THE INFLUENCE OF GALL MIDGES *RHOPALOMYIA* SPP. ON THE ANATOMICAL AND PHYTOCHEMICAL PROFILES OF THEIR HOST PLANTS IN SAINT KATHERINE PROTECTORATE

Submitted By

Marina Rogah Nabih Samaan

B.Sc. of Science Faculty of Science, Ain Shams University, 2010

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A Thesis Submitted in Partial Fulfillment
Of
The Requirement for the Doctor of Philosophy Degree
In
Environmental Sciences

Department of Environmental Basic Sciences
Institute of Environmental Studies and Research
Ain Shams University

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APPROVAL SHEET

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This Thesis Towards a Doctor of Philosophy Degree in Environmental Sciences Has been Approved by:

Name Signature

1-Prof. Dr. Ali Ahmed Younis
Prof. of Entomology
Faculty of Science
Cairo University

2-Prof. Dr. Mohamed Nabeh Al-Shorbagy
Prof. of Plant Eco-Physiology
Faculty of Science
Tanta University

3-Prof. Dr. Hala Abdel Hamid Mohamed Kassem
Prof. of Entomology, Head of Environmental Basic Sciences Department – Institute of Environmental Studies & Research
Ain Shams University

4-Prof. Dr. Amal Ahmed Morsy
Prof. of Plant Eco-Physiology
Faculty of Science
Ain Sham University

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1-Prof. Dr. Hala Abdel Hamid Mohamed Kassem
Prof. of Entomology, Head of Environmental Basic Sciences Department – Institute of Environmental Studies & Research
Ain Shams University

2-Prof. Dr. Amal Ahmed Morsy
Prof. of plant Eco-physiology
Faculty of Science
Ain Shams University

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Abstract

St. Katherine protectorate (SKP) is one of the richest spots of floral diversity in the Middle East up to date. *Seriphidium herba-album, Tanacetum sinaicum* are important medicinal plants belonging to family Asteraceae; covering large areas within SKP wadies and mountains. *Pterocephalus sanctus,* is a rare endemic plant belonging to family Dipsacacae, was recorded only in SKP. These plants are suffering from number of biotic stresses including plant galls (tumors) induced by the gall midge *Rhopalomyia sp*. Permanent slides of galled and non-galled tissues were made in order to assess the anatomical-induced effects in the host plants. Crude aqueous and ethanolic extracts of both galled and non-galled tissues in the three studied plants were prepared in order to assess the phytochemical-induced effects in the plants. Induction of a nutritive tissue surrounded by a storage tissue and newly developed vascular tissue connecting gall tissues with the stem were formed in the three plants. Formation of neo-vascularization within the gall tissue was a key feature within *T. sinaicum and P. sanctus* galls. Induction of protective tissue was characteristic to *S. herba-album* galls. Phytochemical assay showed that the gall midges mainly induced metabolites to ensure its food, development and protection. Galls were rich in bioactive phytochemicals such as phenolic compounds, alkaloids, rare sugars, polyols, terpenes, steroids and organometallic compounds. Despite sharing common anatomical features, galls induced in plants were morphologically and chemically different. It was suggested that the galls were induced by different *Rhopalomyia* species. More studies are needed to accurately identify the gall inducer to the species level and to identify the unknown compounds extracted from these important medicinal plants and their galls. Studies are also needed to identify how

insects overcome plant defensive phytochemicals in order to initiate the galls.

Key words: Plant galls, St. Katherine Protectorate; *Tanacetum sinaicum*; *Seriphidium herba-album*; *Pterocephalus sanctus*: *Rhopalomyia sp.*; Plant histology, Insect-plant interaction.

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