	1	21	0	4	7	6	4
3	1	12	0	1	3	2	6
3	1	9	0	0	3	2	4
3	2	4	0	0	0	1	3
3	2	4	0	0	0	2	2
3	2	8	0	1	3	2	2
3	2	0	0	0	0	0	0
3	2	8	0	0	3	4	1
3	3	12	2	2	3	1	4
3	3	17	0	5	2	2	8
3	3	5	0	0	0	4	1
3	3	24	0	0	4	4	16
3	3	9	0	0	4	4	1
3	4	17	0	1	7	3	6
3	4	25	0	4	9	4	8
3	4	29	0	0	5	3	21
3	4	38	0	7	20	7	4
3	4	8	0	0	2	1	5
3	5	4	0	0	0	0	4
3	5	11	0	1	2	2	6
3	5	2	0	0	0	0	2
3	5	9	0	1	4	2	2

```
3   16  23  0   1   7   8   7
3   16  11  0   1   3   2   5
3   16  7   0   0   0   3   4
3   16  9   0   0   0   1   8
3   16  18  0   0   9   1   8
3   17  0   0   0   0   0   0
3   17  3   0   0   0   2   1
3   17  5   0   0   1   3   1
3   17  10  0   0   3   3   4
3   17  7   0   2   3   2   0
3   18  15  0   0   5   3   7
3   18  6   0   1   2   1   2
3   18  8   0   3   3   1   1
3   18  7   0   1   1   2   3
3   18  15  0   0   2   4   9
3   19  4   0   0   0   0   4
3   19  15  0   2   2   2   9
3   19  3   0   1   0   0   2
3   19  10  0   1   0   1   8
3   19  8   0   0   1   3   4
3   20  3   0   0   0   0   3
3   20  3   0   0   0   0   3
3   20  3   0   1   0   0   2
3   20  5   0   0   0   0   5
3   20  4   0   0   0   0   4
3   21  2   0   0   0   0   2
3   21  4   0   0   0   0   4
3   21  6   0   0   0   1   5
3   21  6   0   0   0   0   6
3   21  6   0   0   0   0   6
:
```