

# **Embryo-larvicidal activities of lufenuron on selected lepidopteran pests**

by

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## Declaration

This thesis reports the results of original research I conducted under the auspices of the Zoology and Entomology Department, University of Pretoria, between September 1997 and January 2001. All the assistance that I received has been fully acknowledged. This work has not been submitted for a degree at any other university.

  
.....  
Edomwande O Emmanuel

## **Dedication**

I dedicate this thesis to the memory of my father, Mr. Richard Edo Edomwande who showed me that there is more pleasure in carrying the pen rather than the gun, and to my beautiful mother, Madam Cecilia Adah, without whose love and strength I would not have survived the rigours and traumas of the Nigerian civil war.

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## ABSTRACT

Studies on the embryo-larvicidal activities of lufenuron on immature stages of the American bollworm, Helicoverpa armigera (Hübner); potato tuber moth, Phthorimaea operculella (Zeller); diamondback moth, Plutella xylostella (L.); and the false codling moth, Cryptophlebia leucotreta (Meyrick) under laboratory conditions were carried out between September 1997 and January 2001. In the embryo-larvicidal (ovo-larvicidal) bioassays, mortality of eggs placed on treated substrates (plant materials - leaves, fruits and tubers), was 1.0 – 6.4 % for American bollworm eggs, 0.3 – 5.1 % for potato tuber moth eggs, 2.8 – 6.9 % for diamondback moth eggs and 4.7 – 21.1 % for false codling moth eggs. These results show that lufenuron has a low effect on the embryonic stages of the American bollworm, potato tuber moth, diamondback moth and the false codling moth.

Mortality of first instars of the American bollworm and the potato tuber moth larvae after emergence from the treated substrates was very high (> 90.3 %) but mortality of the first instars of false codling moth larvae was low (< 5.0 %). In the diamondback moth, mortality of first instars from the treated cabbage leaf discs was 37.0 – 80.5 % and 1.8 – 4.5 % for eggs that emerged from untreated cabbage leaf discs. In the four insect pests studied, mortality was most common during or after larval moult and nearly all the dead and dying larvae had typical symptoms of acylurea poisoning, such as black shrivelled body, ruptured exoskeleton, leaking haemolymph and failure to shed the old larval skin.

Emergence of adult C. leucotreta from lufenuron-treated orange fruits was high (75.8 – 90.0 %), but the emergence of adult H. armigera, P. operculella and P. xylostella from the treated plant substrates was very low (< 4.3 %). In the residual activity bioassays, lufenuron was highly effective against first and second instar stages of the American bollworm, potato tuber moth and the diamondback moth over the 10-day trial period, but had no significant effect on the larval and post larval stages of the false codling moth. Histological examination of the integument of larval instars that emerged from eggs placed on lufenuron-treated substrates showed a complete distortion or disorganization of the endocuticular layers. This distortion of larval endocuticle and the degeneration of the epidermal layer suggest that larval death during or after moult could have been caused by a defect in the process of cuticle deposition.

Findings from this study shows that the topical application of lufenuron prior to egg oviposition would reduce the amount of damage caused by the larval instars of H. armigera, P. operculella and P. xylostella.

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