ATTRACTANT ENHANCED OVITRAPS FOR THE SURVEILLANCE OF CONTAINER BREEDING MOSQUITOES[1]

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The use of ovipositional attractants in mosquito surveillance is not a new technique. Gjullin et al. (1965) reported that grass infusion was effective as an ovipositional attractant to *Culex quinquefasciatus* Say and *Aedes aegypti* (Linn.). Hazard et al. (1967) determined that the bacteria growing in these infusions were responsible for the attractiveness of the substance. Reiter (1983, 1987) discussed traps baited with standardized hay infusions specifically designed for collection of gravid *Culex* females.

The recent introduction of *Aedes albopictus* (Skuse), the forest day mosquito[4], into the continental United States has caused considerable concern to public health officials (Moore 1986). The rapid detection of new infestations of *Ae. albopictus* in an area is important if effective eradication measures are to be initiated. Ovitraps, constructed of 1-pint (0.47 liter) glass jars painted black are often employed for this purpose. Preliminary laboratory results indicated that *Ae. albopictus* deposited greater numbers of eggs in artificial containers filled with a hay infusion mixture as described by Reiter (1986) than in containers filled with plain water. A field experiment was conducted to evaluate hay infusion as well as several other ovipositional attractants.

The experiment was conducted in a forested area adjacent to a commercial tire yard in Baton Rouge, Louisiana, as described by Schreiber et al. (1988). Adult populations of *Ae. albopictus, Ae. triseriatus* (Say), *Ae. atlanticus* Dyar and Knab, and *Psorophora ferox* (Humboldt) were present during the study period. No adults or immatures of *Ae. aegypti* were observed at this location. A randomized complete block experiment was conducted for four weeks from mid-June through mid-July 1987. Four potential ovipositional attractants were tested: distilled water; distilled water + leaf litter collected and added to the ovijars at the study site; hay infusion mixture (Reiter 1986); and a 1% emulsion of fish oil fertilizer in distilled water as used by the Orleans Parish Mosquito Control Board, New Orleans, Louisiana (E. S. Bordes, personal communication).[5,6] Every week, 40 black, one-pint glass jars were placed on the ground in a 8 × 20 m grid with ovitraps set at 2-meter intervals. This interval was selected because *Ae. albopictus* females can differentiate between oviposition containers placed within 20 cm of each other. Ten jars were randomly assigned each week to each attractant (150 ml/jar). A 2.5 × 10 cm masonite paddle was placed in each jar as an oviposition substrate and was removed weekly. Eggs collected on strips that remained in the jars for a full week were identified. Since the eggs of *Ae. albopictus* cannot be distinguished from those of *Ae. aegypti* with a light microscope (Matsuo et al. 1974), a portion of the eggs was aged, hatched and identified, with the results extrapolated to the rest of the population. Records of the number of eggs/species/paddle were recorded. The treatment data was analyzed by the SAS general linear models procedure (SAS 1985) using treatment, week and the week by treatment interaction as class variables. Two mean separation procedures ($\alpha = 0.05$) were employed; Scheffe's test was used to guard against type I errors and the Student-Neuman-Keuls test to guard against type II errors (SAS 1985).

A total of 4,845 eggs from 106 ovijars were collected over the course of the experiment. *Aedes albopictus* accounted for 4,398 or 90.8% of the eggs collected. A random sample of these eggs (300) was hatched and identified in the 4th instar. All 300 larvae were identified as *Ae. albopictus*. A probability test based on these results indicated that at least 4,222 (96%) of these eggs collected were indeed *Ae. albopictus* ($P < 0.01$). *Aedes triseriatus* deposited 425 eggs (8.8%) and *Ps. ferox* 22 eggs (0.45%). The

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[4] Common name as approved by the Entomological Society of America (ESA. 1982. Common names of insects and related organisms 1982. Entomological Society of America, Hyattsville, MD. 132 pp.).

[5] Green Light Fish Emulsion Plant Food, Green Light Co., San Antonio, TX 78217.

[6] Mention of a commercial product does not constitute a recommendation of its use by the LSU Agricultural Center.

latter eggs were all collected from one ovijar during the third week. A total of 83% (88/106) of all ovijars were positive for mosquito eggs. When hay infusion was used as an ovipositional attractant, 92% of the jars were positive for *Ae. albopictus,* and 24% were positive for *Ae. triseriatus.* With distilled water, 80% of the jars were positive for *Ae. albopictus* eggs, and *Ae. triseriatus* had oviposited in 4% of the jars. A 70% positive rate was observed for *Ae. albopictus* in leaf litter + water, vs. 15% for *Ae. triseriatus* with the same attractant. Sixty-four percent (64%) of the ovijars containing 1% fish oil emulsion contained *Ae. albopictus* eggs, with a 50% positive rate observed for *Ae. triseriatus.*

Table 1 shows the results of an analysis of variance (ANOVA) on the *Ae. albopictus* and *Ae. triseriatus* ovilure data. For *Ae. albopictus,* significant ($P < 0.01$) differences were found among treatments. The results of both Scheffe's and Student-Neuman-Keuls mean separation procedures were identical. Ovijars containing hay infusion had significantly ($P < 0.05$) more *Ae. albopictus* eggs (76.0/jar) than ovijars containing leaf litter + water (34.6 eggs/jar), distilled water (26.3 eggs/jar), or 1% fish oil emulsion (16.7 eggs/jar). For *Ae. triseriatus,* the week by treatment interaction was found to be significant ($P < 0.01$), thus dictating the use of the interaction mean square as the proper error term. Treatments were found to be not significant at the $P = 0.05$ level ($P = 0.1$ for this data). Means were calculated for each treatment. Fish oil emulsion (1%) (21.5 eggs/jar) appeared to be the preferred ovilure for *Ae. triseriatus.* Jars containing hay infusion (2.3 eggs/jar), leaf litter + water (0.3 eggs/jar), and distilled water (0.04 eggs/jar) were next in order of number of eggs collected. The effect of the significant week by treatment interaction is not entirely clear, but the data suggest that differences may well exist among the treatments. Further studies in areas where larger *Ae. triseriatus* populations exist could lead to statistically significant results.

Table 1. Analysis of variance on ovipositional attractant data. Randomized complete block design with week = block; and ovipositional attractant = treatment.

Aedes albopictus Source	df	MS	F	Pr > F
Week	3	14,520.2	4.67	0.01
Treatment	3	12,747.9	4.10	0.01
Week*Trt	9	3,106.4	1.78	0.08
Error	90	1,750.0		
C. Total	105			
Aedes triseriatus Source	df	MS	F	Pr > F
Week	3	1,482.6	1.70	>0.10
Treatment	3	2,027.9	2.32	0.10
Week*Trt	9	872.1	5.31	0.01
Error	90	164.1		
C. Total	105			

The method described should prove useful to public health officials interested in monitoring the spread of *Ae. albopictus.* Ovijars filled with hay infusion should be more efficient at attracting gravid *Ae. albopictus* in areas where ample oviposition sites occur or where population densities are low. The attraction of *Ae. triseriatus* to 1% fish oil emulsion merits further investigation. The isolation and purification of the attractant chemicals from these ovilures might lead to new control strategies involving trapping of gravid females.

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