

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

LABORATORY ASSESSMENT OF AN INSECTICIDE SPECIALITY

Speciality:

ENVIRA CRAWLING INSECTS

MAY 2016

Report n° 2077/0416R

Sponsor:

Envira GmbH

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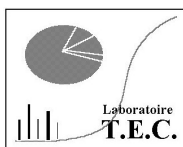
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I, hereby Bruno Serrano, T.E.C. Director certify that the trials presented in this issue were done according to the Good Experiment Practices (G.E.P.) – French Agriculture Ministry agreement 94-021.

Anglet, le 25th May 2016

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 the ones agreed by the sponsor. As such the results should be taken only as an indication of the potential for activity of the formulations or products under test. The trial has been conducted on a laboratory strain of a “model” insect and the susceptibility of the local insects strains can be different in other labs or in the real conditions of use. 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 PRACTICES

STUDY TEC N°: 2077/0416
NUMBER OF PAGES: 17
SPONSOR: ENVIRA GMBH – Austria (Europe)

PRODUCT: Crawling Insects Killer - ENVIRA - experimental sample /
liquid in a hand-held pump sprayer 500 ml, received the 26th April 2016

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

DATE OF TESTING: Start 3rd May 2016 - End 10th May 2016

REPLICATES: 4

STUDY DIRECTOR: Bruno Serrano / Agronomist engineer

STUDY ENGINEER: Martine Falquier / Agronomist engineer

QUALITY INSURANCE RESPONSIBLE: Bruno Serrano / Agronomist engineer

METHODOLOGY:
The test system was adapted from the standard method C.E.B. n°135/159.
This method is part of the Appendix of approved methodologies for PT1 Biocides registration, in the BPD 528/2012 - CA-Dec12-Doc.6.2.a-Final - Manual for the Authorization of Pesticides - EU part – Biocides - Chapter 7 Efficacy - version 1.1; January 2013.
The trial was conducted in accordance with the procedures of Good Practices required to conduct Officially Recognised Trials (EOR), from the European directive 91/414/CE, according to the laboratory agreement by the French Ministry of Agriculture.

ARCHIVING: 10 years, hard and electronic copies

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

Bruno Serrano

Date: 25th May 2016

LABORATORY ASSESSMENT OF AN INSECTICIDE SPECIALITY

PURPOSE:

The purpose of this study was to assess the efficacy of an insecticide speciality applied as a residual spray onto surfaces and intended to control insect pests in household environment.

The trial was conducted using a method adapted from the French registration standard:

The test system is based on the standard method C.E.B. n°135/159.

This method is part of the Appendix of approved methodologies for PT1 Biocides registration, in the "DRAFT Guideline to replace part of Appendices to chapter 7 (page 187 to 200) from TNsG on Product evaluation".

The trial is conducted in accordance with the procedures of Good Practices required to conduct officially Recognised Trials (EOR), from the European directive 91/414/CE, according to the laboratory agreement by the French Ministry of Agriculture.

ARCHIVING: 10 years, hard and electronic copies

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

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

1. EXPERIMENTAL CONDITIONS

1.1. Treatment chamber

The treatment was done in a closed 60 m³ chamber to be close to the reality of use.

The test chamber had no ventilation and it was separated from the storage room where the treated tiles are kept for ageing.

The treatment room allowed to keep controlled temperatures between 20 and 25°C ($\pm 2^\circ\text{C}$).

1.2. Treated materials

1.2.1. Plates

A "plate" was defined as a plate of a material usually found in construction of food storage premises, which can be more or less sorbent and porous.

1.2.1.1. Choice of the treated materials

The materials used for the trial have been checked as non effective against the pest species by a preliminary biological testing.

Two types of materials were treated in order to assess the efficacy of the product in relation with the physical properties of the materials found in the actual conditions of use (sorbent and unsorbent).

- ceramic tiles (non porous),
- concrete (500 kg/m³).

1.2.1.2. Dimension and preparation of the plates

The plates were squares of 15 cm x 15 cm in order to be covered by a Petri box adapted to the species (e.g. 14 cm for insects and 5,5 cm for dust mites).

1.2.1.3. Storage of the treated plates

The treated plates were stored at a temperature of 25 °C +/- 2 °C and a relative humidity of 70 +/- 5 %, without contact between each other to avoid any transfert of product.

The plates are stored flat on the floor of a special chamber with an homogeneous lighting by fluorescent tubes placed at 2.5m from the floor.

The lights used are typical fluorescent tubes found in the food industry: PHILIPS MASTER TL-D Xtra Secura 58W/840 (color 840, power 58 W, 1.50 m long and 26 mm diameter).

The plates are exposed to the light with a photoperiod of 16 hours, alternating with 8 hours of darkness.

Ventilation : smooth, passive (< 1 m³/h).

1.3. Target insect species

In relation with the use, the species chosen are:

Blattella germanica (German cockroach)
Blatta orientalis (Oriental cockroach)
Lasius niger (black ant)
Ctenocephalides felis (flea)
Dermatophagoides pteronyssinus (house dust mite)
Tineola bisselliella (clothes moth)
Reticulitermes santonensis (termite)
Cimex lectularius (bed bug)

The target organisms were from laboratory colony breedings from french official specialized institutes (INRA, TEC, ORSTOM, INA Paris-Grignon), except ants and wasps which were from wild nests.

AGE AND INSTAR OF TARGET ORGANISMS

Scientific name	Common name	Instar	Age
<i>Blattella germanica</i>	German cockroach	adult, male	1 to 3 weeks
<i>Blatta orientalis</i>	Oriental cockroach	adult, male	1 to 3 weeks
<i>Lasius niger</i>	black ant	adult worker	unknown
<i>Ctenocephalides felis</i>	flea	adult+larvae	2 weeks + 3rd instar
<i>Derm. pteronyssinus</i>	dust mite	mix ad+larvae	0 to 2 weeks
<i>Tineola bisselliella</i>	clothe moth	larvae	3rd instar
<i>Reticulitermes santonensis</i>	termite	adult worker	2 to 4 weeks
<i>Cimex lectularius</i>	bed bug	adult mixed sex	1 to 3 weeks

For each replicate, 25 organisms were exposed.

Untreated control:

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

2. TREATMENTS

2.1. Standard product and dosis

No standard product was used in the trial design.

2.2. Experimental product and dosis

The experimental sample was provided by ENVIRA :

Crawling Insects Killer ENVIRA, experimental sample / liquid in a hand-held pump sprayer 500 ml, received the 26th April 2016

Dosis: 55 ml per m².

2.3. Application of the treatment

The treatment was done by using the provided hand-held pump-up sprayer.

The droplets were thin enough to wet the surfaces without leaking and without excessive vapourization in the air.

Average rate of application of the product: 55 ml/m².

The materials were treated falt and the actual treated area was 10 times the area of the materials.

The treated plates were randomly assigned among the total treated area and not handled before complete drying.

The untreated materials were used as they were.

4 replicates were conducted by factor. A factor was a combination of the date of persistence, the organism species and the type of material.

3. Assessments

3.1. Principle

The day of the treatment (after drying), the organisms were placed onto the plates during 1 hour.

There was no residual assessment.

The experimenter recorded the mortality at regular time intervals.

After the 1 hour exposure time, the organisms were withdrawn from the plates by gentle suction and placed onto untreated plates with food and water sources, in breeding climatic conditions.

3.2. Mortality assessments

3.2.1. Knockdown and mortality

The observations recorded 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, soem recoveries can occur after a knockdown effect lasting more or less longer.

3.2.2. Assessments

- knockdown effect: during the 1 hour exposure time. Another assessment was done after 4 hours.
- Lethal effect: after 24 hours of exposure. An insect unable to move (fly) properly was classified as dead.

3.3. Dates of assessments

3.3.1. Instant effect

Until 24 hours after exposure.

3.3.2. Residual activity

There was no residual assessment.

4. RESULTS

4.1. PRESENTATION

The synthesis of data is given in Table I.

The raw data by species/date/replicate/materials are given in APPENDIX.

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

TRIAL AT DAY0 (day of application):

KT100 = time of exposure to knockdown/kill 100% insects/mites

<i>Target</i>	<i>Material</i>	<i>KT100</i>	<i>Death rate</i>	<i>Mortality 24h</i>
German cockroach <i>Blattella germanica</i>	Ceramic	15 min	100%	100%
	Concrete	30 min	100%	100%
Oriental cockroach <i>Blatta orientalis</i>	Ceramic	30 min	100%	100%
	Concrete	30 min	100%	100%
Black ant <i>Lasius niger</i>	Ceramic	5 min	100%	100%
	Concrete	5 min	100%	100%
Flea (adult) <i>Ctenocephalides felis</i>	Ceramic	5 min	100%	100%
	Concrete	5 min	100%	100%
Flea (larvae) <i>Ctenocephalides felis</i>	Ceramic	5 min	100%	100%
	Concrete	5 min	100%	100%
House dust mite <i>Dermatophagoides pteronyssinus</i>	Ceramic	5 min	100%	100%
	Concrete	5 min	100%	100%
Clothes moth (larvae) <i>Tineola bisselliella</i>	Ceramic	5 min	100%	100%
	Concrete	5 min	100%	100%
Termite (adult worker) <i>Reticulitermes santonensis</i>	Ceramic	5 min	100%	100%
	Concrete	15 min	100%	100%
Bed bug <i>Cimex lectularius</i>	Ceramic	5 min	100%	100%
	Concrete	15 min	100%	100%

4.2. COMMENTS

During all the trial, the death rates of the Untreated control batches of insects were lower than 5%, the trial was then validated.

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

5. CONCLUSION

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

The product **Crawling insects Killer - ENVIRA** , applied as a surface treatment at a rate of 55 ml/m², has proved:

- A fast and definitive insecticide efficacy against the following pests:
 - crawling insects: the German cockroach, the Oriental cockroach, the black ant and the flea
 - hidden insects: house dust mites, clothes moths, termites and bed bugs
-

A P P E N D I X

Raw data

RAW DATA

On the following pages :

D = knockdown/dead A = alive %D = % knockdown/mortality
Rep = replicate

BG = *Blattella germanica*
BO N = *Blatta orientalis*
LN AD = *Lasius niger*
CF AD = *Ctenocephalides felis* – adults
CF N = *Ctenocephalides felis* - nymphs
MD = *Musca domestica*
DP = *Dermatophagoides pteronyssinus*
TB = *Tineola bisselliella*
RS = *Reticulitermes santonensis*
AA – *Aedes aegypti*
AAL – *Aedes albopictus*
CL = *Cimex lectularius*
VV = *Vespula vulgaris*

EXPERIMENTAL PRODUCT

Knockdown after 5 minutes

D = knockdown/dead A = alive %D = % knockdown/mortality

CERAMIC

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	11	14	44,0	16	9	64,0	12	13	48,0	15	10	60,0	54,0	9,5
BO	0	25	0,0	0	25	0,0	1	24	4,0	0	25	0,0	1,0	2,0
LN	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF AD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF N	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
MD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
DP	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
TB	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
RS	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AA	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AAL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
VV	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0

CONCRETE

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	3	22	12,0	0	25	0,0	2	23	8,0	3	22	12,0	8,0	5,7
BO	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
LN	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF AD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF N	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
MD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
DP	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
TB	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
RS	18	7	72,0	20	5	80,0	18	7	72,0	18	7	72,0	74,0	4,0
AA	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AAL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CL	16	9	64,0	15	10	60,0	21	4	84,0	18	7	72,0	70,0	10,6
VV	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0

EXPERIMENTAL PRODUCT

Knockdown after 15 minutes

D = knockdown/dead A = alive %D = % knockdown/mortality

CERAMIC

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
BO	16	9	64,0	13	12	52,0	18	7	72,0	14	11	56,0	61,0	8,9
LN	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF AD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF N	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
MD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
DP	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
TB	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
RS	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AA	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AAL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
VV	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0

CONCRETE

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	25	0	100,0	21	4	84,0	22	3	88,0	20	5	80,0	88,0	8,6
BO	8	17	32,0	8	17	32,0	10	15	40,0	7	18	28,0	33,0	5,0
LN	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF AD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF N	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
MD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
DP	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
TB	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
RS	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AA	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AAL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
VV	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0

EXPERIMENTAL PRODUCT

Knockdown after 30 minutes

D = knockdown/dead A = alive %D = % knockdown/mortality

CERAMIC

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
BO	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
LN	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF AD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF N	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
MD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
DP	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
TB	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
RS	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AA	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AAL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
VV	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0

CONCRETE

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
BO	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
LN	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF AD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF N	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
MD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
DP	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
TB	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
RS	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AA	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AAL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
VV	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0

EXPERIMENTAL PRODUCT

Knockdown after 1 hour

D = knockdown/dead A = alive %D = % knockdown/mortality

CERAMIC

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
BO	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
LN	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF AD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF N	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
MD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
DP	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
TB	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
RS	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AA	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AAL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
VV	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0

CONCRETE

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
BO	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
LN	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF AD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF N	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
MD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
DP	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
TB	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
RS	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AA	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AAL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
VV	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0

EXPERIMENTAL PRODUCT

Knockdown after 4 hours

D = knockdown/dead A = alive %D = % knockdown/mortality

CERAMIC

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
BO	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
LN	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF AD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF N	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
MD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
DP	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
TB	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
RS	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AA	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AAL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
VV	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0

CONCRETE

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
BO	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
LN	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF AD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF N	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
MD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
DP	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
TB	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
RS	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AA	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AAL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
VV	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0

EXPERIMENTAL PRODUCT

Mortality after 24 hours

D = knockdown/dead A = alive %D = % knockdown/mortality

CERAMIC

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
BO	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
LN	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF AD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF N	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
MD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
DP	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
TB	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
RS	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AA	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AAL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
VV	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0

CONCRETE

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
BO	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
LN	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF AD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CF N	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
MD	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
DP	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
TB	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
RS	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AA	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
AAL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
CL	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0
VV	25	0	100,0	25	0	100,0	25	0	100,0	25	0	100,0	100,0	0,0

UNTREATED CONTROL

Knockdown after 4 hours

D = knockdown/dead A = alive %D = % knockdown/mortality

CERAMIC

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
BO	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
LN	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
CF AD	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
CF N	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
MD	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
DP	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
TB	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
RS	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
AA	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
AAL	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
CL	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
VV	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0

CONCRETE

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
BO	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
LN	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
CF AD	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
CF N	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
MD	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
DP	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
TB	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
RS	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
AA	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
AAL	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
CL	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
VV	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0

UNTREATED CONTROL

Mortality after 24 hours

D = knockdown/dead A = alive %D = % knockdown/mortality

CERAMIC

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
BO	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
LN	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
CF AD	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
CF N	1	24	4,0	0	25	0,0	2	23	8,0	1	24	4,0	4,0	3,3
MD	1	24	4,0	0	25	0,0	1	24	4,0	0	25	0,0	2,0	2,3
DP	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
TB	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
RS	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
AA	1	24	4,0	1	24	4,0	0	25	0,0	1	24	4,0	3,0	2,0
AAL	1	24	4,0	0	25	0,0	1	24	4,0	0	25	0,0	2,0	2,3
CL	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
VV	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0

CONCRETE

	rep 1			rep 2			rep 3			rep 4			mean	sd
	D	A	%D	D	A	%D	D	A	%D	D	A	%D		
BG	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
BO	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
LN	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
CF AD	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
CF N	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
MD	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
DP	1	24	4,0	0	25	0,0	2	23	8,0	1	24	4,0	4,0	3,3
TB	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
RS	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
AA	1	24	4,0	1	24	4,0	0	25	0,0	1	24	4,0	3,0	2,0
AAL	1	24	4,0	1	24	4,0	1	24	4,0	0	25	0,0	3,0	2,0
CL	0	25	0,0	0	25	0,0	0	25	0,0	0	25	0,0	0,0	0,0
VV	1	24	4,0	1	24	4,0	1	24	4,0	0	25	0,0	3,0	2,0