WIND TUNNEL EVALUATION OF NEW COMPOUNDS AS ADULTICIDES AGAINST TWO SPECIES OF MOSQUITOES FOUND IN RICE FIELDS[1, 2]

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ABSTRACT. Four compounds, American Cyanamid AC-222,705, (±)-cyano (3-phenoxyphenyl) methyl (+) - 4 - (difluoromethoxy) - α(1 - methylethyl) benzeneacetate; Montedison M-9270, *O* - [3 - chloro - 1 - (1 - methylethyl) - 1*H* - pyrazol - 5 - yl] *O,O* - dimethyl phosphorothioate; Montedison M-9580, *O* - (3 - chloro - 1 - methyl - 1*H* - pyrazol - 5 - yl) *O* - ethyl *O* - methyl phosphorothioate; and Montedison M-9751, *O* - (3 - chloro - 1 - phenyl - 1 *H* - pyrazol - 5 - yl) *O* - ethyl *O*-methyl phosphorothioate, were tested as wind tunnel-generated aerosols against field-collected females of *Anopheles quadrimaculatus* and *Psorophora columbiae*.

American Cyanamid AC-222,705 was 778X and 3.6X, Montedison M-9270 was 0.7X and 0.4X, Montedison M-9580 was 3.2X and 2.4X, and Montedison M-9751 was 0.8X and 0.7X as effective at the LC-90 level as the malathion standard against *An. quadrimaculatus* and *Ps. columbiae*, respectively. Based on these data, American Cyanamid AC-222,705 and Montedison M-9580 are promising candidates for further development as mosquito adulticides.

In our screening program for potential mosquito adulticides we seek compounds that are equivalent to or are more effective than the malathion standard in wind tunnel aerosol evaluations against a laboratory strain of *Aedes taeniorhynchus* (Wiedemann). Those meeting these performance characteristics are selected for testing against natural mosquito populations or field-collected specimens. The present paper reports the effectiveness of 4 promising compounds tested against field-collected specimens of *Anopheles quadrimaculatus* Say and *Psorophora columbiae* (Dyar and Knab) at the Arkansas Rice Brance Experiment Station, Stuttgart, Arkansas.

MATERIALS AND METHODS

The adulticides evaluated were: American Cyanamid AC-222,705, (±)-cyano (3-phenoxyphenyl) methyl (+)-4-(difluoromethoxy)-α-(1-methylethyl) benzeneacetate; Montedison M-9270, *O*-[3-chloro-1-(1-methylethyl)-1*H*-pyrazol-5-yl] *O,O*-dimethyl phosphorothioate; Montedison M-9580, *O*-(3-chloro-1-methyl-1*H*-pyrazol-5-yl) *O*-ethyl *O*-methyl phosphorothioate; and Montedison M-9751, *O*-(3-chloro-1-phenyl-1*H*-pyrazol-5-yl) *O*-ethyl *O*-methyl phosphorothioate. Malathion, (*O,O*-dimethyl phosphorodithioate of diethyl mercaptosuccinate) was used as the standard. Controls of both species treated with acetone alone were run concurrently with all insecticide tests.

The mosquitoes used in this study were females collected from naturally-occurring populations in riceland areas

[1] This paper reports the results of research only. Mention of a pesticide in this paper does not constitute a recommendation for use by the U.S. Department of Agriculture nor does it imply registration under FIFRA as amended. Also, mention of a commercial or proprietary product in this paper does not constitute an endorsement of this product by the USDA.

[2] This research was conducted as a cooperative effort between the State Agricultural Experiment Stations of Arkansas, California, Louisiana, Mississippi and Texas and the Agricultural Research Service, USDA as part of the USDA/CSRS Southern Regional Project S-122 on the Biology, Ecology and Management of Riceland Mosquitoes in the Southern Region.

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Table 1. Toxicity of wind tunnel-generated aerosols to field-collected females of indicated species at Stuttgart, AR, 1980.

Adulticide	*An. quadrimaculatus* LC-50 (μg/ml)	*An. quadrimaculatus* LC-90 (μg/ml)	Reciprocal LC-90 ratio to malathion	*Ps. columbiae* LC-50 (μg/ml)	*Ps. columbiae* LC-90 (μg/ml)	Reciprocal LC-90 ratio to malathion
American Cyanamid AC-222,705	7.6 (7.4–7.9)[a]	12.5 (11.8–13.5)	778.0	5.9 (5.1–6.7)[a]	68.6 (54.4–91.4)	3.6
Montedison M-9270	2737 (2536–2940)	13902 (12305–16012)	0.7	77.8 (67.2–88.3)	591 (472–789)	0.4
Montedison M-9580	525 (468–580)	3026 (2667–3520)	3.2	60.5 (57.4–63.3)	103 (97–112)	2.4
Montedison M-9751	2622 (2411–2840)	11599 (9983–13908)	0.8	71.1 (64.1–78.0)	346 (303–408)	0.7
Malathion	1253 (1119–1394)	9727 (7717–13018)		29.9 (26.4–33.4)	250 (216–295)	
Malathion	49[b] (46–52)	120 (106–138)				

[a] Figures in parentheses are the 95% confidence limits.
[b] Laboratory (Gainesville) susceptible strain.

near Stuttgart, Arkansas. Battery-powered aspirators fitted with plastic holding tubes were used to collect specimens attracted to humans or from various resting places in barns and other buildings. The tubes which contained about 200 adults each were placed in chilled insulated chests with a bottom layer of moist cotton. Immediately after returning to the laboratory, the mosquitoes were anesthetized with carbon dioxide and placed in groups of about 25 each in cardboard exposure cages 8.65 cm diam × 5.12 cm high with 16-mesh galvanized screen wire ends. Each of the adulticides was tested across a range of 4–6 discriminating concentrations with 6 replicates of 25 mosquitoes per concentration. The wind tunnel and testing procedures used were described by Mount et al. (1976). The data obtained were analyzed on a Hewlett-Packard Model 9810A calculator with a probit analysis program written according to the procedure given by Finney (1971).

RESULTS AND DISCUSSION

The toxicity data from the test compounds against *An. quadrimaculatus* are presented in Table 1. The most effective compound tested was American Cyanamid AC-222,705. This compound was about 778X more effective than the malathion standard at the LC-90 level. The second most effective compound was Montedison M-9580, which was about 3X more effective than the standard. The other 2 Montedison compounds, M-9270 and M-9751, were about equivalent to the standard.

The LC-90 for malathion against the field strain was 9727 μg/ml. This was 81X greater than the LC-90 for our laboratory (Gainesville) insecticide susceptible strain of *An. quadrimaculatus*. In 1978 the LC-90 of the field strain was 2197 μg/ml (Roberts et al. 1980). Thus, in a 2-year period between testing the field strain at Stuttgart, Arkansas, a 4-fold increase to this OP compound has occurred. However, additional testing may be warranted to determine if this recent increase is significant or if the amount of change in susceptibility is within the normal range of variation in the natural population.

The toxicity data for the test compounds against *Ps. columbiae* are presented in Table 1. The most effective compound, American Cynamid AC-222,705, was about 4-fold more effective than the standard at the LC-90 level. The next most effective compound, Montedison M-9580, was about 2-fold more effective than the standard. The other 2 Montedison compounds were less effective than the standard. The LC-90 for malathion against the field strain, 250 μg/ml, was lower than the LC-90 of 355 μg/ml reported in 1978. This difference probably represents a normal variation in the field population.

In summary, the activity of 2 of the 4 compounds tested, AC-222,705 and M-9580, was sufficient to warrant further testing against natural populations.

References Cited

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