

## Second Evaluation of The Fool-a-bug® V-m Protector as an Exclusion Device Against Foraging Red Imported Fire Ants and German Cockroaches

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A device which can exclude foraging insects and prevent recruitment could prove valuable for free standing vending machines and/or free standing food service equipment, such as food preparation tables. This was the second trial conducted in the laboratory to determine the effectiveness of the Fool-A-Bug® V-M Protector (**Fig. 1**) (manufactured by Alternative Control Systems Corporation, 4046 B Fernandina Road, Columbia, SC 29212-3367) as a foraging deterrent against the red imported fire ant, *Solenopsis invicta* Buren (Hymenoptera: Formicidae) (**Fig. 2**), and the German cockroach, *Blatella germanica* (Hymenoptera: Formicidae) (**Fig 3**).



**Fig. 1.** A Fool-A-Bug® V-M Protector Device.



**Fig. 2.** *Solenopsis invicta* Buren (Hymenoptera: Formicidae)



**Fig. 3.** *Blatella germanica* (Hymenoptera: Formicidae)

## Materials and Methods

Eight Fool-A-Bug V-M dishes were washed with mild soap and warm water and then dried. They were then placed onto a 3/4 inch thick piece of plywood that measured approximately 5 inches by 5 inches. Four of the devices were placed on the plywood as they would naturally sit (raised) (**Fig. 4.**). This treatment will be referred to as the “Experimental device” in this report. The other four devices were placed into holes in the plywood which allowed them to rest on the outside lip (level) (**Fig. 5.**). This treatment will be referred to as the “Control device” in this report.



**Fig. 4. Experimental device**



**Fig. 5. Control device**

The plywood and device were placed in pairs (one Experimental device and one Control device) into a plastic rectangular box (“Rubbermaid Underbed Box” 9.8 Gal, approximate dimensions- 23 in. long by 17 in wide by 6 inches deep), which will be referred to as the “test arena” in this report. The devices were placed in the test arenas so that they were at least 6 inches away from any wall of the arena. The sides of the test arena were coated with a 1:1 mixture of Parade™ Vaseline and Squibb® Mineral Oil to prevent insect escape. The insect colonies were housed in separate containers. Fire ants were kept in a plastic box which measured approximately 16 in. long by 11 in wide by 4 inches deep. The sides of the box were coated with Fluon® to prevent ant escape. German cockroaches were kept in five gallon buckets sealed with a lid with a vent. These will be referred to as the “colony boxes” in this report.

The experiments were conducted in a tile-lined, windowless, room. Lighting consisted of a single, incandescent, 60 watt bulb located on the ceiling. An electric fan was placed at the lowest possible speed and directed across the top of the experimental area.

Upon initiation of the experiment, both insect species (fire ant and German cockroach) were allowed access to the arena for 4 hours before placing the V-M Protector® inside the arena. This allowed the insects time to become familiar with the arena.

## I. Red Imported Fire Ant

On 5 April 1999, four red imported fire ant colonies were collected from Royalty Pecan Orchard in Burleson County and placed into five gallon buckets. The sides of the buckets were coated in talcum powder to prevent escape. The buckets were brought back to the lab and the ants were allowed several days to rebuild. Each colony was provided water and crickets for food.

On 7 April 1999, water was slowly dripped into the colonies in the five gallon buckets over a period of approximately 8 hours. As the water level rose over the mound, the ants rose to the surface and formed a loose cluster of floating ants and brood. The ants were scooped from the five gallon buckets and placed in colony boxes. The ants were supplied water through a test tube plugged with cotton, and provided frozen crickets for food. A petri dish with holes in the lid was provided as shelter.

On 4 May 1999, 1/4 tablespoon of Jif® Crunchy Peanut Butter was placed into the bottom of eight 7.5 ml polyurethane vials. The inner walls of the vials were coated with Fluon® to prevent ant escape. The vials were then placed into 5/8 inch holes in a 3 1/2 inch wooden furniture leg that was provided by the Alternative Control Systems Corporation. The leg was placed in the bottom of the Fool-A-Bug V-M devices, and held upright using a small 1/2 inch square piece of double sided sticky paper attached to the bottom of the wooden leg. The Fool-A-Bug V-M devices were placed on the plywood and then placed in the test arena (**Fig. 6**).



**Fig. 6. Fire Ant Experimental dish**

The foraging bridge which connected the colony box to the test arena consisted of an aluminum strip, approximately 26 inches long by 2 inches wide, wrapped in clear packaging tape. It was bent into a slight “U” shape and attached to the colony box and test arena using tape. Water was provided in baby food jars with a rope for a wick and placed in the test arena. (**Fig. 7.**)



**Fig. 7. Red Imported Fire Ant Experiment**

The ants that managed to gain entry into the devices and climb up the wooden leg were then trapped in the bottom of the vials. At intervals of six hours, 1, 3, 7, 8, 9, and 10 days, the number of red imported fire ants trapped in the vials was recorded as well as the approximate number of ants visible on and in the Fool-A-Bug V-M device. The dishes were then removed from the colony boxes and thoroughly cleaned with mild soap and water and then dried.

Resulting insect numbers per dish were analyzed using the PC SAS and PROC MEANS by paired comparison ( $p < 0.05$ ).

## **II. German Cockroach**

On 18 May 1999, the insides of four five gallon buckets were thinly coated with a 1:1 mixture of Parade™ Vaseline and Squibb® Mineral Oil to prevent cockroach escape. Three sheets of wadded up paper towel was placed in the bottom of the five gallon buckets and in the test arena to provide shelter. A foraging bridge was constructed from Tygon® tubing with an inside diameter approximately  $\frac{1}{2}$  inch. A  $\frac{1}{2}$  inch hole was drilled into the base of the five gallon bucket and the test arena. The Tygon® tubing was attached to the holes in the five gallon bucket with silicone and then attached to the test arena.

Eight Victor® Roach Magnet boxes (**Fig. 8**) were obtained from Alternative Control Systems Corporation. The Roach Magnet consisted of a cardboard box, approximately 3 inches long by 2  $\frac{1}{2}$  inches wide by 1 inch high. There were several openings, one in the front, another on the top in the far corner, and a large opening on one side (approximately 3 inches long by 1 inch high). A sticky glue was located on the bottom of the inside of the box, and a small piece of Balsa wood (approximately  $\frac{1}{2}$  inch by  $\frac{1}{2}$  inch) soaked in attractant was located on the inside ceiling of the box. The cardboard box was cut apart so that only the bottom of the box (where the sticky glue was located) remained. This measured approximately 2 inches by 2 inches. The Balsa wood attractant was torn from the inside ceiling of the box and placed in the middle of the sticky glue. The trap and attractant were placed in the bottom of the eight Fool-A-Bug V-M devices. (**Fig. 9**)



**Fig. 8. Victor® Roach Magnet**



**Fig. 9. Top View of the German cockroach trap and attractant**

The Fool-A-Bug V-M devices were placed on the 3/4 inch thick plywood and then placed in the test arena. Water was provided in baby food jars with a rope for a wick and placed in the test arena. Twenty-five German cockroaches were placed in each colony box labeled. At intervals of six hours, 1, 3, and 7 days, the of German cockroaches trapped on the Roach Magnet was recorded (**Fig 10**).



**Fig. 10. German Cockroach Experiment**

Resulting insect numbers per dish were analyzed using the PC SAS and PROC MEANS by paired comparison ( $p \leq 0.05$ ).

## Results and Discussion

### I. Red Imported Fire Ant

As shown in Table 1 and Table 2, on Day 3 and Day 7 of the experiment, there was a statistically significant difference between treatments. There was also an average numerical difference of 84% in the number of fire ants observed in the vials of Experimental Device versus Control Device, and an average numerical reduction of 33% of the number of fire ants observed in and around the Experimental Device versus Control Device. Results indicate that the Fool-A-Bug<sup>®</sup> Protector significantly reduced the number of foraging red imported fire ants that gained access to a food source placed within the device versus a food source in devices with the flange touching the floor. However, these devices did not completely exclude the ants.

### II. German Cockroach

As in the Fire Ant Experiment, the Fool-A-Bug<sup>®</sup> Protector was found to numerically reduce the number of cockroaches gaining entry into the Experimental Device versus the Control Device (Table 3). While there were no statistically significance differences between treatments ( $P \neq 0.05$ ), there was an average numerical reduction of 82%. Results indicate that the Fool-A-Bug<sup>®</sup> Protector reduced the number of foraging German cockroaches that gained entry into the device. Two of the devices completely excluded the German cockroaches.

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**Table 1. Fire Ant Experiment (“In Vial”)-** Mean number of red imported fire ants, *Solenopsis invicta* Buren, counted in vials of Experimental Device versus Control Device following exposure of the device to laboratory colonies (4 replicates).

<b>Fool-A-Bug<sup>®</sup> Protector Device</b>	<b><u>6</u> hours</b>	<b><u>1</u> Day</b>	<b><u>3</u> Days</b>	<b><u>7</u> Days</b>	<b><u>8</u> Days</b>	<b><u>9</u> Days</b>	<b><u>10</u> Days</b>
Control Device	1.50	11.00	19.50 *	22.00 *	17.00	17.25	16.25
Experimental Device	0.00	1.25	1.00*	2.25*	3.75	5.00	3.50
Probability*	0.3559	0.0742	0.0002	0.0015	0.0900	0.1811	0.0814
t-statistic	1.0000	2.1589	8.3433	5.4997	2.0191	1.5129	2.0920
DF= 6.0							

\*Significantly different means in columns using the Student’s *T* test and PROC TTEST ( $P \neq 0.05$ ).

**Table 2. Fire Ant Experiment (“In and Around Device”)-** Mean number of red imported fire ants, *Solenopsis invicta* Buren, counted in and around Experimental Device versus Control Device following exposure of the device to laboratory colonies (4 replicates).

<b>Fool-A-Bug® Protector Device</b>	<b><u>6</u> hours</b>	<b><u>1</u> Day</b>	<b><u>3</u> Days</b>	<b><u>7</u> Days</b>	<b><u>8</u> Days</b>	<b><u>9</u> Days</b>	<b><u>10</u> Days</b>
Control Device	3.75	16.25	15.75*	14.00	10.50	7.00	11.75
Experimental Device	2.25	5.00	1.50*	6.75	5.75	12.25	15.75
Probability	0.5717	0.1088	0.0060	0.2466	0.2584	0.5367	0.7357
t-statistic	0.5980	1.8821	4.1461	1.2837	1.2483	-0.6551	-0.3536
DF= 6.0							

\*Significantly different means in columns using the Student’s *T* test and PROC TTEST (P# 0.05).

**Table 3. German Cockroach Experiment-** Mean number of German Cockroaches, *Blatella germanica*, counted in Victor® Roach Magnet traps in Experimental Device versus Control Device following exposure of the device to laboratory colonies (4 replicates).

<b>Fool-A-Bug® Protector Device</b>	<b><u>6</u> hours</b>	<b><u>1</u> Day</b>	<b><u>3</u> Days</b>	<b><u>7</u> Days</b>
Control Device	0.00	2.75	5.00	5.00
Experimental Device	0.00	0.00	1.25	1.50
Probability*	-----	0.1572	0.1734	0.2057
t-statistic	-----	1.6160	1.5444	1.4190
DF= 6.0				

\*No significant differences between means using the PROC TTEST (P# 0.05).