

FINAL REPORT

Woodstream Corporation Mosquito Magnet Executive Trap Evaluation Proposal

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ABSTRACT

The MM-X trap significantly outperformed the MM-Exec and Terminator in species and numbers of mosquitoes collected. The MM-Exec and Terminator were not significantly different in numbers of mosquitoes captured. The Terminator caught several hundred insects during each trapping event; however, over 95% of the Terminator collection was non-mosquitoes.

OBJECTIVE

The aim of this study was to compare the mosquito-trapping prowess of the Mosquito Magnet Executive (MM-Exec), Terminator, and Mosquito Magnet X (MM-X). This study was designed to measure numbers and species caught and not to assess mosquito control efficacy.

MATERIAL AND METHODS:

Study Site:

The study was performed October 11-24, 2012 at three homes in a residential subdivision in Panama City Beach, Florida. The subdivision is located at the following Google Earth coordinates: 30° 09'56.02" N and 85° 46'25.72" W (Fig.1).



Fig. 1. Location of three trapping sites in Palm Bay Subdivision, Panama City Beach, FL.

Site 1 was located 336' from Site 2 and 414' from Site 3. Site 2 was 317' from Site 3. A ground level picture of each site is shown in the following photos (Fig. 2-4).



Fig. 2. Site 1 - 8205 Grand Palm Blvd.



Fig. 3. Site 2 - 8213 Grand Palm Blvd.



Fig. 4. Site 3 - 8214 Grand Palm Blvd.

Traps were positioned in the back yards of each home which were surrounded by a wooden fence and varied in the amount of foliage as follows. Site 1 was more open with palm trees, banana trees, and swimming pools surrounding the trap site (Fig. 2). Site 2 was located in the back corner of the homeowner's yard near a cane patch in a relatively dense oak-pine habitat (Fig. 3). Site 3 was kept in a natural state with dense native vegetation including beach oaks, palmettos and other leafy plants (Fig. 4).

Traps:

The MM-X was supplied with a 20# cylinder set to deliver CO₂ through a 1/8" diameter plastic hose at 500 ml/min through a 15 psi regulator, filter, and .007 restrictor orifice. The base of the trap was suspended 18 in. from the ground. The trap was supplied with one octenol cartridge as an additional attractant and powered by two serially connected 6V 13 Amp/H gel cell batteries.

The MM-Exec was supplied with a 20# propane tank and operated for continuous operation according to manufacturer directions contained in the shipping box. One octenol cartridge was supplied as an additional attractant.

The Terminator used a black light instead of CO₂ as the primary attractant. It was supplied with two octenol cartridges, powered by an AC fan, and suspended ca. 3 ft. from the base to the ground.

Experimental Design:

A 3X3 Latin square repeated 3 times was utilized for this study. Treatments were trap models (3) and the blocking variables were location (3 sites) and dates (9). Average trap counts were derived from the number of

mosquitoes collected from each trap over 9 collecting events. Traps were randomly assigned to each home site and operated for a period of 23 hrs from 5 p.m. to 4 p.m. C.T. the following day ensuring both day and night biting mosquitoes were accessible. The traps were rotated clockwise from Site 1 to 2 and then to 3, and so forth until each trap had operated in all sites three times. A complete rotation through all sites constituted one repetition. Three repetitions were conducted. Traps were re-run at their same location on three events: 1) power outage turned off the Terminator trap; 2) animal tripped MM-X battery wires; and 3) windy day resulting in an excessively low catch (< 25 for all three traps). Mosquitoes were removed, sorted, identified to species, and counted after each collection.

Environmental Conditions:

Temperature, humidity, wind speed, and direction data were obtained from a weather station located about one mile due east of the study site (Table 1). Ambient conditions were normal for October with temperatures ranging in the upper 70s and low 80s during the day and lower 50s to upper 60s during the evenings. Humidity averaged between mid-50s and lower 80s. Wind averaged about 1 mph except on one day, Oct. 16 when it elevated to 3 mph with wind gusts to 16 mph. This was the day mosquito counts fell to very low levels and consequently was repeated on Oct 24. Winds prevailed from the south on six dates and from the north on four. It was unusually dry during most of the study. 1.3” of rain fell on October 18. This was the only precipitation for the month. No trapping was conducted on that date.

Table 1. Weather data collected while trap study was ongoing. Source: <http://wunderground.com> Oakwood Court, PCB, FL weather station (KFLPANAM23).

Date	TempHi	TempLo	TempAvg	HumHi	HumLo	Hum Av	WSHi	WSAvg	Wgust	Wdir
10-Oct-12	80.1	63.9	71.8	97.0	56.0	78.0	9.0	1.0	10.0	WSW
11-Oct-12	81.8	65.1	71.6	93.0	52.0	76.0	8.0	1.3	11.0	WSW
12-Oct-12	81.7	66.9	72.0	97.0	55.0	78.0	8.0	0.8	9.0	WSW
13-Oct-12	82.7	67.0	74.3	91.0	61.0	76.0	9.0	1.8	13.0	E
14-Oct-12	81.4	66.8	74.5	95.0	68.0	81.0	8.0	1.3	8.0	SSE
15-Oct-12	83.1	66.6	74.3	98.0	65.0	82.0	9.0	1.2	11.0	W
16-Oct-12	76.2	62.3	68.4	73.0	33.0	55.0	13.0	2.6	16.0	NNE
17-Oct-12	77.2	63.3	69.5	86.0	55.0	70.0	8.0	1.0	9.0	S
19-Oct-12	78.2	59.9	69.6	99.0	29.0	57.0	9.0	1.5	11.0	WNW
20-Oct-12	76.0	53.3	65.8	83.0	33.0	57.0	8.0	0.8	11.0	WSW
21-Oct-12	77.8	53.1	65.3	93.0	42.0	70.0	9.0	1.5	11.0	NNE
22-Oct-12	80.0	58.6	68.3	93.0	48.0	73.0	9.0	1.3	11.0	NNE
23-Oct-12	79.1	60.9	69.8	93.0	60.0	79.0	6.0	1.1	9.0	E
24-Oct-12	81.7	64.0	71.4	95.0	53.0	78.0	8.0	1.3	10.0	NNE

RESULTS:

Total numbers of mosquitoes collected were adjusted by log+1 transformation to insure normality. Analysis of variance was conducted on transformed means of the main effect variables, i.e. trap, location, and date. There was no significant difference ($p>0.05$) in location or date; however, there was a significant difference ($p=0.009$) in traps. Trap means were subjected to

Tukey's Studentized Range and Duncan Mean Separation tests. The MM-X trap caught significantly ($p < 0.05$) more mosquitoes than the MM-Exec and Terminator. Although the mean was higher in the Terminator, there was no significant ($p > 0.05$) difference between the MM-Exec and Terminator because of large variance. Plotted non-transformed means showed the MM-X captured on average near or above 2X the number of mosquitoes in the Terminator and MM-Exec traps (Fig. 5).

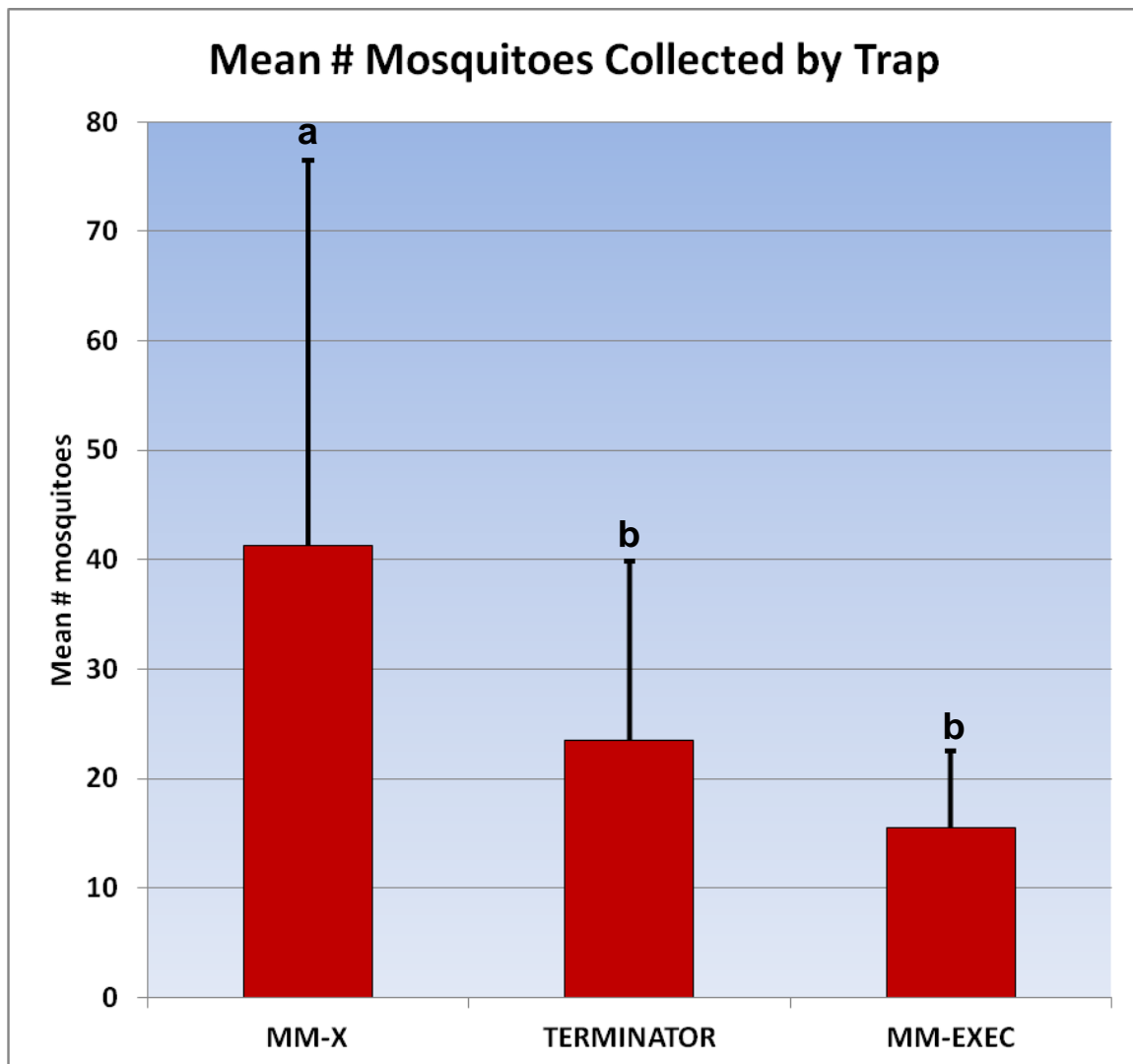


Fig. 5. Average mosquito collection and 95% confidence limit by trap (n=9). Means marked with different letters are significantly different at $p < 0.05$.

The MM-X captured eleven species of mosquitoes, while the MM-Exec captured nine (Fig. 6). *Aedes albopictus*, *Culex erraticus*, and *Psorophora ferox* were collected only from the MM-X, while *Aedes canadensis* was uniquely collected from the MM-Exec. These observations may have been incidental and associated more with trap date and location. Over 95% of the insects collected in the Terminator were non-mosquitoes including: gnats, beetles, ants, flies, true bugs, moths, wasps and midges. Most of the mosquitoes recovered from the

Terminator could not be identified to species level due to the poor conditions of the specimens. As such, identifications were limited to genera.

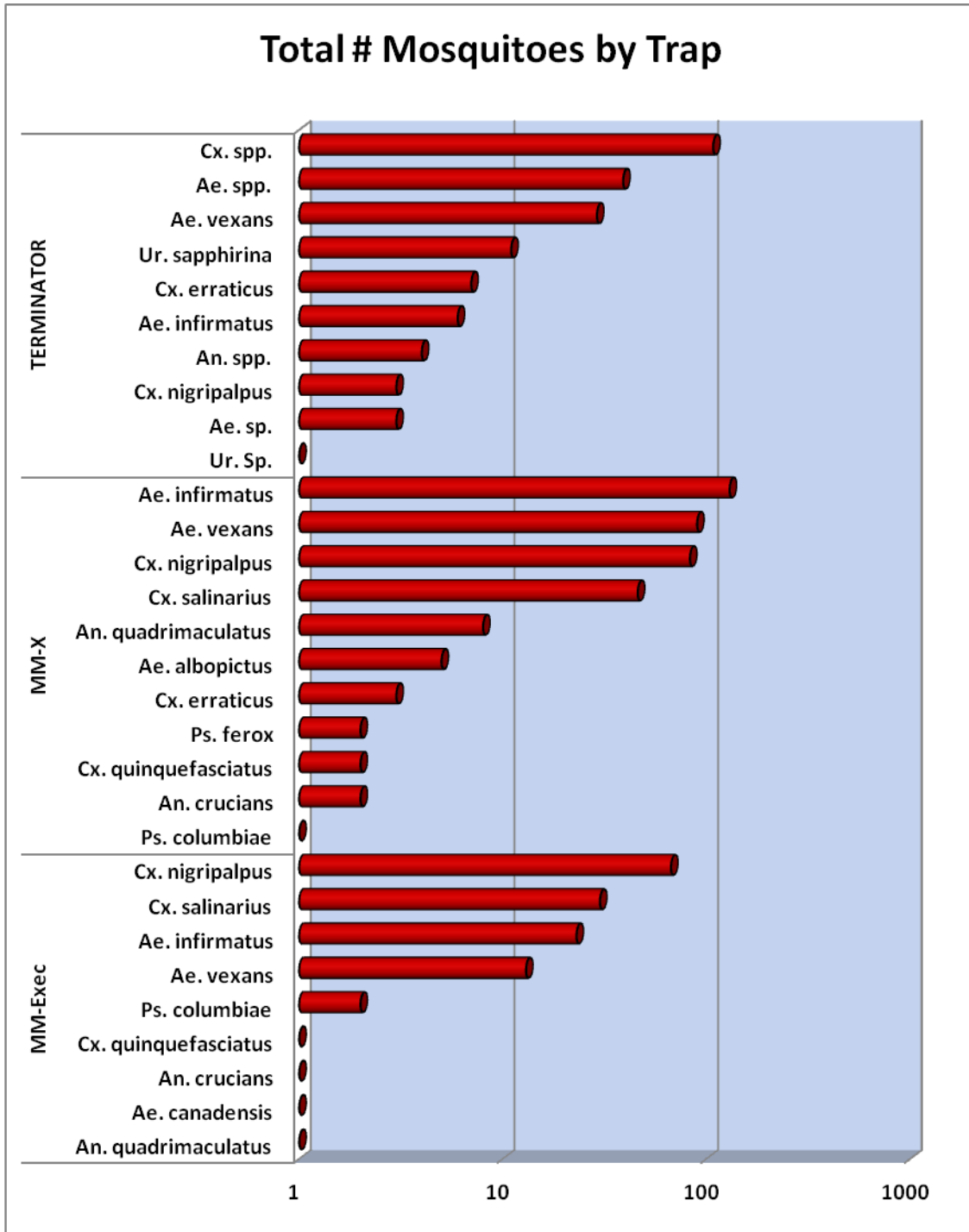


Fig. 6. Species composition for the Terminator, MM-X, and MM-Exec.

CONCLUSIONS:

Operationally, all traps performed flawlessly. The MM-X collected significantly more mosquitoes than the other two traps probably attributable to the source of CO₂ utilized. Compressed CO₂ gas at 500 ml/min was deployed in the MM-X trap, whereas, the MM-X Exec produced CO₂ converted from propane.

Previous studies have shown similar results when comparing pure CO₂ with propane traps regardless of the manufacturer. The Terminator trap performed surprisingly well considering it did not deploy CO₂. It has been my experience, that all of the most productive traps use CO₂ as an attractant. Black lights lure a large variety of insects most of which are non-biting. The Terminator could be significantly enhanced if the light was replaced or supplemented with CO₂.