

***ARYTAINA MOPANE'S ASSOCIATION WITH  
COLOPHOSPERMUM MOPANE***

**By**

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# DECLARATION

I declare that this dissertation hereby submitted to the University of Limpopo for the degree Masters of Science has not been previously submitted by me or for a degree at any other University, that it is my own work in design and execution, and that all material contained therein has been duly acknowledged.

Signature -----

C.K. Oppong

## **DEDICATION**

**This dissertation is dedicated to my wife, Mercy and to my children Vincent, Beatrice, Ronald and the late Bright Oppong**

# ABSTRACT

This dissertation reports on the results of field (Letsitele area) and laboratory investigations on the biology of *Arytaina mopane*, its ecological role as well as its physiological influences on the host plant *Colophospermum mopane*. The work is divided into three sections.

Section one describes the various aspects of the biology of *A. mopane*, which includes the morphology of the eggs, nymphs and adults including the behaviour of nymphs and adults. Damage caused to the host plant by infestation as well as predation of *A. mopane* is discussed.

Eggs are randomly laid on green and senescent *C. mopane* leaves, very often in clusters and along the veins. The eggs are black and conical in shape with a reticulate-sculptured membrane surrounding each. Each egg has a pedicel at the apical end and a filament at the basal end. An egg is not attached by a pedicel (contrary to the literature) but glued to the leaflet surface.

*Arytaina mopane* exhibits an incomplete metamorphosis with the life cycle consisting of an egg, 5 nymphal instar and an adult. The five nymphal stages differed only in size and minor morphological features except for development of wings. Wingpad development is prominent from the third instars onwards. Nymphs construct scutcheon-like encrustations, commonly known as lerps over their bodies, which partly protect them from enemies and desiccation. Lerps covered only about 0.2% of the adaxial leaflet surface, where they were more common. Nymphs feed by piercing through the epidermal cells into the vascular bundle tissue of the leaflet with their stylet to reach the phloem sap. Feeding damage by nymphs results in black and reddish-brown spots on the leaflet surface. Two forms of nymphs that varied in colour and abdominal markings were identified, that could either be two different female morphotypes of the species, gender variation or natural variation.

When not feeding, adults rest almost motionless on the leaflet or petiole with their stylet withdrawn and wings folded. Adults prefer walking or crawling to flying between

leaflets but sometimes jump when disturbed. When violently disturbed adults did fly short distances and returned to settle on a leaf of the same tree. The mean adult body length is 3.5 mm. In the laboratory, the life span of adults ranged between 5 and 8 days.

Predators include birds such as the Red winged starling (*Onychognathus morio*) and Tawnyflanked prinia (*Prinia subflava*), the Painted reed frog (*Hyperolius marmoratus taeniatus*), the larvae of the Brown lacewing (Neuroptera: Hemerobiidae), a suspected Coccinellid beetle, and ants belonging to the genus *Crematogaster*.

The second section reports on the physiological influences in terms of the chemical composition of lerps and the mineral content of both infested and uninfested *C. mopane* leaves. Lerps, infested and uninfested *C. mopane* leaves were tested for carbohydrate and mineral contents. The carbohydrate constituent of lerps and leaves (infested and uninfested) was sugar in the form of glucose, fructose and raffinose. Infested leaves contained significantly higher amounts of the macro elements calcium and magnesium than uninfested leaves. The uninfested leaves in contrast had significantly higher amounts of nitrogen, potassium, iron and copper.

The ecological role of the infestation on *C. mopane* is reported in section three. *Colophospermum mopane* leaves at certain times of the year are known to have high tannin levels, which presumably results in bitter tasting leaves. The sweet encrustation (lerp) of *A. mopane*, apart from possibly reducing this bitter taste of the senescent leaves, raises the energy content by adding to the glucose and fructose levels of the leaves. This could consequently increase *C. mopane*'s browsable potential to game and wild animals during autumn. This could have an important impact on the game industry of the Limpopo and Mpumalanga Provinces of South Africa.

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## **ABBREVIATIONS USED**

ARC: Agricultural Research Council

CPD: Critical point dried

DM: Dry mass

EDS: Energy dispersive X-ray spectroscopy

FAA: Formalin acetate acid alcohol

FET: Further Education and Training

GMA: Glycol methacrylate

HPLC: High performance liquid chromatographic

ICP: Inductively-coupled plasma

MEF: Musina Experimental Farm

PEG: Polyethylene glycol

SD: Standard deviation

SEM: Scanning electron microscope

TCE: Trichloroethalene

U.D.: Undated

WMA: Water management area