

Laboratoire T.E.C.
1, rue Jules Védrières – ZAC Maignon
F – 64600 Anglet

LABORATORY ASSESSMENT OF AN INSECTICIDE SPECIALITY INTENDED TO CONTROL INSECT – Space treatment

**Complementary trial on mosquito *Culex pipiens* + Cockroach *Blatta Orientalis*
+ wasp *Vespula* sp.**

Product: OXYPY

JANUARY 2013
Report n° 1457a3/0711R

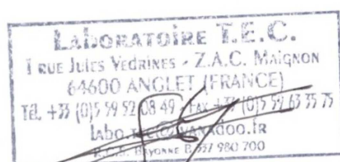
Sponsor:

OXY'PHARM

917, rue Marcel Paul
94500 Champigny-sur-Marne
France

LABORATOIRE T.E.C.
1, rue Jules Védrières
ZAC Maignon
64600 Anglet
France

B.Serrano
T.E.C. Director



PARTICIPANTS TO THE TRIALS

Bruno SERRANO

Trial responsible / T.E.C. Director

Agronomist engineer ENSAT T84

Martine FALQUIER

Trial enginner

Agronomist engineer ENSAR R74

Marie-Paule MONTAUT

Technician

Dominique LARICQ

Technician

BTSA

I, hereby Bruno Serrano, T.E.C. Director certify that the trials presented in this issue were done according to the Good Experiment Practices (G.E.P.) – French Agriculture Ministry agreement 94-021.

Anglet, 24th January 2013



Disclaimer

The results described in this report were generated *in vitro* and on the provided samples.

The samples tested were accepted in good faith that they were representative of the intended final formulation(s)/products and the test methods employed were those agreed by the sponsor.

The trial has been conducted on a laboratory strain of “model” insects and the susceptibility of the local insects strains can be different in other labs or in the real conditions of use.

As such the results should be taken only as an indication of the potential for activity of the formulations or products under test.

Then, these results cannot be considered as confirmation that a formulation or product will work in a clinical or field application.

Evidence for such activity can only be obtained from properly constructed and executed clinical or local field trials.

GOOD EXPERIMENT PRACTICES

STUDY TEC N° : 1457a3/0711

SPONSOR : OXY'PHARM – 94500 Champigny-sur-Marne (France)

PRODUCT : OXYPY

FACILITIES : T.E.C. 1 rue Jules Védrières 64600 Anglet (France)

TIMING : 26th December 2012 – 23rd January 2013

STUDY DIRECTOR : Bruno Serrano / Agronomist engineer

STUDY ENGINEER : Martine Falquier / Agronomist engineer

QUALITY INSURANCE RESPONSIBLE : Bruno Serrano /Agronomist engineer

METHODOLOGY :

In accordance with the “DRAFT Guidance document to replace part of Appendices to chapter 7 (page 187 to 200) from TNSG on Product evaluation” and adapted French registration standard methodology C.E.B. N°135bis (1st edition: 1989 - Revised Mai 1996).

The trial is conducted in accordance with the procedures required to conduct Officially Recognized Trials (EOR), from the european directive 91/414/CE and according to the laboratory agreement by the french Ministry of Agriculture.

ARCHIVAGE : 10 years, papers and electronic files

There were no circumstances which can have affected the reliability of the data presented in this report.

Bruno Serrano / Date : 24th January 2013



LABORATORY ASSESSMENT OF AN INSECTICIDE SPECIALITY INTENDED TO CONTROL INSECTS

PURPOSE:

These complementary trials were conducted as complementary trials to the report TEC n°1457a2/0711.

The efficacy is assessed against three other pests:

- the mosquito *Culex pipiens*
- the Oriental cockroach *Blatta orientalis*
- the common wasp *Vespula* sp.

The trial was conducted according to the french registration standard:

- Méthode C.E.B. 135bis (1ère édition : 1989 Révision : Mai 1996) : "Méthode d'étude de l'efficacité des préparations insecticides et/ou acaricides destinées aux traitements de volumes des locaux de stockage, de transformation industrielle et de commercialisation des produits d'origine animale ou végétale"

Beside of the direct insecticide efficacy, the trial is also measuring the residual activity until 4 weeks on surfaces exposed to the treatment.

This issue follows the standard method design and relates any deviations.

1. EXPERIMENTAL CONDITIONS

1.1. Treatment chamber

The treatment is done in a closed 60 m³ chamber (8 m long x 3 m wide x 2.50 m high) in accordance with the CEB 135bis method and to be close to the reality of use.

The chamber represents the average conditions of a premise. There is no ventilation.

The treatment room is kept in controlled climatic conditions:

20°C±1°C / 65%HR±5%RH / light 1200 lux.

1.2. Insects

Target organisms:

Culex pipiens (mosquito)

Blatta orientalis (Oriental cockroach)

Vespula sp. (wasp)

AGE AND INSTAR OF THE TARGET SPECIES

| Scientific name | Common name | Instar | Age |
|--------------------------|--------------------|---------------|--------------|
| <i>Culex pipiens</i> | mosquito | adult, female | 2 to 4 days |
| <i>Blatta orientalis</i> | Oriental cockroach | adult, male | 1 to 3 weeks |
| <i>Vespula sp.</i> | wasps | adult worker | unknown |

For each dose and modality, 25 insects are exposed, except for the wasps (only 10 due to the difficulty to find this insect).

Untreated control:

Some batches of insects are placed onto the same materials treated with water and handled in the same conditions than the materials treated with the product.

WASPS:

Adult workers of *Vespula sp.*

They are retrieved from wild nests. The nests are taken with the help of firemen or a PCO and brought to the laboratory for anesthesia using CO₂ during the time to expose the insects into the Petri dishes.

CO₂ anesthesia was used before the trial / recovery time before the trial = 2 h

Due to the difficulty and the hazard to handle this kind of insect, only 10 insects are exposed.

Density of the target organisms: 10 (x 4 replicates) in 60 m³ test volume, and 10 per treated surface of 15 cm x 15 cm (x 4 replicates).

MOSQUITOES:

25 (x 4 replicates) two to four days old females of *Culex pipiens* from laboratory colony breedings since 1996 (origin of the strain: ORSTOM / WHO).

The females are starved from blood meal during 24 hours before the trial.

Density of the target organisms: 25 (x 4 replicates) in 60 m³ test volume, and 15 per treated surface of 15 cm x 15 cm (x 4 replicates).

25 (x 4 replicates) in each 0.05 m³ test volume.

COCKROACHES:

Blatta orientalis from a French standard strain (I.N.A Paris-Grignon – strain INA-TEC 1991). Colony breeding is done according to French method C.E.B N° 159, and susceptibility to the main insecticide groups is checked annually.

Breeding conditions: in a controlled climatic conditions chamber kept at 22+/-1°C, 70+/-10% HR, light 16h dark 8h 700 lux (but the boxes are covered by a black cardboard to avoid too direct light source).

The cockroaches are in plastic metacrylate boxes of 35 cm x 25 cm x 20 cm containing a shelter (pile of egg cardboards), a food source (dog petfood biscuit) and a water source (cotton wick in a test tube filled with water).

The food and water source are changed twice a week.

25 insects males aged 2 to 15 days were exposed to the product in each replicate. 4 replicates are conducted.

Density of the target organisms: 25 (x 4 replicates) in 60 m³ test volume, and 25 per treated surface of 15 cm x 15 cm (x 4 replicates).

Insects are classified as “dead” if they are unable to move properly (fly for flying insects).

2. TREATMENTS

2.1. Product and dosis

The experimental product is provided by OXYPHARM :

OXYPY – ready to use – Lot 12/2012 OXY EXP 12/2014 REF 4200.001

Dose: 1 ml /m³

2.2. Application of the treatments

The treatments are done by using the fogger device provided by OXYPHARM (brand name : NOCOSPRAY®) and set in a corner of the test chamber.

The treatment is following the recommendations of the manufacturer:

- the bottle of product is shaken before use
- the bottle is screwed in the diffuser NOCOSPRAY®
- the diffuser is adjusted to the room volume (60 m³)
- the diffusion is activated (mean duration of the treatment: 1,1 minutes)
- the “fog” is let inside the test chamber until 2 hours
- 2 hours after the end of the diffusion, the room is air exhausted and washed (TEC depollution procedures)
- the bottle is withdrawn and closed.

Treatment data:

Volume: 60 m³

Duration of treatment: 1.1 minutes

Amount of product: 60 +/-2 ml

Time of exposure of the target organisms and surfaces (for residual trial): 2 hours

No ventilation during the treatment and the 2 hours following the treatment.

The rate of the device is 1 ml par m³, i.e. 60 ml sprayed in the 60 m³ test chamber and this theoretical data is checked by an accurate measurement of the amount of product actually used in the bottle.

Residual trial: some squares of materials (15 cm x 15 cm) are set into the test chamber (on the floor) and exposed to the treatment (2 hours), using the principles of the standard C.E.B. 159/135 relative to insecticide surface treatments.

In order to be representative of the actual conditions of use, 2 materials are exposed, one unporous (ceramic tiles, sleek side) and one porous (short-hair carpetn Gerfelx tiles 181).

Some untreated materials are treated with water to be used as a control.

4 tiles per material are exposed to the treatment.

2 treatments are done (i.e. one replicate, as required by the standard method), and 4 replicates are done inside a same treatment (4 batches of target organisms are exposed to each treatment).

There was no ventilation during and 2 hours after the treatment.

3. Assessments

3.1. Principle

The experimenter records the mortality at regular time intervals.

After the 2 hours exposure time, the insects (dead and/or alive) are withdrawn from the test and placed into glass jars with food and water sources, in breeding climatic conditions.

The observations are recording two phenomenons:

- knockdown (KD),
- mortality, lethal effect.

Main insecticides are acting on the nervous system and give successive effects: excitation, uncoordination of moves, paralysis (knock down) and lethargy conducting to death.

The paralysis phase depends on the active ingredient and the dosis, some recoveries can occur after a knockdown effect lasting more or less longer.

- knockdown effect : assessed 2 hours or less after teatment
- lethal effect: assessed 24 hours, 48 hours and 7 days after treatment.

As it is not doable to check if insects are knockdown of actually dead, the insects in the tables data will be classified as "dead" or "alive":

- dead (or knockdown): insects unable to move properly (fly for flying insects)
- alive: insects able to move properly

4. RESULTS

4.1. PRESENTATION

The synthesis of data is given in Table I.

The raw data by species and replicate are given in APPENDIX.

Table I: synthesis of data in KT100 (time of exposure to kill or knockdown 100% of the insects):

| | | DIRECT CURATIVE EFFICACY | RESIDUEL EFFICACY AFTER 4 WEEKS | |
|-------|------------|--------------------------|---------------------------------|-------------|
| | | | Ceramic tile | Carpet tile |
| OXYPY | <i>C.p</i> | < 1h | < 1h | < 1h |
| | <i>B.o</i> | < 1h | < 2h | < 2h |
| | <i>V.s</i> | < 1h | < 1h | < 2h |

C.p = *Culex pipiens* *B.o* = *Blatta orientalis* *V.s* = *Vespula sp.*

4.2. COMMENTS

During all the trial, the death rates of the untreated control batches of insects are lower than 15%, the trial is then validated.

The treatment gave a complete and definitive mortality (no recoveries after 24 hours).

The residual efficacy remains effective until 28 days after application.

5. CONCLUSION

In the conditions of this trial, with the product sample provided, the insects strains and methodology used:

The product **OXYPY**, applied as a space treatment at a rate of 1 ml per m³, has proved:

- A fast and definitive insecticide efficacy against the following pests: the Oriental cockroach, the mosquito *Culex* and the wasp,
- A residual activity of at least 28 days after treatment in laboratory conditions.

| |
|------------------------|
| A P P E N D I X |
|------------------------|

Raw data

Note: the standards CEB can not be reproduced, but it can be purchased from the AFPP website: <http://www.afpp.net/>

RAW DATA / SPACE TREATMENT

| REPLICATE 1 | | | 1 h | | | 4h | | | 24h | | | 48h | | | 7 days | | |
|-------------|--------------------------|------|-----|---|-----|-----|---|-----|-----|---|-----|-----|---|-----|--------|---|-----|
| | | | D | A | %M | D | A | %M | D | A | %M | D | A | %M | D | A | %M |
| OXYPY | <i>Culex pipiens</i> | H1 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | B1 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | H2 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | B2 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | mean | 100 | | | 100 | | | 100 | | | 100 | | | 100 | | |
| | <i>Blatta orientalis</i> | H1 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | B1 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | H2 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | B2 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | mean | 100 | | | 100 | | | 100 | | | 100 | | | 100 | | |
| | <i>Vespula sp.</i> | H1 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 |
| | | B1 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 |
| | | H2 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 |
| | | B2 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 |
| | | mean | 100 | | | 100 | | | 100 | | | 100 | | | 100 | | |

| REPLICATE 2 | | | 1 h | | | 4h | | | 24h | | | 48h | | | 7 days | | |
|-------------|--------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------|-----|-----|
| | | | D | A | %M | D | A | %M | D | A | %M | D | A | %M | D | A | %M |
| OXYPY | <i>Culex pipiens</i> | H1 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | B1 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | H2 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | B2 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | mean | 100 | | | 100 | | | 100 | | | 100 | | | 100 | | |
| | <i>Blatta orientalis</i> | H1 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | B1 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | H2 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | B2 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 |
| | | mean | 100 | | | 100 | | | 100 | | | 100 | | | 100 | | |
| | <i>Vespula sp.</i> | H1 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 |
| | | B1 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 |
| | | H2 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 |
| | | B2 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 |
| | | mean | 100 | | | 100 | | | 100 | | | 100 | | | 100 | | |
| Untr-eated | <i>Culex pipiens</i> | - | 0 | 101 | 0 | 0 | 101 | 0 | 0 | 101 | 0 | 3 | 98 | 3 | 7 | 94 | 7 |
| | <i>Blatta orientalis</i> | - | 0 | 100 | 0 | 0 | 100 | 0 | 0 | 100 | 0 | 0 | 100 | 0 | 0 | 100 | 0 |
| Control | <i>Vespula sp.</i> | - | 0 | 40 | 0 | 0 | 40 | 0 | 0 | 40 | 0 | 1 | 39 | 3 | N/A | N/A | N/A |

H1, H2, B1, B2 = pests locations inside the test chamber (H = high ; B = low)
 D = dead or knockdown A = alive %M = % mortality or knockdown

RAW DATA / RESIDUAL SURFACE TREATMENT + 4 WEEKS

CULEX PIPIENS / EXPERIMENTAL PRODUCT

UNPOROUS MATERIAL

| | rep 1 | | | rep 2 | | | rep 3 | | | rep 4 | | | |
|--------|-------|---|-----|-------|---|-----|-------|---|-----|-------|---|-----|------|
| | D | A | %KD | D | A | %KD | D | A | %KD | D | A | %KD | mean |
| 1 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 2 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 3 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 4 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 8 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 24 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 48 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 72 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 96 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 7 days | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |

POROUS MATERIAL

| | rep 1 | | | rep 2 | | | rep 3 | | | rep 4 | | | |
|--------|-------|---|-----|-------|---|-----|-------|---|-----|-------|---|-----|------|
| | D | A | %KD | D | A | %KD | D | A | %KD | D | A | %KD | mean |
| 1 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 2 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 3 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 4 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 8 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 24 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 48 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 72 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 96 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 7 days | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |

D = dead or knockdown insects A = alive insects %KD = % knockdown/mortality
 rep = replicate h = hours

RAW DATA / RESIDUAL SURFACE TREATMENT + 4 WEEKS

CULEX PIPIENS / UNTREATED CONTROL

UNPOROUS MATERIAL

| | rep 1 | | | rep 2 | | | rep 3 | | | rep 4 | | | mean |
|--------|-------|----|-----|-------|----|-----|-------|----|-----|-------|----|-----|----------|
| | D | A | %KD | D | A | %KD | D | A | %KD | D | A | %KD | |
| 1 h | 0 | 25 | 0,0 | 0 | 25 | 0,0 | 0 | 25 | 0,0 | 0 | 25 | 0,0 | 0 |
| 2 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 3 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 4 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 8 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 24 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 48 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 72 h | 1 | 24 | 4 | 0 | 25 | 0 | 1 | 24 | 4 | 0 | 25 | 0 | 2 |
| 96 h | 1 | 24 | 4 | 0 | 25 | 0 | 1 | 24 | 4 | 0 | 25 | 0 | 2 |
| 7 days | 3 | 22 | 12 | 1 | 24 | 4 | 1 | 24 | 4 | 2 | 23 | 8 | 7 |

POROUS MATERIAL

| | rep 1 | | | rep 2 | | | rep 3 | | | rep 4 | | | mean |
|--------|-------|----|-----|-------|----|-----|-------|----|-----|-------|----|-----|----------|
| | D | A | %KD | D | A | %KD | D | A | %KD | D | A | %KD | |
| 1 h | 0 | 25 | 0,0 | 0 | 25 | 0,0 | 0 | 25 | 0,0 | 0 | 25 | 0,0 | 0 |
| 2 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 3 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 4 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 8 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 24 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 48 h | 1 | 24 | 4 | 1 | 24 | 4 | 0 | 25 | 0 | 0 | 25 | 0 | 2 |
| 72 h | 1 | 24 | 4 | 1 | 24 | 4 | 0 | 25 | 0 | 0 | 25 | 0 | 2 |
| 96 h | 2 | 23 | 8 | 1 | 24 | 4 | 1 | 24 | 4 | 1 | 24 | 4 | 5 |
| 7 days | 3 | 22 | 12 | 2 | 23 | 8 | 1 | 24 | 4 | 1 | 24 | 4 | 7 |

D = dead or knockdown insects A = alive insects %KD = % knockdown/mortality
 rep = replicate h = hours

RAW DATA / RESIDUAL SURFACE TREATMENT + 4 WEEKS

BLATTA ORIENTALIS / EXPERIMENTAL PRODUCT

UNPOROUS MATERIAL

| | rep 1 | | | rep 2 | | | rep 3 | | | rep 4 | | | |
|--------|-------|---|-----|-------|---|-----|-------|---|-----|-------|---|-----|------------|
| | D | A | %KD | D | A | %KD | D | A | %KD | D | A | %KD | mean |
| 1 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 2 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 3 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 4 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 8 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 24 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 48 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 72 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 96 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 7 days | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |

POROUS MATERIAL

| | rep 1 | | | rep 2 | | | rep 3 | | | rep 4 | | | |
|--------|-------|----|-----|-------|---|-----|-------|----|-----|-------|----|-----|------------|
| | D | A | %KD | D | A | %KD | D | A | %KD | D | A | %KD | mean |
| 1 h | 13 | 12 | 52 | 16 | 9 | 64 | 11 | 14 | 44 | 13 | 12 | 52 | 53 |
| 2 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 3 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 4 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 8 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 24 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 48 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 72 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 96 h | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |
| 7 days | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 25 | 0 | 100 | 100 |

D = dead or knockdown insects A = alive insects %KD = % knockdown/mortality
 rep = replicate h = hours

RAW DATA / RESIDUAL SURFACE TREATMENT + 4 WEEKS

BLATTA ORIENTALIS / UNTREATED CONTROL

UNPOROUS MATERIAL

| | rep 1 | | | rep 2 | | | rep 3 | | | rep 4 | | | mean |
|--------|-------|----|-----|-------|----|-----|-------|----|-----|-------|----|-----|------|
| | D | A | %KD | D | A | %KD | D | A | %KD | D | A | %KD | |
| 1 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 2 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 3 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 4 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 8 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 24 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 48 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 72 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 96 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 7 days | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |

POROUS MATERIAL

| | rep 1 | | | rep 2 | | | rep 3 | | | rep 4 | | | mean |
|--------|-------|----|-----|-------|----|-----|-------|----|-----|-------|----|-----|------|
| | D | A | %KD | D | A | %KD | D | A | %KD | D | A | %KD | |
| 1 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 2 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 3 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 4 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 8 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 24 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 48 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 72 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 96 h | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |
| 7 days | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 | 25 | 0 | 0 |

D = dead or knockdown insects A = alive insects %KD = % knockdown/mortality
 rep = replicate h = hours

RAW DATA / RESIDUAL SURFACE TREATMENT + 4 WEEKS

VESPULA SP. / EXPERIMENTAL PRODUCT

UNPOROUS MATERIAL

| | rep 1 | | | rep 2 | | | rep 3 | | | rep 4 | | | |
|--------|-------|---|-----|-------|---|-----|-------|---|-----|-------|---|-----|------|
| | D | A | %KD | D | A | %KD | D | A | %KD | D | A | %KD | mean |
| 1 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 2 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 3 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 4 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 8 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 24 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 48 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 72 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 96 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 7 days | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |

POROUS MATERIAL

| | rep 1 | | | rep 2 | | | rep 3 | | | rep 4 | | | |
|--------|-------|---|-----|-------|---|-----|-------|---|-----|-------|---|-----|------|
| | D | A | %KD | D | A | %KD | D | A | %KD | D | A | %KD | mean |
| 1 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 2 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 3 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 4 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 8 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 24 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 48 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 72 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 96 h | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |
| 7 days | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 10 | 0 | 100 | 100 |

D = dead or knockdown insects A = alive insects %KD = % knockdown/mortality
 rep = replicate h = hours

RAW DATA / RESIDUAL SURFACE TREATMENT + 4 WEEKS

VESPULA SP. / UNTREATED CONTROL

UNPOROUS MATERIAL

| | rep 1 | | | rep 2 | | | rep 3 | | | rep 4 | | | mean |
|------|-------|----|-----|-------|----|-----|-------|----|-----|-------|----|-----|-----------|
| | D | A | %KD | D | A | %KD | D | A | %KD | D | A | %KD | |
| 1 h | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 |
| 2 h | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 |
| 3 h | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 |
| 4 h | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 |
| 8 h | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 |
| 24 h | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 1 |
| 48 h | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 2 |
| 72 h | 1 | 9 | 10 | 1 | 9 | 10 | 0 | 10 | 0 | 1 | 9 | 10 | 8 |
| 96 h | 1 | 9 | 10 | 2 | 8 | 20 | 0 | 10 | 0 | 1 | 9 | 10 | 10 |

POROUS MATERIAL

| | rep 1 | | | rep 2 | | | rep 3 | | | rep 4 | | | mean |
|------|-------|----|-----|-------|----|-----|-------|----|-----|-------|----|-----|-----------|
| | D | A | %KD | D | A | %KD | D | A | %KD | D | A | %KD | |
| 1 h | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 |
| 2 h | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 |
| 3 h | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 |
| 4 h | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 |
| 8 h | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 |
| 24 h | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 1 |
| 48 h | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 2 |
| 72 h | 1 | 9 | 10 | 2 | 8 | 20 | 0 | 10 | 0 | 1 | 9 | 10 | 10 |
| 96 h | 1 | 9 | 10 | 2 | 8 | 20 | 1 | 9 | 10 | 1 | 9 | 10 | 13 |

D = dead or knockdown insects A = alive insects %KD = % knockdown/mortality
rep = replicate h = hours

Note : the +7 days assessment has not been done on the untreated batches as it is not possible to keep alive wasps for such a long time in laboratory conditions far from their nest.