CHEMICAL CONTROL OF RATTUS SP.

IN CERTAIN EGYPTIAN REGIONS

BY

MICHAEL WILLIAM MIKHAIL

A thesis submitted in partial fulfillment of

the requirements for the degree of

MASTER OF SCIENCE

in

Agriculture (Pesticides)

Plant Protection Department

Faculty of Agriculture

Ain Shams University

1988

APPROVAL SHEET

Title of Thesis ; Chemical Control of Rattus sp. in Certain Egyptian Regions.

Degree : M.Sc. (Pesticides)

Name of Student : Michael William Mikhail

Approved by :

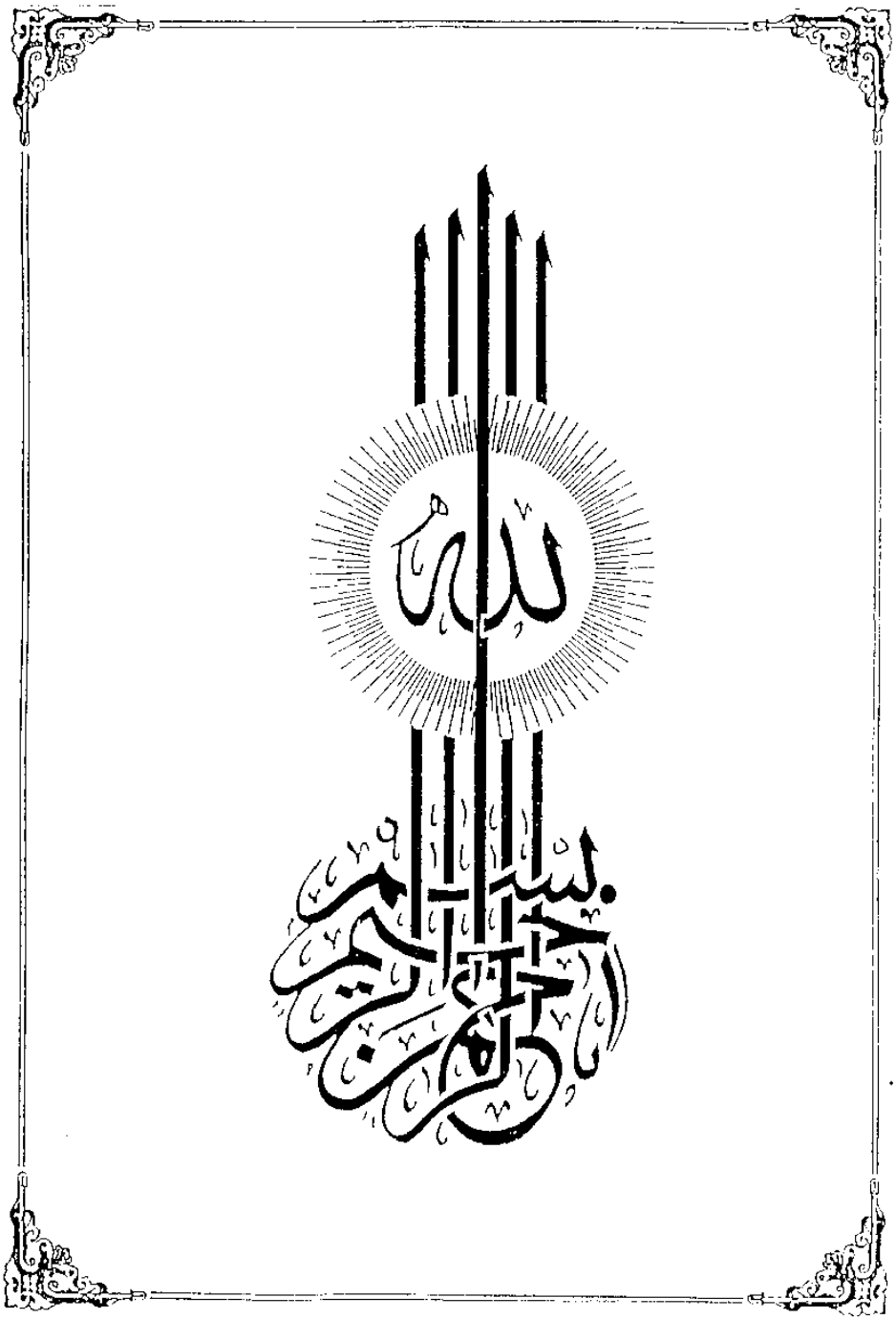
.....

.....

.....

Committee in charge

Date : 2 / 3/1988



ACKNOWLEDGEMENT

This work has been carried out under the supervision of Professor ***Dr. M.I. Abdel-Megeed*** *and* ***Dr. M.S.*** El-Zemaity, *Assosiate Professor of Pesticide, Plant Protection Department, Faculty of Agriculture, Ain Shams University, to them the author wishes to express his great appreciation, deep gratitude and indebtedness for suggesting the problem, supervision of the work, sincere help, kind encouragement and keen interest in the progress of the work.*

The author also wishes to express his deep gratitude to Prof. ***Dr. A.S. Kansouh*** *and the late Prof.* ***Dr. A.M. Shaaban*** *for their help and careful advice.*

Sincere thanks to Professor ***Dr. A.A. Selim*** *and Professor* ***Dr. Z.H. Zidan*** *for their advice and reading manuscript.*

Thanks are also due to Professor ***Dr. Samira Sadek Bekheit,*** *Director Generaly of Research Institute of Medical Entomology, Ministry of Health for offering the facilities throughout this study.*

The author wishes to thank the non-professional staff at the same Institute for their real help in both field and laboratory.

CONTENTS

Introduction

INTRODUCTION

The control of commensal rodents is very important to safeguard human and to prevent economic losses. Recommendation for rodents control is directing towards preventing rats and mice from living in and around buildings at both urban and rural areas, or eradicating rodent populations that have already established in the considered areas (Brooks 1973). Thus, the usual control practice involves the improvement in evironmental sanitation, the protection of buildings by proofing means and the use of poisonings, fumigation and trapping techniques. Sometimes satisfactory control could be achieved by employing one of the above mentioned methods only. However, in more recent times, chemical control using rodenticides has become the most widely used option. Accordingly, the anticoagulants proved the most important and effective in concern of their chronic toxicity. Thus they were widely used at many parts of the world and succeeded in achieving superssion the usage of the acute poisons. Anticoagulants acts by preventing the production of the essential vitamin K_1 dependent blood clotting factors in the liver. The advent of the acticoagulants led to a revolution in the practice of rodents control. The most world widely anticoagulants in the market at the present time are either cumarin derivatives or indandiones. Except in a few areas of the world where resistance has appeared, these distinguish group of rodenticides control at least the common rat, Rattus norvegicus, reasonably well (Boyle, 1960 & 1967; Lund, 1964; Rowe and Redfern, 1965; Drummond, 1966; Drummond and Bently, 1967; Drummond and Wilson, 1968; Bell and Galdwall, 1973; Brooks and Bowerman, 1973;

Greaves and Ayres, 1976 and Mahmoud and Redferm, 1981). The best anticoagulant can be very effective indeed, although different claims are made at different countries. For example, Bentley (1972) reported that warfarin is expected to give 100% control of R. norvegicus infestations in built-up areas in same countries, but in others 85% or higher rate of control is considered to be "seccessful" such diffrences may depend on the techniques used in control programmes, but basically they are almost certainly related to the value of control effort than in considered economical to expend in different situations.

Although most of the anticoagulants on sale are generally effective, laboratory tests have shown that some are discernibly better than others for the control of certain species of rodent. In some instances this can be ascribed to an obvious physiological effect. It is well known, for example, that at the recommended dosages some anticoagulant affect the clotting factors in mammalian blood much more quickly than others. In some instances, variations in the effectiveness of different anticoagulants in field may reflect differences in palatability, which may depend partly on the concentration of the poison. In view of those differences in effectiveness, it is of interest to note that anticoagulant usage varies widely from one country to another. In some countries, warfarin has become so well established that, it would be difficult and commercially hazardous to market new products. However, two other factors may also be involved-namely, the need for more comparative studies on the performances of the various substances and for the better interchange of laboratory and field results among control biologists working at different countries.

Control of rodent populations in village is complicating process due to the renewly infestation from surrounding field crop areas or adjacent vegetable gardens by native or commensal rodents. Large-scale reduction of rodents living in and around the village structures frequently leads to invasion of the village habitat by field rodents. Invasion may also occur on a seasonal basis due to harvesting of corps. Thus, control methods in villages must take in account not only of resident but also of potential immigrant rodents. Control treatments may have to be scheduled according to the cropping and harvesting practices (Greaves, 1982).

By the guide of mentioned background, the present study was taken up to achieve the following aims and objectives :

1. Population density of dominated domestic rodents at Dahshour, Geiza Governorate.
2. Population density of fleas parasites associated with rodent species at Dahshour, Geiza Governorate.
3. Response of the roof rat, Rattus rattus to the studied anticoagulant rodenticides under laboratory conditions.
4. Susceptibility and resistance of the roof rat, Rattus rattus to warfarin.
5. Haematological changes in warfarin treated roof rat, Rattus rattus.

Review of Literature

REVIEW OF LITERATURE

A - Population density of domestic rodents in Egypt :-

Rifaat, et. al. (1969); reported that, Rattus norvegicus was the most prevalent rodent species, representing 89.2% of the total part population at Coastal zone in Port Said, at Alexandria, Mus musculus was the most dominant rodent (53.3%) and at the Coastal area of Sinai, (75.6%). In the Nile Delta, various species showed almost homogenous distribution all over the representing area. Acomys cahirinus which was absent from the coastal areas, while it is the most dominant species (85.0%) at the northern part of upper Egypyt. In contrast, Rattus rattus was the most prevalent species at the middle part (71.7%). At Aswan Governorate, Rattus rattus proved to be the dominant species (17.7%), while Rattus rattus frugivorus is the most prevalent species at Fayoum (57.0%) and at Kharga oasis (63.1%). Moreover, at Kharga Rattus rattus alexandrinus was next to Rattus rattus frugivorus (32.8%), Acomys cahirinus was not found at this location and is replaced by Mus musculus (4.0%).

Mahdi, et. al. (1970); reported that rodent index at Suez area differed from one locality to another depending on the sanitary conditions and adequacy of anti-rat measures. Also the frequency of the various species differs, according to the prevailling environmental conditions. Norway-rat, Rattus norvegicus is the most dominant species in this area. The white-bellied rat Rattus rattus frugivorus proved to be quite dominant in certain localities, and less dominant in the others. The house mouse, Mus musculus showed more or less even distribution in the various places and it represents the second dominant species in the town. The Cairo spiny mouse, Acomys cahirinus in contrast with the former species, prevails in the town and rural suburbs. It also exists in good abundance in the desert settlements.

Mahdi, et. al. (1971); reported that the rodent fauna at Beheira Governorate comprises the brown rat, Rattus norvegicus (42.3%), followed by Rattus rattus frugivorus (41.6%), Mus musculus (12.1%) and Rattus rattus alexandrinus. Moreover, Rattus rattus rattus and Acomys cahirinus were not trapped from this area.

Mahdi, et. al. (1971); reported that the maximum rodent-index at Fayoum occurred during spring, due to the mild temperature and relative humidity as well as abundant food supply. The whitebellied rat is the most dominant species throughout the year, with some lower frequency during autumn. Spring was found to be the main season for breeding associated with high general rodent-index as well as very high frequency and the least immature percentage. The marked reduction in reproduction during summer season might be attributed to interspecific competition between individuals as a result of the rapidly extending population during the previous season, nevertheless the frequency was still maintained, at high level. At this area, it is very difficult to determine the exact time season, but rather seasons of diminished breeding (summer) or diminished density (autumn), entailling maintenance of control measures throughout the year with particular stress during summer and autumn.

Mahdi and Arafa (1971); reported that spring is the main reproduction seasons of the house mouse, Mus musculus at Alexandria. The obvious reduction in frequency and reproduction during summer, may be the result of increased intra-and inter-specific competition. This will be translated into partial cessation of reproduction and decimation of a part of the population to keep the rodent population within normal limits of the environment. The reduction during autumn and winter is rather related to natural external factors (abiotic) such as low temperature

and high rain fall.

Abdel-Gawad and Maher (1982); reported that. Rattus rattus frugivorus females, showed high pregnancy rate through May (33.7%) and June (35.4%). The number of embroyos per female reached average of 8.1 and 8.8, respectively.

Abdel-Gawad, et. al., (1982); reported that, there was no significant differences between the numbers of females and males of immature and mature stages of Rattus rattus alexandrinus at El-Gorayeb farm as a newly reclaimed land in the outskirts of eastern desert at Assiut. Females out-numbered males all over the year except at the end of autumn whereas the reverse was observed. Females of Rattus rattus frugivorus markedly exceeded males all the year round except June and November. All species shows that, mature animals markedly exceeded immature ones. The highest density of immature in all species was observed during autumn and summer seasons.

Abdel-Gawad, et. al. (1982); reported that population density of rodents in Assiut as indicated by rat index varied from year to year forming a cycle with peak every four years in the cultivated areas. In the semi-desert area, population density formed a cycle with a peak every five years. This cycle appeared every four years in Ruttus rattus frugivorus, Arvicanthis niloticus and Jaculus spp.. It was every five years for Rattus rattus alexandrinus, Gerbillus spp. and Meriones spp. Within each year the highest and lowest density of all species was observed during summer and winter.

Salit, et. al. (1982); reported that domestic, commensal and field rodents were attacking the newly reclaimed areas in competition with

the desert rodents at Assiut. The cultivated land reveald that the nile field rat, Arricanthis niloticus was the most predominant species with some individuals of the whitebellied-rat Rattus rattus frugivorus at the cultivated areas.

Mourad, et. al. (1982); reported that the population density of rodents in the city at Minia Governorate was less than in towns adjacent to rural areas. The greybellied rat, Rattus rattus alexandrinus was the dominant species followed by Rattus norvegicus, rattus r a t t u s frugivorus, Arricanthis niloticus and Acomys cahirinus. Population density of rodents as indicated by rat-index was varied from year to year forming a cycle with peak every four years in all areas. Within each year the highest of all species was noticed during spring followed by autumn, while the lowest was recorded during winter and summer seasons.

B - Fleas associated with domestic rodents :

Rifaat, et. al. (1969); found that the oriental-rat flea, Xenopsylla cheopis was the most predominant species parasitizing the commensal and domestic rodents in Egypt. The cat-flea Cetenocephalides felis including two subspecies Ct. felis felis and Ct. felis strongylus occurred mainly on Rattus norvegicus and was absent from the common black rat, Rattus rattus rattus and the house mouse, Mus musculus, it existed to a lesser extent on Rattus rattus alexandrinus, Rattus rattus frugivorus and Acomys cahirinus. The mouse-flea, leptopsylla segnis, occurred at a very low density, and was distributed on Rattus rattus rattus, Mus musculus, Rattus rattus alexandrinus and Rattus rattus frugivorus. It was not recorded from either Rattus norvegicus or Acomys cahirinus. The human-flea Pulex irritans was recoered from Rattus norvegicus and Mus musculus.