Palatability of individuals of *Blattella germanica* dead for Imidacloprid gel bait assumption. Evaluation of secondary killing.

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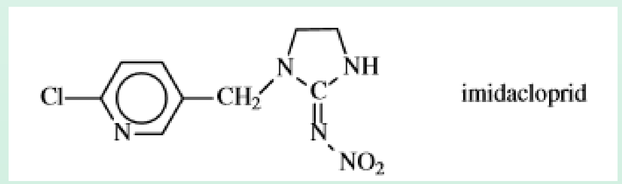
INTRODUCTION

One of principal methods of control for *Blattella germanica* is the application of insecticide baits. These baits are made from active ingredients with low repellency and a matrix food attractant. One of the most common active ingredients used is Imidacloprid. *B. germanica* is an omnivorous insect with a propensity toward necrophagy and cannibalism. The event in which insecticide residue is transferred from a dead cockroaches to another that feeds on it is termed **«secondary killing».**

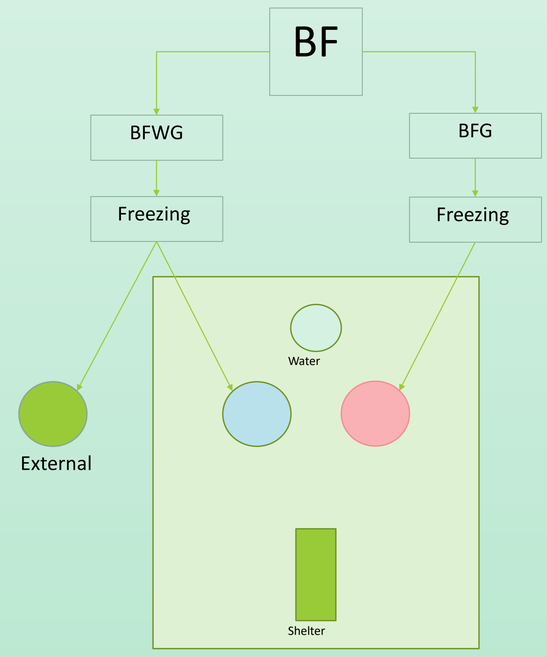
In this study, we investigated the difference in palatability between insecticide-killed *B. germanica* and frostbite-killed cockroaches without any insecticide residue, and the consequent level of secondary killing.

MATERIALS AND METHODS

B. germanica used in this study was from a colony maintained in the laboratory of Entostudio s.r.l.. 3 commercially available insecticide gel baits were tested in this study, all cointaining **2.15% Imidacloprid**. 6 replicates for each gel were carried out.



Two main group of cockroaches were used: *B. germanica* Test (**BT**) and *B. germanica* Food (**BF**). BF are the specimens used as food for BT during the test. BF was compound of two sub-groups: *B. germanica* Food Gel - **BFG** (cockroaches killed by the gel bait consumption) and *B. germanica* Food Without Gel - **BFWG** (cockroaches killed by freezing).



20 BT adult cockroaches (10 ♂♂ and 10 ♀♀) were starved for 3 days in an arena. At the end of the starving period, BFG and BFWG were positioned in the BT arena. Three categories of data were collected: i) weight losses of BFs internal and external, ii) mean number of active cockroaches feeding on BFG and on BFWG, and iii) number of dead individuals.

i) To evaluate the natural variation of weight of the defrosted cockroaches after 24 hours, the BFs Control were used (External BF).

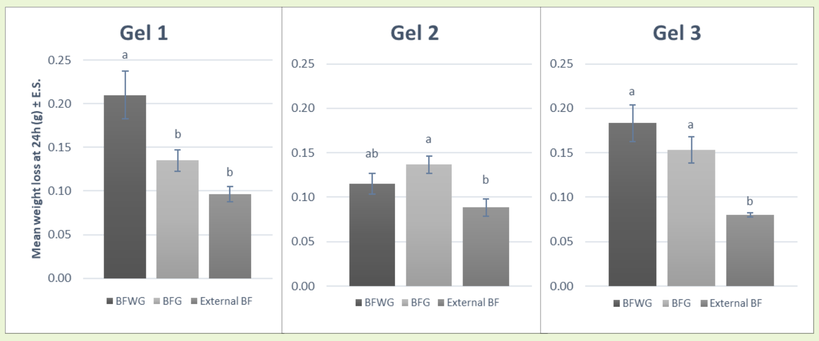
ii) All the arenas were filmed during the first 90 minutes. The videos were analysed couting the number of BT feeding on BFG and BFWG every 2 minutes for the first 60 minutes, and every 5 minutes for the remaining 30 minutes.

iii) After 24h, the dead BTs were counted.

RESULTS

WEIGHT LOSS

For the Gel 1 and Gel 3, the BFWG was consumed in a significant amount. For the Gel 2, the BFG was significantly more consumed that BFWG. The weight loss of BFG of Gel 1 and of BFWG of Gel 2 was not significant.



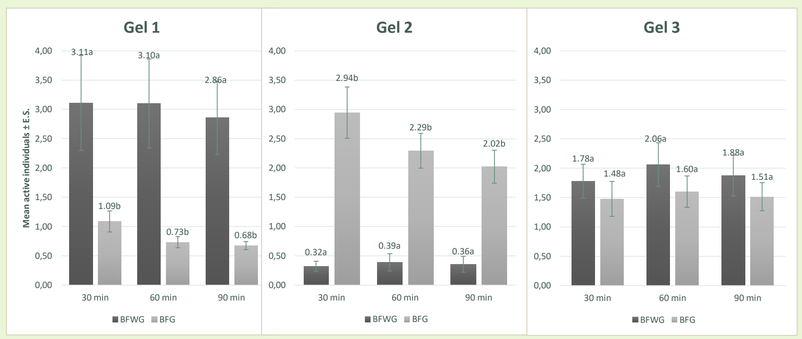
ACTIVE COCKROACHES

Cockroaches behaved in different ways for each of the three cases.

In the case of Gel 1, cockroaches were found significantly more frequently on BFWG.

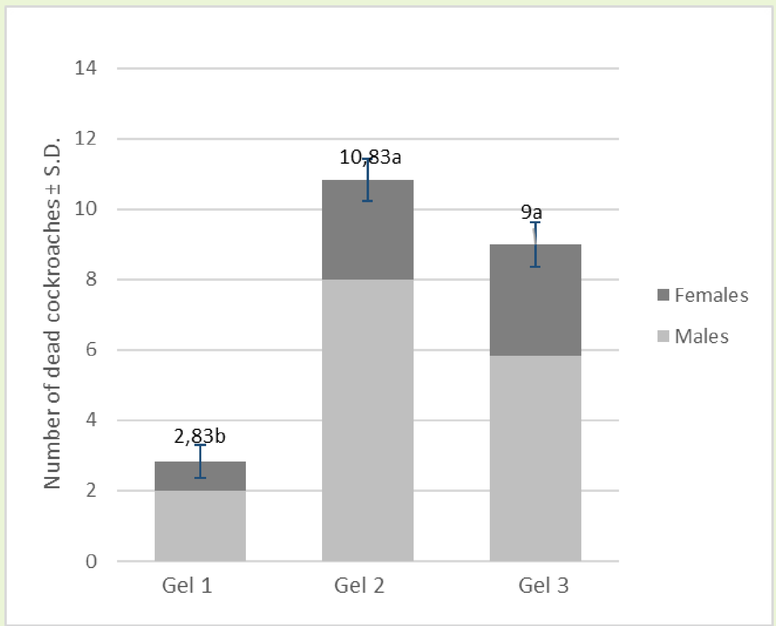
Gel 2 showed the opposite situation, with cockroaches significantly more active on BFG.

Gel 3 did not exhibit any preferences between BFG and BFWG.



DEATH RATE AFTER 24 H

Gel 1 caused the lowest mortality rate of secondary killing after 24 hours, with 14.15% of dead individuals in all replications. Gel 2 and Gel 3 caused 54.15% and 45% mortality, respectively.



DISCUSSION

BT behaved differently in each of the three cases.

For Gel 1, it seems that BT could distinguish BFG from BFWG, showing a clear preference for the latter, with a consequent mortality quite low.

In the case of Gel 2, the results were the opposite. It appears that BT preferred BFG, but the weight loss of BFG, was not significantly different from that of BFWG. The hypothesis for this could be that the cockroaches which fed on BFG quickly get intoxicated, consuming just a small amount. In fact, the mortality rate is high.

For Gel 3, BT did not show a strong preference from BFG to BFWG. In fact, the weight losses and the intensity of frequentation were comparable. The mortality in the Gel 3 is not statistically significant respect to the Gel 2.

CONCLUSIONS

The study shows how not just the Active Ingredient affects the palatability of cockroaches dead for the assumption of Imidacloprid baits, but co-formulants play a key role too. The baits should be therefore developed not only evaluating the immediate efficacy but also considering the secondary killing consequences. More studies should be done to evaluate the palatability of other baits and active ingredients, toward other species of infesting cockroaches too.

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