

**ENVIRONMENTAL CONDITIONS AFFECTING BEE
VENOM PRODUCTION AND QUALITY AT
QALYOBIA GOVERNORATE**

Thesis Presented By

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Diploma in Economic Entomology, Faculty of Agriculture,
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2012

الظروف البيئية المؤثرة على إنتاجية وجودة سم النحل في محافظة القليوبية

رسالة مقدمة من الطالبة

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دبلوم تخصصي وقاية نبات (حشرات اقتصادية) من كلية الزراعة، جامعة القاهرة ٢٠٠٤

لاستكمال متطلبات الحصول على درجة الماجستير في العلوم البيئية

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ختم الإجازة

أجيزت الرسالة بتاريخ / / ٢٠١٢

موافقة الجامعة

/ / ٢٠١٢

موافقة مجلس المعهد

/ / ٢٠١٢

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Abstract

The quantity and quality of bee venom produced by *Apis mellifera* L. workers as being affected by the rearing season and the age of workers had been studied. The heaviest venom sac was found in middle aged workers, followed by young and old bees. However, the heaviest poison sac was recorded in the spring, followed by summer, autumn, and winter.

Chemical analysis of bee venom shows that the highest amount of protein content and phospholipase A2 in the venom was obtained in the old bees during the spring season. The same trend could be applied for the amount of Melittin (as an active compound in the bee venom) as being affected by the rearing season and the age of worker. On the other hand the highest amount of apamin was recorded during autumn in young bees. The resultant bee venom was applied on treatment of women suffers from repeated abortions.

Before starting the treatment with bee venom, results of blood analysis of women suffers from repeated abortions showed increase in the viruses taxoplasma, cyto-megalo virus and rubella IgG and IgM, these women had a course of stinging sessions by using 5 bees weekly.

Some of these cases were fully healed, while others need more stinging courses. Results showed that the nature of women work affects the needing of more stinging session such as working in rearing birds or buying food from street vendors that increase the contamination.

After repeated stinging session with venom, the bloods showed decreased levels of viruses and increased the ability of pregnancy was 95% while it was 100% in patients at ages less than 35 years which need only 5 courses of stinging sessions.

CONTENTS

| | SUBJECT | PAGE |
|----------|--|-------------|
| 1 | INTRODUCTION & AIM OF WORK | 1 |
| 2 | REVIEW OF LITERATURE | 4 |
| 2.1 | The stinging apparatus of the honey bee workers | 4 |
| 2.2 | Collecting bee venom | 5 |
| 2.3 | Properties and composition of bee venom | 8 |
| 2.4 | Bee venom composition in different seasons | 10 |
| 2.5 | Factors affecting production and active materials of bee venom | 11 |
| 2.6 | The use of bee venom in therapy | 15 |
| 3 | <i>MATERIALS AND METHODS</i> | 23 |
| 3.1 | Experimental colonies | 23 |
| 3.2 | Production of bee for chemical analysis | 23 |
| 3.3 | Amount of bee venom during different | 24 |
| 3.4 | Qualitative and quantitative standard operating procedure (HPLC) estimation of bee venom fraction and their active components. | 24 |

| | | |
|----------|---|------------|
| 4 | RESULTS AND DISCUSSION | 37 |
| 4.1 | Effect of rearing season and worker age on the quantity and quality of honey bee venom. | 37 |
| 4.1.1 | Weight of poison sac picked up from workers of different ages. | 37 |
| 4.1.2 | Total protein content in bee venom of worker bees. | 38 |
| 4.1.3 | Amount of active compounds in bee venom taken from workers of different ages | 46 |
| 4.2 | Effect of bee venom on pregnancy acceptance in women suffering from recurrent pregnancy loss. | 58 |
| 4.2.1 | Effect of rearing season bee venom quality. | 60 |
| 4.2.2 | Recommendation | 66 |
| 4.2.3 | Effect of number of stinging sessions on the antibodies levels in blood of patients. | 69 |
| 4.2.4 | Effect of number of abortions occurred before bee venom treatment on IgG and IgM levels. | 77 |
| 4.2.5 | Effect of patient age on IgG and IgM levels. | 86 |
| 5 | SUMMARY | 97 |
| 6 | REFERENCES | 111 |
| 7 | ARABIC SUMMARY | |

List of Tables

| No. of table | Title of table | Page |
|---------------------|---|-------------|
| Table (1) | Weight of poison sac picked up from bee worker at the different ages. | 39 |
| Table (2) | Amount of total Protein ($\mu\text{g/ bee}$) found in venom taken from bee workers of different ages in different seasons. | 43 |
| Table (3) | Amounts of Melillin ($\mu\text{g/ bee}$) found in venom taken from bee workers of different ages in different seasons. | 47 |
| Table (4) | Amounts of Apamin ($\mu\text{g/ bee}$) found in venom taken from bee workers of different ages in different seasons. | 51 |
| Table (5) | Amounts of Phospholipase ($\mu\text{g/ bee}$) found in venom taken from bee workers of different ages in different seasons. | 55 |
| Table (6) | Toxoplasma level in blood of patients before and after bee venom treatments in the different seasons of 2009& 2010 years. | 61 |
| Table (7) | Cyto-megalovirus level in blood of patients before and after bee venom treatments in the different seasons of 2009& 2010 years. | 64 |
| Table (8) | Rubella level in blood of patients before and after bee venom treatments in the different seasons of 2009& 2010 years. | 67 |

Contents

| No. of table | Title of table | Page |
|---------------------|---|-------------|
| Table (9) | Toxoplasma level in blood of patients before and after several sessions of bee venom stings (5bees / session) | 70 |
| Table (10) | Cyto-megalovirus level in blood of patients before and after several sessions of bee venom stings (5bees / session) | 73 |
| Table (11) | Rubella level in blood of patients before and after several sessions of bee venom stings (5bees / session) | 75 |
| Table (12) | Toxoplasma level in blood of patients who exposed to abortion before bee venom treatments. | 78 |
| Table (13) | Cyto-megalovirus level in blood of patients who exposed to abortion before bee venom treatments. | 81 |
| Table (14) | Rubella level in blood of patients who exposed to abortion before bee venom treatments. | 84 |
| Table (15) | Toxoplasma level in blood of patients at different ages before and after bee venom treatments. | 87 |
| Table (16) | Cyto-megalovirus level in blood of patients at different ages before and after bee venom treatments. | 90 |
| Table (17) | Rubella level in blood of patients at different ages before and after bee venom treatments. | 93 |

LIST OF FIGURES

| No. of figure | Title of figure | Page |
|----------------------|---|-------------|
| Fig.1 | Schematic presentation for the elution of different protein fractions through the column. | 30 |
| Fig.2 | Protein fraction system. | 33 |
| Fig.3 | Weight of poison sac picked up from bee workers at different seasons. | 40 |
| Fig.4 | Weight of poison sac picked up from bee venom workers at different ages. | 41 |
| Fig.5 | Amount of total Protein found in venom taken from bee workers at different seasons. | 44 |
| Fig.6 | Amount of total Protein found in bee venom from bee workers at different ages. | 45 |
| Fig.7 | Amount of Melittin found in venom from bee venom workers at different seasons. | 48 |
| Fig.8 | Amount of Melittin found in venom taken from bee workers at different ages. | 49 |
| Fig.9 | Amount of Apamin taken from venom of bee workers at different seasons. | 52 |
| Fig.10 | Amount of Apamin taken from venom of bee workers at different ages. | 53 |
| Fig.11 | Amount of Phospholipase A2 found in venom taken from bee workers at different seasons. | 56 |
| Fig.12 | Amount of Phospholipase A2 found in venom taken from bee workers at different ages. | 57 |
| Fig.13 | Percent of reduction in Toxoplasma levels (IgG, IgM) in blood of patients after bee venom treatment in different seasons. | 62 |

| No. of figure | Title of figure | Page |
|----------------------|---|-------------|
| Fig.14 | Percent of reduction in Cyto-megalovirus levels (IgG, IgM) in blood of patients after bee venom treatment in different seasons. | 65 |
| Fig.15 | Percent of reduction in Rubella levels (IgG, IgM) in blood of patients after bee venom treatment in different seasons. | 68 |
| Fig.16 | Percent of reduction in Toxoplasma levels (IgG, IgM) in blood of patients after sessions of bee stings. | 71 |
| Fig.17 | Percent of reduction in Cyto-megalovirus levels (IgG, IgM) in blood of patients after sessions of bee stings. | 74 |
| Fig.18 | Percent of reduction in Rubella levels (IgG, IgM) in blood of patients after sessions of bee stings. | 67 |
| Fig.19 | Percent of reduction in Toxoplasma levels (IgG, IgM) in blood of patients exposed to abortions after venom treatment. | 79 |
| Fig.20 | Percent of reduction in Cyto-megalovirus levels (IgG, IgM) in blood of patients exposed to abortions after venom treatment. | 82 |
| Fig.21 | Percent of reduction in Rubella levels (IgG, IgM) in blood of patients exposed to abortions after venom treatment. | 85 |
| Fig.22 | Percent of reduction in Toxoplasma levels (IgG, IgM) in blood of patients after bee venom treatment in different ages. | 88 |
| Fig.23 | Percent of reduction in Cyto-megalovirus levels (IgG, IgM) in blood of patients after bee venom treatment in different ages. | 91 |
| Fig.24 | Percent of reduction in Rubella levels (IgG, IgM) in blood of patients after bee venom treatment in different ages. | 94 |

LIST OF ABBREVIATIONS

| | |
|--------|---|
| A12O2 | Alumina |
| BSA | Bovine Serum Albumin |
| BV | Bee Venom |
| CNS | Central Nervous System |
| CV | Coefficients of Variation |
| ERPC | Evacuation of Retained Products of Conception |
| HBV | Honey Bee Venom |
| HPLC | High Pressure Liquid Chromatography |
| HUVECs | Human Umbilical Vein Endothelial Cells. |
| IgG | Immunoglobulin G |
| IgM | Immunoglobulin M |
| KDa | Kilo Dalton |
| L.S.D | Least Significant Difference |
| LLC | Lewis Lung Carinoma |
| MCD | Mast Cell Degranuing |
| MHC | Major Histocompatibility Complex |
| MS | Multiple Sclerosis |
| PBML | Peripheral Blood Mononuclear Lymphocytes |
| PLA2 | Phospholipase A2 |
| SDS | Sodium Dodecyl Sulphate |
| SIO2 | Silica Gel |

Contents

| | |
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| VACSERA | Egyptian Company for Production of Vaccines, Sera & Drugs |
| VCD | Venom Collector Device |
| VEGF | Vascular Endothelial Growth Factor |
| VIT | Venom Immunotherapy |

1. INTRODUCTION & AIM OF WORK

Insects have many ways to defend those selves and the most effective defending behavior in order the social insects is stinging behavior that only found in Hymenoptera. According to **Palmer (1961)**, there are four significant Hymenoptera families in insect stinging, i.e., Apidae (honey bees), Bombidae (bumble bees), Vespidae (wasps & yellow jackets), and Formicidae (ants).

There are many enemies to honeybee colony which target it for its honey or brood. The primary role of defending the colony is stinging behavior, using the venom apparatus that modified from ovipositor apparatus (**O'Connor and Peck, 1978**). A single sting of bee contains a small amount of venom, which acts as a painful deterrent for vertebrates but has lethal effect on a wide variety of invertebrates (**Langer, 1997**).

In the available literature, many researches were conducted on honey bee products. This may be due to their important pharmacological activities, which influence different biological and medical aspects.

Bee venom therapy is part of apitherapy which utilizes bee venom in the treatment of health conditions. Apitherapy is the use of bee products, including honey, pollen, propolis, royal jelly, wax and venom. It has been used since ancient times and in this modern age as an alternative therapy to treat multiple sclerosis, Lyme disease, and chronic fatigue syndrome. Bee venom is a rich source of enzymes, peptides and biogenic amines and contains at least 18 active components (**El-Bassiony, 2007**).

According to **Shipolini (1994)**, the properties of bee venom is a clear liquid with bitter taste, aromatic odour and acidic reaction. It dissolves completely in water. Bee venom contains a number of pharmacologically active polypeptides, chief among which are apamin, melittin, mast cell degranulating peptide.

The sting apparatus in workers and queens of honey bee is an ovipositor which is modified to play an important role of defense to the colony and stinging behavior is most commonly observed in the proximity of the hive or nest. Pheromones secretion is considered as one of the main stimuli for inducing an aggressive attitude among defending worker bees (Gary, 1974).

According to **De Lima and Borchetto Braga (2003)**, venoms of social insects belonging to order Hymenoptera are complex mixtures containing simple organic molecules, proteins, peptides and other bioactive elements. Some of these components have been isolated and characterized, and their primary structures are determined by using several biochemical techniques. These compounds are responsible for many toxic reactions in different organisms, such as local pain, inflammation, itching, irritation, and moderate or severe allergic reactions. The most extensively characterized venoms of Hymenopterous insects are those which are collected from genus *Apis*, social wasps and ant species. However, there is little information about other Hymenoptera groups. The honey bee venom presents high molecular weight molecules, enzymes with a molecular weight higher than 10.0 KDa and peptides. The same authors added that the most important bee venom enzymes are found to be phospholipase A2; which is responsible for cleaving the membrane phospholipids, hyaluronidase; which degrades the matrix component hyaluronic acid into non-viscous segments, and acid phosphatase which act on organic phosphates. The main peptide compounds of bee venom are found to be lytic peptide melittin, apamin (neurotoxic) and mastocyte degranulating peptide (MCD).

The using of the bee venom for medical purposes is known to be a very old practice, especially for rheumatism and arthritis. Hypocrites (400 B.C.) has mentioned about bee sting therapy used for arthritis. At present, bee venom (epitoxen) is used naturopaths for the treatment of such diseases. It is also used in immunotherapy as a mean for decreasing