UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
Centre de Recerca en Seguretat
i Control Alimentari

TEST REPORT

CLIENT:	**RADARCAN, S.L.**
PETITIONER:	**XAVIER CASTELLON**
ADDRESS:	**Pasaje Montserrat Isern Nº 1–P.I. Gran Vía Sur**
	08908 L'HOSPITALET DE LLOBREGAT

TESTED MATERIAL:	SONIC DEVICE MOD. R-101
TEST REQUIRED:	FIELD TEST ON OUTDOOR AREA INFESTED WITH MOSQUITOES *Aedes albopictus*

TEST STARTING DATE: 15th/July/2015
TEST END DATE: 15th/July /2015
REPORT EMISSION DATE: 6th/August/2015

The results of the tests can only be applied to the material received and tested in this Research Centre on the indicated dates.

This report contains a total of twelve (12) pages and it cannot be reproduced without CRESCA-UPC's authorization, except in an unabridged version.

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TECHNOLOGIST	BIOLOGIST

CRESCA

SUMMARY

A field test use trial was conducted to assess the efficacy of the sonic R-101 device against mosquitoes, *Aedes albopictus*, in terms of repellency.
Four human volunteers were also placed on an infested mosquitoes *Aedes albopictus* outdoor area.
The number of mosquitoes that landed on each volunteer was assessed with device and without it switched on over a 3 minutes period.

Activation of the R-101 device resulted in a decrease in the number of mosquitoes landing on the volunteer with device compared with before activation in “control” repetition without device. (Table 2, page 9).

It can be concluded that the R-101 device has indicated a significant repellent effect against *Aedes albopictus* mosquitos in this field test.

SAMPLES CHARACTERISTICS

On the 10th July 2015, CRESCA-UPC received two samples from "**RADARCAN, S.L.**" of the sonic device mod. "**R-101**".

Test Substance	Active ingredient	Lot Number	Physical description of test substance	Storage conditions	Expiry date
Sonic waves (under 20 KHz)	N/a	N/a	Portable device	Ambient	-

***Figure 1**. R-101 pictures*

Two units of the same model reference R-101 were received from the petitioner, for the test.

***Figure 2**. R-101, "Device 1" and "Device 2"*

TEST REQUIRED

A field test was required to assess the efficacy of one sonic device against mosquito *Aedes albopictus*, in terms of repellency.

TEST CARRIED OUT

1.- TEST METHODOLOGY

As there is no regularized protocol for testing the effectiveness of Electronic Pest and Insect Repellent Devices, it has been designed a protocol to do a field test against mosquito ***Aedes albopictus*** at an outdoor area infested of mosquitoes. This protocol is based on the criteria of the WHO (World Health Organization), who recommends many different volunteers and results to compare real situations.

The main objective of this test with participants, conformed consent, is to evaluate the effectiveness of the Electronic Device in a real situation.

Understanding that the repellent effect of Electronic Devices acts at a specific distance, and that Electronic Devices are not applied directly to the skin (like most chemicals and/or poison sprays) it makes no sense that Electronic repellents have to be tested under standardized protocol for chemicals and poisons aerosol products, where participants introduce their arms in breeding cages where mosquitoes (female inseminated mosquitoes with a high host seeking activity) can not fly or escape outside the scope of protection of the device.

1. Test systems and geographical location. A mosquito (*Aedes albopictus*) infested area was located near to a growing area close to Ripoll River (Castellar del Vallés, 08211 Barcelona).

Previously to the test, the volunteers had verified that there was a massive *Aedes albopictus* affected area with a high host seeking activity.

***Figure 3**. Situation of Castellar del Vallés.*

***Figure 4**. Area affected by mosquitoes.*

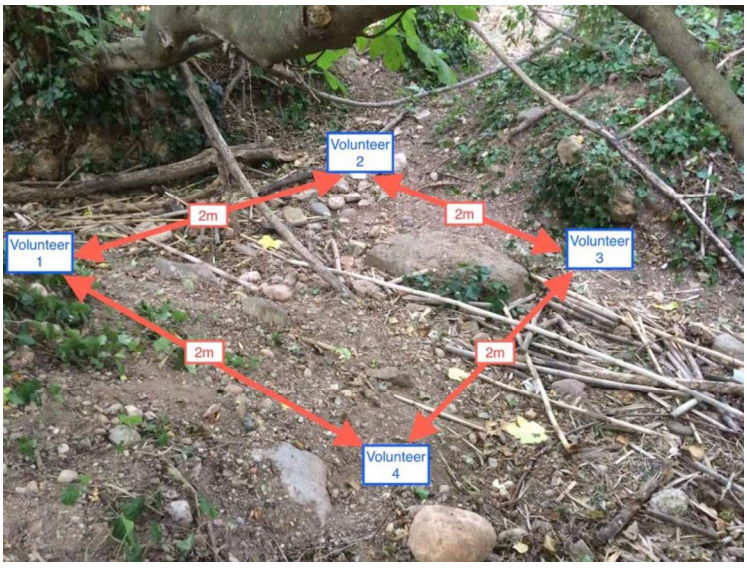


***Figure 5**. Mosquito affected area and field test place.*

Ronda de Ponent
08211 Castellar del Vallès
Barcelona, SPAIN
41.606657, 2.079351

CRESCA

2. Test Treatments. The volunteers should not be left bitten by mosquitoes.

The biting pressure of mosquitoes to reach every repetition on each volunteer was measured before and after the device was switched on. The human volunteers exposed their forearms and lower legs to the mosquitoes before the device was activated for a 3 minutes period. The number of insects that landed and attempted to bite (insect settled and attempted to penetrate the skin) was recorded over the 3 minutes period. Insects were not allowed to bite; this is a health and safety requirement. Almost all were eliminated at the time of landing a slap; in order not affect repetitions of the same mosquito landing.

3. Human volunteers. Four human volunteers three were men volunteer nº 1, 3, and 4 and a women volunteer nº2 (menstrual period) have consciously collaborated in this field test, conformed consent.

Test subjects were asked to avoid alcohol, caffeine, tobacco and fragrance products (e.g., perfume, cologne, hair spray, lotion, etc.) for 12 hours before, and during, the test.

4. Experimental design. Two devices were assessed, provided by the sponsor; the sonic and portable R-101 device.

Four volunteers were positioned in the mosquito affected test area, forming a virtual square spaced 2 meters from each other.

Two opposite volunteers have got a device (turned on) during the repetition, and the other two volunteers have not got device.

The volunteers were standing.

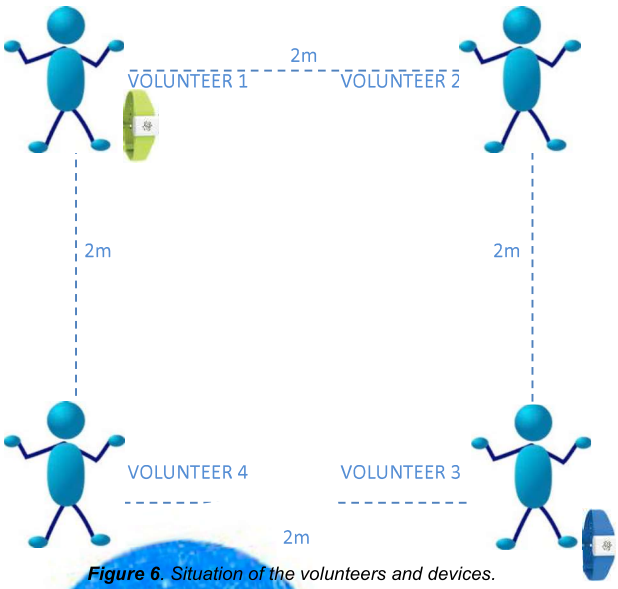
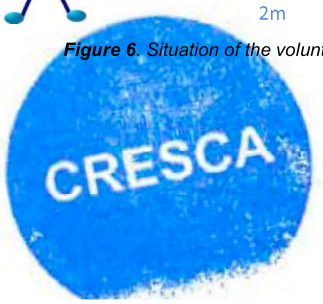


Figure 6*. Situation of the volunteers and devices.*



5. Repetitions. Eight repetitions were performed.

Each repetition lasted 3 minutes.

At the end of each repetition the device was given to the next volunteer.

At the end of the test, each volunteer had performed 4 repetitions with device, and 4 repetitions without device.

	Rep.1	Rep.2	Rep.3	Rep.4	Rep.5	Rep.6	Rep.7	Rep.8
Volunteer 1	DEVICE 1	No device	DEVICE 2	No device	DEVICE 1	No device	DEVICE 2	No device
Volunteer 2	No device	DEVICE 2	No device	DEVICE 1	No device	DEVICE 2	No device	DEVICE 1
Volunteer 3	DEVICE 2	No device	DEVICE 1	No device	DEVICE 2	No device	DEVICE 1	No device
Volunteer 4	No device	DEVICE 1	No device	DEVICE 2	No device	DEVICE 1	No device	DEVICE 2

Figure 7. *Sequence of repetitions and volunteer turn device.*

6. Procedure. The field test was conduced on Wednesday 15th July 2015.

All the repetitions were replicated in the same conditions of temperature (31ºC and 43%HR).

The sonic devices were turned on five seconds before starting each repetition.

The sonic devices were turned off five seconds after ending each repetition.

RESULTS and DATA ANALYSIS

A decrease in the number of mosquitoes landing on the volunteer with the device after activation was compared with before the activation (Table 2, page 9).

In terms of percentage reduction, is not possible to average the four volunteers results, because each volunteer offers several attractive parameters. But all the volunteer's results are significant and show high reduction on mosquito landings compared with itself previous landings.

In terms of percentage reduction, the device resulted a range of mosquito reduction from 52.63% to 82.35%.

It can be concluded that the R-101 device has indicated a repellent effect against *Aedes albopictus* mosquitoes.

Table 1. Total of *A. albopictus* mosquitoes landed on each volunteer with and without device, over 8 experimental repetitions.

	Rep.1	Rep.2	Rep.3	Rep.4	Rep.5	Rep.6	Rep.7	Rep.8
Volunteer 1	0	3	1	5	0	4	2	5
Volunteer 2	5	1	5	3	3	2	6	3
Volunteer 3	2	4	2	7	1	4	0	2
Volunteer 4	4	3	2	0	11	0	1	1

Device #1
Device #2
Without device

***Figure 8**. Sequence of repetitions and mosquito landings.*

Table 2. Percentage of *A. albopictus* mosquito's landings reduction present on each volunteer with and without device, over 8 experimental repetitions.

Volunteer	Rep	Device	NO Device	Rep	Results
1	R1	0	3	R2	3 mosquito landings with Device R-101.
	R3	1	5	R4	17 mosquito landings without device.
	R5	0	4	R6	Reduction of 14 mosquito landings (17-3).
	R7	2	5	R8	
TOTAL	**#**	**3**	**17**	**#**	$Effectiveness_{V1} = \frac{14}{17} \cdot 100 \approx 82,35\%$
2	R2	1	5	R1	9 mosquito landings with Device R-101.
	R4	3	5	R3	19 mosquito landings without device.
	R6	2	3	R5	Reduction of 10 mosquito landings (19-9).
	R8	3	6	R7	
TOTAL	**#**	**9**	**19**	**#**	$Effectiveness_{V2} = \frac{10}{19} \cdot 100 \approx 52,63\%$
3	R1	2	4	R2	5 mosquito landings with Device R-101.
	R3	2	7	R4	17 mosquito landings without device.
	R5	1	4	R6	Reduction of 12 mosquito landings (17-5).
	R7	0	2	R8	
TOTAL	**#**	**5**	**17**	**#**	$Effectiveness_{V3} = \frac{12}{17} \cdot 100 \approx 70,59\%$
4	R2	3	4	R1	4 mosquito landings with Device R-101.
	R4	0	2	R3	18 mosquito landings without device.
	R6	0	11	R5	Reduction of 14 mosquito landings (18-4).
	R8	1	1	R7	
TOTAL	**#**	**4**	**18**	**#**	$Effectiveness_{V4} = \frac{14}{18} \cdot 100 \approx 77,78\%$

Figure 9. *Effectiveness of the R-101 device on each volunteer.*

Table 3. Comparative results about landings occurred with the use of each device.

	Mosquito landings Device #1	Mosquito landings Device #2
Volunteer 1	3	0
Volunteer 2	3	6
Volunteer 3	3	2
Volunteer 4	1	3
TOTAL LANDINGS	***10***	***11***

Figure 10. *Landings with each device.*

OBSERVATIONS

Observations of the *Aedes albopictus* behaviour against the devices*:*

- The number of mosquito landings on volunteer with device is significantly lower than volunteers without device.
- The number of mosquito landings on volunteer with device is significantly lower than the same volunteer in previous/rear repetitions without device.
- The number of mosquito landings obtained with “Device #1” or “Device #2” are equivalent.

CONCLUSIONS

R-101 effects on *Aedes albopictus*

- The number of mosquito landings suffered on the volunteer with device R-101 is lower than the volunteer without device.
- The equivalent number of landings with both devices demonstrates that the results are not aleatory.
- Even though was theorized that women had some hormonal attractant that brought them to the attention of mosquitoes more than men. Even menstruation and ovulation could be factors in this. But such an attractant was never found. However, looking the results , gender now seem to be the all-important factor in mosquito "bite" susceptibility.
- ***It can be concluded that the R-101 device has indicated an important and significant repellent effect against Aedes albopictus mosquitoes in this field test.***

RECOMMENDATIONS

- *Although the information in these tests is valid to observe the behaviour on Aedes albopictus mosquitoes, it would be of great interest to carry out other tests in order to measure other effects on mosquitoes.*
- *More repetitions are recommended in order to obtain more significant results, and more conclusive results regarding behaviour.*
- *Longer repetitions are recommended for long-term results.*