Studies on the population dynamics of two different insects in a storage ecosystem

A Thesis

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By

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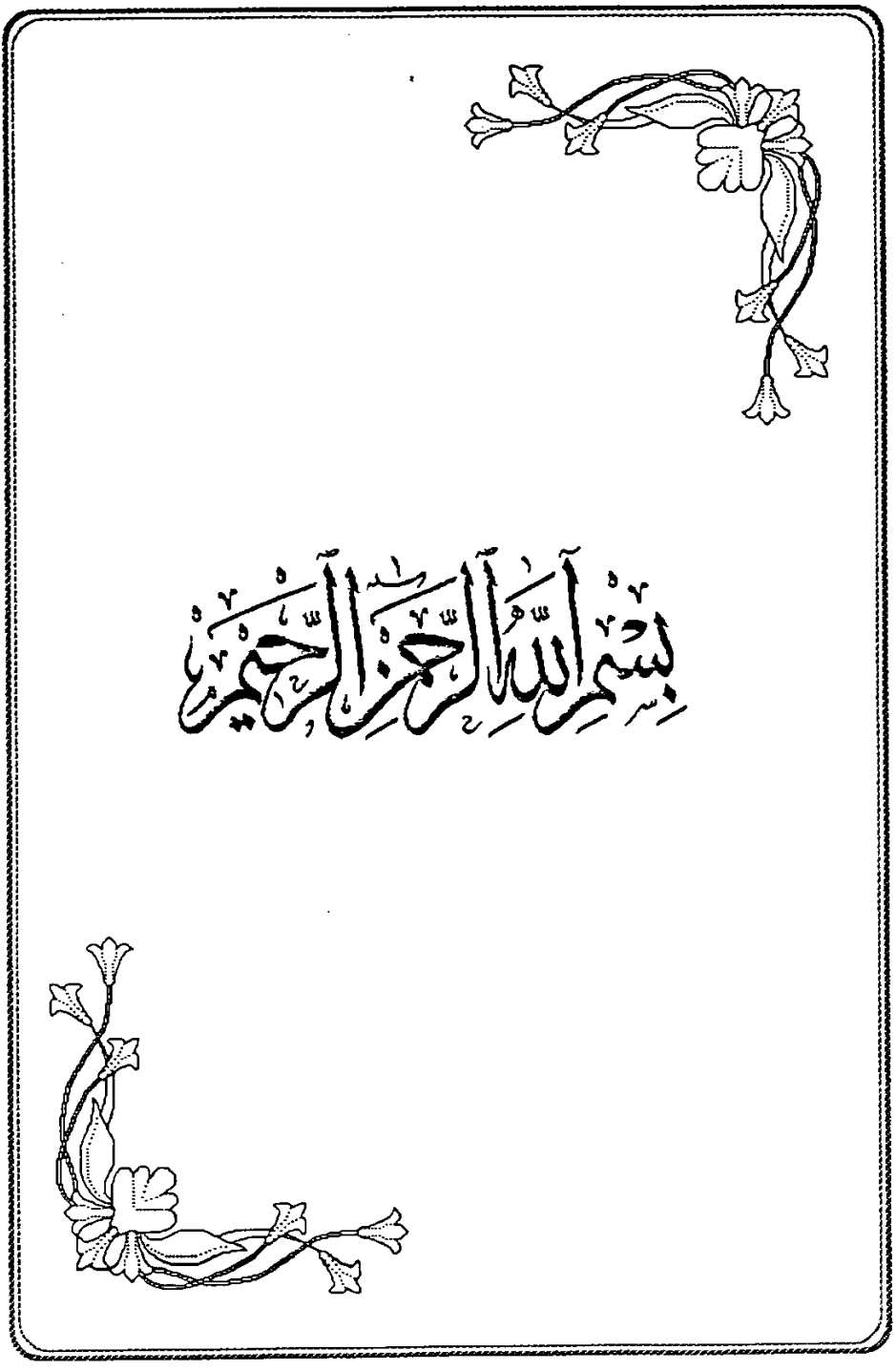

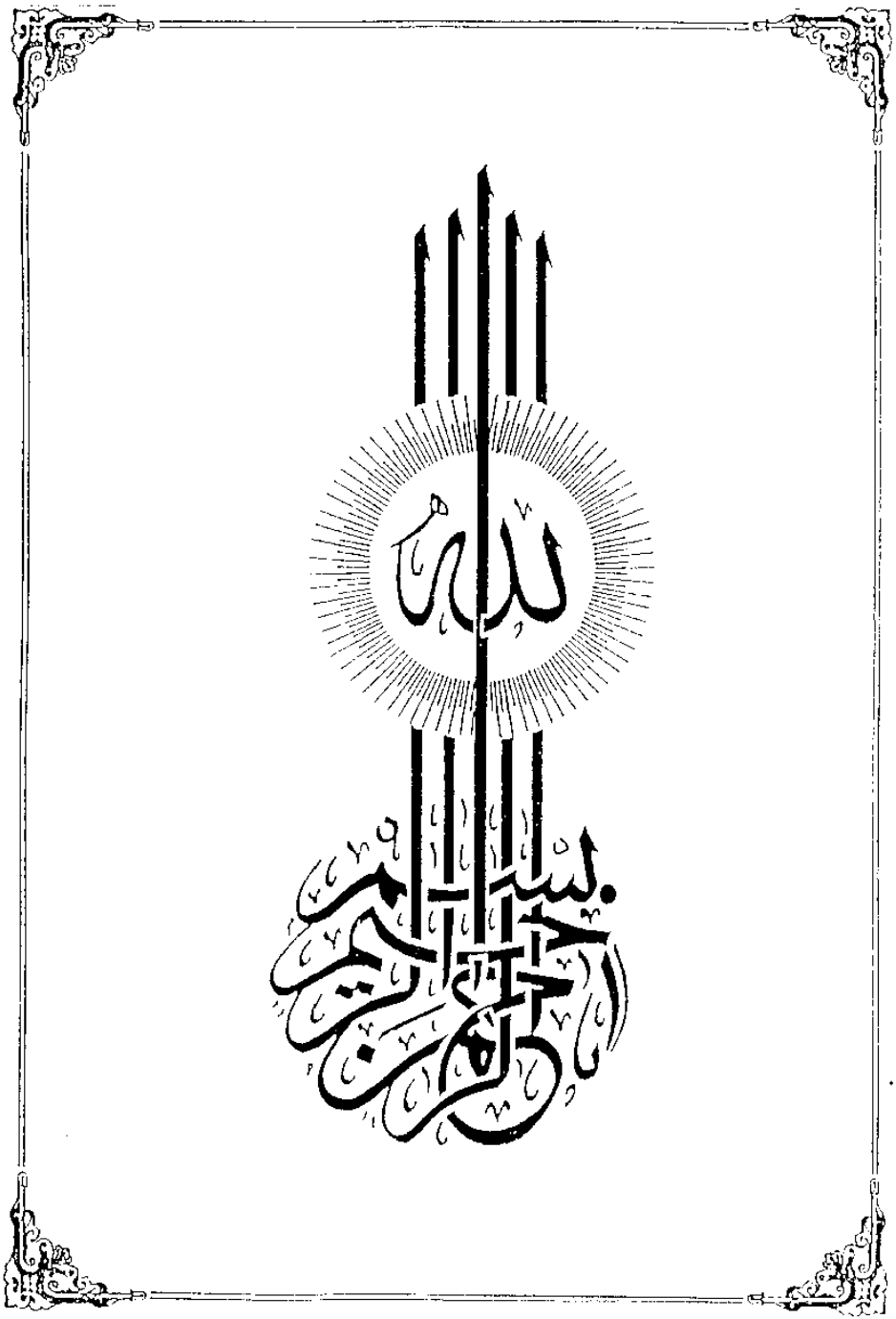

جامعة عين شمس
كلية العلوم

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Abstract

The present investigation dealt with the study of intra - and interspecific competition in two stored grain insects, *Tribolium confusum* and *Corcyra cephalonica*, in different levels of initial infestation, in a limited storage ecosystem at 26 ± 2°C and 50 ± 5% r.h. for different periods.

It covered the effects of competition in each species and in both species on competitors population growth and population mortality, as well as on grain moisture content and counts and kinds of associated storage fungi.

The population density increased with increasing initial infestation and/or storage period to a certain extent and then sharply decreased. Finally, the population of *T. confusum* vanished; while that of *C. cephalonica* remained alive. Mortality, on the other hand, was very low at the beginning of infestation, but tremendously increased after the population became crowded.

A positive correlation existed between the insect population density and the moisture content of infested madia. The increase in moisture content due to insect crowding was usually accompanied by the growth of different species of storage fungi mainly of the genera *Aspergillus and Penicillium*.

Key words: *Tribolium confusum*, *Corcyra cephalonica*, population dynamics, intraspecific competition, interspecific competition, population growth, population mortality, storage fungi, moisture content.

Contents

I.Introduction

I. INTRODUCTION

The infestation of stored grain and grain products by insects is a common problem throughout the world. Generally, several species of insects invade stored grain and grain products simultaneously or in close succession. Consequently, competition for food and space affect insect populations, the quality of stored products and its rate of deterioration **(Kabir, 1966; Lefkovitch, 1968; Ciesielska, 1975; Le cato, 1975; Abdel Fattah, 1992)**.

The infestation of these insects with one another and their environment under favourable temperature and grain moisture content usually maximizes biological activity leading to rapid floral and faunal succession and deterioration of grain and grain products **(Sinha and Wallace, 1966; Abdel-Rahman 1967, 1969; Abdel-Fattah, 1992)**.

Intra-and interspecific competition have been brought to be the primary driving force of evolution since Darwin proposed the theory of natural selection. Some ecologists referred intraspecific competition as the major factor controlling population dynamics **(Elton, 1947; Nicholson, 1948)**. Interspecific competition, on the other hand, has been one of the most attractive subjects in ecological researches **(Connell, 1983; Schoener, 1983)**. This is the first and most important step to bridge gap between community ecology and lower levels of

ecological phenomena at the population or the individual level **(Toquenaga and Fujii, 1991)**.

Competing species often adapt different and in some cases, opposite types of resource utilization **Nicholson (1954)** proposed the two extreme forms of competition when individuals compete for common resources; "scramble" type and "contest" type competitions. The former type occurs when competing individuals have equal access to a common resource. With this mode of competition, all individuals die when the resource is used up. In "contest" type competition, on the other hand, some individuals monopolize the resource, while the others are left with no resource. This concept of "scramble" and "contest" type competitions has been very useful in the study of population ecology; especially when considering the mechanism of population dynamics.

The confused flour beetle, ***Tribolium confusum*** duval, and rice moth, ***Corcyra cephalonica*** (Staint) are cosmopolitan pests of stored products and are widely distributed in Egypt. They cause considerable damage to different stored grain and grain products; and may render the grain more susceptible to attack by secondary insect pests and storage fungi. Because of their similar habits, both insects have been regarded as ecological homologues.