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SCREENING OF CHEMOSTERILANTS AGAINST THE SOUTHERN HOUSE MOSQUITO *CULEX PIPIENS QUINQUEFASCIATUS*[1]

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Abstract

Concentrations of 31 chemosterilants for male house flies, *Musca domestica* L., were formulated in a 20% solution of sugar and water and offered as food to the southern house mosquito, *Culex pipiens quinquefasciatus* Say. Nine caused complete sterility at concentrations of 0.1% or less.

In view of the current interest in the use of sterile males to control or eradicate some species of mosquitoes, information is needed about chemicals or other methods that induce sterility in these insects. Thus, at the Insects Affecting Man Investigations Laboratory at Gainesville, Fla., we have begun to evaluate the sterilizing effect of chemicals on the southern house mosquito, *Culex pipiens quinquefasciatus* Say.

Chemosterilants can be applied to mosquitoes (1) in food (Weidhaas et al. 1961), (2) in larval rearing media (Dame et al. 1964, Mulla 1964), (3) by immersing the pupae in the chemical (White 1966), and (4) by exposing adults to sterilants on glass or other surfaces (Weidhaas et al. 1962). Since the initial screening of chemicals as potential mosquito chemosterilants was done with *Aedes aegypti* (L.) and *Anopheles quadrimaculatus* Say by mixing the chemical in the food (Weidhaas et al. 1961), we decided to use this same procedure with *C. p. quinquefasciatus*. By this method, the insect may pick up the chemical by ingestion, tarsal contact, or both. The chemosterilants selected for evaluation in the present test were compounds that had demonstrated sterilant activity in the male house fly, *Musca domestica* L., in tests at the laboratory (Fye et al. 1966).

Methods and Materials

The test compounds (0.1% concentrations) were mixed in a buffered (pH 7) solution of 20% sucrose in water. This solution was then poured over a cotton pad in a waxed paper cup, and the cup was placed in a 10 by 10 by 6 inch aluminum screen cage containing 25 males and 25 females (24 hr old or less). The mosquitoes were allowed to feed ad libitum on the solution for 72 hr; then the mixture was removed from the cage and replaced with 2% sucrose solution. Four days later, the females were fed on young chicks and allowed to oviposit in paper cups containing a weak solution of hay infusion. The cups were removed from the cages, covered to prevent water evaporation, and held until all eggs had hatched (96 hr). Then 10 rafts were selected at random from each cup and placed in a small vial containing a 1% solution of KOH. The KOH acted to separate the individual eggs in each raft, which made it easier to determine whether

[1]Mention of a pesticide in this paper does not constitute a recommendation of this product by the USDA.

TABLE 1.—FERTILITY AND MORTALITY OF *Culex pipiens quinquefasciatus* ALLOWED TO FEED AD LIBITUM ON CHEMOSTERILANTS IN 20% SUGAR SOLUTION.

ENT No.	Chemosterilant	Concentration (%)	Egg hatch (%)	Adult mortality (%)
7570	Tetrahydrofuran	0.1	90	0
16198	2,2',2"-Trichlorotriethylamine	1.0		100
		.1	31	0
16292	2-Imidazolidinethione	1.0		100
		.5	0	92
		.1	98	0
22078	*p*-Ethoxybenzoic acid 2-phenyl= hydrazide	1.0	26	0
		.1	53	0
22959	3-Ethoxypropionic acid 2-phenylhydrazide	.1	70	0
24915	Tepa	.1	0	0
		.01	0	0
		.005	0	0
		.001	0	0
26316	Apholate	.1	0	0
		.05	0	0
		.01	2	0
26398	Fluoroörotic acid	.1	0	0
50003	Metepa	.1	0	0
		.05	0	0
		.01	57	0
50055-a	2,4,6-Tris(2-methyl-1-aziridinyl)-*s*-triazine	1.0		100
		.1	0	0
		.01	85	0
50124	Diethylene glycol di-2-methyl-1-aziridinecarboxylate	2.0	70	0
		1.0	57	0
		.1	90	0
50171	1-Aziridinecarboxanilide	.1	80	0
50333	1,4-Dimethyl-1,4-diazoniabicyclo= [2.2.2]octane dibromide	.1	73	0
50358	1,1'-Sulfinylbis[2-methylaziridine]	1.0		100
		.5		100
		.1	76	0
		.05	67	0
50548	1-*p*-Toluoylaziridine	.1	94	0
50550	1-*o*-Toluoylaziridine	.1	96	0
50610	1,1'-Adipoylbisaziridine	.1	98	0
50612	1,1'-Sebacoylbisaziridine	.1	55	0
50665	4'4'"-Bi[1-Aziridinecarbox-*o*-anisidide]	.1	73	0
50666	*N,N'*-1,5-Naphthylenebis[2-methyl-1-aziridinecarboxamide]	.1	91	0

TABLE 1.—CONTINUED

ENT No.	Chemosterilant	Concentration (%)	Egg hatch (%)	Adult mortality (%)
50677	2,5-Bis(1-aziridinyl)hydroquinone	.1	57	0
50685	1-Aziridinecarboxy-*o*-toluidide	1.0		100
		.5	0	99
		.1	90	0
50687	1-Aziridinecarboxy-*m*-toluidide	.1	90	0
50736	1,1',1"-(*s*-Phenenyltricarbonyl)=trisaziridine	.1	96	0
50742	1-Aziridinecarbox-*p*-anisidide	1.0	16	90
		.1	35	13
50787	*P,P*-Bis(1-aziridinyl)-*N*-ethylphos=phinic amide	1.0		100
		.1	0	0
50788-a	*P,P*-Bis(1-aziridinyl)-*N*-octylphosphinic amide	1.0		100
		.5	0	92
		.1	63	0
		.05	59	0
50825	Porfiromycin	1.0		100
		.1	0	0
		.05	0	0
		.01	65	0
50852	Hemel	.1	89	0
50882	Hempa	1.0	0	20
		.1	0	0
		.05	0	0
		.01	41	0
51029	*P,P*-Bis(1-aziridinyl)-*N*-hexylphosphinic amide	1.0		100
		.1	0	0
		.05	29	0
		.01	92	0
	Check	0	95	0

any eggs had hatched. Samples of about 100 such eggs were used to determine the degree of sterility caused by each concentration tested. The mortality of the fed insects was determined after 72 hr, that is, at the end of the exposure. All tests were duplicated, and additional tests were made with compounds that caused sterility at the concentration of 0.1% to determine the minimum sterilizing dose and the maximum dose that gave sterility without causing mortality.

RESULTS

Of the 31 compounds tested, only 9 caused complete sterility in the southern house mosquito at a concentration of 0.1% or less (Table 1). Tepa, apholate, metepa, hempa, and porfiromycin appeared to be the most effective because they caused complete sterility without causing adult mor-

tality at 2 or more concentrations. Tepa caused complete sterility at a concentration of 0.001%; apholate, metepa, hempa, and porfiromycin caused sterility at a concentration of 0.05%; 2,4,6-tris[2-methyl-1-aziridinyl]-*s*-triazine and *P,P*-bis(1-aziridinyl)-*N*-hexylphosphinic amide caused complete sterility at a concentration of 0.1%; *P,P*-bis(1-aziridinyl)-*N*-ethylphosphinic amide and 5-fluoroörotic acid also caused total sterility at a concentration of 0.1% but the latter 2 were not tested at other concentrations.

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