Improving entomological surveillance by minimizing insect damage in traps

Thomas Hempy[1], Lee Cohnstaedt[2], Elin Maki[2], and Dustin Swanson[2]

[1]Department of Biology, College of Arts and Sciences, Kansas State University

[2]Arthropod-Borne Animal Diseases Research Unit, Agricultural Research Service, United States Department of Agriculture

Abstract

In the United States, mosquito control is a multi-billion dollar a year business. Municipal, state, and federal mosquito control organizations use mosquito surveillance traps such as the CDC light trap to target insect population control measures and monitor for pathogens. Most surveillance uses mosquito traps with fans. However the mosquitoes in the traps can be damaged during collection and storage by the fan, dehydration, and during sorting. This research shows the best ways to prevent the mosquitoes from being damaged.

Purpose

The purpose of the experiment is to determine how much damage is caused by the fan, dehydration, and how long insects remain in the trap; and to determine the best way in preventing the damage.

Questions, Hypotheses, and Predictions

Question: (1) What are the causes of damage in the mosquito traps? (2) What are the best ways to prevent the damage?

Hypothesis: H_0 Traps do not cause damage to the insects.
H_1 Passing through the fan blades results in damage.
H_2 Dehydration leads to insect death makes the insects more brittle.
H_3 Storage time weakens the insects and results in more damage during sorting.

Predictions: (1) The six volt battery charged fan will do less damage then the twelve volt.
(2) The trap with the apple will have the least amount damage in the dehydration tests.
(3) Keeping the mosquitoes in the traps for 24 hours will have cause a lot of damage.

Study System

Each leg, wing, and antenna on the mosquitoes represent a point. When a mosquito is missing a leg, wing, and/or antenna, the points are subtracted from 10. The higher the points the less damaged the mosquito.

Culex *quinquefasciatus*

Culex *tarsalis*

Methods and Experimental Design

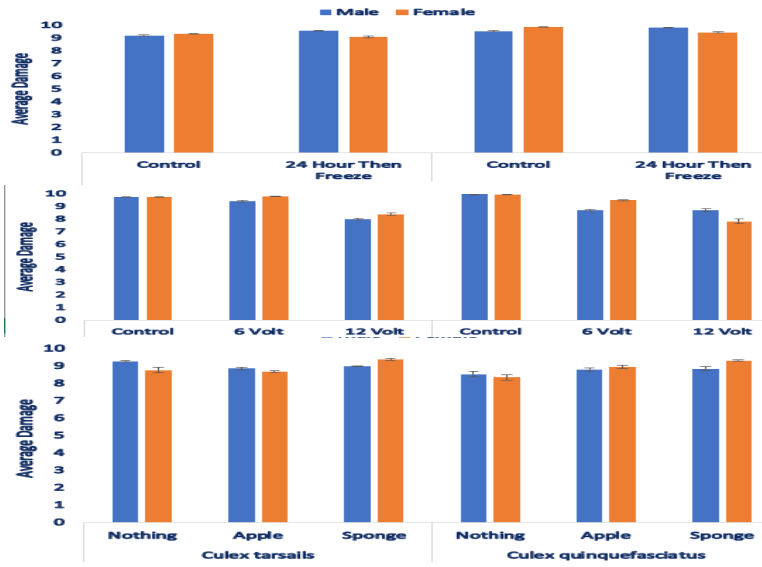
	Mixed together	Separate species
Culex tarsalis	30 insects	30 insects
Culex quinquefaciatus		30 insects

	Fan running on 6 volt battery	Fan running on 12 volt battery	Control (mosquitoes not passed through a fan)
Culex tarsalis	30 insects	30 insects	30 insects
Culex quinquefaciatus	30 insects	30 insects	30 insects

	Apple	Sponge	No food or water
Culex tarsalis	30 insects	30 insects	30 insects
Culex quinquefaciatus	30 insects	30 insects	30 insects

Assessing the damage

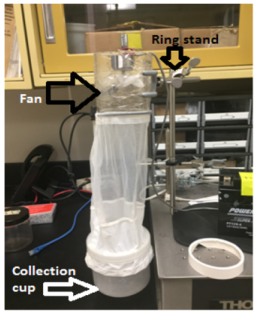
Placing the mosquitoes through the fan

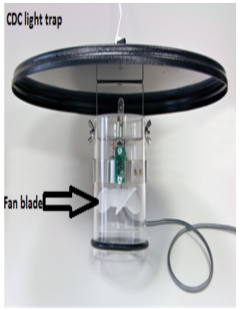


Data collected with standard error bars

Results

- Not much damage in sorting trial
- Not much damage in dehydration trial
- Fan trials had the most damage
- Culex *tarsalis* overall took less damage
- Males and Females had similar damage





Conclusion

The following three things recorded best for least damage: adding a moist sponge in the trap, using a six volt battery to power the fan, and leaving the insects in the traps for 24 hours doesn't seem to have an effect on the mosquitoes.

Future Directions

In the future there should be more trials for each test. It would also be useful to test different disease vector species of different sizes. For example, house flies and biting midges. There should also be experiments that would test the suction rate of the fans, that way it could decided what is needed to be done to make the best trap, that catches the most insects and keeps them healthy.

References

Focks, D. A. 2003. A review of entomological sampling methods and indicators for dengue vectors. TDR, Geneva, Switzerland WHO..

Jones, J. W., R. Sithiprasasna, S. Schleich, and R. E. Coleman. 2003. Evaluation of selected traps as tools for conducting surveillance for adult *Aedes aegypti* in Thailand. *J Am Mosq Control Assoc* 19:148–150.

Schoeler, G. B., S. S. Schleich, S. A. Manweiler, V. L. Sifuentes, and J. E. Joy. 2004. Evaluation of surveillance devices for monitoring *Aedes aegypti* in an urban area of northeastern Peru. *J Am Mosq Control Assoc* 20:6–11.

Acknowledgements

Thanks to Bill Yarnell and Jeremy Marshall