TRADE SECRET

Report

A multiple-rate cage test to study effects of Confidor SL 200 on honeybee (*Apis mellifera* L.) when applied to flowering *Phacelia tanacetifolia* 24, 48 and 96 hours before bee exposure

Test Guidelines

OEPP/EPPO 1992: Guideline on Test Methods for Evaluating the Side-Effects of Plant Protection Products on Honeybees. Bulletin OEPP-EPPO Bulletin 22, 203-215

Report Date

24 April 2003

Study Sponsor

Bayer CropScience AG
BCS-D-EB / Building 6620
Alfred-Nobel-Strasse. 50
D-40789 Monheim
Germany
Study Monitor: [redacted]

Testing Facility

MITOX
PO-Box 92260
1090 AG Amsterdam, The Netherlands
Study Director: [redacted]

Study/Reference Numbers

Test item: Confidor SL 200
MITOX Study Number: B075AMS

B075AMS / MO-03-005575

SPONSOR COPY

MITOX COPY

Table of contents

Confidentiality statement

[redacted]

Sponsor's Report Approval

Report accepted on behalf of the sponsor (Bayer CropScience AG):

Sponsor Representative ..... [redacted] 2003-04-29
date

Management Statement

I, the undersigned, hereby declare that the following persons have contributed to the study and that they were qualified to perform the tasks that they were assigned:

[redacted]

Good Laboratory Practice Compliance Statement

[redacted]

Report Title:

A multiple-rate cage test to study effects of Confidor SL 200 on honeybee (*Apis mellifera* L.) when applied to flowering *Phacelia tanacetifolia* 24, 48 and 96 hours before bee exposure

Quality Assurance Audit Statement

[redacted]

1 EXECUTIVE SUMMARY

Report: [redacted] (2003): A multiple-rate cage test to study effects of Confidor SL 200 on honeybee (*Apis mellifera* L.) when applied to flowering *Phacelia tanacetifolia* 24, 48 and 96 hours before bee exposure

Source: MITOX, Amsterdam, unpublished report No.: B075AMS, 24 April 2003

Guidelines: OEPP/EPPO 1992: Guideline on Test Methods for Evaluating the Side-Effects of Plant Protection Products on Honeybees. Bulletin OEPP-EPPO Bulletin 22, 203-215

Deviations from guidelines: None

GLP: Yes (certified laboratory)

Materials and methods:

The insecticide Confidor SL 200 (active ingredient NTN 33893, content: 196 g/l, TOX no.: 6037-00, Art. no: 0004958808, Batch no.: 233026473) was applied to flowering *Phacelia tanacetifolia* plants (Fiddleneck), approximately 24, 48 and 96 hours before bee exposure at two nominal rates, 21 and 35 g a.i./ha at an application volume equivalent to 200 l/ha. The control was treated with deionised water. PennCap M at a rate of 5 g product per liter (i.e. 1000 g product/ha) was used as toxic reference. For each treatment there were four replicate groups.

Five days before exposure in the evening, small, standardised honeybee colonies were placed in meshed cages of 4 x 5 meter and 2 meter high, each containing 36 pots with untreated flowering *Phacelia* plants. During the next four days mortality was assessed after every period of honeybee flight. During the last two days before exposure, foraging activity was recorded for all cages at six moments during the day. After this initial 4-day period, exposure was initiated by replacing the plants inside the cages with a second series of treated plants in all tents. Before treatment, these plants had been growing under identical conditions. The timing of treatments was such that at the start of exposure, i.e. the beginning of bee flight following plant exchange, groups of plants had been treated 24, 48 or 96 hours before. Foraging activity and mortality of the honeybees were assessed during 4 days after initiation of

exposure. The number of flowers was counted at the first day and the fourth day of the exposure period.

Effects on foraging activity were analysed using repeated measures ANCOVA, with the number of flowers as a covariate. Treatments were compared to the deionised water control using linear contrasts.

Effects on mortality were analysed, using a covariance alternated to repeated measured ANOVA. The cumulative number of bees that died in the last 2 days before exposure was used as a covariate. Treatments were compared to the deionised water control using linear contrasts.

Dates of work (biological part): 27 July 2002 – 5 August 2002.

Findings:

Foraging activity and low mortality in the deionised water control indicated that the trial was valid for the purposes to which it was designed. High mortality in the toxic reference treatment (about 10 times higher than the in deionised water control) showed that the test set-up was sufficiently sensitive and that potential adverse effects of exposure to test item residues could be detected. Due to sub-optimal weather conditions, overall foraging activity one day after initiation of exposure was low. Therefore findings concerning foraging behaviour pertaining to this day are not considered for the evaluation.

On the day of exposure and two days later, foraging activity in the cages with plants treated one day earlier with Confidor SL 200 at a rate of 35 g a.i./ha was reduced and significantly different from foraging in the water control. Foraging was also reduced and significantly different from foraging in the water control when plants were treated 4 days before exposure with Confidor SL 200 at a rate of 21 g a.i./ha. Reductions in foraging activity were not observed in any of the other groups treated with Confidor SL 200.

Overall mortality in the treatments where Confidor SL 200 was applied at 21 g a.i./ha two and four days before exposure and the treatment where Confidor was applied at 35 g a.i./ha four days before exposure, was about one fifth of the toxic reference treatment and two times higher than in the deionised water control. These differences were statistically significant. In the other Confidor SL 200 treatments

mortality was roughly equal to or 1.5 times higher than in the deionised water control and no significant effect on mortality was observed.

A summary of findings is given in Table 1.1 (foraging data) and Table 1.2 (mortality data).

Table 1.1 Summary of findings foraging data

Treatment	Pre-exposure average day -2-1	Exposure day 1	day 2 (see note)	day 3	day 4
Deionised water	79.4 ± 16.8	67.5 ± 8.5	5.3 ± 1.8	69.5 ± 12.7	33.3 ± 5.3
Confidor SL 200 (hours before application)					
21 g a.i./ha (24)	88.1 ± 8.5	58.8 ± 14.5	5.0 ± 2.2	59.5 ± 8.9	28.5 ± 1.7
21 g a.i./ha (48)	97.9 ± 10.2	54.0 ± 6.3	2.5 ± 0.6 *	63.0 ± 1.1	30.0 ± 4.3
21 g a.i./ha (96)	81.1 ± 8.1	104.3 ± 17.6 *	5.3 ± 1.7	77.5 ± 18.7	32.3 ± 2.7
35 g a.i./ha (24)	82.5 ± 18.5	38.3 ± 15.3 *	1.0 ± 0.7 **	32.0 ± 7.9 *	26.0 ± 2.4
35 g a.i./ha (48)	64.5 ± 4.3	51.8 ± 16.2	1.0 ± 0.4 **	46.3 ± 7.6	29.3 ± 2.8
35 g a.i./ha (96)	90.5 ± 6.6	85.0 ± 12.0	0.8 ± 0.5 *	50.8 ± 12.4	22.3 ± 4.3
PennCap M	60.9 ± 7.1	34.8 ± 8.3	0.3 ± 0.3 **	13.5 ± 4.6 **	25.5 ± 3.0

*= P<0.05; ** = P<0.01 (Difference with water control; ANCOVA followed by linear contrasts)

note: due to sub-optimal weather conditions foraging activity on this day was low and and observed effects are suspected and should not be taken as biologically meaningful.

Table 1.2 Summary of findings mortality data

Treatment	Pre-exposure Average day -2 -1	Exposure cumulative
Deionised water	3.6 ± 0.5	18.5 ± 3.0
Confidor SL 200 (hours before application)		
21 g a.i./ha (24)	4.0 ± 0.8	21.8 ± 2.1
21 g a.i./ha (48)	2.8 ± 0.4	35.0 ± 3.5 *
21 g a.i./ha (96)	5.3 ± 1.1	36.8 ± 4.0 *
35 g a.i./ha (24)	4.5 ± 1.2	28.3 ± 5.5
35 g a.i./ha (48)	3.5 ± 1.3	27.5 ± 5.0
35 g a.i./ha (96)	5.5 ± 0.9	40.0 ± 8.8 *
PennCap M	3.9 ± 1.2	216.3 ± 34.8 ***

*= P<0.05; *** = P<0.001 (Difference with water control; ANCOVA followed by linear contrasts)

2 TEST ITEM AND TEST RATES

The product and the rates tested were:

Product name:	Confidor SL 200
Active ingredient:	NTN 33893
TOX number:	6037-00
Type of formulation:	Soluble liquid (SL)
Content [a.i.]:	196 g/l
Test rates:	21 and 35 g a.i./ha

Detailed information on the test item, preparation of the test solutions and Certificate of Analysis is given in Appendix II.

3 PRINCIPLE OF THE TEST

3.1 Rationale of the test

Honeybees play an important role as pollinators in a large number of crops. The purpose of the study was to compare the effect of two test rates of the insecticide Confidor SL 200, when honeybees, *Apis mellifera* L., are exposed to flowering *Phacelia tanacetifolia* (Fiddleneck) at different times after application of the test item.

3.2 Endpoints of the test

Endpoints of the test were:

- Foraging activity as the cumulative number of honeybees observed feeding in the crop at six moments per day.
- The cumulative number of honeybees that died inside the cage up to 96 hours after the start of exposure.
- Condition of the brood.

3.3 Experimental design

The insecticide Confidor SL 200 (active ingredient NTN 33893, content: 196 g/l, TOX no.: 6037-00, Art. no: 0004958808, Batch no.: 233026473) was applied to flowering *Phacelia tanacetifolia* plants, approximately 24, 48 and 96 hours before bee exposure at two nominal rates, 21 and 35 g a.i./ha, at an application volume

equivalent to 200 l/ha. The control was treated with deionised water. PennCap M at a rate of 5 g product per liter (i.e. 1000 g product/ha) was used as toxic reference. For each treatment there were four replicate groups.

Four days before exposure in the morning, before the bees started to fly, small, standardised honeybee colonies were placed in meshed cages of 4 x 5 meter and 2 meter high, each containing 36 pots with untreated flowering *Phacelia*-plants. During the next four days mortality was assessed after every period of honeybee flight. During the last two days before exposure, foraging activity was recorded for all cages at six moments during the day.
After this initial 4-day period, exposure was initiated by replacing the plants inside the cages with a second series of treated plants in all tents. Before treatment, these plants had been growing under identical conditions, except that they were protected from rain. The treatment was such that at the moment of exchange, groups of plants had been treated 24, 48 or 96 hours before. Because exposure started with the onset of the bee flight following the moment of plant exchange an exact interval is difficult to define. However, application always started around 07:30 a.m., which is shortly before the moment bee flight normally starts. Foraging activity and mortality of the honeybees were assessed during 4 days after initiation of exposure. The number of flowers was counted at the first day and the fourth day for the post-exposure period.

4 TEST ORGANISM AND EQUIPMENT

<u>Test species</u>

Species: *Apis mellifera* L

Source: INBUZZ, Imkersbedrijf Boot & Calis

Life stage tested: Honeybee colonies, standardised with respect to age structure and total honeybee weight

Food: Pollen and honey

<u>Test units</u> (see Appendix VI)

Test substrate: *Phacelia tanacetifolia*

Mortality and foraging phase:	A meshed cage of 20 m^2 and 2 m high containing approximately 108 flowering *Phacelia* plants and one standardised honeybee colony.
Application equipment:	The application was performed using a hand-held compression sprayer fitted with a disposable reservoir containing the exact amount of spray liquid for the surface area to be treated.

5 TEST PROCEDURES

5.1 Preparation of the test solutions

The test product was stored at room temperature in the dark and all use was registered.

All solutions were prepared with calibrated precision laboratory equipment less than 1.5 hours before application. Deionised water was used as solvent for all solutions.

The test solutions were prepared as follows:

Testitem

For the 21 g a.i./ha treatment, 105 µl product was diluted up to 200 ml.

For the 35 g a.i./ha treatment, 180 µl product was diluted up to 200 ml.

Toxic reference

A total of 200 ml solution was prepared by dispersing 1 g product in 200 ml of deionised water.

5.2 Application procedures

Application was performed by spraying 35 ml of the final solutions on two trays with plants with a total surface of 17550 cm^2, resulting in an application volume equivalent to 200 l/ha. The entire volume was homogeneously distributed over the test plants. Spray deposit distribution of all treatments was documented with water-sensitive paper during application, by placing 1 spray card (manufacturer Novartis) just below the top of the flowers of one plant per tray (see Appendix V).

5.3 Preparation of bee hives

Standardised colonies were obtained through a commercial supplier (INBUZZ, Imkersbedrijf Boot & Calis). As is common in The Netherlands, the bees used were not of a specific strain, but hybrids of existing genotypes.

Standardised mini-hives of 23.5 x 39 cm and 22.5 cm high (measured inside) were assembled on 26 July 2002. This was done by placing into each mini-hive: (1) an isolated queen; (2) a brood comb with brood up to 7 days old plus a comb with pollen and honey, and (3) approximately 2000 young worker bees.

Ad (1) On 26 July 2002 preparation of the mini-hives started by collecting 32 queens from existing colonies. Each queen was put inside a small cage of 3.5 x 8.0 cm and 1.4 cm high together with two worker bees. The cage included a sugar plug (of 2.5 cm long) and was inserted into a mini-hive shortly after preparation. Release of the queen (enabled because the worker bees fed on the sugar plug) was expected to take at most 12 hours.

Ad (2) On 19 July 2002 empty combs were introduced into the centre of the brood nests of 45 healthy colonies. Seven days later (26 July 2002), 32 of these combs were removed and each comb, now containing eggs and larvae of up to 7 days old, was transferred to one mini-hive. In addition, each mini-hive received one comb with pollen and honey. This procedure ensured that new worker bees would not emerge during the trial, which facilitated the interpretation of the data.

Ad (3) To reduce background mortality due to ageing of the bees, the experiments were performed with predominantly young worker bees. To get rid of the older worker bees, 16 large colonies were moved about 25 meters away from their original site on 24 July 2002. Normally the foragers, generally old honeybees, fly to the original site and drift into colonies neighbouring this original site, thus leaving the hive with young bees. Two days later, the young honeybees remaining in the colonies were introduced into the mini-hives.

To transfer the young worker bees to the mini-hives, all workers of two to three colonies were collected in one large container. From this container, approximately 250 grams of honeybees were transferred to each mini-hive. After preparation of 8 mini-hives the batch of bees in the large container was supplemented with the

worker bees of 2 or 3 additional colonies. Hence, for the preparation of 32 mini-hives, four batches derived from a total of 10 colonies were used. For each of the four replicates per treatment bees from a different source batch were used.

The total weight of the honeybees in the mini-hives was assessed by weighing the hives before and after entering of the honeybees. To relate the net weight of the mini-hive to the actual numbers of bees transferred, sub-samples of bees were collected, counted and weighed. For each of the four source batches one sample of between 49 and 64 honeybees was taken. From these data it could be shown that on average 1911 ± 95 (n=32) young worker bees were present in each mini-hive at the start of the experiment.

5.4 Test plants

Phacelia tanacetifolia was chosen as a test plant because it ensured a high foraging activity of the honeybees. Plants were obtained from MITOX nurseries, where they were grown prior to the experiment. The plants were grown inside the test cages. They were potted in commercial pot soil and contained in 64 plastic trays with approximate dimensions of 135 x 65 and 15 cm high. The pots were connected to a drip irrigation system. Through this system the pots received water regularly. Throughout their development no treatment with plant protection products took place. Each tray contained 18 pots (Ø 12 cm). In each of these pots about 12 seeds of *Phacelia tanacetifolia* were put individually in prepared seed-holes. After germination, seedlings were removed such that 5 plants per pot remained.

At least once a week, the phenological growth stage of the plants was registered, according to the BBCH-scale of oilseed rape (Enz and Dachler 1997). This was done for five randomly chosen plants at a time. The trial was started when all plants were flowering (BBCH>65).

5.5 Actions and assessments

Throughout the experiment mortality was assessed on a daily basis, by searching the test cages for dead bees. Bee corpses were collected and removed before or after bee flight.

Foraging activity was determined six times per day, usually around 10:00, 11:00, 12:30, 13:30, 14:30 and 16:00 (see Appendix III for the precise timing of assessments). On these occasions all bees foraging on the test plants during a 20-

second period were recorded. Because of weather conditions bees were not active during the fifth foraging assessment on 1 August and a shorter observation period was considered sufficient: no foraging bees were observed.

At the end of the experiment the hives were closed and transported to the INBUZZ facilities in Wageningen. The condition of the mini-hives (brood development and numbers of dead bees in hive) was evaluated two days after the last assessment. Hereto the hives were opened and the brood present on the combs was inspected and counted as eggs, larvae and pupae (capped brood) up to 50 individuals in each category. In case more than 50 individuals were counted brood development was considered normal and counting was stopped.

6 CLIMATIC CONDITIONS DURING THE TEST

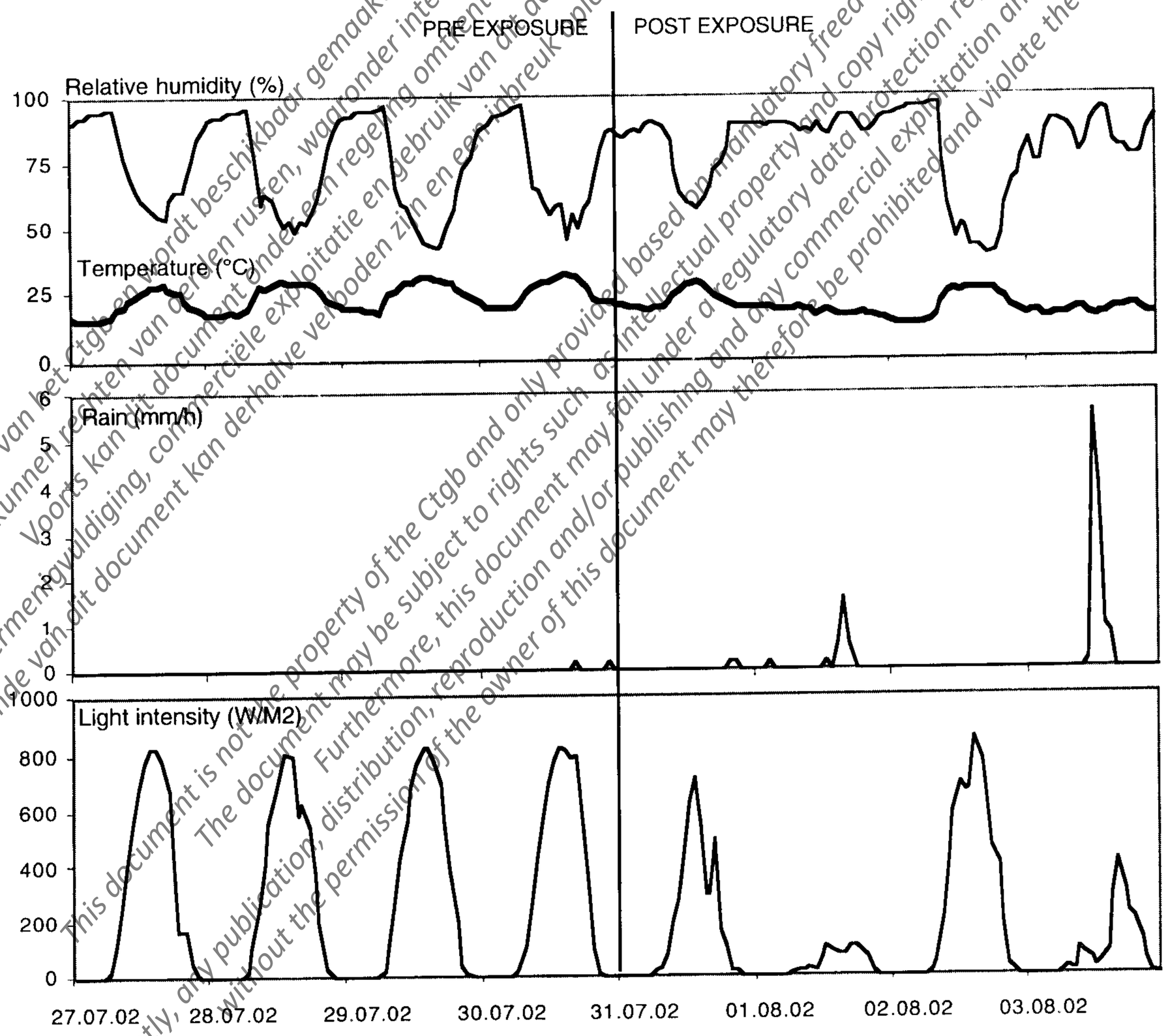


Figure 6.1. Climate conditions during the trial

Throughout the experiment relative humidity and temperature were measured every 5 minutes by the internal sensors of a MiniMet meteostation (Skye instruments, model SDL2900) positioned outside one of the tents. Averages were logged every hour. Rainfall was measured with an external rain gauge connected to the MiniMet datalogger (Environmental Measurements, model ARG 100). Cumulative millimeters rainfall/hour were logged every hour. Light intensity was measured every 5 minutes with an external pyranometer sensor (Skye Instruments, type SKS1110), measuring in the range of 350 to 1100 nm, also connected to the datalogger. Averages were logged every hour. See Figure 6.1 for the actual test conditions. Plants were shielded from potential rain by an UV-transparent rain cover of about 2 m^2.

7 DATA ANALYSIS

Foraging

Treatment effects on foraging in the post-exposure were analysed with a repeated measures analysis of variance, using the number of flowers and average pre-exposure forging activity as a covariate, followed by linear contrasts to compare treatments in the water control on each observation day. The variable for analysis was the total number of foraging bees on each day.

Mortality

Mortality during the last 2 days of the pre-exposure period was analysed using the Mann-Whitney U Test. Treatments were compared pairwise to the water control for each day separately.

Effects on mortality were analysed by comparing the number of dead bees found in the different treatment groups to the water control using a covariance alternative to repeated measures ANOVA, using pre-treatment mortality as a predictor variable (pre-post design). This analysis was done both for cumulative post-exposure mortality and for each post-exposure observation day separately and was followed by Fisher's LSD test for direct comparison to the water control. The dead bees observed on the first two days of the trial were not included in the analysis because mortality in this period was likely to reflect potential differences in manipulation during the preparation of the mini-hives and their subsequent transport to the test

site. Log transformed variates were found to satisfy ANOVA conditions, which was investigated with Bartlett's test (homoscedasticity) and Lilliefors' test (normality of residuals).

Null hypotheses was rejected if the probability of observing the test statistic (type I error level) fell below 5% (alpha = 0.05). Systat 5.2 for the Macintosh was used for all statistical analyses.

8 RESULTS

8.1 Findings

Condition of the brood

In all colonies condition of the brood at the end of the trial was good. In two colonies, a Confidor SL treatment at 35 g a.i./ha applied one day before exposure and a Confidor SL treatment at 35 g a.i./ha applied four days before exposure, the queen was not retrieved. No eggs were observed in these hives. Brood that was already present had developed normally.

In all hives ample amount of food (sugars and pollen) was present.

Foraging

In the pre-exposure phase, on average 10 to 17 bees per cage were found foraging on the test crop at any observation moment (see Appendix VII). There were no statistically significant differences between treatment groups in the pre-exposure period.

Foraging activity in the Penncap M treatment was low on the day of application, however on this day the observed difference was not statistically significant (P=0.136). One and two days later the reduction in foraging activity in the PennCap M treatment was significant. No significant effect of PennCap M was observed 3 days after exposure.

On the day of exposure foraging activity was significantly (P<0.05) reduced in two treatments, namely Confidor SL 200 at 21 g a.i./ha applied 4 days before exposure and Confidor SL 200 at 35 g a.i./ha applied 1 day before exposure. The day after the

initiation of exposure was overcast and rainy. Overall foraging activity on this day was low. Therefore observations made on this day are not considered explicitly for the evaluation. On the third day and last day of exposure, a statistically significant effect (P<0.05) was found for the treatment group Confidor SL 200 at 35 g a.i./ha applied 1 day before exposure.

An overview of foraging data is given in Table 8.1 and Appendix VII.

Table 8.1 Average foraging activity per day

Treatment	Pre-exposure day -2	day -1	average day -2-1
Deionised water	84.5 ± 18.2	74.3 ± 15.5	79.4 ± 16.8
Confidor SL 200 (hours before application)			
21 g a.i./ha (24)	95.3 ± 11.4	100.5 ± 10.3	88.1 ± 8.5
21 g a.i./ha (48)	89.0 ± 4.9	92.0 ± 9.8	97.9 ± 10.2
21 g a.i./ha (96)	76.0 ± 9.2	86.3 ± 9.0	81.1 ± 8.1
35 g a.i./ha (24)	80.0 ± 13.8	85.0 ± 24.2	82.5 ± 18.5
35 g a.i./ha (48)	84.5 ± 10.0	91.8 ± 7.2	64.5 ± 4.3
35 g a.i./ha (96)	60.0 ± 6.3	69.0 ± 2.7	90.5 ± 6.6
PennCap M	55.8 ± 7.8	66.0 ± 7.0	60.9 ± 7.1

Treatment	Exposure day 1	day 2 (see note)	day 3	day 4
Deionised water	67.5 ± 8.5	5.3 ± 1.8	69.5 ± 12.7	33.3 ± 5.3
Confidor SL 200 (hours before application)				
21 g a.i./ha (24)	58.8 ± 14.5	5.0 ± 2.2	59.5 ± 8.9	28.5 ± 1.7
21 g a.i./ha (48)	54.0 ± 6.3	2.5 ± 0.6 *	63.0 ± 1.1	30.0 ± 4.3
21 g a.i./ha (96)	104.3 ± 17.6 *	5.3 ± 1.7	77.5 ± 18.7	32.3 ± 2.7
35 g a.i./ha (24)	38.3 ± 15.3 *	1.0 ± 0.7 **	32.0 ± 7.9 *	26.0 ± 2.4
35 g a.i./ha (48)	51.8 ± 16.2	1.0 ± 0.4 **	46.3 ± 7.6	29.3 ± 2.8
35 g a.i./ha (96)	85.0 ± 12.0	0.8 ± 0.5 *	50.8 ± 12.4	22.3 ± 4.3
PennCap M	34.8 ± 8.3	0.3 ± 0.3 **	13.5 ± 4.6 **	25.5 ± 3.0

*= P<0.05; **= P<0.01 (Difference with water control; ANCOVA followed by linear contrasts)
note: due to sub-optimal weather conditions foraging activity on this day was low and and observed effects are suspected and should not be taken as biologically meaningful.

<u>Mortality</u>

In the two days before treatment, mortality ranged on average from 2 to 6 dead bees per cage in each group assigned to a treatment. There were no statistically significant differences among treatment groups. Mortality in the toxic reference treatment PennCap M was significantly higher compared to the water control throughout the exposure phase of the trial. Together these findings show that the experiment was valid for the purposes to which it was conducted.

When Confidor SL 200 was applied one day before the start of exposure no significant differences with the control were found. However, applications with the test item at a rate of 21 g a.i./ha made two and four days before exposure resulted in

significant mortality. The same was found when Confidor was applied at a rate of 35 g a.i./ha four days before exposure. An ageing period of two days did not result in significant cumulative mortality at this rate.

Analysis of each exposure day separately showed that between treatment differences in cumulative mortality could be mostly attributed to mortality occurring on the 4th day of exposure. Up to three days after plants were exchanged, no significant effects of Confidor SL 200 were found in any of the treatment groups. Although cumulative mortality in the Confidor SL 200 35 g a.i./ha treatment applied 2 days before exposure was not statistically significant, the number of dead bees observed on day four of exposure was significantly different (see Table 8.2). The Confidor SL 200 21 g a.i./ha treatment applied 2 days before exposure did not result in significant mortality on day four although cumulative mortality was significant.

A summary of mortality data is given in Table 8.2 and Figures 8.1 and 8.2. Raw data are given in Appendix VI.

Table 8.2 Average mortality per day

Treatment	Pre-exposure day-2		day-1		average pre-exposure	
Deionised water	1.8 ± 0.3		5.5 ± 1.0		3.6 ± 0.5	
Confidor SL 200 (hours before application)						
21 g a.i./ha (24)	2.8 ± 1.2		5.3 ± 1.3		4.0 ± 0.8	
21 g a.i./ha (48)	3.0 ± 0.0	*	2.5 ± 0.9		2.8 ± 0.4	
21 g a.i./ha (96)	6.0 ± 2.1	*	4.5 ± 1.2		5.3 ± 1.1	
35 g a.i./ha (24)	4.3 ± 1.0	*	4.8 ± 1.9		4.5 ± 1.2	
35 g a.i./ha (48)	1.5 ± 0.3		5.5 ± 2.8		3.5 ± 1.3	
35 g a.i./ha (96)	6.0 ± 1.1	*	5.0 ± 1.1		5.5 ± 0.9	
PennCap M	3.5 ± 1.2		4.3 ± 1.7		3.9 ± 1.2	

*= 0.01>P<0.05 (Difference with water control; Mann-Whitney U Test)

Treatment	Exposure day 1		day 2		day 3		day 4		cumulative	
Deionised water	6.0 ± 1.5		3.0 ± 0.9		4.3 ± 0.3		5.3 ± 1.3		18.5 ± 3.0	
Confidor SL 200 (hours before application)										
21 g a.i./ha (24)	8.8 ± 2.3		3.8 ± 1.5		2.5 ± 0.5		6.8 ± 1.3		21.8 ± 2.1	
21 g a.i./ha (48)	11.3 ± 1.5		5.3 ± 2.0		9.0 ± 2.3		9.5 ± 2.1		35.0 ± 3.5	*
21 g a.i./ha (96)	9.0 ± 1.2		2.8 ± 1.1		9.3 ± 3.5		15.8 ± 2.9	**	36.8 ± 4.0	*
35 g a.i./ha (24)	9.5 ± 2.6		1.8 ± 0.3		6.5 ± 1.9		10.5 ± 3.3		28.3 ± 5.5	
35 g a.i./ha (48)	6.5 ± 0.9		4.0 ± 1.2		3.3 ± 1.1		13.8 ± 3.6	**	27.5 ± 5.0	
35 g a.i./ha (96)	11.0 ± 3.2		2.3 ± 0.6		12.0 ± 4.3		14.8 ± 3.3	*	40.0 ± 8.8	*
PennCap M	92.8 ± 21.6	***	37.0 ± 10.0	***	52.8 ± 8.3	***	33.8 ± 3.0	***	216.3 ± 34.8	***

*= P<0.05; **= P<0.01; *** = P<0.001 (Difference with water control; ANCOVA followed by linear contrasts)

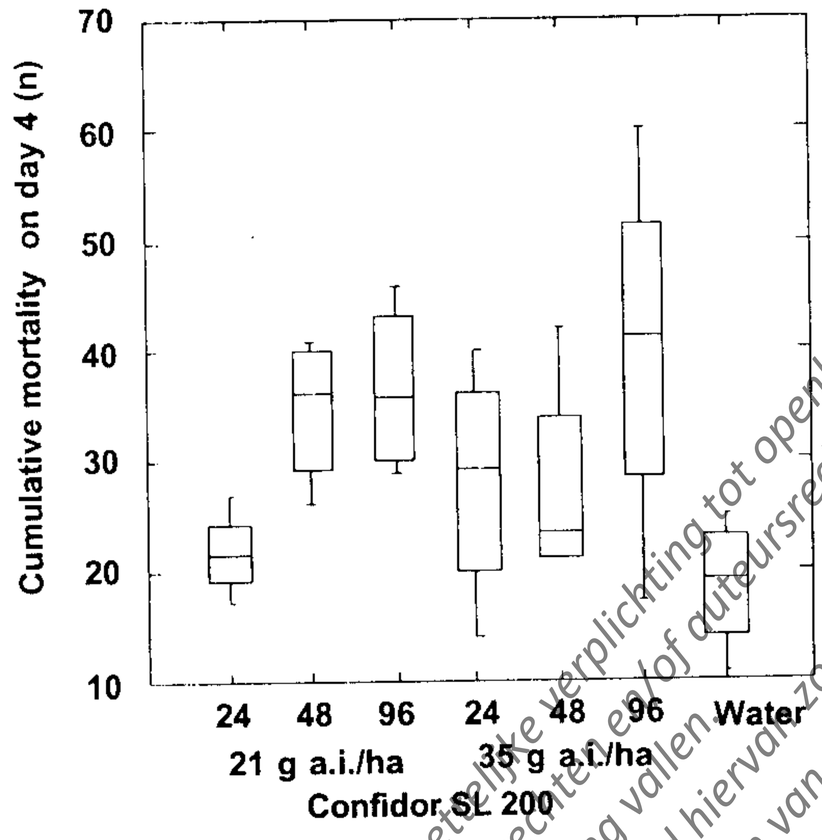


Figure 8.1 Box and whisker plot of cumulative post-treatment mortality

Confidor SL 200 was applied 24, 48 and 96 hours before exposure. The actual data distribution is shown as a box comprising the midrange, i.e. the 2nd and 3rd quartile ranges, divided by a horizontal line representing the median. Values within 1.5x the midrange are shown as "whiskers".

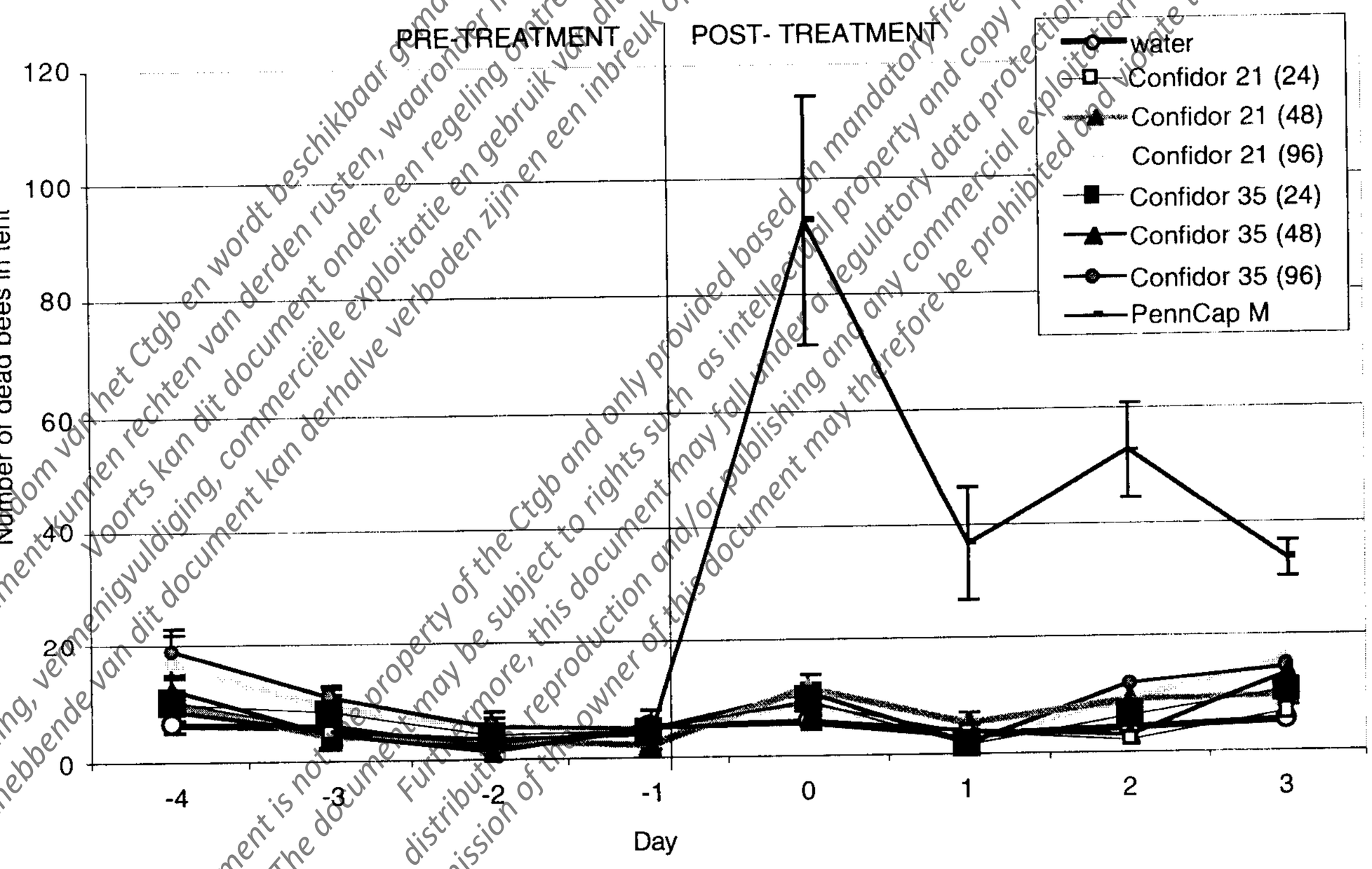


Figure 8.2 Average mortality per day

Confidor SL 200 was applied 24, 48 and 96 hours before exposure (day 0). Mortality during the first two days after colonies were installed (day -4 and -3) were not included in the evaluation.

8.2 Conclusions

Foraging activity and low mortality in the deionised water control (estimated to be 1%) indicated that the trial was valid for the purposes to which it was designed. High mortality in the toxic reference treatment showed that the test set-up was sufficiently sensitive and that potential adverse effects of exposure to test item residues could be detected. Due to sub-optimal weather conditions, overall foraging activity one day after initiation of exposure was low. Therefore findings concerning foraging behaviour pertaining to this day are not considered for the evaluation.

On the day of exposure and two days later, foraging activity in the cages with plants treated one day earlier with Confidor SL 200 at a rate of 35 g a.i./ha was reduced and significantly different from foraging in the water control. Foraging was also reduced and significantly different from foraging in the water control when plants were treated 4 days before exposure with Confidor SL 200 at a rate of 21 g a.i./ha. Reductions in foraging activity were not observed in any of the other groups treated with Confidor SL 200.

Overall mortality in the treatments where Confidor SL 200 was applied at 21 g a.i./ha two and four days before exposure and the treatment where Confidor was applied at 35 g a.i./ha four days before exposure, was about one fifth of the toxic reference treatment and two times higher than in the deionised water control. These differences were statistically significant. In the other Confidor SL 200 treatments mortality was roughly equal to or 1.5 times higher than in the deionised water control and no significant effect on mortality was observed.

9 STUDY LOCATION

The study was carried out at MITOX Laboratories BV, Kruislaan 320, 1098 SM Amsterdam, The Netherlands. MITOX is GLP compliant (see Appendix IX) and located on the premises of the University of Amsterdam.

10 ARCHIVING

All raw data and records are kept in a file labeled with the study number. They are on loose sheets and forms, each bearing the study number, date and initials of the originator. The report and study records are assigned the study number B075AMS. For the periods demanded by the appropriate authorities, but at minimum 10 years, study documents and materials will be stored in the archives of MITOX, including:

- study protocol
- protocol and/or report amendments
- all raw data
- comments of the sponsor on the draft report
- one original signed copy of the final report
- all documentation generated by the Quality Assurance Unit (archived by the MITOX Quality Assurance Unit, separate from study records)
- laboratory-specific or site-specific raw data such as personnel files, instrument, equipment raw data
- data and specimens concerning species identification

At the conclusion of the testing any unused portion of the experimental materials will be disposed of after they have expired, or returned to Bayer AG, if Bayer AG has declared so in writing. MITOX reserves the rights to use data obtained in this study on reference treatments to set up reference databases.

11 REFERENCES

OEPP/EPPO 1992. Guideline on test methods for evaluating the side-effects of plant protection products on honeybees. Bulletin OEPP-EPPO Bulletin 22: 203-215.

Enz, M. and Dachler, Ch. 1997. Compendium of growth stage identification keys for mono- and dicotyledonous plants; extended BBCH-scale. 2nd edition.

APPENDIX I: PROTOCOL DEVIATIONS AND ERRATA

Protocol	§3.6.2 Foraging activity Foraging activity will be monitored during 20-second observation periods.
Deviation 1	One foraging assessment (all tents) was less than 20 seconds (1 August, 15:55 h)
Rationale	Because of weather conditions, bees were not active and a shorter observation period was considered sufficient.
Implication	None
Date	1 August 2002
Protocol erratum 1	By erratum, the reference Ganzelmeier *et al.* 1995 was listed in the protocol.
Implication	None
Date	16 July 2002

APPENDIX II: INFORMATION ON THE TEST ITEM

Product name:	Confidor SL 200
Active ingredient:	NTN 33893
CAS number:	138261-41
TOX number:	6037-00
Batch number:	233026473
Product use:	Insecticide
Type of formulation:	SL
Nominal formulation concentration:	200 g/l
Analysis of sample	
• Relative density	1.121 g/ml
• Content:	196 g/l
• Analysis performed at:	Bayer AG ZF-ZAD, Germany
• Date of analysis:	14 March 2002
• Expiration date:	14 March 2003
MITOX ID number:	2002 03 21A
Test application volume:	200 l/ha
Test rate*:	21 and 35 g a.i./ha

* The calculations of the concentrations/rates were based on the test item containing 196 g a.i./l.

CERTIFICATE OF ANALYSIS TEST ITEM

[redacted]

APPENDIX III: INFORMATION ON TOXIC REFERENCE

Product name:	PennCap M
Active ingredient:	Methyl parathion
CAS number:	298-00-0
Type of formulation:	Micro capsules suspension
Nominal formulation concentration:	240 g/l
MITOX ID number:	1999 08 19A
Test application volume:	Equivalent to 200 l/ha
Test application rate*:	1000 g product/ha
Test concentration:	5 g product/l

The toxic reference was characterised by a CAS number; no certificate of analysis was provided because the exact composition was considered of relatively minor importance.

APPENDIX IV: TIME SCHEDULE OF THE TEST

PREPARATORY ACTIVITIES AT MITOX

Growing of *Phacelia*

Installing test cages and drip irrigation

PREPARATORY ACTIVITIES AT INBUZZ (Wageningen)

D-12	19-Jul			Preparation of 45 broodcombs for the mini-hives
D-7	24-Jul			Relocation of 16 standard hives to shed older foragers
D-5	26-Jul			Weighing of bee samples for determine initial bee weight
				Preparation of 32 queen cages
				Preparation and weight determination of mini-hive
				Delivery of mini-hives in Amsterdam
D-4	27-Jul	8:20	8:55	Test item 21 and 35 g a.i./ha treatments 96 hours before exposure applied
				Placement of mini-hives inside test cages
D-3	28-Jul			Mortality recorded
D-2	29-Jul			Mortality and foraging recorded
		7:55	8:30	Test item 21 and 35 g a.i./ha treatments 48 hours before exposure applied
d-1 (day)	30-Jul			Mortality and foraging recorded
		7:58	8:23	Test item 21 and 35 g a.i./ha treatments 24 hours before exposure applied
D-1 (eve)	30-Jul			Mortality recorded
		20:00	23:30	untreated plants for all groups exchanged
D0	31-Jul	8:50	9:20	Deionised water control and toxic reference treatment applied
				foraging activity after applying deionised water control and toxic reference treatment recorded
				Numbers of flowers counted for all trays
D1	1-Aug			Mortality and foraging recorded
D2	2-Aug			Mortality and foraging recorded
D3	3-Aug			Mortality and foraging recorded
				Numbers of flowers counted for all trays
				Transport of hives to Wageningen
D5	5-Aug			Evaluation of the mini-hives
				Mortality recorded

ASSESSMENTS MORTALITY AND FORAGING ACTIVITY

		mortality		foraging activity I		II		III		IV		V		VI	
		from	to	from	to	from	to	from	to	from	to	from	to	from	to
D-3	28-Jul	5:30	7:30												
D-2	29-Jul	5:30	7:00	9:55	10:23	10:54	10:22	12:25	12:52	13:29	13:57	14:33	14:59	15:56	16:23
D-1	30-Jul	5:30	7:00	10:00	10:15	11:10	11:42	12:30	12:45	13:30	13:53	14:41	15:07	16:00	16:15
D-1 (eve)	30-Jul	20:00	21:15												
D0	31-Jul			9:58	10:24	10:57	11:25	12:20	12:46	13:27	13:55	14:25	14:52	16:00	16:26
D1	1-Aug	5:30	7:30	9:50	10:20	11:15	11:30	12:30	13:20	14:50	15:15	15:55	16:02	16:15	16:39
D2	2-Aug	5:30	7:00	10:05	10:40	11:00	11:40	12:30	13:15	13:40	14:00	14:30	14:45	16:00	16:30
D3	3-Aug	5:30	7:00	9:00	9:30	10:00	10:30	13:45	14:15	14:30	15:00	15:16	15:31	15:45	16:15
D5	5-Aug	8:30	10:00												

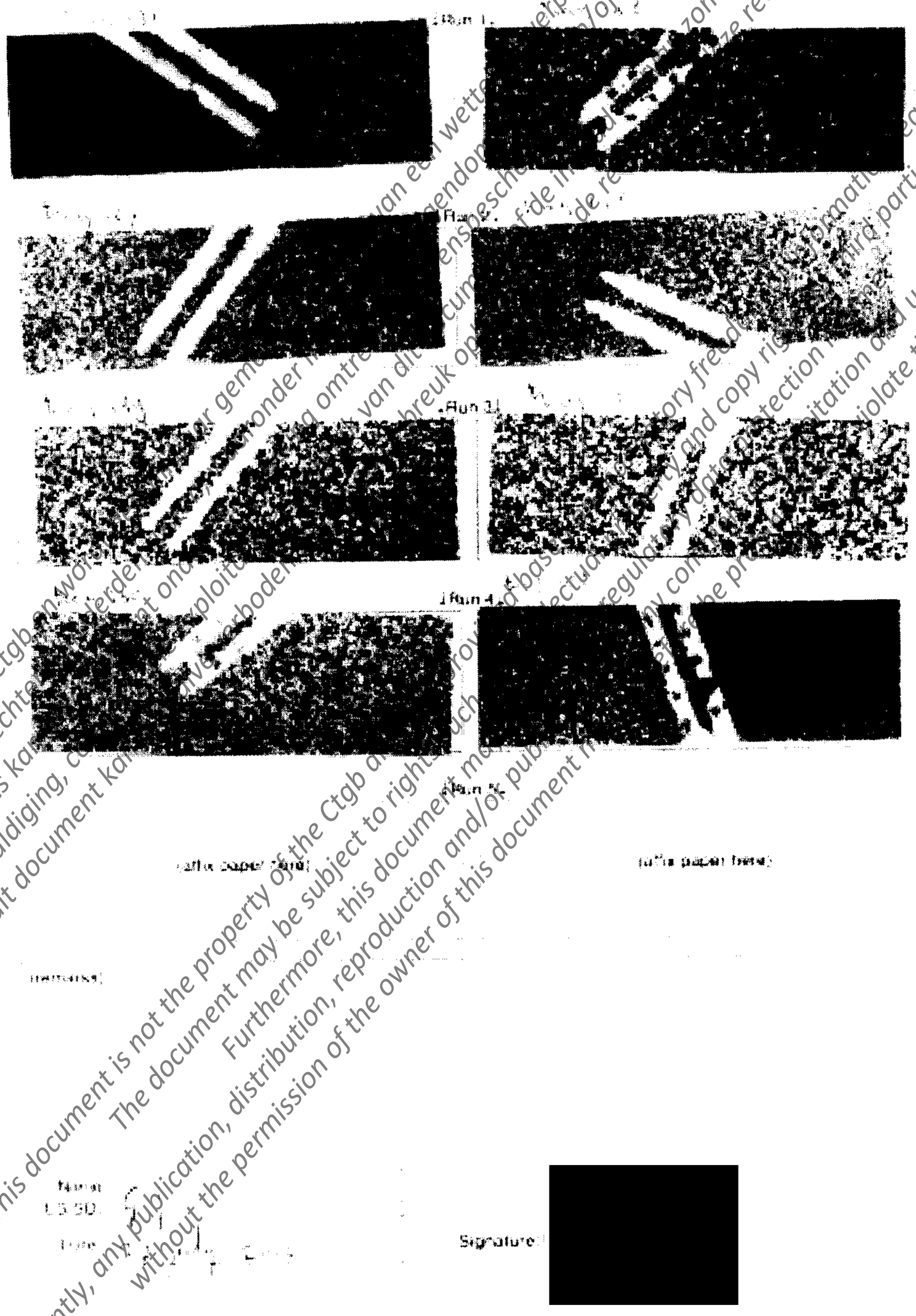
(note cages were removed 3/8/02 around 22:00) hives examined at Inbuzz

APPENDIX V: DOCUMENTATION OF SPRAY DEPOSIT

Test item applied 27 July 2002 (4 days before exposure) at 21 g a.i./ha

[illegible] B075AMS [illegible]

Documenting spray deposit with water-sensitive paper



[illegible]

[illegible]

Signature: [redacted]

Test item applied 27 July 2002 (4 days before exposure) at 35 g a.i./ha

MITOX DATA FORM F-[illegible] Study No. B075AMS Page [illegible]

Documenting spray deposit with water-sensitive paper

Application Date: [illegible]

Treatment: [illegible]

[Run 1]

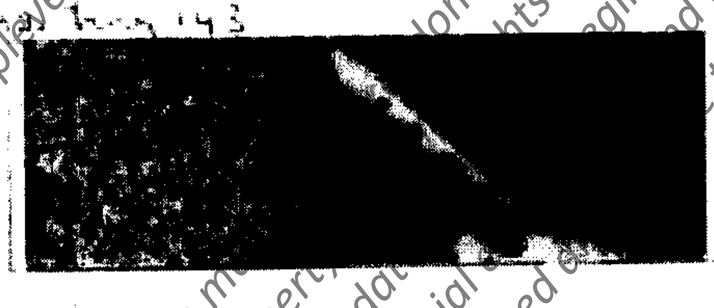
[Run 2]

[Run 3]

[Run 4]

[Run 5]

[Run 6]



[attach paper here]

[attach paper here]

[remarks]

Name: [illegible]
ESS.D
Date: [illegible]

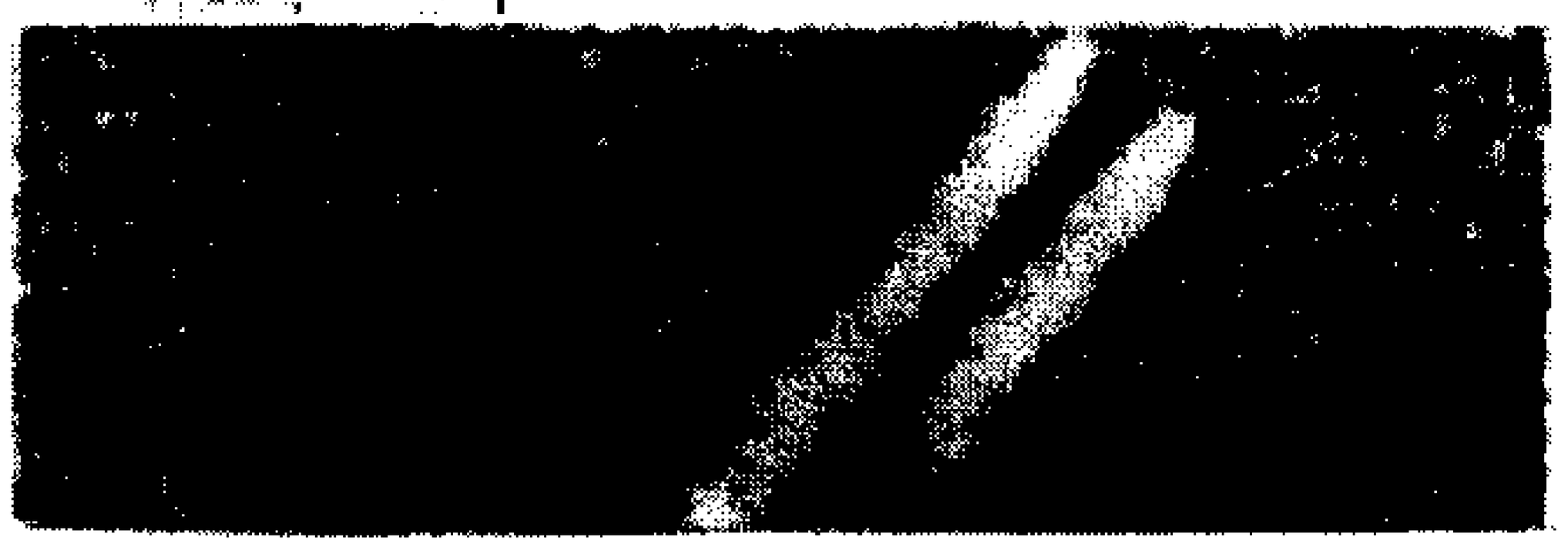
Signature: [redacted]

Test item applied 29 July 2002 (2 days before exposure) at 21 g a.i./ha

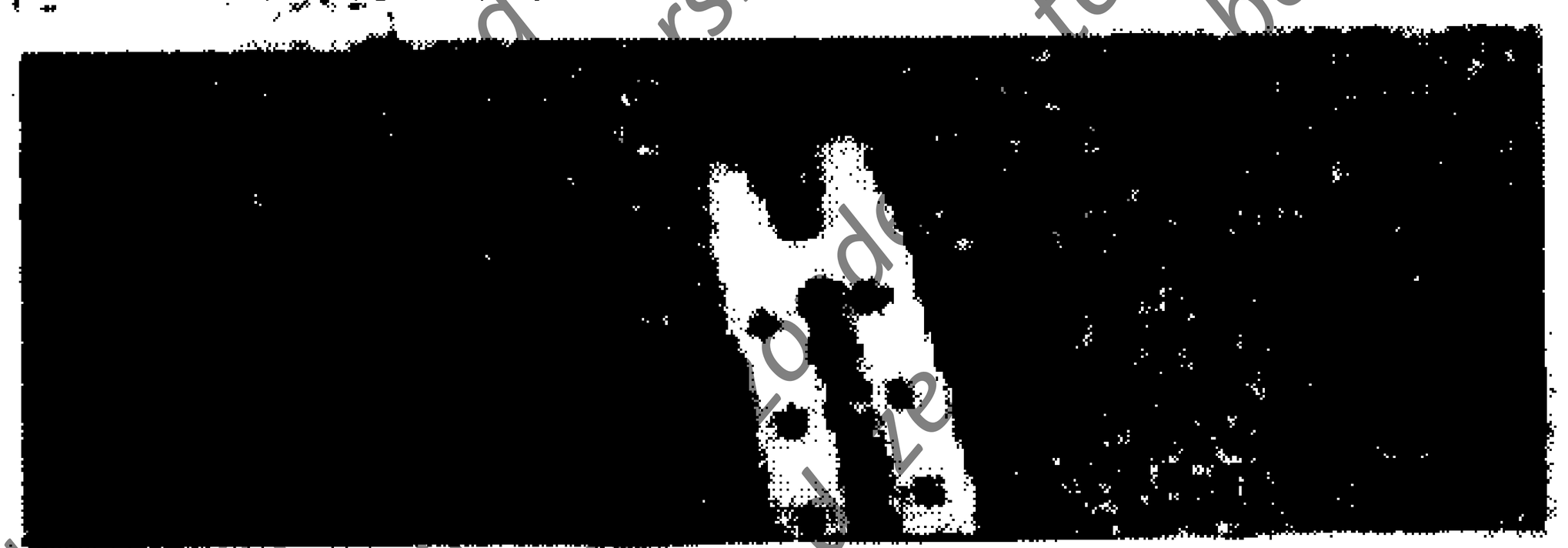
MITOX DATA FORM | Study no. B075AMS | Page 1 of 1

Documenting spray deposit with water-sensitive paper

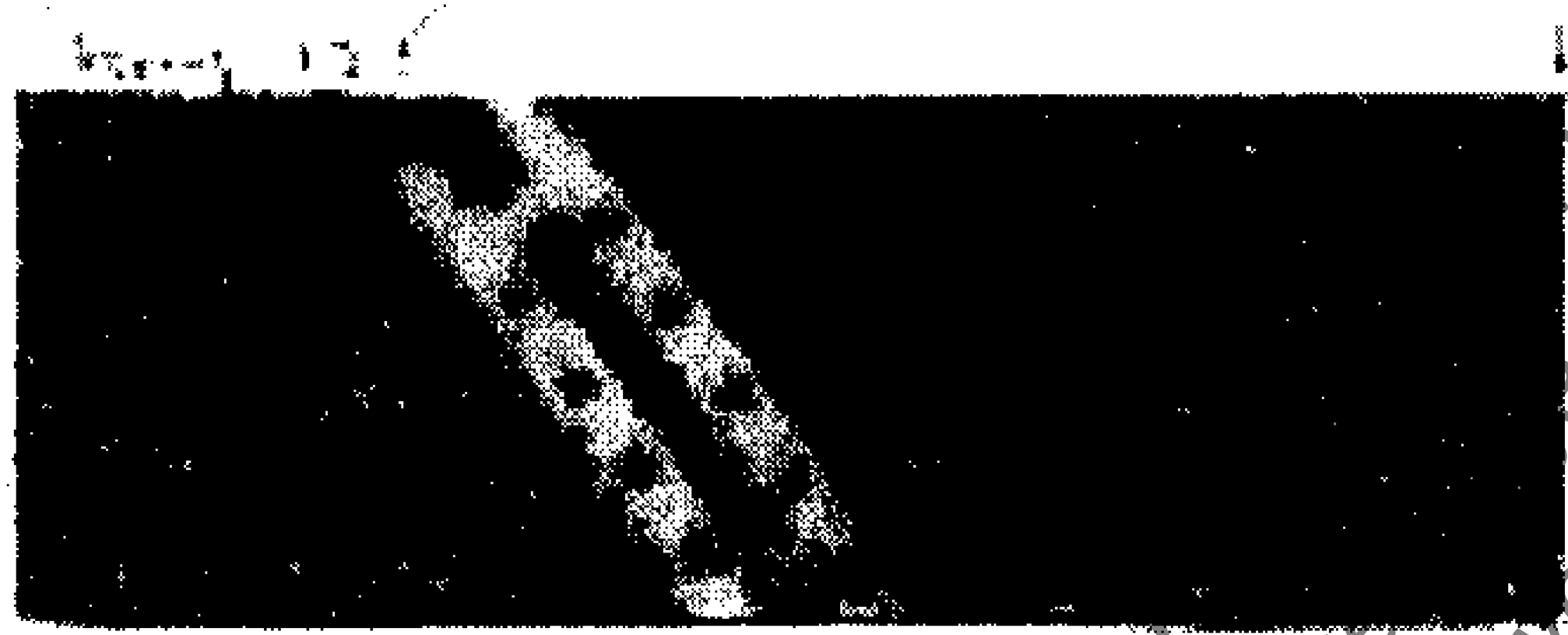
Application date | Treatment

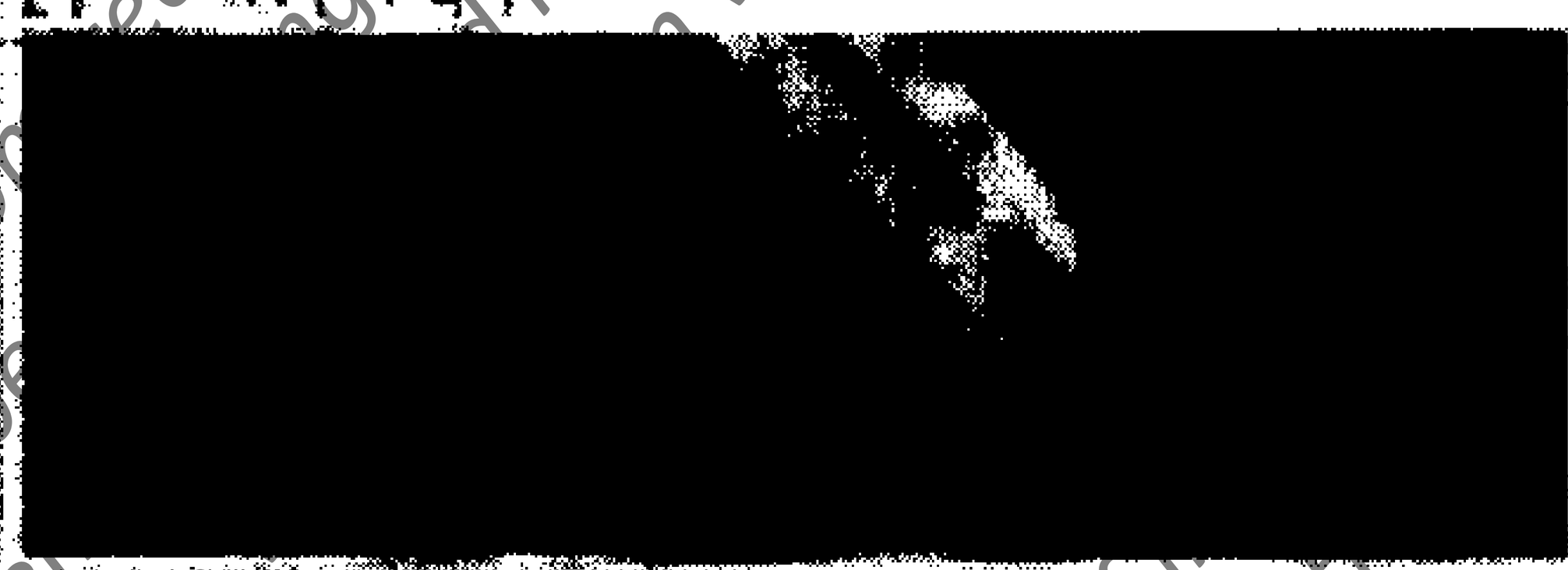


Run 1



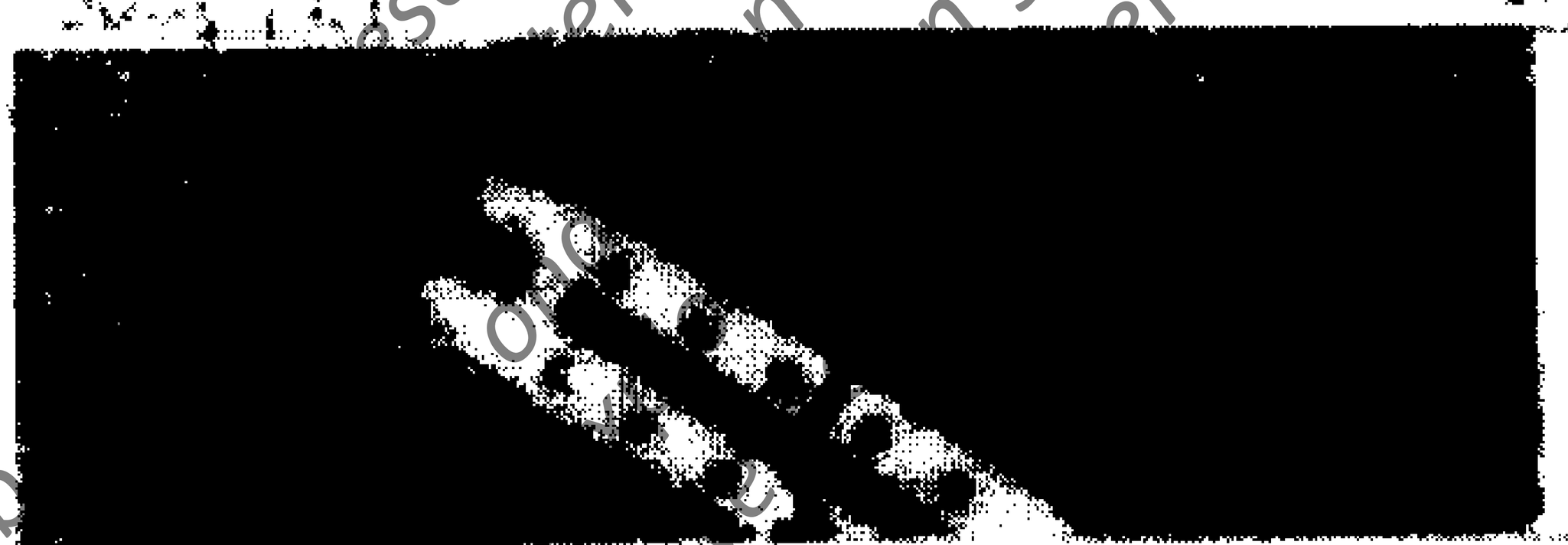
Run 2





Run 3

Run 4



Run 5

(affix paper here) | (affix paper here)

Remarks

Name

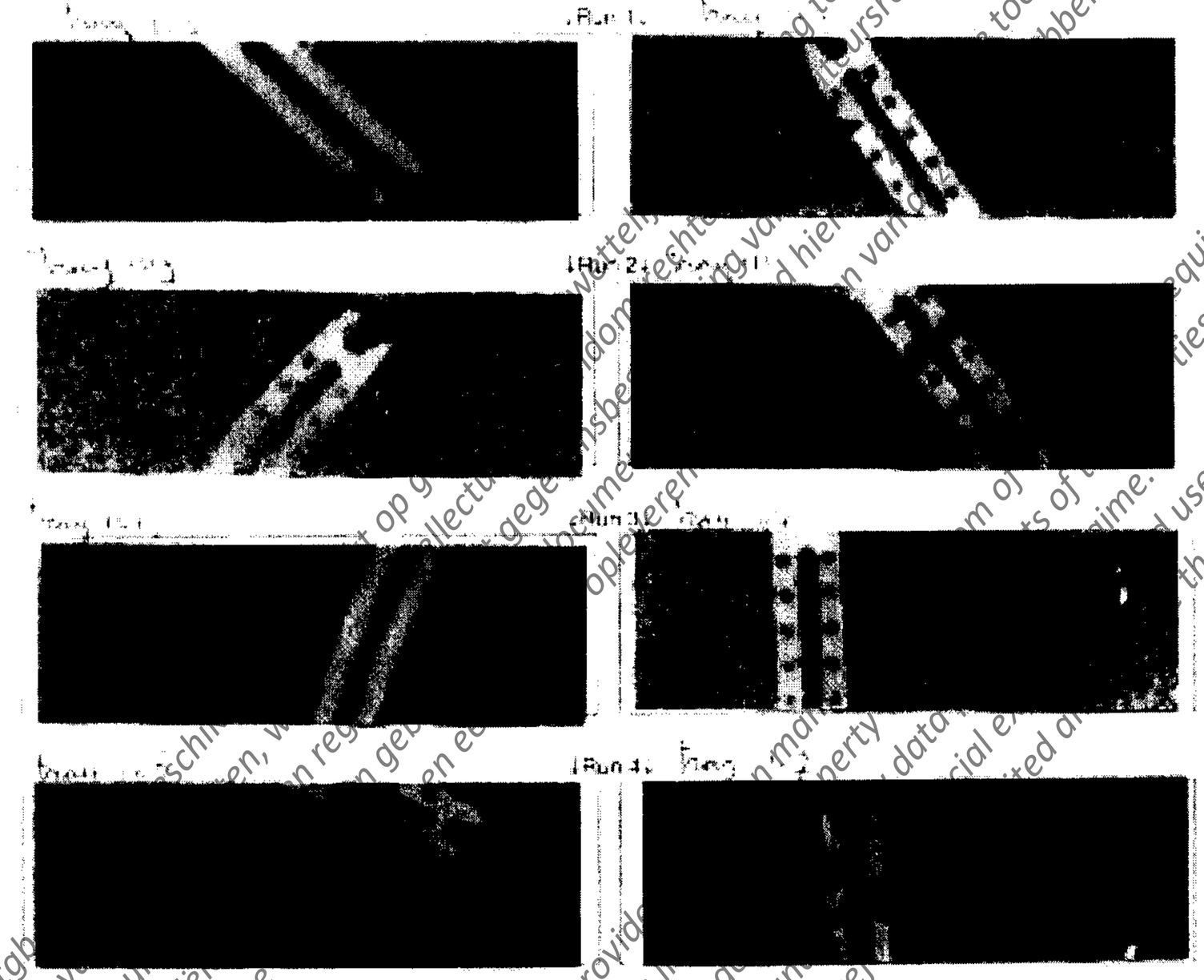
Date

Signature [redacted]

Test item applied 29 July 2002 (2 days before exposure) at 35 g a.i./ha

B075AMS

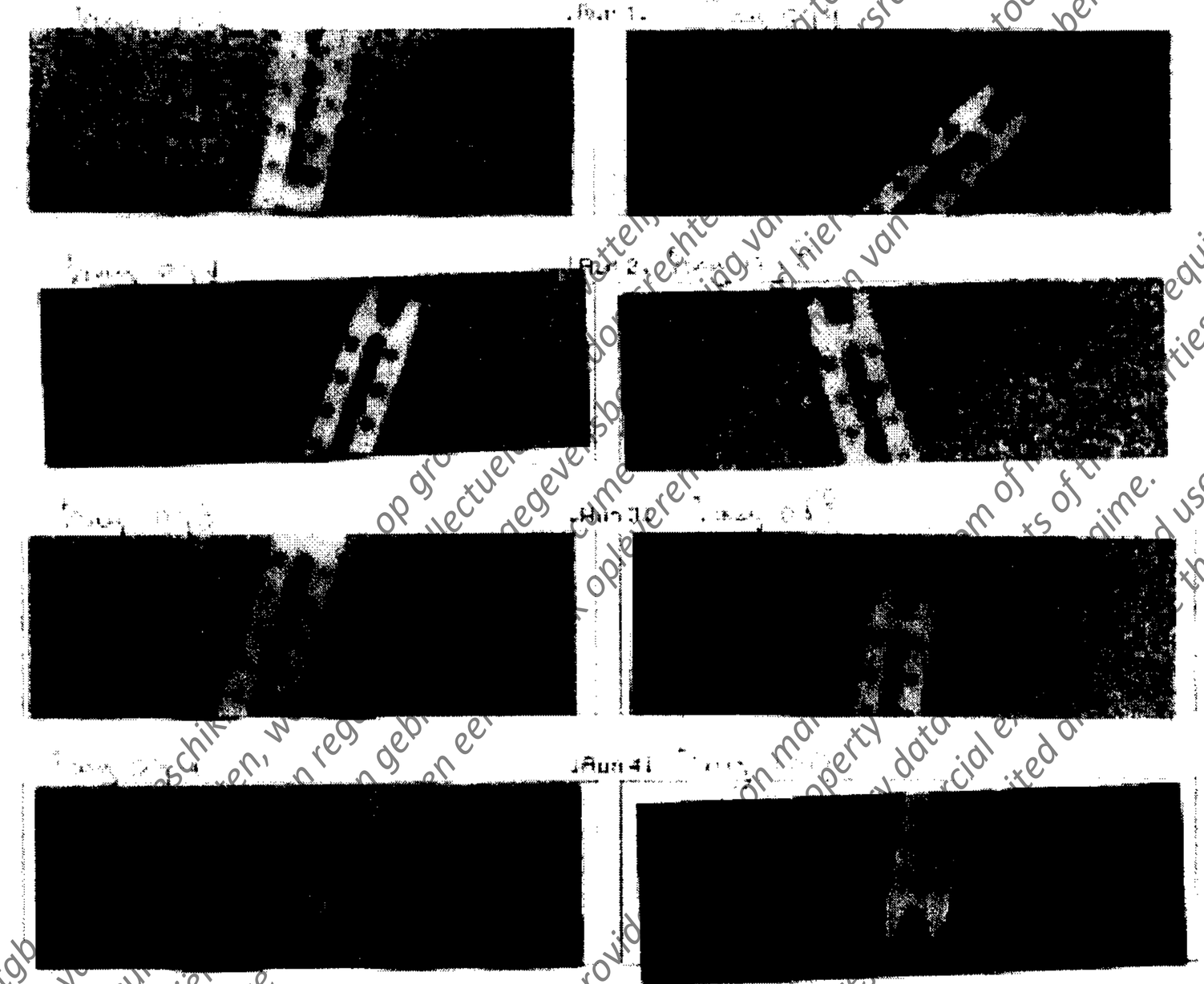
Documenting spray deposit with water-sensitive paper



Test item applied 30 July 2002 (1 day before exposure) at 21 g a.i./ha

B075AMS

Documenting spray deposit with water-sensitive paper



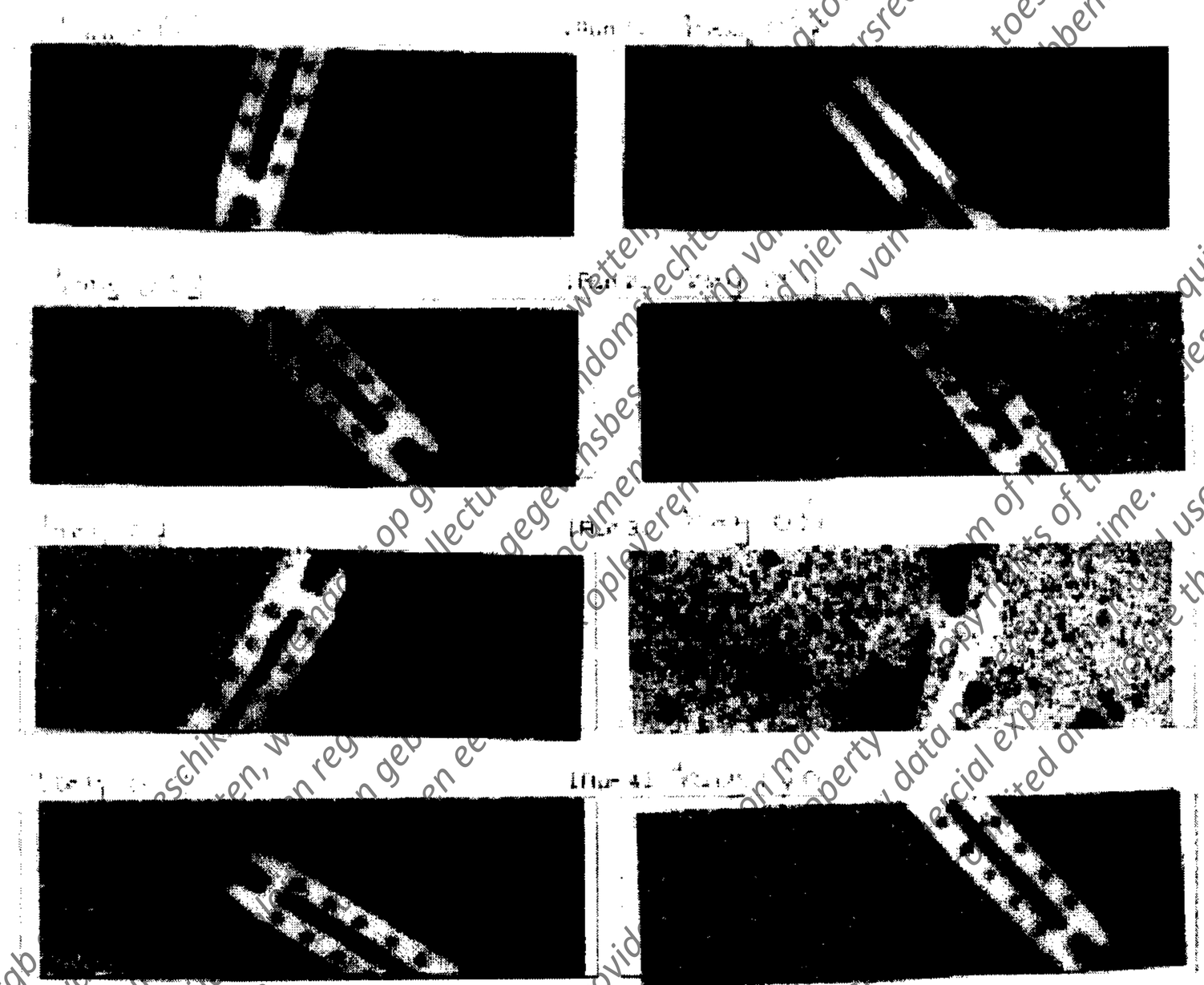
SPONSOR COPY

MITOX COPY

Test item applied 30 July 2002 (1 day before exposure) at 35 g a.i./ha

Study
B075AMS

Documenting spray deposit with water-sensitive paper



(affix paper here)

(affix paper here)

Name:

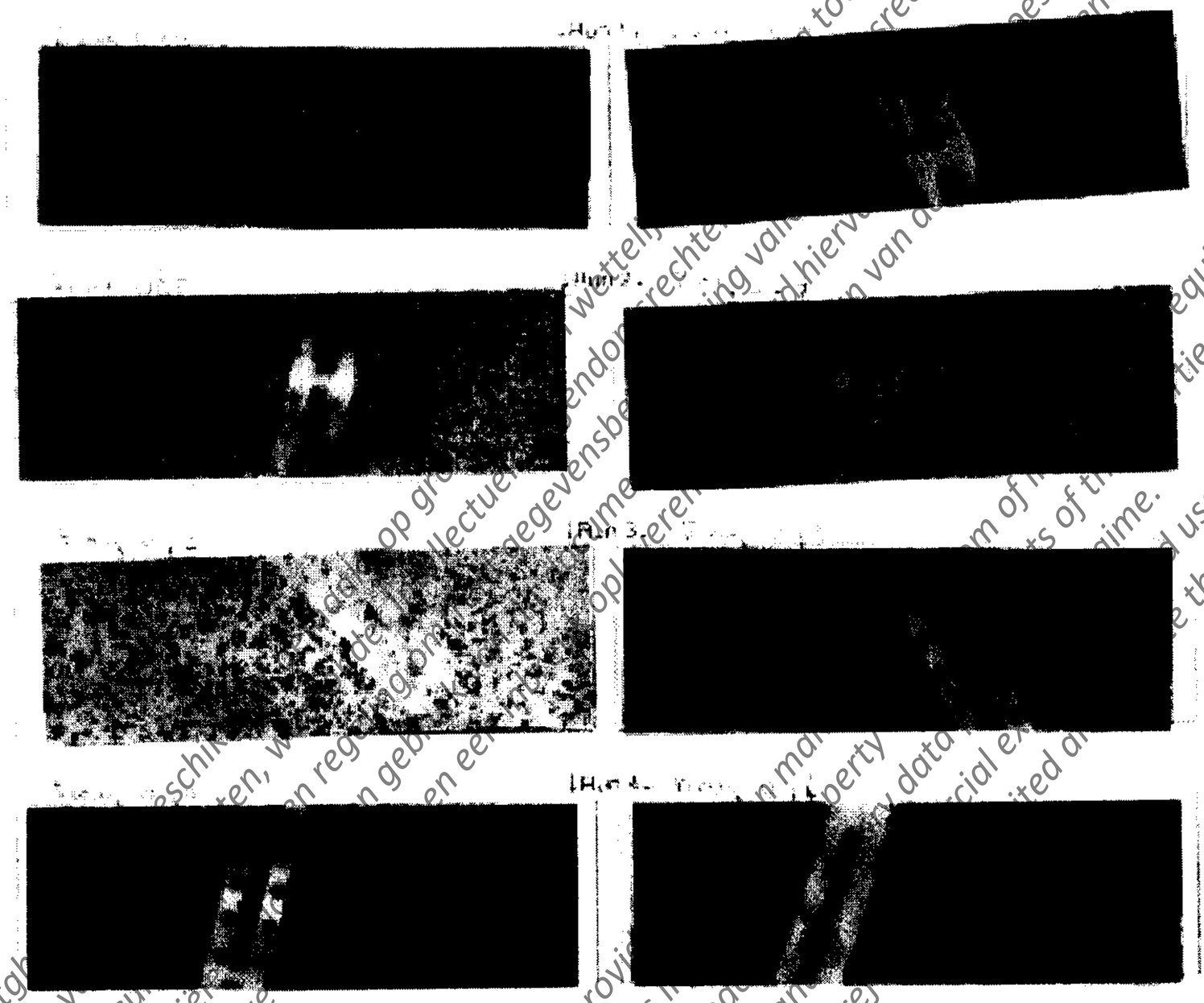
Date:

Signature:

Water control treatment applied 31 July 2002 (during bee flight) at 200 L/ha

B075AMS

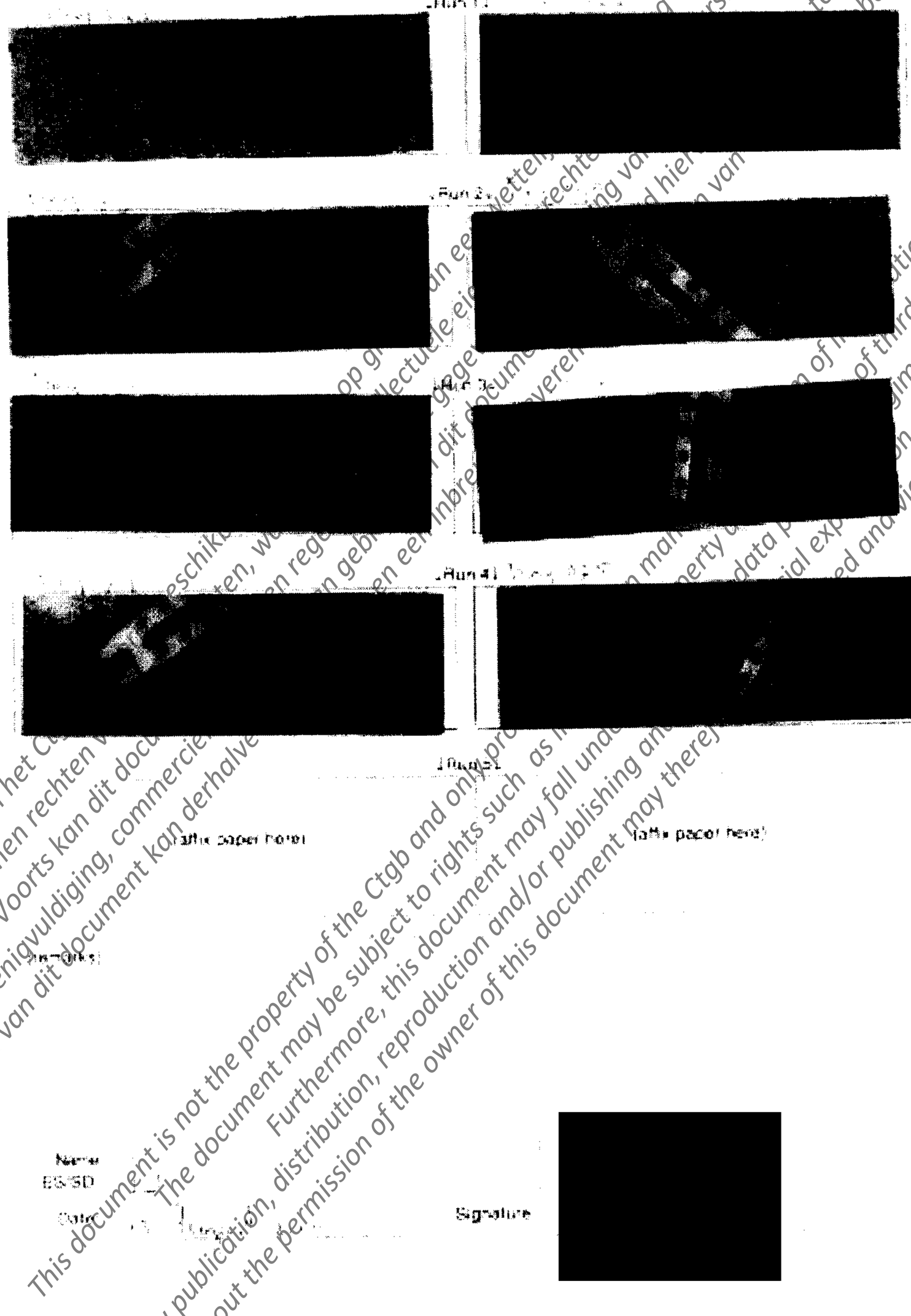
Documenting spray deposit with water-sensitive paper



Toxic reference treatment PennCap M at 1000 g product/ha applied 31 July 2002 (during bee flight)

B075AMS

Documenting spray deposit with water-sensitive paper



Name
BS-SD

Signature

APPENDIX VI MORTALITY DATA

PRE-EXPOSURE

TENT	TREAT	28-Jul DEAD	29-Jul DEAD	30-Jul DEAD	30-Jul evening DEAD	SUM
5	Confidor 21 g a.i./ha D-1	13	5	3	9	30
18	Confidor 21 g a.i./ha D-1	10	9	6	3	28
21	Confidor 21 g a.i./ha D-1	12	5	1	5	23
30	Confidor 21 g a.i./ha D-1	7	1	1	4	13
3	Confidor 21 g a.i./ha D-2	12	7	3	4	26
11	Confidor 21 g a.i./ha D-2	8	2	3	1	14
31	Confidor 21 g a.i./ha D-2	9	2	3	1	15
32	Confidor 21 g a.i./ha D-2	12	6	3	4	25
8	Confidor 21 g a.i./ha D-4	5	20	3	7	35
10	Confidor 21 g a.i./ha D-4	31	5	12	4	52
16	Confidor 21 g a.i./ha D-4	11	4	5	6	26
25	Confidor 21 g a.i./ha D-4	20	8	4	1	33
14	Confidor 35 g a.i./ha D-1	11	16	7	5	39
19	Confidor 35 g a.i./ha D-1	17	1	4	1	23
26	Confidor 35 g a.i./ha D-1	5	10	4	10	29
28	Confidor 35 g a.i./ha D-1	7	6	2	3	18
2	Confidor 35 g a.i./ha D-2	11	5	1	14	31
20	Confidor 35 g a.i./ha D-2	8	5	2	2	17
23	Confidor 35 g a.i./ha D-2	19	7	2	3	31
29	Confidor 35 g a.i./ha D-2	12	2	1	3	18
1	Confidor 35 g a.i./ha D-4	21	17	4	6	48
17	Confidor 35 g a.i./ha D-4	18	5	6	2	31
22	Confidor 35 g a.i./ha D-4	29	13	5	5	52
27	Confidor 35 g a.i./ha D-4	9	8	9	7	33
4	PennCap M	17	9	7	6	39
7	PennCap M	12	2	3	8	25
9	PennCap M	3	3	2	2	10
13	PennCap M	4	6	2	1	13
6	Water	6	4	2	8	20
12	Water	7	4	2	3	16
15	Water	9	9	2	5	25
24	Water	3	7	1	6	17

EXPOSURE

TENT	TREAT	1-Aug DEAD	2-Aug DEAD	3-Aug DEAD	5-Aug DEAD	SUM
5	Confidor 21 g a.i./ha D-1	8	2	2	9	21
18	Confidor 21 g a.i./ha D-1	14	1	2	5	22
21	Confidor 21 g a.i./ha D-1	3	8	2	4	17
30	Confidor 21 g a.i./ha D-1	10	4	4	9	27
3	Confidor 21 g a.i./ha D-2	12	3	6	5	26
11	Confidor 21 g a.i./ha D-2	12	2	7	12	33
31	Confidor 21 g a.i./ha D-2	14	5	7	14	40
32	Confidor 21 g a.i./ha D-2	7	11	16	7	41
8	Confidor 21 g a.i./ha D-4	8	4	18	16	46
10	Confidor 21 g a.i./ha D-4	11	2	1	17	31
16	Confidor 21 g a.i./ha D-4	11	0	8	22	41
25	Confidor 21 g a.i./ha D-4	6	5	10	8	29
14	Confidor 35 g a.i./ha D-1	8	1	11	20	40
19	Confidor 35 g a.i./ha D-1	17	2	5	9	33
26	Confidor 35 g a.i./ha D-1	8	2	8	8	26
28	Confidor 35 g a.i./ha D-1	5	2	2	5	14
2	Confidor 35 g a.i./ha D-2	5	1	4	11	21
20	Confidor 35 g a.i./ha D-2	6	4	1	15	26
23	Confidor 35 g a.i./ha D-2	9	4	2	6	21
29	Confidor 35 g a.i./ha D-2	6	7	6	23	42
1	Confidor 35 g a.i./ha D-4	19	2	16	23	60
17	Confidor 35 g a.i./ha D-4	5	2	3	7	17
22	Confidor 35 g a.i./ha D-4	13	4	7	16	40
27	Confidor 35 g a.i./ha D-4	7	1	22	13	43
4	PennCap M	77	16	67	37	197
7	PennCap M	122	32	47	38	239
9	PennCap M	39	36	32	25	132
13	PennCap M	133	64	65	35	297
6	Water	9	2	5	9	25
12	Water	8	5	4	4	21
15	Water	3	1	4	3	11
24	Water	4	4	4	5	17

APPENDIX VII: FORAGING DATA

PRE-EXPOSURE

TENT	TREATMENT	July 29, 2002						July 30, 2002					
		9:55	10:54	12:25	13:29	14:33	15:56	10:00	11:10	12:30	13:30	14:41	16:00
5	Confidor 21 g a.i./ha D-1	21	14	18	15	17	14	24	21	25	22	20	8
18	Confidor 21 g a.i./ha D-1	22	19	28	20	19	18	21	23	26	20	19	5
21	Confidor 21 g a.i./ha D-1	20	11	14	10	11	14	15	21	18	12	16	11
30	Confidor 21 g a.i./ha D-1	9	12	19	17	9	10	12	13	13	8	24	5
3	Confidor 21 g a.i./ha D-2	13	8	16	12	15	16	14	12	18	14	13	15
11	Confidor 21 g a.i./ha D-2	19	20	22	12	9	9	12	16	8	13	15	6
31	Confidor 21 g a.i./ha D-2	19	18	13	12	12	9	15	22	20	15	16	7
32	Confidor 21 g a.i./ha D-2	13	17	26	17	19	10	24	23	20	24	19	7
8	Confidor 21 g a.i./ha D-4	16	13	13	14	8	11	14	17	11	20	16	14
10	Confidor 21 g a.i./ha D-4	13	12	15	9	13	16	15	14	24	18	16	18
16	Confidor 21 g a.i./ha D-4	15	11	14	23	17	18	15	20	20	11	10	10
25	Confidor 21 g a.i./ha D-4	10	11	5	12	9	6	10	8	9	14	12	9
14	Confidor 35 g a.i./ha D-1	15	11	11	17	11	12	7	8	12	15	11	6
19	Confidor 35 g a.i./ha D-1	17	16	23	22	25	17	26	32	34	25	20	17
26	Confidor 35 g a.i./ha D-1	14	9	10	7	12	8	10	16	23	12	14	7
28	Confidor 35 g a.i./ha D-1	4	12	18	12	8	9	4	9	9	9	13	1
2	Confidor 35 g a.i./ha D-2	19	10	16	25	12	17	18	20	17	17	18	17
20	Confidor 35 g a.i./ha D-2	15	13	27	19	14	16	12	14	27	22	15	11
23	Confidor 35 g a.i./ha D-2	13	11	17	10	8	4	9	15	21	14	17	3
29	Confidor 35 g a.i./ha D-2	6	10	10	12	18	16	7	10	23	14	15	11
1	Confidor 35 g a.i./ha D-4	5	4	9	10	5	9	12	13	10	8	10	11
17	Confidor 35 g a.i./ha D-4	13	8	9	12	13	12	14	12	15	13	9	12
22	Confidor 35 g a.i./ha D-4	10	10	14	9	14	13	8	11	17	18	12	6
27	Confidor 35 g a.i./ha D-4	8	9	11	17	8	8	10	12	15	9	14	5
4	PennCap M	10	8	6	5	9	7	9	10	15	8	8	5
7	PennCap M	15	13	16	13	12	10	15	16	14	12	14	13
9	PennCap M	7	6	8	11	6	10	10	12	11	12	15	10
13	PennCap M	4	10	13	10	6	8	4	5	14	11	14	7
6	Water	11	14	8	15	6	8	7	9	12	10	7	9
12	Water	25	29	19	16	26	23	13	14	21	24	26	21
15	Water	14	8	18	17	10	10	7	13	12	14	10	15
24	Water	12	8	12	12	8	9	7	11	12	11	10	2
	AVERAGE	13	12	15	14	12	12	13	15	17	15	15	10

EXPOSURE

TENT	TREATMENT	July 31, 2002 9:58	10:57	12:20	13:27	14:25	16:00	August 1, 2001 9:50	11:15	12:30	14:50	15:55	16:15
5	Confidor 21 g a.i./ha D-1	13	17	17	17	21	14	0	0	9	2	0	0
18	Confidor 21 g a.i./ha D-1	7	14	12	12	9	6	0	0	2	1	0	0
21	Confidor 21 g a.i./ha D-1	4	8	7	9	9	6	0	0	1	0	0	0
30	Confidor 21 g a.i./ha D-1	2	5	12	9	3	2	0	0	4	1	0	0
3	Confidor 21 g a.i./ha D-2	4	8	15	15	16	14	2	0	0	0	0	0
11	Confidor 21 g a.i./ha D-2	3	7	10	13	11	1	0	0	2	1	0	0
31	Confidor 21 g a.i./ha D-2	3	9	11	10	8	5	0	0	2	2	0	0
32	Confidor 21 g a.i./ha D-2	7	1	16	13	6	10	0	0	1	0	0	0
8	Confidor 21 g a.i./ha D-4	5	17	17	20	19	8	0	1	1	0	0	0
10	Confidor 21 g a.i./ha D-4	15	19	33	37	34	19	6	0	2	2	0	0
16	Confidor 21 g a.i./ha D-4	4	19	15	15	22	10	0	0	3	2	0	0
25	Confidor 21 g a.i./ha D-4	9	22	15	15	13	15	0	0	4	0	0	0
14	Confidor 35 g a.i./ha D-1	6	8	4	0	2	6	0	0	0	0	0	0
19	Confidor 35 g a.i./ha D-1	7	20	16	22	8	5	0	0	3	0	0	0
26	Confidor 35 g a.i./ha D-1	7	8	13	8	5	2	0	0	0	1	0	0
28	Confidor 35 g a.i./ha D-1	0	2	2	1	1	0	0	0	0	0	0	0
2	Confidor 35 g a.i./ha D-2	4	14	15	12	18	7	0	0	1	0	0	0
20	Confidor 35 g a.i./ha D-2	8	19	13	20	17	11	0	0	0	0	0	0
23	Confidor 35 g a.i./ha D-2	4	2	6	7	5	2	0	0	1	0	0	0
29	Confidor 35 g a.i./ha D-2	2	4	4	4	5	4	0	0	1	1	0	0
1	Confidor 35 g a.i./ha D-4	12	15	18	24	18	17	1	0	1	0	0	0
17	Confidor 35 g a.i./ha D-4	13	21	21	19	25	8	0	0	1	0	0	0
22	Confidor 35 g a.i./ha D-4	8	12	11	8	15	6	0	0	0	0	0	0
27	Confidor 35 g a.i./ha D-4	4	14	13	14	15	9	0	0	0	0	0	0
4	PennCap M	9	15	16	8	3	6	0	1	0	0	0	0
7	PennCap M	0	7	5	6	5	5	0	0	0	0	0	0
9	PennCap M	3	5	10	8	9	1	0	0	0	0	0	0
13	PennCap M	2	2	4	9	1	0	0	0	0	0	0	0
6	Water	1	9	6	18	11	8	0	0	6	0	0	0
12	Water	6	16	21	18	16	9	0	0	0	10	0	0
15	Water	6	13	16	19	18	6	1	0	0	1	0	0
24	Water	2	10	10	14	8	9	0	0	1	1	0	1

EXPOSURE

TENT	TREATMENT	August 2, 2001 10:05	11:00	12:30	13:40	14:30	16:00	August 3, 2001 9:00	10:00	13:45	14:30	15:16	15:45
5	Confidor 21 g a.i./ha D-1	19	8	18	10	12	14	0	0	5	6	8	9
18	Confidor 21 g a.i./ha D-1	13	12	8	9	6	8	0	0	4	6	10	11
21	Confidor 21 g a.i./ha D-1	10	12	14	16	5	6	0	2	4	5	7	6
30	Confidor 21 g a.i./ha D-1	4	10	5	9	5	5	0	1	5	8	7	10
3	Confidor 21 g a.i./ha D-2	16	11	10	13	5	11	0	4	10	9	7	7
11	Confidor 21 g a.i./ha D-2	7	16	13	10	8	9	0	1	11	7	8	11
31	Confidor 21 g a.i./ha D-2	12	11	13	13	5	8	0	1	3	6	5	8
32	Confidor 21 g a.i./ha D-2	11	13	15	6	7	9	0	0	6	6	5	5
8	Confidor 21 g a.i./ha D-4	10	11	9	12	12	9	1	0	7	8	4	11
10	Confidor 21 g a.i./ha D-4	21	27	25	25	22	12	0	0	9	9	10	12
16	Confidor 21 g a.i./ha D-4	13	11	13	12	12	7	0	1	11	8	6	4
25	Confidor 21 g a.i./ha D-4	7	9	10	6	8	7	0	2	6	6	6	8
14	Confidor 35 g a.i./ha D-1	2	7	3	5	7	4	0	1	4	5	5	8
19	Confidor 35 g a.i./ha D-1	15	9	6	7	3	11	0	1	8	6	7	7
26	Confidor 35 g a.i./ha D-1	12	4	7	6	5	2	1	0	3	7	5	5
28	Confidor 35 g a.i./ha D-1	0	1	0	9	2	1	0	1	7	8	5	10
2	Confidor 35 g a.i./ha D-2	15	9	12	7	9	4	1	0	4	5	6	6
20	Confidor 35 g a.i./ha D-2	11	6	15	9	13	7	2	0	10	8	6	9
23	Confidor 35 g a.i./ha D-2	9	3	3	5	3	5	0	1	5	8	7	7
29	Confidor 35 g a.i./ha D-2	9	4	9	5	5	8	0	7	4	9	5	7
1	Confidor 35 g a.i./ha D-4	13	12	11	11	10	10	1	1	7	6	9	8
17	Confidor 35 g a.i./ha D-4	14	15	12	14	11	11	0	0	5	5	6	6
22	Confidor 35 g a.i./ha D-4	6	3	5	5	7	4	0	1	2	1	3	4
27	Confidor 35 g a.i./ha D-4	3	3	6	8	6	3	0	2	6	6	3	7
4	PennCap M	0	0	0	0	0	0	0	0	8	5	5	5
7	PennCap M	0	0	0	8	5	7	0	0	9	2	5	3
9	PennCap M	0	0	0	1	8	7	0	1	10	9	5	8
13	PennCap M	0	4	1	2	5	6	0	0	7	7	7	6
6	Water	5	7	11	10	11	14	0	0	8	3	6	7
12	Water	15	14	14	14	16	17	0	1	10	10	9	13
15	Water	3	2	4	11	10	9	0	1	6	4	4	9
24	Water	23	14	11	12	18	13	0	7	10	8	8	9

APPENDIX IX: ENDORSEMENT OF COMPLIANCE

[redacted]

SPONSOR COPY