FACTORS INFLUENCING *AEDES AEGYPTI* OCCURRENCE IN CONTAINERS

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INTRODUCTION. The oviposition preferences of *Aedes aegypti* have been shown to be influenced by various environmental stimuli such as relative humidity (Bar-Zeev, 1960), organic components in the water (Manefield, 1951), light reflection (O'Gower, 1957), inorganic chemical components (Wallis, 1954) and color (Williams and DeLong, 1961). Certain of these stimuli were combined in an ovitrap designed for use in *Ae. aegypti* surveillance (Fay and Perry, 1965; Fay and Eliason, 1966).

In general, water-holding containers in the field represent various combinations of these environmental stimuli. Therefore, in 1967, in studies at Meridian, Mississippi, a composite group of some containers commonly harboring larvae of the species were exposed to natural field populations of *Ae. aegypti* to determine the relative attractiveness of various containers in relation to each other and to the ovitrap.

MATERIALS AND METHODS. The test site provided direct sunlight to all containers until approximately 1:00–2:00 p.m. each day, after which all were shaded for the remainder of the day. Weeds and grass at the test site were kept close-cropped by mowing.

Nineteen pairs of containers, 9 of metal, 5 of plastic, 3 of glass, and 2 of rubber (i.e., tires), were placed in an 8- x 25-ft. grid pattern (Fig. 1) making the containers approximately 2 ft. apart except for the tires. One pair of tires, standing upright, was tied together at the top and spread apart at the base approximately 1 ft.; the other pair, lying flat, was immediately adjacent to each other. Random placement of containers was followed except for the tires which were at one end because of their relative size.

Sufficient tap water was put into each container, except the tires, to fill it to the half-way mark. By adding approximately 1 gallon of water to each tire, the upright ones were filled to within 1½ inches of overflowing; the ones lying flat to a depth of 1 in. To one container of each pair, organic matter, a sandy loam soil duff, was added at the rate of 1 cubic inch for each pint of water content.

Each container was inspected weekly and population counts were made, based on the numbers of 3rd and 4th instar larvae and pupae found and subsequently destroyed. At each inspection the water temperature was measured with an immersion probe and recorded from a portable Yellow Springs telethermometer. The water was decanted or dipped from the container into a white enamel pan, the count was made and the water was immediately returned to the container with any remaining 1st or 2nd instar larvae. After each count the water level was adjusted to the half-way mark, either by addition of tap water or removal of excess rain water.

The initial test conditions were progressively modified through accumulation of excess algal growths in certain containers and by high turbidity of the water in others, and by mid-June and late July it became necessary to remove and clean all containers thoroughly. After cleaning, each container was returned to the original experimental positions.

RESULTS AND DISCUSSION. Data were collected from April through October, 1967, which was the period of oviposition

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Fig. 1.—Grid placement of containers and adjacent test area.

activity of *Ae. aegypti* in east central Mississippi. During the season a total of 9,412 immature stages of this mosquito were recovered from the test containers during 27 weekly inspections. Fluctuations in the mosquito densities were indicated both by the monthly total counts and by the percent of positive containers. Values were as follows: for monthly counts, April—0, May—202, June—831, July—2,305, August—4,300, September—1,250 and October—524 and for percent of containers positive—April—0, May—9, June—23, July—53, August—64, September—61 and October—41 percent, respectively.

The addition of organic matter, such as a sandy loam soil duff, enhanced both the frequency of positive containers, with a single exception of the pair of 1-gallon black tin cans, and the populations for the study period found in the various type containers (Table 1).

The capacity of a container is apparently correlated with frequency of positivity and with population numbers. The following values were obtained with the different sizes of containers: with respect to average frequency of positivity, containers more than 1 gallon in capacity—69 percent; ovitrap—40 percent; 1 gallon—33 percent; ½ gallon—27 percent; 1 pint—27 percent; and ½ pint—15 percent. With respect to average seasonal population, values were: with containers more than 1 gallon in capacity—1,379; ovitrap—143; 1 gallon—145; ½ gallon—102; 1 pint—72; and ½ pint—38. Ovitrap values are listed separately in the table since they are used as a standard surveillance tool.

The effect of color as a selective stimulus was not as clearly manifest. In grouping the test containers on a color basis, the following values are shown: Relative to average frequency of positivity, black containers—57 percent; metal and rust—32 percent; color other than white—30 percent; white—26 percent; and clear—5 percent. Relative to average seasonal population, black containers—640; metal

Table 1.—Variation in frequency of oviposition and populations of *Aedes aegypti* in field containers with and without added organic matter. Results based on 27 weekly inspections.

Container Description	Frequency of Positivity (%)		Net Diff. (%)	Population Count (Season)		Net Diff.
	with org.	without org.		with org.	without org.	
1 gal. tin black	33	48	15	127	113	14
" " red	48	30	18	181	93	88
" " white	33	0	33	265	0	265
" " tarred*	63	48	15	276	84	192
" " unpainted	41	26	15	201	40	161
" " "	63	22	41	256	78	178
½ gal. tin blue**	44	11	33	124	5	119
1 pt. " unpainted	41	18	23	142	29	113
½ pt. " "	30	15	15	109	29	80
1 gal. plastic green	37	15	22	203	57	146
" " white	48	30	18	448	51	397
½ gal. " "	37	15	22	264	15	249
1 pt. " "	41	4	37	95	20	75
1 pt. plastic blue	44	15	29	108	41	67
1 gal. glass clear	7	0	7	141	0	141
½ pt. glass clear	11	4	7	13	1	12
Rubber tire vertical	67	63	4	1083	756	327
Rubber tire horizontal	82	64	18	2248	1430	818
1 pt. ovitrap***	65	41	24	178	108	70
Total values	832	469	366	6462	2950	3512
Average values	44	24	19	340	155	185

* Tarred inside only.
** Blue outside only.
*** Black ceramic outside finish. Value for egg counts only.

and rust—110; color other than white—101; white—145; and clear—39.

The frequency of oviposition and the size of populations in containers seem to be related to container material and thus to water temperature. In these studies, the degree of exposure to sunlight was essentially uniform for all test containers. However, the materials had different insulating qualities, and as a result the temperatures varied measurably. The lowest were consistently found in the rubber tires, the highest in glass containers, and intermediate values in the other containers. Positives were recorded most frequently and seasonal populations were the highest in the containers with the lowest water temperatures (Table 2).

Ae. aegypti larvae and pupae were found in water within a temperature range of 62° F. to 98° F. but did not occur when water temperatures exceeded 98° F.

Observations made on this variety of containers in closely comparable ecological conditions show that content of organic matter, capacity and color of the container, and temperature of the water are all factors which influence the selection of an oviposition site and the number of eggs laid by *Ae. aegypti*. Rubber tires combine the most attractive factors and clearly represented the most prolific *Ae. aegypti*-producing units of the present study. With the exception of tires, the ovitraps

Table 2.—Variation in frequency of oviposition and size of *Aedes aegypti* populations in field containers in relation to container material and water temperatures.

Container Material	Avg. water temp. ° F.	Average Percent Positivity	Average Seasonal Population
Rubber	75.7	69	1379
Ovitrap	81.8	**53**	**143**
Plastic	82.3	29	130
Tin	83.5	34	120
Glass	85.9	6	39

compared favorably with all other containers in the percentages positive and the population numbers.

It must be recognized, however, that, in addition to the factors above, the attractiveness of a given container is also influenced by its position with regard to shade, protection from the wind and ability to collect and retain water.

SUMMARY. In field studies at Meridian, Mississippi, in 1967, water-holding containers were exposed in pairs in close proximity to determine the effects of color and capacity of the container and temperature and organic content of the water as attractant factors for ovipositing *Aedes aegypti*. Various sizes of containers were included; and both containers of a pair were of the same material—glass, metal, rubber, or plastic. Rubber tires were the containers most preferred and clear glass containers were the least preferred. Dark colors and a larger capacity were positively correlated with attractivity. The addition of organic matter increased the attractivity of all types of containers. The ovitraps showed equal or higher attractivity than other types of containers except for the rubber tires.

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OVIPOSITION TRAPS AND POPULATION SAMPLING FOR THE DISTRIBUTION OF *AEDES AEGYPTI* (L.)[1]

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INTRODUCTION

The oviposition trap has been used effectively to detect infestations of the yellow fever mosquito, *Aedes aegypti*, by providing an attractive oviposition site for gravid females (Fay and Eliason, 1966; Hoffman and Killingsworth, 1967). The trap consists of a black, tapered mason jar supplied with an inch of tap water and an absorbent pressed-wood paddle clipped to the inside of the jar in a perpendicular position. Paddles from traps in the field are collected weekly and examined for *Ae. aegypti* eggs, which, if the species is present, the females will deposit on the rough sides and edges of the paddles.

During 1967, the Aedes aegypti Eradication Program operated 30,875 ovitraps in 24 southern cities to determine the distribution and densities of *Ae. aegypti*. Of these ovitraps, 306 were placed in Waycross, Georgia, a city in which no insecticidal treatment for *Ae. aegypti* had been applied. The traps in Waycross were de-

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