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CATTLE: *Bos taurus* (L.)

Susceptibility of Larvae of *Chrysomya rufifacies* (Diptera: Calliphoridae) to the Insecticides Methyl Parathion and Carbofuran, 2011*

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Cattle

hairy maggot blow fly | *Chrysomya rufifacies*

2,3-Dihydro-2,2-dimethyl-7-benzofuranol methylcarbamate; Phosphorothioic acid O,O-dimethyl O-(4-nitrophenyl) ester

Chrysomya rufifacies (Macquart) is widely known as a colonizer on corpses. In the state of Nuevo León, Mexico, it has been usually found as part of the cadaveric fauna of human corpses, in "necro" traps with pigs, and in bottle traps with carrion. In the archives of the Attorney General of the State of Nuevo Leon, there is abundant evidence that criminals have used organophosphate and carbamate insecticides to poison persons and cause death.

The trial was conducted at the Facultad de Ciencias Biológicas of Universidad Autónoma de Nuevo León and Instituto de Criminalística y Servicios Periciales of Procuraduría General de Justicia del Estado de Nuevo León, on larvae of *Ch. rufifacies* collected from human cadavers used for forensic research.

In this study, bioassays were performed in 250-ml polyethylene terephthalate containers containing 13.5 g of beef liver paste ground in a blender to which was added 1.5 ml of insecticide solution and subsequently mixed with a wooden applicator. Distilled water rather than insecticide was used for check treatments. Groups of 20 larvae of each stadium were exposed for 24 h to either treatment or check containers, with three replications for each insecticide concentration. Containers were placed in a bioclimatic chamber (Thermo Scientific, model 3759; Marietta, OH), set at $27 \pm 1°C$ and $70 \pm 10\%$ RH, with a photoperiod of 12:12 (L:D) h. After the 24-h exposure time, the number of dead larvae was recorded, where the criterion of mortality was immobility as the response to a mechanical stimulus. The insecticide formulations tested, Parathion metilico 720 (methyl parathion) and Furadan 350 L (carbofuran), were diluted in distilled water to make a stock solution of 1,000 µg/ml of active ingredient (AI) which was then further diluted for each bioassay and recorded as µg AI per g of beef liver. AI concentrations resulting in mortality from 10 to 90% of larvae are shown in Table 1 with the LC_{50} and corresponding confidence interval (95% CI) for each AI determined by log-Probit analysis using SPSS version 17.0 shown in Table 2. The LC_{50} values of both AIs differed significantly at each larval stadium, with larvae more susceptible to carbofuran than to methyl parathion. The LC_{50} values in all three larval stadia are in the ranges of concentrations that might be expected in a human poisoned with these insecticides. The purpose of the study was to determine the susceptibility of larvae of *Ch. rufifacies* to the insecticides to complement the medical and chemistry analysis in the estimation of the concentration of toxic at the time of death, when the corpses are at advanced decay.

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Table 1

Test material	Larval stadium	Concentration range of AI (µg/g)
Methyl parathion	First	0.100–6.000[a]
	Second	2.000–4.000[a]
	Third	18.000–32.000[b]
Carbofuran	First	0.100–1.000[a]
	Second	0.500–1.200[a]
	Third	0.500–2.750[a]

[a]Five concentrations.
[b]Eight concentrations.

Table 2

Test material	Larval stadium	*n*	Slope (SE)	LC_{50}, µg/g (95% CI)	χ^2
Methyl parathion	First	300	1.495 (0.159)	1.756 (1.353–2.290)	2.516[a]
	Second	300	6.299 (0.785)	2.771 (2.606–2.932)	4.798[a]
	Third	480	7.112 (0.823)	27.605 (26.510–29.015)	4.767[b]
Carbofuran	First	300	2.815 (0.321)	0.441 (0.292–0.601)	5.704[a]
	Second	300	6.041 (0.618)	0.782 (0.732–0.832)	1.192[a]
	Third	300	2.831 (0.349)	1.899 (1.662–2.230)	0.429[a]

[a]χ^2 critical value = 7.815.
[b]χ^2 critical value = 12.592.