

EFFECTIVENESS OF THREE 2-METHYL-AZIRIDINE DERIVATIVES AS HOUSE FLY CHEMOSTERILANTS

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Several compounds have demonstrated the property of inducing sterility in house flies (*Musca domestica* L.) when administered in the food (LaBrecque *et al.*, 1960). Particular promise has been shown by certain ethylenimine derivatives, which have consistently given favorable results in laboratory and field experiments (LaBrecque, 1961, Weidhaas *et al.*, 1961, LaBrecque *et al.*, 1962a, 1962b). Another group of closely related compounds, the 2-methyl-aziridine derivatives, are also effective as house fly chemosterilants. This paper presents the initial results with three compounds of this group, metepa (tris(2-methyl-1-aziridinyl)phosphine oxide), methiotepa (tris(2-methyl-1-aziridinyl)phosphine sulfide), and phenyl metepa (bis(2-methyl-1-aziridinyl)phenylphosphine oxide).

In screening tests 25 grams of fly food consisting of six parts of sugar, six parts of powdered nonfat dry milk, and one part of powdered egg was treated with 12.5 ml. of acetone containing 0.2% or 2.0% of the chemical in suspension or solution. The food was then allowed to dry, repulverized, and placed in an emergence cage containing 100 pupae. Cages containing untreated food were used as checks. Seven days later the first examination of each cage was made to note the number of flies that had emerged, their condition, and any acute toxic effect of the treated food.

Two days later another examination was made and oviposition medium was placed in the cage. Four to six hours later the oviposition medium was inspected for eggs. If none were present, the medium was replaced and examined daily until oviposition occurred or all of the adults were dead. The viability of any eggs deposited was determined by inspecting the medium for growing larvae two days after oviposition. The larvae were reared to adults and observed for any abnormalities. Secondary tests were made with higher or lower concentrations of the sterilants to determine the full range of activity. The results are given in Table 1.

Metepa caused some mortality of the flies at 1% and eliminated hatching at concentrations as low as 0.3%. Methiotepa also acted as a toxicant at 1%, eliminated hatching completely at 0.5%, and produced variable results at 0.1%. Phenyl metepa caused complete sterility only at 5%, the highest concentration tested.

In tests to determine the effect of the compounds on each sex, males and females were given food treated at various concentrations for the first five days after emergence. They were then given untreated food for two days, and on the seventh day were mated with flies of the opposite sex that had been given either treated or untreated food. Ten insects of each sex were used, and all flies were maintained on untreated food thereafter. On the ninth day, oviposition medium was made available for four to six hours, after which all egg masses were removed and placed in water

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to break up the egg masses into individual eggs. The eggs from all egg masses were mixed thoroughly and a random sample of 100 eggs was then taken and placed on a moistened patch of black cloth. This patch was placed in a container partially filled with moist larval medium into which any larvae that hatched could crawl. Forty-eight hours later the cloth was removed and the hatching rate was determined. If any eggs hatched, the medium was held until the larvae had time to develop to the pupal stage to determine whether the chemical had any effect on the larvae. Fecundity and fertility were determined by offering oviposition medium in this manner at weekly intervals for three weeks. Each test was compared to untreated checks run concurrently. The results are given in Table 2.

Metepa induced complete sterility in males at concentrations as low as 0.5%, and partial sterility at 0.1%. In females the sterility was complete at 2%, almost complete at 1%, and partial at 0.5%. The failure of the

TABLE 1.—EFFECT OF THREE 2-METHYL-AZIRIDINE DERIVATIVES IN THE FOOD ON THE FERTILITY OF HOUSE FLIES.

Concentration (%) :	Effect on house flies
<i>Metepa</i>	
1.0	Toxicant
1.0	Oviposition normal, no hatch
1.0	Oviposition normal, no hatch
0.5	Oviposition normal, no hatch
.5	Oviposition normal, no hatch
.4	Oviposition normal, no hatch
.3	Oviposition normal, no hatch
.25	Oviposition normal, no hatch
.25	Oviposition normal, hatch light
	Few F ₁ adults
.1	None
<i>Methiotepa</i>	
1.0	Toxicant
0.5	Oviposition normal, no hatch
.25	Oviposition normal, no hatch
.1	Oviposition normal, no hatch
.1	None
.05	None
.025	None
<i>Phenyl metepa</i>	
5.0	Oviposition normal, no hatch
2.5	Oviposition normal, hatch light
	Few F ₁ adults—died on emergence
1.0	None
1.0	None
0.1	None

TABLE 2.—FERTILITY OF MALE AND FEMALE HOUSE FLIES GIVEN FOOD TREATED WITH CHEMOSTERILANTS DURING THE FIRST 5 DAYS FOLLOWING ECLOSION.

Concentration (%)	Fertility of eggs					
	First egging		Second egging		Third egging	
	Percent hatch	Percent pupation	Percent hatch	Percent pupation	Percent hatch	Percent pupation
<i>Metepa: males treated</i>						
2.0	0	0	0	0	0	0
1.0	0	0	0	0	0	0
0.75	0	0	0	0	0	0
.5	0	0	0	0	0	0
.5	0	0	0	0	0	0
.25	0	0	40	0	21	0
.25	3	0	40	0	15	0
.1	21	21	25	7	0	—
.1	7	5	79	0	89	6
<i>Metepa: females treated</i>						
2.0	0	0	0	0	0	0
1.0	7	0	0	0	0	0
1.0	0	0	0	0	0	0
1.0	13	7	0	0	0	0
1.0	14	14	0	0	0	0
1.0	6	0	0	0	0	0
1.0	0	0	0	0	0	0
1.0	0	0	0	0	0	0
1.0	2	0	0	0	0	0
0.75	8	7	*	*	*	*
.75	3	2	*	*	*	*
.5	15	15	*	*	*	*
.5	0	0	*	*	*	*
<i>Methiotepa: males treated</i>						
1.0	0	0	1	0	0	0
1.0	0	0	0	0	*	*
<i>Methiotepa: females treated</i>						
1.0	22	12	15	7	3	0
1.0	88	0	*	*	*	*
<i>Phenyl Metepa: males treated</i>						
5.0	11	11	20	2	64	10
5.0	25	25	45	42	87	27
<i>Phenyl Metepa: females treated</i>						
5.0	14	4	89	73	98	73
5.0	6	6	88	81	98	52
<i>Untreated check</i>						
—	92	82	94	87	98	92
—	95	88	93	78	91	86
—	97	84	90	69	91	83
—	90	90	100	63	97	91

* No oviposition.

four groups of females treated concurrently with metepa at 0.75%, and 0.5% to lay second and third clutches of eggs may not have been caused by the chemical, since females given food containing higher concentrations, in tests conducted at other times, oviposited normally. Methiotepa sterilized males, but not females at 1%, and phenyl metepa failed to cause complete sterility in either sex at 5%.

LITERATURE CITED

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NOTICE OF ANNUAL MEETING

The 46th annual meeting of the Florida Entomological Society will be held September 12 and 13, 1963, at the Outrigger Inn, St. Petersburg. Registration will begin and a pre-meeting "Bull Session" will be held on the evening of September 11. This is a change from the August 29-30 dates originally scheduled.