

## Testing Different Products for *Aedes albopictus* (Skuse) (Diptera: Culicidae) Control

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### ABSTRACT

The Asian tiger mosquito, *Aedes albopictus* (Skuse) (Diptera: Culicidae) is the insect carrier for Dengue Fever. Since there is no medical treatment to prevent Dengue Fever, control measures to reduce the spread of this disease in Hawai'i are targeted towards reducing the mosquito population. Several products that can be purchased in a grocery or garden store were tested on the larvae of the Asian tiger mosquito. The products tested were Neem Seed Oil, Thuricide, Dawn, and Suave.

All the products killed the mosquito larvae. Neem Seed Oil killed 97% of the mosquito larvae on the first day and 100% by the second day at  $\frac{1}{4}$  tsp per gallon water. Thuricide killed 98% at  $\frac{1}{4}$  tsp per gallon water on the first day and 100% by the second day. Dawn killed 96% on the first day at 0.0625 ml per gallon water and 100% by the second day. Suave killed 67% at 0.03125 ml per gallon water on the first day and 100% on the second day.

### INTRODUCTION

To date, there have been 108 confirmed cases of Dengue Fever in Hawai'i. The insect carrier for this disease is the Asian tiger mosquito, *Aedes albopictus* (Skuse) (Diptera: Culicidae). Since there is no vaccine or medical treatment to prevent Dengue Fever, control of this disease is targeted at reducing the mosquito population.

Homeowners have been encouraged to help reduce mosquito populations by removing standing water where mosquito larvae breed though in some cases where areas are too large to remove the water or water collects when it rains, removal of all standing water is not feasible. The purpose of this study was to test several relatively safe products that could be purchased at the grocery or garden store to determine which products and at what concentrations these products could kill mosquito larvae. If any of these fairly common household products had insecticidal effects, homeowners would have a means to kill mosquito larvae in water reservoirs around their homes that were too large to eliminate.

### MATERIALS AND METHODS

Mosquito larvae were reared in large plastic tubs (breeding tubs) filled with water collected from plastic tubs (collecting tubs) that had been set under trees as mosquito egg laying sites. The breeding tubs were held outdoors under shelter until experimental use. The collecting tubs were refilled with water and reset under trees and then emptied every 2 weeks during the experimental period to insure a constant supply of mosquito larvae (Ali et al. 1995). The mosquito larvae were identified as *A. albopictus* before experimental use.

**Neem Seed Oil.** Neem Seed Oil is a product that is produced using the extract from the Neem plant. The extract, azadiractin, has been shown to have insecticidal properties for a wide variety of insects though not specifically for mosquito larvae. Neem Seed Oil was purchased at a garden store. The recommended concentration was 1 tsp per gallon water. One tsp of Neem Seed Oil was mixed with one gallon of water. After mixing, 200 ml of the solution was placed into a 700 ml glass jar. Five mosquito larvae from the breeding tub were collected and placed into the glass jar of Neem Seed Oil solution. Twenty replicates were made. The following day, the number of mosquito larvae alive in each jar was recorded. If all the mosquito larvae died, the test was repeated with the concentration of Neem Seed Oil reduced by 50%. The test was repeated using a 50% reduction of the concentration until some of the mosquito larvae survived after 1 day.

**Thuricide.** Thuricide is formulated using a bacteria, *Bacillus thuringiensis*. The bacteria in Thuricide is consumed by the insect and causes death (Becnel et al. 1996, Furutani & Arita-Tsutsumi 2002). Like Neem Seed Oil, Thuricide is used on a wide variety of insects but not specifically for mosquito larvae. Thuricide was purchased at a garden store. The recommended concentration was 2 tsp per gallon water. Two tsp of Thuricide was mixed with one gallon of water and the same protocol used for the Neem Seed Oil tests was used.

**Dawn.** Dawn, dish washing liquid, was purchased from a grocery store. Since there was no recommendation for mosquito control use, 1 ml of Dawn was mixed with one gallon of water. The same protocol used for the Neem Seed Oil was repeated for the Dawn tests.

**Suave.** Suave, hair shampoo, was purchased from a grocery store. Since there was no recommendation for mosquito control use, 1 ml of Suave was mixed with one gallon of water. The same protocol used for the Neem Seed Oil was repeated for the Suave tests.

## RESULTS AND DISCUSSION

**Neem Seed Oil.** The results of the Neem Seed Oil tests are presented in Table 1. At a concentration of 1 tsp per gallon water, all the mosquito larvae (100) died on the first day. The concentration of the Neem Seed Oil was then reduced by half to  $\frac{1}{2}$  tsp per gallon and at this concentration, all the mosquito larvae (100) died so the concentration was reduced by half again. At  $\frac{1}{4}$  tsp per gallon, 97 of the 100 mosquito larvae tested died on the first day compared to 3 in the control that had no Neem Seed Oil. By the second day, all the remaining mosquito larvae in the  $\frac{1}{4}$  tsp per gallon Neem Seed Oil solution had died compared to a total of 4 dead larvae in the control.

**Thuricide.** The results of the Thuricide tests are presented in Table 2. At 2 tsp per gallon, all the mosquito larvae died on the first day. The concentration was reduced to 1 tsp then to  $\frac{1}{2}$  tsp per gallon and at both of these concentrations, all the mosquito larvae died on the first day. At  $\frac{1}{4}$  tsp per gallon 98 out of 100 mosquito larvae died as compared to the control that had only 1 dead mosquito larva after one day. On the second day, the remaining mosquito larvae in the  $\frac{1}{4}$  tsp per gallon concentration died as compared to 4 total larvae dead in the control.

**Dawn.** The results of the Dawn tests are presented in Table 3. At 1 ml per gallon, all the mosquito larvae died on the first day. The concentration of the Dawn was then reduced by half to 0.5 ml, 0.25 ml, and 0.125 ml per gallon and at all concentrations, all the mosquito larvae died on the first day. At 0.0625 ml per gallon, 4 mosquito larvae survived as compared to 99 mosquito larvae surviving in the control. On the second day, the remaining 4 larvae in the Dawn solution died and there were no additional deaths in the control.

**Suave.** The results of the Suave tests are presented in Table 4. At 1 ml per gallon, all the mosquito larvae died on the first day. The concentration of the Suave was then reduced by half to 0.5 ml, 0.25 ml, 0.125ml, and 0.625 ml per gallon and at all the concentrations, all the mosquito larvae died on the first day. At 0.03125 ml per gallon, 33 mosquito larvae survived the first day compared to 99 in the control. By the second day, all the mosquito larvae in the Suave solution had died and there were no additional deaths in the control.

All the products tested were shown to kill mosquito larvae. The price of the Thuricide and Neem Seed Oil are higher than that for Dawn and Suave since these products are specifically sold as products to kill insects. Dawn and Suave are sold in grocery stores for purposes other than to kill insects. These products are less expensive and can be used at very low concentrations. Comparing the results of the Dawn and Suave tests, Suave appears to be a better choice for homeowners to use since less of the product is needed for control.

## LITERATURE CITED

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Table 1. Daily total mortality counts of *A. albopictus* larvae at different concentrations of Neem Seed Oil, n = 100.

Concentration	Day				
	1	2	3	4	5
1 tsp	100	-	-	-	-
½ tsp	100	-	-	-	-
¼ tsp	97	100	-	-	-
0 (control)	3	4	5	5	6

Table 2. Daily total mortality counts of *A. albopictus* larvae at different concentrations of Thuricide, n = 100.

Concentration	Day				
	1	2	3	4	5
2 tsp	100	-	-	-	-
1 tsp	100	-	-	-	-
½ tsp	100	-	-	-	-
¼ tsp	98	100	-	-	-
0 (control)	1	4	6	10	11

Table 3. Daily total mortality counts of *A. albopictus* larvae at different concentrations of Dawn, n = 100.

Concentration	Day				
	1	2	3	4	5
1 ml	100	-	-	-	-
0.5 ml	100	-	-	-	-
0.25 ml	100	-	-	-	-
0.125 ml	100	-	-	-	-
0.0625 ml	96	100	-	-	-
0 (control)	1	1	1	3	4

Table 4. Daily total mortality counts of *A. albopictus* larvae at different concentrations of Suave, n = 100.

Concentration	Day				
	1	2	3	4	5
1 ml	100	-	-	-	-
0.5 ml	100	-	-	-	-
0.25 ml	100	-	-	-	-
0.125 ml	100	-	-	-	-
0.0625 ml	100	-	-	-	-
0.03125 ml	67	100	-	-	-
0 (control)	1	1	1	1	5