ECOLOGICAL STUDIES OF SCALE INSECTS INFESTING MANGO AND GUAVA TREES AND THEIR CONTROL IN QALIOBIYA GOVERNORATE.

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ABSTRACT

The scale insects infesting mango and guava trees at Qaliobiya governorate are surveyed. Due to the difficulty in their identification, this study is carried out to introduce an identification keys as a guide with diagnosis, figures and illustrations to mango and guava scale insect pests that recorded in four families. In additions to give attention to the m

ost serious species. Mango leaf morphology and anatomy are used to detect the resistant and susceptible varieties.

Ceroplastes cirripidiformis is collected and identified as a new record on guava trees. The key to Egyptian *Ceroplastes* species is constructed to differentiate this species from the others. The associated parasite is collected, identified with figures and diagnosis. In addition to study its effect with the climatic factors and its associated parasite on the seasonal fluctuation of this pest.

The seasonal fluctuation of *Lepidosaphes pallidula* (which was the important hard scale pest on mango trees) and of *Pulvinaria psidii* (which was the most serious soft scale on mango and guava trees) are studied during two successive years. Also, the associated predators and parasites are identified, with diagnosis and figures. Finally, their effects with the other climatic factors are analyzed statistically.

The efficacy of the alternative insecticides (IGR, biological insecticides, mineral oils and soap) was compared with that of the chemical insecticides. Mineral oils gave high efficacy after two weeks of spraying and increased gradually till the end of the

experiment. IGR started to give good efficacy after one month of spraying and also still increase till the end of the experiment. Also, soap gave good efficacy after two weeks and increased gradually till the end of the experiment. All these treatments were relatively safe for man, animals and natural enemies. On the other hand, the tested insecticides gave a very good efficacy at the beginning of the experiment and decreased gradually till the end of experiment.

CONTENTS

INTRODUCTION

Mango and guava are of the most important and popular fruits in Egypt, the mango were considered the third major fruit crop after citrus and grapes. According to the survey of ministry of agriculture of Egypt, the cultivated mango and guava trees occupy 102352& 30431 feddans, respectively producing about 325465 & 228814 tons mango and guava fruits, respectively.

Due to the great damage that can be done by the scale insects not only by sucking the plant sap that give low photosynthesis and respiration, which leads to curling, yellowing, dropping to leaves and weakness of the trees, so malformation, dwarfing and decreasing fruit production (quality and quantity),even plant death; but also due to the excretion of large amount of honey-dew that rich in sugars and nitrogenous components, so give a good media for sooty molt fungi that increase the inhibition of photosynthesis quality of plant (Radwan, 2003). In addition to the insect secretion of toxic saliva that resulted in malformed leaf and shoot growth, these characteristic symptoms similar to damages caused by viruses (Fisher & Foresty,2008). In dense population the infestation appears not only on the lower surfaces, but also attack the upper surfaces, twigs, stems, fruits & even roots, it is difficult to remove them from the fruits (Hosny, 1939).

On the other hand of bringing the associated insects: bees, ants and wasps that give the protection to these scales from their enemies in turn of taking the honey-dew. These special ants (fondling) (Myremcophilies, Reda F. Baker *et al.*, 2007) usually found in the vicinity of the scales and are cemented together to form a covering the scale. So the ants associated with soft scale colonies are larger than the same scales on the same host without associated ants (Hamon & Williams, 1984).

The different species of scale insects that attack mango and guava trees belong to superfamily Coccoidea; most soft scales can reproduce sexually or parthenogenetically so many differences can be found in scale colonies; sexual dimorphism is apparent, male usually smaller, lighter and winged with vestigial mouthparts. It is also clear that, due to the differentiation in the climatic agricultural & the biotic factors, the picture of mango and guava pests reflect differences from the previous studies, so this work is used to establish the updated survey to mango and guava soft, hard scales and mealybugs; the results are tabulated and the histograms are introduced. For the first times the two keys for mango and guava scale insects are constructed with figures & illustrations, in addition to the diagnosis and synonyms to facilitate the identification.

The infestation for the important different mango varieties (Hendi, Langra and Alphonso) are compared with the leaf

morphology and anatomy examination to give the recommendation of using the resistant Alphonso variety in a new cultivation and more future studies on gene transportation to the susceptible Hendi variety.

The natural enemies, the predators and parasites, associated with these three species, in addition to the effect of these enemies and the other climatic factors on these three important scale insects are studied.

The aim of work:

1- Survey of the scale insects infest mango and guava trees at Qaliobiya governorate.
2- Study the seasonal abundance of serious scale insects infested mango and guava trees and their natural enemies for two successive years.
3- Study the susceptibility of mango varieties to the infestation of the studied scale insects.
4- Toxicological studies on the most important pests infesting mango and guava trees by using some insecticides, mineral oils, IGRs, Soup and Bio insecticides.

REVIEW OF LITERATURE

A) Survey of scale insects infesting Mango and Guava trees.

Mozette, (1921) recorded the scale insects on rose apple, sudtard-apple, sapodilla, allamanda, bread-fruit, mango, jasminum, ixora, starplum, starapple and nutmeg. He also stated that these scale insects were found in Grenada, Barbados, Dominica, Antigua, Trinidad, Jamaica and British Guiana.

Mozette, (1927) noticed that the scale insects were concentrated on mango leaves in the Island of Bahama Archipelago. .

Hosney, (1943) stated that *Pulvinaria psidii* Scale insect is an important pest attacking guava, mango trees and many other host plants in different parts of Egypt.

Dekll, (1976) noticed *Lepidosaphes pallida* on mango trees in Florida.

Ofek *et al.*, (1977) stated that *Aonidiella orientalis* and *A. aurantii* were found on mango trees at northern Israel. Then, they become established in almost all mango rowing regions. They

added that these pests caused damage to leaves, twigs and fruits. They were found in mixed population on the infested leaves.

Visalakshi. *et al*., (1981) stated that *Pulvinaria psidii* (Mask), was observed infesting clove in kerala and India in January and February.

Copland, (1984) reported that scale insects were widely distributed, on the bark of many kinds of woody plants such as fruit trees and brushes, ornamental plants, shrubs, and forest trees in the United Kingdom.

Hamon and Willians, (1984) determined about 117 host plants for the scale insectsin Florida and neighboring land areas. These hosts belonging to the different plant families. Out of Anacardiaceae, (*Mangifera indica*), Aquifoliaceae, (*Ilex* spp;) Apocynaceae (*Plumeria* spp.), Myrsinaceae, (*Ardisia* spp.), Oleaceae, (*Jasminum* spp.) and (*Alea* spp.) and Rosaceae were detected.

Gupta, (1988) recorded that a severe infestation by scale insects, *Aspidiotus destpuctor*, *Aonidiella inornata* and *Pulvinaria*(*Chloropulvinaria*) *polygonata* were observed on mango trees in western Uttar Pradesh. The mean number of scale insects per leaf was (21-1640) individuals. In (1987 – 88), there

were (343.9 – 714.4) for *Aonidiella inornata* per leaf in 14 orchards in the Meerut and Muzaffarnagar districts.

El-wan, (1990), stated that mango in Egypt, is normally at tacked by scale insects ; *Aonidiella aurantii* (Mask.), *Ceroplastes floridensis* (Comst.), *Cerolastes ulmi* (Comst), *Chloropulvinaria psidi* (Maskell), *Hemiberlesia latania* (sign), *Lepidosaphes Pallidula* (Green), *Kilifia acuminatae* (sign), M*ycetaspis persanata* (comst) and *Parlatoria olea* (Colvee).

Nada *et al.,* (1990) found that twenty-three species belonging to five families of Coccoidae have been determined in Egypt. *Chloropulvinaria pasidii* (Maskell), *Insulaspis pallida* (Maskell) and *Kilifia acuminata* (Signoret) were highly infested mango trees and may cause great loss to mango crop.

Hassan, (1998) stated that *Lepidosaphes pallidula* was found with its parasitoid, *Aphytus lepidosaphes* as moderates and highly infestation on *mangifera indica* in summer and winter seasons at Beheira, Gharbia, Cairo, Giza, Monifiya, Fayoum and Qliobiya governorate. She also found that *kilifia acuminata* is the major pest infesting mango trees in Qaliobiya during September. Finally he reported that Cairo has moderate infestation by *Hemibrlesia latanae* while Fayoum and Beheira mango trees were heavily infested with *Parlatoria olea*

Moussa *et al*., (1994) reported that the armored scale insect is the most serious pest for different varieties of orange trees among the following scale insects (the purple scale, *Cornuaspis beckii* (Newman), the California red scale, *Aonidiella aurantii* (Mask) and the black scale, *Chrysomphalus aonidium)*. This study was carried out in a private orchard at Meet ghamer. Dakahlia governorate for two years from February 1989 to January 1990. For the purple scale and California red scale, there were significant differences between them. The sweet variety was the highly infested variety, followed by Navel, For the Florida red scale, there were no significant differences between varieties. The more infested variety was sweet, followed by Navel. The least infested one was balady.

Salem, (1994) was found that the mango trees varieties (zebda and hindy) were highly infested with certain scale insects, (*Insulaspis pallidula*, *Kilifia acuminata* and *Parlatoria olea*). The variety dabsha was moderately infested with the same scales. In contrast taimor and alfons were the least infested one. This maybe attributed to the very thin leaves, which did not cover with waxy layer in var. Zebda and hindy. So, it was easily penetrative by scale insects and conversely for alfonso and taimor varieties.

EL-Serafi *et al*., (2004) conducted field experiments at a guava orchard in Egypt for two successive years, (2000 and

2001) to study the population density of the most important insect pests infesting guava trees and their associated predatory insects. Twelve insect species belonging to the two orders: Homoptera and Diptera were recorded. These insects were *Coccus hesperidum, Pulvinaria psidii (ChloroPulvinaria psidii), Ceroplastes floridensis, Coccus elongatus (Parthenoleconium persicae), Hemiberlesia lataniae, Icerya seychellarum, Icerya acgyptiaca, Empoasca lybica (Jacobiasca lybica), Empoasca decipiens, Aphis gossypii, Ceratitis capitata and Bactrocera zonata.* The dominant specie was *Coccus hesperidum*.

Takagi and Moghaddam, (2005) stated that new or noteworthy armored scale insects occurring in Iran (Homoptera:Coccoidea: Diaspididae). Twelve species of armored scale insects occurring in Iran are dealt with, including two new species, *Rungaspis avicenniae* and *Diaspidiotus platychaetae,* and three newly recorded species, *Lepidosaphes pallidula* (Williams), *Mongrovaspis quadrispinosa* (Green), and *Oceanaspidiotus spinosus* (Comstock)

Wilson Popenoe (2009) stated that the guava is subjected to the attack by numerous insect pests and fungous. The list of scale insects injurious to it is a particularly long one, including many species belonging to the genera *Aspidiotus, Ceroplastes, Icerya, Pseudococcus, Pulvinaria*, and *Saissetia.*