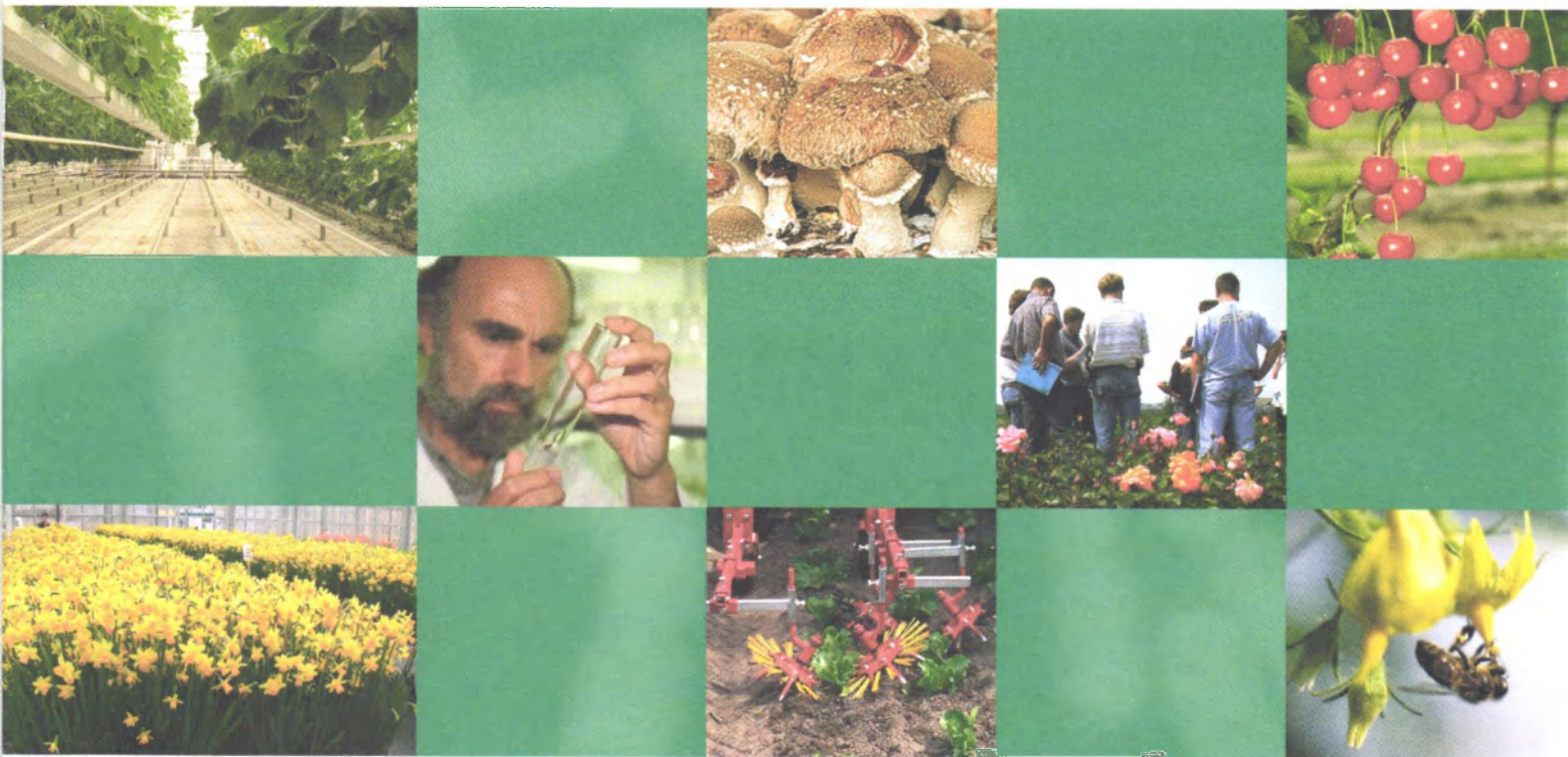




Effects of Activus for weed control in bulbs

Trials with the use of pendimethalin in Tulip and Lily

A.A.E. Bulle en A.Th.J. Koster



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This research had been executed in order of Mabeno.



PPO Project no. 3234043400 (trial nrs. H07t1, H07L1, H07L2 and H07L3)

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Table of contents

	page
1 INTRODUCTION	5
2 MATERIAL AND METHOD	7
3 RESULTS TULIP	9
3.1 Weed	9
3.2 Crop	9
3.3 Yield	10
3.4 Forcing trial tulip	11
4 RESULTS LILY	13
4.1 Weed	13
4.2 Crop	15
4.3 Yield	15
4.4 Forcing trials lily	16
5 CONCLUSIONS	17
APPENDIX 1 EXPERIMENTAL DATA FIELD TRIALS	19
APPENDIX 2 EXPERIMENTAL DATA FORCING TRIALS	23
APPENDIX 3 APPLICATION DATA	25
APPENDIX 4 RAW DATA WEED	27
APPENDIX 5 RAW DATA CROP	31
APPENDIX 6 RAW DATA BULBS	33
APPENDIX 7 RAW DATA FORCING TRIALS	35

1 Introduction

In 2006-2008 a study has been conducted by order of Maktheshim-Agan Benelux & Nordic (Mabeno) with the herbicide Activus (a.i. pendimethalin). It consisted of one field trial with tulip and three field trials with lily. In the field trials pendimethalin was sprayed in different dosages at pre-emergence, direct after emergence and after the leaves were spread.

After the field trials forcing trials were executed in the greenhouse to see if the field applications had an effect on the flower quality of the bulbous crops in the following culture.

These trials were conducted according the EPPO-guidelines (PP 1/88 (2)).

2 Material and method

In experimental field trials different treatments with the herbicide Activus (a.i. pendimethalin) were investigated to control weeds and the influence on the crop. The treatment schedule is given in table 2.1. In november 2006 a trial started with tulip 'Christmas Dream' at the PPO location in Lises (trialnr H07t1) and in april/may 2007 three trials started with lily 'Menorca' and 'Cordelia'. Two trials with Lily were carried out at PPO in Lisse (trialnrs H07L1 and H07L2) and one trial was carried out at the location of Floratuin in Julianadorp (trialnr H07L3). Bulbs of the three lily trials were forced in the greenhouse in the beginning of 2008.

Table 2.1. Treatment schedule

Treat. no.	product	Name active ingredient (a.i.)	content active ingredient	Formulation	Dosage (kg/ha)	Mode of application/ timing
1	Untreated Not weeded	-	-	-	-	-
2	Untreated Weeded	-	-	-	-	-
3	Activus	pendimethalin	400 g/kg	WG	2	Spray, pre-emergence
4	Activus	pendimethalin	400 g/kg	WG	2	Spray, after emergence
5	Activus	pendimethalin	400 g/kg	WG	4	Spray, after emergence
6	Activus	pendimethalin	400 g/kg	WG	2	Spray, after spreading leaves
7	Activus	pendimethalin	400 g/kg	WG	4	Spray, after spreading leaves

The efficacy of the treatments was determined by observing the weed control, the number of three specific weeds and after harvest by measuring the yield parameters. Phytotoxicity was determined by emergence, crop quality and yield. In the forcing trial of tulip crop quality and average plant weight was determined. For the statistical analysis Genstat 10th edition was used.

A detailed overview of the experimental setup can be found in appendix 1 and 2.

3 Results tulip

3.1 Weed

The results of the assessment for weed control and the number of the weeds of the most common species are given in table 3.1.

All Activus treatments had a better weed control than the untreated-1. There were small differences between the Activus treatments. The differences in number of Senecio, Chenopodium and Capsella were not statistically reliable. Poa annua and Stellaria media were hardly seen in the field, the numbers per replicate are given in appendix 4.

Table 3.1. Assessment of weed control and number of specific weeds

Treat. nr.	Product	Dosage / application time	Weed control ¹⁾ 1-5-2007	Average number of weeds per treatment 8-5-2007		
				Senecio vulgaris	Chenopodium album	Capsella bursa-pastoris
1	Untreated-1 Not weeded	-	7.5 d	4.5	2.0	3.0
2	Untreated-2 weeded	-	0.0 a	0.0	0.0	0.0
3	Activus	2 kg/ha, pre-emergence	3.7 c	16.8	3.3	1.5
4	Activus	2 kg/ha, after emergence	1.2 ab	6.3	2.8	2.3
5	Activus	4 kg/ha, after emergence	2.7 bc	16.0	3.0	1.8
6	Activus	2 kg/ha, after spreading	3.5 c	16.8	7.5	2.0
7	Activus	4 kg/ha, after spreading	2.5 bc	15.8	0.0	0.8
	<i>Fprob</i>		<i><.001</i>	<i>0.116</i>	<i>0.357</i>	<i>0.951</i>
	<i>LSD</i>		<i>2.25</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>

¹⁾: 0 = no weed, 10 = many weeds

3.2 Crop

On May 1st no differences were seen in crop quality. In the beginning of June differences in die back of the plants were seen. Leaves were green for a longer period when Activus was used after spreading of the leaves, compared to the pre-emergence use. The dosage of 2 kg/ha was not different from the dosage of 4 kg/ha Activus, sprayed after emergence.

Table 3.2. Assessments of crop quality (10= green canopy, 0= decreased plants)

Treat. Nr.	Product	Dosage / application time	crop quality 1-5-2007	crop quality 5-6-2007
1	Untreated-1 Not weeded	-	9	4.25 a
2	Untreated-2 weeded	-	9	4.5 ab
3	Activus	2 kg/ha, pre- emergence	9	4.75 abc
4	Activus	2 kg/ha, after emergence	9	5 bc
5	Activus	4 kg/ha, after emergence	9	5.25 cd
6	Activus	2 kg/ha, after spreading	9	5.75 d
7	Activus	4 kg/ha, after spreading	9	6.75 e
	<i>Fprob</i>		-	<.001
	<i>LSD</i>		<i>ns</i>	0.73

3.3 Yield

After harvest the bulbs were counted and weighed. The results are shown in table 3.3.

The treatments with Activus had no effect on yield of tulip compared with untreated. Between 'untreated - not weeded' and 'untreated - weeded' no differences in yield were found.

Table 3.3. Yield after harvest of tulip.

Treat. Nr.	Product	Dosage / application time	Total bulbweight <10 (g)	Total bulbweight >10 (g)	Total bulbweight (g)	Number of harvested bulbs >10	Average bulbweight (>10) (g)
1	Untreated Not weeded	-	1454	4933	6387	154	32.1
2	Untreated weeded	-	1500	4928	6428	155	31.9
3	Activus	2 kg/ha, pre- emergence	1555	5010	6565	155	32.3
4	Activus	2 kg/ha, after emergence	1600	4874	6474	154	31.6
5	Activus	4 kg/ha, after emergence	1426	4861	6287	151	32.3
6	Activus	2 kg/ha, after spreading	1454	4832	6287	154	31.4
7	Activus	4 kg/ha, after spreading	1438	4870	6308	154	31.6
	<i>Fprob</i>		0.261	0.694	0.145	0.712	0.410
	<i>LSD</i>		<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>

3.4 Forcing trial tulip

The average plant weight after forcing of the tulips is shown in table 3.4. The average plant weight was lower when Activus was used after spreading, although the highest dosage was statistically not different from untreated and Activus treatmentnr. 3 and 5.

No differences in plant weight were found between the Activus treatments pre- and after emergence.

Table 3.4 Average plant weight of the forcing trial tulip

Treat. Nr.	Product	Dosage / application time	Average plant weight (g)
1	Untreated Not weeded	-	32.6 bc
2	Untreated weeded	-	33.7 bc
3	Activus	2 kg/ha, pre- emergence	33.2 bc
4	Activus	2 kg/ha, after emergence	35.5 c
5	Activus	4 kg/ha, after emergence	32.8 bc
6	Activus	2 kg/ha, after spreading	27.0 a
7	Activus	4 kg/ha, after spreading	31.4 b
	<i>Fprob</i>		<i>0.007</i>
	<i>LSD</i>		<i>3.8</i>

4 Results Lily

4.1 Weed

The results of the assessments for weed control is shown in table 4.1. The Activus treatments pre- and after emergence had a better weed control than untreated. An application with Activus after spreading of the leaves gave more weeds in the trials H07L1 and H07L2. Also in trial H07L3 more weeds were found when Activus was used later in time but these differences were not statistically reliable.

Table 4.1. Assessment for weed control for three lily trials

Treat. Nr.	Product	Dosage / application time	Weed control ¹⁾		
			H07L1 30-5-2007	H07L2 30-5-2007	H07L3 20-6-2007
1	Untreated Not weeded	-	-	7.0 d	4.3 c
2	Untreated weeded	-	0.0 a	0.0 a	0.0 a
3	Activus	2 kg/ha, pre- emergence	1.3 a	1.3 a	1.5 ab
4	Activus	2 kg/ha, after emergence	2.3 a	1.8 a	1.8 b
5	Activus	4 kg/ha, after emergence	2.0 a	1.8 a	1.3 ab
6	Activus	2 kg/ha, after spreading	3.5 b	6.0 c	2.3 b
7	Activus	4 kg/ha, after spreading	4.8 c	4.8 b	2.8 bc
		<i>Fprob</i>	<i><.001</i>	<i><.001</i>	<i>0.002</i>
		<i>LSD</i>	<i>1.04</i>	<i>1.10</i>	<i>1.67</i>

¹⁾: 0 = no weed, 10 = many weeds

For trial H07L1 there were only bulbs for 6 treatments planted, so it had been decided that 'untreated not weeded' was not involved. 'Untreated weeded' in this trial had been weeded directly after assessing the weeds.

In the field trials in Lisse mainly the weeds *Stellaria media*, *Poa annua* and *Chenopodium album* were seen. In table 4.2 the results are given from counting the number of these weeds.

In the two trials in Lisse there was less *Chenopodium* when Activus was sprayed pre- and after emergence. No differences were found in number of *Chenopodium* between doses of 2 or 4 kg/ha.

Activus had no effect on the number of *Poa annua*.

In the field trial in Julianadorp (H07I3) there were less weeds than in the fields in Lisse (table 4.3). No differences were found in the number of *Senecio vulgaris* and *Polygonum persicaria*. The number of *Chenopodium* was less when Activus was sprayed, but between the Activus treatments no differences were found.

Table 4.2. Number of Stellaria, Poa and Chenopodium per treatment in the lily trials in Lisse on June 7

Treat. Nr.	Product	Dosage / application time	H07L1 (Menorca) Number of weedplants			H07L2 (Cordelia) Number of weedplants		
			Stellaria media	Poa annua	Chenopodium album	Stellaria media	Poa annua	Chenopodium album
1	Untreated Not weeded	-	-	-	-	68.5 c	60.0 b	90.0 d
2	Untreated weeded	-	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a
3	Activus	2 kg/ha, pre-emergence	35.5 bc	79.5 b	2.3 a	27.0 ab	69.5 b	1.0 a
4	Activus	2 kg/ha, after emergence	35.5 bc	112.5 b	23.0 a	46.5 bc	86.5 b	17.5 ab
5	Activus	4 kg/ha, after emergence	16.0 ab	107.5 b	21.5 a	13.0 a	82.5 b	29.5 b
6	Activus	2 kg/ha, after spreading	53.0 c	90.5 b	71.5 b	60.0 c	87.5 b	62.5 c
7	Activus	4 kg/ha, after spreading	36.2 bc	126.0 b	84.5 b	27.0 ab	85.0 b	65.0 cd
		<i>Fprob</i>	0.012	0.001	<.001	0.001	<.001	<.001
		<i>LSD</i>	26.94	49.62	31.49	30.14	36.27	25.78

Table 4.3 Number of specific weeds per treatment in the lily trial in Julianadorp on June 20

Treat. Nr.	Product	Dosage / application time	H07L3 (Cordelia) Number of weedplants		
			Senecio vulgaris	Polygonum persicaria	Chenopodium album
1	Untreated Not weeded	-	2.0	3.5	16.2 b
2	Untreated weeded	-	0.0	0.0	0.0 a
3	Activus	2 kg/ha, pre-emergence	0.3	3.8	4.0 a
4	Activus	2 kg/ha, after emergence	1.5	2.3	4.2 a
5	Activus	4 kg/ha, after emergence	2.5	1.0	0.5 a
6	Activus	2 kg/ha, after spreading	1.5	2.5	3.0 a
7	Activus	4 kg/ha, after spreading	1.8	2.5	4.0 a
		<i>Fprob</i>	0.156	0.259	0.029
		<i>LSD</i>	ns	ns	9.16

4.2 Crop

In table 4.4 the results of the assessments for crop quality are shown. On May 30 the length of the Menorca plants seems a little bit shorter. Later in time on August 15 no differences in crop quality were seen anymore.

With Cordelia no differences were found in crop quality during the whole growth period.

The Cordelia plants in Julianadorp (trial H07L3) were at the end of august shorter and had more yellow leaves when Activus was sprayed after emergence or after spreading of the leaves.

Table 4.4 Assessments of crop quality (10= green canopy, 0= decreased plants)

Treat. Nr.	Product	Dosage / application time	H07L1 Menorca 30-5-2007	H07L1 Menorca 15-8-2007	H07L2 Cordelia 15-8-2007	H07L3 Cordelia 24-8-2007
1	Untreated Not weeded	-	-	-	9	7.8 d
2	Untreated weeded	-	8.8	9	9	7.0 c
3	Activus	2 kg/ha, pre- emergence	7.3	9	9	7.0 c
4	Activus	2 kg/ha, after emergence	7.5	9	9	5.8 b
5	Activus	4 kg/ha, after emergence	7.8	9	9	4.5 a
6	Activus	2 kg/ha, after spreading	8.3	9	9	4.3 a
7	Activus	4 kg/ha, after spreading	7.0	9	9	4.8 a
		<i>Fprob</i>	<i>0.637</i>	-	-	<i><.001</i>
		<i>LSD</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>0.70</i>

4.3 Yield

The results of harvested bulb weight are shown in table 4.5. Trial H07L1 showed no significant effects of Activus on total bulb weight. In trial H07L2 bulb weight was lower in the untreated-not weeded treatment because of the weed grow. In this trial all the treatments with Activus were as good as the untreated-weeded.

Both in trial 1 and 2 no differences were found in the number of harvested bulbs (average resp. 149 and 136 bulbs).

In trial H07L3 Activus sprayed, pre-emergence, in a dose of 2 kg/ha gave a comparable weight as untreated. The other Activus treatments, after emergence and after spreading, gave a lower bulb weight. In this trial also a tendency of differences were seen in the number of harvested bulbs.

Table 4.5 Yield after harvest of lily

Treat. nr.	Product	Dosage / application time	Total harvested bulbweight (g)			Number harvested bulbs
			H07L1	H07L2	H07L3	
1	Untreated Not weeded	-	11118	6925 a	7336 b	141 c
2	Untreated weeded	-	10776	7382 bc	7131 b	134 ab
3	Activus	2 kg/ha, pre- emergence	10851	7756 c	7174 b	137 bc
4	Activus	2 kg/ha, after emergence	11508	7514 bc	6180 a	131 ab
5	Activus	4 kg/ha, after emergence	11182	7558 bc	5822 a	131 ab
6	Activus	2 kg/ha, after spreading	11392	7171 ab	6057 a	132 ab
7	Activus	4 kg/ha, after spreading	11002	7299 ab	6134 a	127 a
		<i>Fprob</i>	<i>0.237</i>	<i>0.008</i>	<i><.001</i>	<i>0.02</i>
		<i>LSD</i>	<i>ns</i>	<i>396</i>	<i>395</i>	<i>7</i>

4.4 Forcing trials lily

The results of the forcing trials of lily are shown in table 4.6. The different treatments with Activus in the field trials had no effects on the forcing results. No differences were found in the average of plant weights.

Table 4.6 Average plant weight of lilies after forcing

Treat. nr.	Product	Dosage / application time	Average harvested plant weight (g)		
			H07L1	H07L2	H07L3
1	Untreated Not weeded	-	176	151	153
2	Untreated weeded	-	182	156	147
3	Activus	2 kg/ha, pre- emergence	177	155	145
4	Activus	2 kg/ha, after emergence	179	157	157
5	Activus	4 kg/ha, after emergence	176	152	149
6	Activus	2 kg/ha, after spreading	175	152	152
7	Activus	4 kg/ha, after spreading	167	148	151
		<i>Fprob</i>	<i>0.04</i>	<i>0.77</i>	<i>0.21</i>
		<i>LSD</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>

5 Conclusions

Tulip

- Treatments with Activus showed a better weed control than 'untreated-not weeded'.
- Plants sprayed with Activus after spreading of the leaves showed a slower die-back of the crop, but in the forcing trial only the treatment sprayed with 2kg Activus after spreading of the leaves had a lower plant weight.
- Yield was not influenced by the treatments with Activus.

Lily

- The weed control with Activus, used pre- and after emergence, was better than untreated.
- There was no effect of Activus on the control of *Poa annua*, but there was a positive control effect on the number of *Chenopodium album*.
- The cultivar Menorca showed shorter plants after spraying of Activus at the start of the growth
- This also was found in the cultivar Cordelia in Julianadorp in August after spraying of Activus after emergence and after spreading of the leaves.
- There were no clear differences between the doses 2 and 4 kg Activus per ha.
- Yield was not influenced by the treatments with Activus, except for the cultivar Cordelia in Julianadorp. In this trial there were also yield losses after spraying of Activus after emergence and after spreading of the leaves.
- There were no differences in forcing of the sprayed lilies with Activus and untreated.

II. Phytotoxicity

- emergence : yes
- stand(crop) : yes
- % bloom (color) : no
- die back or decrease : yes
- yield : yes

Observation scale phytotoxicity : 0-10 scale, where 0 =bad, 10 = excellent, no phytotoxicity symptoms

Observation scale efficacy : 0-10, where 0 = 100% diseased or no effect, 10 = healthy of 100% control

1.7. Remarks / additional information : H07L1 had 6 treatments, the untreated - not weeded was skipped.

2 Treatments

2.1. Number of treatments and coding

Treat. no.	product	Name active ingredient (a.i.)	content active ingredient	Formulation	Dosage (kg/ha)	Mode of application/ timing
1	Untreated Not weeded	-	-	-	-	-
2	Untreated Weeded	-	-	-	-	-
3	Activus	pendimethalin	400 g/kg	WG	2	Spray, pre-emergence
4	Activus	pendimethalin	400 g/kg	WG	2	Spray, after emergence
5	Activus	pendimethalin	400 g/kg	WG	4	Spray, after emergence
6	Activus	pendimethalin	400 g/kg	WG	2	Spray, after spreading leaves
7	Activus	pendimethalin	400 g/kg	WG	4	Spray, after spreading leaves

2.2. Application of treatment

Spraying

- sprayer type : Veeze handsprayer with 3 nozzles
- nozzle type : Lechler AD110 03 VS
- pressure : 3 bar
- volume : 800 l/ha
- spraying surface : 2.20 x 1.25 m = 2.75 m²
- spray mixture per plot : 220 ml

Treat. no.	Product	Dosage (kg/ha)	Desired quantity in spray mixture (ml/treatment)	Amount product needed to be measured (ml)	Amount of spraymixture (carrying fluid) (ml/treatment)
1	Untreated Not weeded	-	-	-	-
2	Untreated Weeded	-	-	-	-
3	Activus	2 kg/ha	1000	2.5	880
4	Activus	2 kg/ha	1000	2.5	880
5	Activus	4 kg/ha	1000	5.0	880
6	Activus	2 kg/ha	1000	2.5	880
7	Activus	4 kg/ha	1000	5.0	880

3. Plot plan

Tulip (H07t1)

	A-replication	B-replication	C-replication	D-replication	
	7	5	6	4	
	2	7	1	2	
	5	4	5	6	
	1	2	3	7	
	3	6	2	5	
	6	3	4	3	
	4	1	7	1	

Lily Menorca (H07L1)

	A-herhaling	B-herhaling	C-herhaling	D-herhaling	
	2	5	6	4	
	5	4	1	2	
	1	2	5	6	
	3	6	3	5	
	6	3	2	3	
	4	1	4	1	

Lily Cordelia (H07L2)

	A-herhaling	B-herhaling	C-herhaling	D-herhaling	
	4	1	7	1	
	6	3	4	3	
	3	6	2	5	
	1	2	3	7	
	5	4	5	6	
	2	7	1	2	
	7	5	6	4	

Lily Cordelia (H07L3)

	A-herhaling	B-herhaling	C-herhaling	D-herhaling	
	3	4	6	3	
	1	7	2	1	
	2	3	4	2	
	6	1	1	7	
	7	2	5	5	
	5	6	3	4	
	4	5	7	6	

Appendix 2 Experimental data forcing trials

I Experimental data Tulip

- 1.1 Crop : Tulip (trial H07t1)
- cultivar : Christmas Dream
- bulb size : 11/12
- Pretreatment bulbs : standard
- Standard disinfection bulbs : yes
- 1.2 Location : PPO Lisse
- greenhouse/field : greenhouse
- soil type : potting soil with Aliette
- 1.3 Plot size
- number of bulbs per plot : 16
- plant weight per plot : 517 g
- number of replications : 4
- 1.5. Trial data
- planting date(s) : 29-10-2007
- transport from cold room to greenhouse : 15-2-2008
- harvest date : 4-3-2008
- 1.6. Observations
- emergence : yes
- stand(crop) : yes
- yield : yes

Observation scale : 0-10 scale, where 0 =bad, 10 = excellent
- 1.7. Remarks / additional information : -

II Experimental data Lily

- 1.1 Crop : Lily (trials H07L1, H07L2, H07L3)
- cultivar : Menorca and Cordelia
- bulb size : 14/16
- Pretreatment bulbs : standard
- Standard disinfection bulbs : yes
- 1.2 Location : PPO Lisse
- greenhouse/field : greenhouse
- soil type : potting soil
- 1.3 Plot size
- number of bulbs per plot : 10
- plant weight per plot : 570 g
- number of replications : 4

- 1.5. Trial data
- planting date(s) : 28-1-2008
- harvest date : 25-4-2008
- 1.6. Observations
- emergence : yes
- stand(crop) : yes
- yield : yes
- Observation scale : 0-10 scale, where 0 =bad, 10 = excellent
- 1.7. Remarks / additional information : -

Appendix 3 Application data

Project nr. 3234043400 Executor: J. Trompert, M. Geutskens (H07L3)

trial	date	time	Order of treatments	Temperature 1,5 m above the ground (°C)	Cloudiness	Wind direction	Wind speed at 2 m height (m/sec)	rain (mm)			moisture	Crop data	
								1 day before	At spraying	1 day after		stage	length (cm)
H07T1	15-2	10-12 h	3	8	half	south - southwest	2	7.0	0	0	dry	first emergence	1
H07T1	2-3	14-15 h	4, 5	7	half	west - northwest	2	5.7	0	14.8	moist	little leaf spread	3
H07T1	13-3	8-9 h	6, 7	5	heavy clouds, fog	northwest	1	0.1	0	0	moist	leafs spread	5
H07L1 H07L2	2-5	13-14 h	3	18	variable	northeast	2	0	0	0	moist	no emergence	0
H07L1 H07L2	10-5	17-18 h	4, 5	15	variable	southwest	3	1.2	0	2.8	dry	emergence	0-5
H07L1 H07L2	24-5	18-19 h	6, 7	17	little	northwest	2	0	0	0	dry	leafs spread	10
H07L3	15-5	8.30-9.30	3	11	half	west	4	2.4	0	7.8	moist	no emergence	0
H07L3	25-5	9.00-10.00	4, 5	15	half	northwest	3	0	0	0.2	dry	emergence	0-5
H07L3	1-6	10.30	6, 7	16	no	northeast	4	2.2	0	0	dry	leafs spread	10

Remarks:

Appendix 4 Raw data weed

Table A. Assessment of weed control and number of weeds in tulip per replicate (H07T1).

treatment	replication	Weed assessment 1-5-2007	Senecio vulgaris	Chenopodium album	Capsella	Poa annua	Stellaria media
					bursa- pastoris 8-5-2007		
1	A	5	7	4	1	0	0
1	B	7	11	4	11	0	0
1	C	8	0	0	0	0	0
1	D	10	0	0	0	0	0
2	A	0	0	0	0	0	0
2	B	0	0	0	0	0	0
2	C	0	0	0	0	0	0
2	D	0	0	0	0	0	0
3	A	2	5	0	1	0	0
3	B	3	10	5	2	0	0
3	C	3	7	5	3	0	0
3	D	7	45	3	0	0	0
4	A	1	5	0	1	0	1
4	B	2	5	5	1	0	0
4	C	1	7	4	4	0	0
4	D	1	8	2	3	0	0
5	A	2	3	1	1	0	0
5	B	1	3	4	2	0	0
5	C	2	18	7	2	0	0
5	D	6	40	0	2	0	2
6	A	3	8	0	0	0	0
6	B	5	20	4	3	0	0
6	C	4	14	25	2	0	0
6	D	2	25	1	3	0	0
7	A	4	22	0	2	1	0
7	B	1	5	0	0	0	0
7	C	2	7	0	1	0	0
7	D	3	29	0	0	0	0

Table B. Weed assessments per replicate in lily trials in 2007

Treatment	Replication	H07L1 30-5-2007	H07L2 30-5-2007	H07L3 20-6-2007
1	A	*	5	2
1	B	*	7	5
1	C	*	8	2
1	D	*	8	8
2	A	0	0	0
2	B	0	0	0
2	C	0	0	0
2	D	0	0	0
3	A	1	1	1
3	B	1	1	2
3	C	2	1	1
3	D	1	2	2
4	A	2	1	1
4	B	3	2	3
4	C	2	1	1
4	D	2	3	2
5	A	2	1	1
5	B	2	1	2
5	C	2	2	1
5	D	2	3	1
6	A	3	4	1
6	B	2	5	2
6	C	5	7	3
6	D	4	8	3
7	A	4	4	2
7	B	4	4	4
7	C	6	4	1
7	D	5	7	4

Table C. Number of weeds per replicate in lily trials in 2007

Treatment	Replication	Trial H07L1 June 7		Trial H07L2 June 7		Trial H07L3 June 20			
		Stellaria media June 7	Poa annua	Stellaria media	Poa annua	Chenopodium	Senecio vulgaris	Chenopodium album	Polygonum persicaria
1	A	*	*	90	120	50	2	5	1
1	B	*	*	24	10	140	2	17	3
1	C	*	*	80	70	70	3	3	0
1	D	*	*	80	40	100	1	40	10
2	A	0	0	0	0	0	0	0	0
2	B	0	0	0	0	0	0	0	0
2	C	0	0	0	0	0	0	0	0
2	D	0	0	0	0	0	0	0	0
3	A	10	38	36	100	2	0	2	0
3	B	32	80	12	32	0	0	4	7
3	C	50	120	10	60	0	1	2	1
3	D	50	80	50	86	2	0	8	7
4	A	28	80	60	106	6	1	2	5
4	B	42	160	60	60	50	1	8	2
4	C	32	100	20	60	4	0	4	0
4	D	40	110	46	120	10	4	3	2
5	A	20	70	2	60	16	2	0	1
5	B	10	100	8	80	34	4	1	0
5	C	26	200	18	90	28	2	0	1
5	D	8	60	24	100	40	2	1	2
6	A	70	30	50	80	40	0	1	1
6	B	32	120	30	70	100	0	3	4
6	C	40	126	80	80	50	5	3	0
6	D	70	86	80	120	60	1	5	5
7	A	1	44	2	80	80	3	2	0
7	B	14	130	6	90	70	2	5	3
7	C	50	200	20	60	40	1	2	0
7	D	80	130	80	110	70	1	7	7

Appendix 5 Raw data crop

Table A. Assessment of crop stand tulip.

Treatment	Replication	Crop stand	
		1-5-2007	5-6-2007
1	A	9	5
1	B	9	4
1	C	9	4
1	D	9	4
2	A	9	5
2	B	9	4
2	C	9	5
2	D	9	4
3	A	9	5
3	B	9	4
3	C	9	6
3	D	9	4
4	A	9	5
4	B	9	5
4	C	9	5
4	D	9	5
5	A	9	6
5	B	9	5
5	C	9	6
5	D	9	4
6	A	9	6
6	B	9	5
6	C	9	6
6	D	9	6
7	A	9	7
7	B	9	6
7	C	9	7
7	D	9	7

Table B. Assessments of crop stand lilies.

Treatment	Replication	H07L1 30-5-2007	H07L2	H07L3 5-6-2007	H07L1 15-8-2007	H07L2	H07L3 24-8-2007
1	A	*	9	9	9	9	8
1	B	*	9	9	9	9	8
1	C	*	9	9	9	9	8
1	D	*	9	9	9	9	7
2	A	8	9	9	9	9	7
2	B	9	9	9	9	9	7
2	C	9	9	9	9	9	7
2	D	9	9	9	9	9	7
3	A	9	9	9	9	9	7
3	B	7	9	9	9	9	7
3	C	5	9	9	9	9	7
3	D	8	9	9	9	9	7
4	A	8	9	9	9	9	6
4	B	4	9	9	9	9	6
4	C	9	9	9	9	9	5
4	D	9	9	9	9	9	6
5	A	9	9	9	9	9	4
5	B	8	9	9	9	9	5
5	C	6	9	9	9	9	5
5	D	8	9	9	9	9	4
6	A	7	9	9	9	9	4
6	B	8	9	9	9	9	4
6	C	9	9	9	9	9	4
6	D	9	9	9	9	9	5
7	A	5	9	9	9	9	5
7	B	8	9	9	9	9	4
7	C	8	9	9	9	9	5
7	D	7	9	9	9	9	5

Appendix 6 Raw data bulbs

Table A. Yield of tulips

Treatment	Replication	Weight (g)	Number of	Weight (g)	Average
		< 10	bulbs >10	>10	bulb weight (g)
1	A	1422	154	4928	32.0
1	B	1571	154	4912	31.9
1	C	1447	152	4945	32.5
1	D	1376	154	4947	32.1
2	A	1462	155	5009	32.3
2	B	1505	154	4930	32.0
2	C	1477	153	4875	31.9
2	D	1555	156	4898	31.4
3	A	1596	156	4809	30.8
3	B	1695	157	5058	32.2
3	C	1531	152	4941	32.5
3	D	1397	156	5233	33.5
4	A	1590	157	5034	32.1
4	B	1603	155	4883	31.5
4	C	1510	157	4946	31.5
4	D	1695	148	4635	31.3
5	A	1588	151	4882	32.3
5	B	1269	144	4751	33.0
5	C	1445	156	4983	31.9
5	D	1403	152	4828	31.8
6	A	1446	157	4860	31.0
6	B	1371	152	4892	32.2
6	C	1536	154	4704	30.5
6	D	1465	152	4874	32.1
7	A	1220	155	5004	32.3
7	B	1521	160	5085	31.8
7	C	1532	156	4874	31.2
7	D	1479	146	4518	30.9

Table B. Number of harvested bulbs and total harvested weight of lily trials

Treatment	Replication	Trial H07L1		Trial H07L2		Trial H07L3	
		Number of bulbs	Total weight (g)	Number of bulbs	Total weight (g)	Number of bulbs	Total weight (g)
1	A	*	*	131	6161	143	7483
1	B	*	*	143	7055	137	7367
1	C	*	*	143	7453	146	7620
1	D	*	*	134	7031	139	6875
2	A	141	11057	144	7389	129	7295
2	B	140	10243	139	7309	133	7128
2	C	146	10845	131	7464	130	6820
2	D	151	10959	136	7367	144	7282
3	A	151	11788	136	7373	133	7029
3	B	147	10679	143	8383	143	7477
3	C	158	10715	136	7443	135	7235
3	D	150	10223	135	7823	135	6953
4	A	151	11889	130	7111	131	6190
4	B	146	10940	141	7962	133	6405
4	C	151	11734	143	7634	136	6641
4	D	148	11468	139	7348	123	5482
5	A	147	11257	129	7187	130	5788
5	B	155	11383	139	7949	136	5863
5	C	150	10801	134	7604	128	5783
5	D	153	11285	139	7491	131	5854
6	A	153	11511	116	6422	134	6391
6	B	146	11170	133	7559	129	5993
6	C	152	12447	132	7261	137	6158
6	D	149	10438	137	7441	128	5687
7	A	146	10836	138	6859	128	6107
7	B	144	10993	140	7802	125	5911
7	C	156	11257	136	7139	130	6465
7	D	155	10924	140	7395	126	6055

Appendix 7 Raw data forcing trials

Table A. Results of the forcing trial tulip: number of harvested plants en weight

Treatment	Replication	Number of harvested plants	Total weight (g)	Average plant weight (g)
1	A	16	440.2	27.5
1	B	16	508.2	31.8
1	C	16	563.8	35.2
1	D	16	571.1	35.7
2	A	16	567.3	35.5
2	B	16	511.9	32.0
2	C	16	511.2	32.0
2	D	16	568.6	35.5
3	A	16	565.6	35.4
3	B	16	508.8	31.8
3	C	16	506.5	31.7
3	D	16	541	33.8
4	A	16	589.7	36.9
4	B	16	616.1	38.5
4	C	16	517.5	32.3
4	D	16	549.3	34.3
5	A	16	493.5	30.8
5	B	16	511.8	32.0
5	C	16	528.8	33.1
5	D	16	565.6	35.4
6	A	15	388.5	25.9
6	B	16	429.1	26.8
6	C	16	469.5	29.3
6	D	15	390.8	26.1
7	A	15	462.2	30.8
7	B	16	556.2	34.8
7	C	16	476.9	29.8
7	D	16	482.9	30.2

Table B. Results of the forcing trials lilies. (N = 10)

Treatment	Replication	Average plant weight (g)		
		Trial H07L1	Trial H07L2	Trial H07L3
1	A	*	152.5	144.8
1	B	*	137.8	150.6
1	C	*	146.5	156.7
1	D	*	167.2	158.4
2	A	191.8	137.5	138.1
2	B	186.9	158.0	148.8
2	C	172.2	166.4	149.7
2	D	177.8	160.6	149.4
3	A	171.1	152.0	138.9
3	B	195.6	153.4	143.5
3	C	169.7	159.1	143.1
3	D	170.9	155.6	154.0
4	A	176.9	161.6	163.1
4	B	187.4	160.0	151.9
4	C	175.1	153.3	158.3
4	D	174.5	154.8	153.4
5	A	180.3	146.7	152.9
5	B	185.4	154.3	151.0
5	C	166.2	148.8	141.5
5	D	173.1	158.8	151.3
6	A	181.9	158.9	159.4
6	B	183.6	149.1	144.8
6	C	155.3	152.3	153.6
6	D	178.7	148.0	148.9
7	A	167.6	159.6	146.0
7	B	172.2	139.3	142.4
7	C	161.7	150.6	162.1
7	D	165.2	143.3	155.1

