

PORPHYRIN DERIVATIVES AS MOSQUITO PHOTOPESTICIDES: A NOVEL APPROACH TO CONTROL *Aedes aegypti*, VECTOR OF DENGUE FEVER

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Phototoxic effects of porphyrin derivatives have been demonstrated previously. These compounds act on biological systems, only when activated by direct sunlight or artificial light, and are described as environmentally friendly. This study investigated a novel approach to larval control, by testing the toxicity of four porphyrin derivatives, namely, protoporphyrin dimethyl ester (PPDME), haematoporphyrin dimethyl ester (HPDME), haematoporphyrin dihydrochloride (HPD) and haematoporphyrin (HP) on 4th instar larvae of *Aedes aegypti*, during the period of April 1999- July 2001. Laboratory and field studies were carried out at 1.25, 2.5, 5 and 10 ppm in aqueous and aqueous-acetone (few drops) solutions, at a unit volume of 2.5 or 4 ml per larva in clear plastic containers. Field experiments (Nagastenna, Kandy) were carried out inside and outside the houses (n=10) simulating the natural breeding habitats of mosquitoes.

Larvicidal activity was dependent on the derivative concentration, duration of exposure to sunlight and the unit volume per larva. Overall, a higher level of larvicidal activity was observed with aqueous solutions of HPD and HP than aqueous solutions containing acetone. In contrast, mortality rates with PPDME and HPDME in aqueous solutions with acetone generated better phototoxic effects than its aqueous counterpart.

A mortality of 55% (n=50; 2.5ml/larva in 10 ppm PPDME), after 4 days of exposure to light, doubled (100%) at 2 days, when the unit volume of PPDME was increased up to 4 ml/larva. Increased mortality levels (90–92%) were also observed after 7 days of exposure, at a unit volume of 2.5 ml/larva, with 18% accounted for natural mortality. In contrast, larvicidal activity was low with HPDME, with only 50% mortality observed after 7days. One hundred percent mortality was observed with HPD (2.5 ppm; 4ml/larva) after 2 days of exposure to sunlight, during which natural mortality was not observed. Although HPD at 1.25 ppm (4 ml/larva), gave similar results, larval mortality in the controls without HPD accounted for 30% of the mortality.

Field experiments carried out in home gardens, revealed that, mortality was only 12-25% (n=100) higher than the controls, even at 5 days, using PPDME and HPDME at 2.5 ppm concentrations. In contrast, with HPD phototoxicity resulted in 100% mortality within 3 days, 16% being accounted for natural mortality. In contrast, there were no appreciable levels of larval mortality, observed in the experiments carried out, inside houses.

Porphyrin compounds tested have phototoxic effects on 4th instar larvae of *Aedes aegypti*. HPD has a higher phototoxic efficiency than other compounds tested. HPD is recognized as a potential photoinsecticidal agent that could be safely used in the field. Experiments are underway to study the effect of HPD on larvae, found in other types of artificial breeding containers.

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