

**BIOLOGY AND MORPHOMETRIC CHARACTERIZATION OF
SWALLOWTAIL BUTTERFLY, *Papilio desmondi teita* AND *Papilio nireus* ON
WILD CITRUS IN TAITA TAVETA COUNTY, KENYA**

GENGA CRAMSWEL OLIVER (BSC. ARM)

A145/25177/2018

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS OF MASTER OF SCIENCE IN CROP PROTECTION
(ENTOMOLOGY OPTION) IN THE SCHOOL OF AGRICULTURE AND
ENVIRONMENTAL SCIENCES, KENYATTA UNIVERSITY**

OCTOBER 2023




DECLARATION

I **Genga Cramswel Oliver** declare that this research thesis is my original work and has not been presented in any other university or institution for consideration for award of a degree.

Signature.......... Date..... 09/10/2023

Approval by supervisors


This research thesis has been submitted for examination with our approval as supervisors.

Signature.......... Date..... 14/10/2023

Dr. Namikoye Everlyne Samita

Department of Agricultural Science and Technology


Kenyatta University (KU)

Signature.......... Date..... 15/10/2023

Dr. Ruth Kahuthia-Gathu

Department of Agricultural Science and Technology

Kenyatta University (KU)

Signature.......... Date..... 13/10/2023

Dr. Esther N. Kioko

Zoology Department

National Museums of Kenya (NMK)

ABSTRACT

Swallowtail butterflies, *Papilio nireus* and *Papilio desmondi teita* include some of the most spectacular pollinator insects in the world. In Kenya, they are commonly found in Taita hills with diverse species of forest trees and shrubs such as *Clausena anisata* and *Toddalia asiatica*. *Papilio desmondi teita*, an endangered species is endemic to Taita hills. Limited information available on the biology, morphology and host preferences make their management and conservation difficult. This study therefore assessed the biology, morphometric characteristics of developmental stages of *P. desmondi teita* and *P. nireus* on two host plants, *C. anisata* and *T. asiatica* from February to July 2021. The host plants were investigated for oviposition preference in Ngangao forest, Taita hills while the morphological characterization of male genitalia of both species of swallowtail was carried out in the laboratory at National Museum of Kenya (NMK). There were 6 treatments replicated 3 times and arranged in a split plot design for the biology studies, the effect of selected host plants on oviposition preference morphology of developmental stages. Data were collected on the growth and developmental periods, morphometric measurements and oviposition preference tests for both species of butterflies and the selected species of wild citrus. The morphometric images were captured using Nikon digital camera and male genitalia were visualized under a microscope. The R-statistical software package, version 4.1.1 was used for the analysis of all data from developmental parameters, morphometric measurements and host preference tests at $P \leq 0.05$. The results revealed that *P. nireus* development period from egg to adult was significantly shorter on *C. anisata* (60.26 days) than *T. asiatica* (66.44 days) during the first season. Similarly, second season had a shorter developmental period on *C. anisata* (63.15 days) than *T. asiatica* (69.01 days). *Papilio desmondi teita* completed development on *T. asiatica* during both rearing seasons. The development periods were 81.13 ± 0.44 days and 112.15 ± 1.20 days in the 1st and 2nd seasons respectively. Sex ratio of *P. nireus* was female-bias in both host plants during the first season. However, in the 2nd season, sex ratio on *C. anisata* was male-biased and that of *T. asiatica* was female-biased. *Papilio desmondi teita* sex ratio was female-biased in both seasons on *T. asiatica*. *Papilio nireus* and *P. desmondi teita* were also morphologically different as demonstrated by their wing, wing venation and male genitalia features. In no-choice test, the number of eggs laid by female *P. nireus* on both host plants was not significantly different ($P = 0.696$). During the choice experiment with the same species, the females laid a significantly higher number of eggs on *C. anisata* (19.30) than on *T. asiatica* (12.15). For *P. desmondi teita*, females laid a significantly higher number of eggs on *T. asiatica* than on *C. anisata* in both choice ($P < 0.001$) and no-choice tests ($P < 0.001$). Findings of this study showed that *C. anisata* was the most suitable for larval development of *P. nireus* while *T. asiatica* was a suitable host plant for larval development and female oviposition of *P. desmondi teita*. Farmers should utilize both host plants for the rearing of *P. nireus* and conserve *T. asiatica* since it is the main host plant for endemic *P. desmondi teita* in Taita Hills.