

LABORATORY EVALUATION OF THREE INSECT GROWTH REGULATORS
AGAINST A MALATHION RESISTANT STRAIN OF *CULEX QUINQUEFASCIATUS*
(DIPTERA: CULICIDAE)

AGUSTIN NAVARRO; FRANCISCA A. GARCIA; SURIA VALDES &
MARIA DEL CARMEN MARQUETTI

Departamento Control de Vectores, Instituto de Medicina Tropical "Pedro Kouri", Ave. 15 y calle 200,
Siboney, Playa, Ciudad de La Habana, Cuba

The chemical control of *Culex quinquefasciatus* Say, a mosquito that breeds in areas high in organic matter and readily enters houses, bothering man and often spreading diseases (R. W. Chamberlain et al., 1959, *Amer. J. Hyg.*, 70: 221-236), has been hampered by the development of resistance and contamination of the environment.

The present study concentrated on laboratory susceptibility evaluation of three Insect Growth Regulators (IGRs) on fourth-early instar larvae of a 1200 X- malathion resistant *Cx. quinquefasciatus* strain, "Isla", obtained from the "Almendares" river in Havana City and maintained for 12 generations in the laboratory without insecticide selection pressure. IGRs tested were methoprene (OMS-1697; Isopropyl (EE)-11-methoxy-3,7,11-trimethyl 1-2,4-dodecadienoate), diflubenzuron (OMS-1804; 1-(4 chlorophenyl)-3-(2,6-difluorobenzyl)-urea) both supplied by the World Health Organization, and Juvenon (an analogue of methoprene; trans-1-methoxy-3,7,1-trimetyldodeca-2,4-dienoato), supplied by M. N. Kostina from the I. N. I. C. D. E., Moscú). A strain of this species, "SS", susceptible to organophosphorus and IGRs compounds, obtained in 1987 from Montpellier, France, was used as control. Three tests were done per IGR and mosquito strain, consisting each of five concentrations of the chemical, utilizing three replicates per concentration. Mortality readings were taken daily until all organisms died or reached the adult stage. Tests were done with 1 ml ethanol solution containing the prescribed amount of the chemical added to 199 ml of distilled water containing twenty five mosquito larvae in a

slightly tapered 500 ml-glass jar. Percent mortality obtained (up to the adult stage) at each concentration tested were subjected to a probit analysis programme (M. Raymond, 1985, *Cahiers ORSTOM*, 23: 117-121) and analyzed by electronic computer. All tests were conducted at $27 \pm 1^\circ\text{C}$.

The results showing the efficacy of the chemicals tested against *Cx. quinquefasciatus* larvae are presented in Table. From the analysis of the data it was observed in general that the "SS" strain was more susceptible than the "Isla" strain ($X^2 = 20.73$; $P = 0.00003$) at the LC50 level for all the three IGRs tested. On the other hand, both LC50 and LC90 values show diflubenzuron to be significantly the most toxic (LC50 = 0.0026 mg/l) ($Z = 9.15$; $P < 0.0001$) to the malathion resistant strain of *Cx. quinquefasciatus*; next in order of effectiveness was methoprene (LC50 = 0.011 mg/l) followed by Juvenon (LC50 = 0.048 mg/l). Diflubenzuron was 4.2 and 18.4 times more toxic than methoprene and Juvenon respectively at LC50 level. Furthermore, it is also observed from the Table that the "Isla" strain was heterogeneous with high chi square value (6.245) suggesting the presence of tolerance to Juvenon. As IGRs have been never used in Cuba, it is possible that the "Isla" strain, resistant to malathion, presents cross-resistance to Juvenon. Various authors have founded cross-resistance to IGRs in insects resistant to organophosphorus compounds (J. Benskin & S. B. Winson, 1973, *J. Econ. Entomol.*, 66: 15-20; D. C. Cerf & G. P. Georghiou, 1974, *J. Agr. Food Chem.*, 22: 1145-1146. Further evaluation is in progress in our laboratory.

TABLE

Efficacy of three Insect Growth Regulators against *Culex quinquefasciatus* larvae

Strain	IGR	LC50 (mg/l)	LC90 (mg/l)	Regression	χ^2	Level of significance
"SS"	Methoprene	0.0035	0.0174	$5.09 + 2.581nX$	2.55	> 0.05
"Isla"	Methoprene	0.0110	0.0766	$5.04 + 1.521nX$	6.36	> 0.05
"SS"	Diflubenzuron	0.0016	0.0056	$5.45 + 2.341nX$	3.41	> 0.05
"Isla"	Diflubenzuron	0.0026	0.0123	$5.42 + 1.891nX$	7.24	> 0.05
"SS"	Juvenon	0.0080	0.0940	$5.25 + 1.251nX$	2.47	> 0.05
"Isla"	Juvenon	0.0480	1.0450	$4.74 + 0.961nX$	10.24	< 0.05

"SS": susceptible strain; "Isla": malathion resistant strain.

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Halipegus dubius - Fig. 27: adult specimen, caudal half. Bar = 1 mm.