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THE EFFECT OF THREE SPECIES OF COCCOID ON GUAVA SEEDLINGS AND TREES

Mohamed, G.H. * and Elham F. Goma'a**

*** Plant Protection Research Institute, Dokki, Giza 12618, Egypt.**

**** Department of Agricultural Botany, Faculty of Agriculture, Cairo University, Egypt.**

ABSTRACT

Two experiments were carried out at El-Mansouria, Giza Governorate during November 2005 till October 2006 to study some morphological, chemical composition and anatomical structure effects of infestation with Coccidae ((*Pulvinaria psidii* Maskell (Homoptera: Coccidae), *Hemiberlesia latania* (Signoret) (Homoptera: Diaspididae) and *Icerya sychellarum* (Westwood) (Homoptera: Margaarodidae)) on seedling and trees.

Results obtained could be summarized in the following:

1- The infestation by *H. latania* and *I. sychellarum* caused a significant reduction in shoot length compared with uninfested seedlings, while the infestation with *P. psidi* caused nonsignificant. Leaf area, leaf dry weight and ratio of nitrogen were leaves from guava seedling infested by *H. latania, I. sychellarum* and *P. psidii* have decrease significant effect compared with uninfested leaves.

2- Fruit quality of guava trees, fruit weight, juice volume, ascorbic acid and yield per tree were decrease for them, affected by infestation by *P. psidii, H. latania* and *I sychellarum*

3- Histological measurements of different stems of Guava seedling infested by *P. psidii* and *I. sychellarum* compared with uninfested stems indicated that, there was a decrease in the diameter of whole stem section, thickness of priderm, cortex and vascular cylinder. While the thickness of both internal phloem and cambium layers were increased.

4-Transverse sections of infested leaves by *H. lataniae* and *I. sychellarum* were show a decrease in thickness of midrib, lower cholenchymatous, diameter of midvein and blade, while the infested by *P. psidii* showed increase in midrib as a result of the increase in upper cholenchyma and midvein.

Keywords: Homoptera, Coccoidea, *Pridium gusjave*, Anatomy.

INTRODUCTION

Guava (*Pridium gusjave* L.) belongs to the family Myrtaccae are considered the most popular fruits in Egypt cultivation areas; The areas cultivation of guava trees in Egypt were 30431 feddans producing annual about 228814 tons. Wide new reclaimed agricultural regions are planted with guava (Agricultural Economic and Statistics Department Ministry of Agriculture, Egypt 2004-2005).Twenty one species of coccoids namely, belongs to 4 families Coccidae, Diaspididae, Margarodidae and Pseudococcidae Balbul (2003), causing a serious damage to Guava orchards in Egypt. In addition, some insects secrete honey-dew, which is a suitable medium for the growth of fungi, hinders the process of food assimilation and interface with respiration of the plant. These insects caused noticeable reduction in the guava yield.

Dutt *et al.* (1951) gave preliminary observation on the histological changes occurred to Rosalie plants due to infestation with *Moconelliecoccus*

hirsutus (Green) (Homoptera: Pseudococcidae). Dutt and Kundu (1964) reported that the abnormal growth of Ramie plants is due to the infestation with *Moconelliecoccus hirsutus* (Green) (Homoptera: Pseudococcidae). Tawfik (1985) reported that citrus infestation with *Parlatoria ziziphus* (Lucas) (Homoptera: Diaspididae) affected the juice volume and the fruit fresh weight. Tawfik (1996) reported that infestation with *Lepidosaphes beckii* (Newman) (Homoptera: Diaspididae) reduced orange fruits fresh weight and juice volume, while the ascorbic acid was increased as a result of infestation. Amin *et al* (1994) observed that, the reduction of the tissues of leaf and stem of grapevine due to infestation with *M. hirsutus*. Mohamed (1999) studied the effect of infestation with *Saissetia oleae* (Olivier) and *Hemiberlesia latania* (Signoret) (Homoptera: Coccidae and Diaspididae) on anatomical characters and chemical components of olive leaf and stem as well as on olive fruit weight. Mohamed and Ibrahim (2001) indicated that, the decrease of morphological characters (stem length, leaf area and dry weight of stems and leaves), anatomical characters (thickness of different tissues such as epidermis , cortex, vascular cylinder and average xylem diameter of stems and leaves) and chemical contents (nitrogen, phosphorus and potassium in stems and leaves) in two cultivars of olive trees due to infestation with *Saissetia coffeae* (Welker) (Homoptera: Coccidae) and *Leucaspis riccae* Targioni-Tozzetti (Homoptera: Diaspididae). Mohamed (2002) found that no differences between the olive oil content extracted from normal and infested by *Parlatoria oleae* (Colvee) (Homoptera: Diaspididae). Radwan (2003) mentioned that infestation with *P. psidii* on Mango and Guava caused damage to young leaf area. Apple fruit characters (i.e. fruit weight, yield per tree) were significantly affected by *P. oleae* infestation level while fruits juice acidity was not significantly affected by infestation (Mohamed 2004). Mohamed and Asfoor (2004) studied the effect of infestation with *Aoniella uranantii* (Maskell) (Homoptera: Diaspididae) on leaf components and fruits quality of Navel and Valencia oranges and found that reduction of 10.45 and 13.81% in nitrogen of two oranges varieties as a result of sever infestation by *A. aurantii*. Mohamed and Goma'a (2004) investigated the effect of three Coccidae ((*S. coffeaeae, A. orientalis* and *Icerya purchasi* Maskell (Homoptera: Margaarodidae)) on anatomical structure of *Ficus nitidda* and reported that the infestation by these insects decreased the tissues of stem, except conductive tissues were increase, while the leaf blade was decrease.

This work aims to clarify the effect of three Coccidae ((*Pulvinaria psidii* Maskell (Homoptera: Coccidae), *H. latania* and *Icerya sychellarum* (Westwood) (Homoptera: Margaarodidae)) on vegetative growth and anatomical structure of Guava seedlings as well as fruit quality of guava trees.

MATERIALS AND METHODS

The two experiments were carried out at El-Mansouria, Giza Governorate during November 2005 till October 2006 , to study the effect of infestation with *P. psidii, H. latania* and *I. sychellarum* on guava (seedlings and trees).

The first experiment was carried out to study the effect of infestation with the mentioned coccoid species on vegetative growth characters (shoot

length, leaf area, leaf dry weight), ratio of nitrogen in leaves and the anatomical structure (stem and leaf) of guava seedlings. Seedlings aged 24 months were used as a plant material, 12 seedlings of the same age, size and health were selected. Seedlings were free of any insect infestation and received no previous pesticide application. Seedlings were potted in plastic bags filled with clay and kept under same horticultural procedures. The 12 seedlings were assigned to 4 replicates. Each replicate was artificially infested with one of the studied insects by attaching of infested plant including one replicate free from infestation as a control. Seedling were kept in screened boxes which allowed air ventilation, light and humidity exchange but prevented other insect infestation or parasitism to occur. At the end of the experiment, the evaluation procedures took place. The sixth leaf and the third branch of the seedling were picked up at same direction from each replicate of the experiment. The mentioned coccoid species insects were removed using smooth brush before washing.

The following parameters were considered, stem length in cm, leaf area in cm^2 measured by using a plane-meter, leaves were independently dried in an oven at 70 C° till constant dry matter weights were reached. Nitrogen was determined by the Kjeldahl's method following sulfuric acid digestion. For anatomical studies, specimens from the third branch and the six leaf were killed and fixed for at least 48 hrs in F. A. A. (10 ml. Formalin, 5 ml Glacial acetic acid and 85 ml Ethyl alcohol 70%). After fixation, specimens were washed in 50% ethyl alcohol and dehydrated in a normal butyl alcohol and series before being embedded in paraffin wax (melting point 56-58 C°). Transverse sections which were cut on a rotary microtome to a thickness of 20 microns were stained with safranin / light green before mounting in Canada balsam (Willey, 1971). Slides were examined microscopically.

Second experiment was assigned to study the effect of infestation with the mentioned coccoid species on fruit quality of guava trees included fruit weight, juice volume, ascorbic acid and yield per tree. Four blocks of six trees each were selected. Each block was divided into three sub-blocks for replication of samples. The first block was almost free of infestation and was sprayed by insecticide to keep it with no infestation. The second, third and fourth blocks were infested by *P.psidii, H.latania* and *I. sychellarum* respectively. Fruit weight mean was determined by weighting 20 fruits and calculating the average. For juice volume, fruit samples per sub-block were squeezed and the produced juice was measured using graduated cylinder. Ascorbic acid was determined using the method of Locaus (1944), by titrating 10 ml of juice with a standardized dichlorophenol dye solution after adding 5 ml of 2 % oxalic acid solution. For yield estimation, the selected sub-block trees were harvested, weighted and recorded. Random fruit samples were taken from every sub-block for evaluation. Samples of guava leaves and stem were picked up at monthly intervals through out the year of study. All alive insects found in each sample were counted and recorded (one year before harvest).Obtained results were subjected to regression using computer SAS program (SAS 1988).0161444675.

RESULTS AND DISCUSSION

Observations:

Population of three coccoid species reared on three groups of guava seedlings reached the following levels at the end of the experiment: *P. psidii* was reached 31 insects / leaf. It was difficult to detecte *P. psidii* on branches. *H. latania* were reached 96 insects/leaf and 28 insects / branch. *I sychellarum* reached 34 insects / leaf and 17 insects / branch.

Morphological characters of vegetative growth and percentage of nitrogen:

Results of measuring leaf area (cm^2), Branch length (cm), leaf dry weight (mg) and the contents the nitrogen percentage in leaves of the seedling are presented in Table (1).

Leaf area mean of uninfested seedling was 49.20 cm^2, while that of the infested seedling by *P. psidii, H. latania* and *I. sychellarum* were 4.1, 2.2 and 6.4 respectively. Mohamed (1999) reported that infestation with *H. latania* on two varieties of olive trees caused reduction in leaves area of about 5%. Radwan (2003) mentioned that infestation with *P. psidii* on Mango and Guava young leaf area, caused reduction of 28 and 32.97 %, respectively. Also Mohamed and Asfoor (2004) mentioned that leaf area, were reduced by 12.4 and 18.3 % of two oranges varieties infested by *A. aurantii*.

The highest shoot length of guava seedlings was observed in uninfested seedling, being 28.43 cm. Increase the level of infestation by *H. latania* and *I. sychellarum* caused significant reduction of the shoot length of Guava seedling, being 7.03 and 9.85, respectively. Meanwhile, infestation by *P. psidii* caused nonsignificant results. These results were in agreement with Mohamed (1999), who stated that the stem length of uninfested olive seedling was significantly affected compared with the infested ones by *H. latania*. The same results obtained with apple trees, when the shoot length was reduced by infestation with *P. oleae* Mohamed (2004).

Leaf dry weight (mg) and Nitrogen % leaves of guava seedling infested by *I. sychellarum* and *P. psidii* were decrease significantly effect compared with those infested by *H. latania* and uninfested leaves, Table (1).Tawfik (1985) stated that there were significant decreases in N% in leaves of orange as result of being infested with *P. ziziphi* (reached 22%).Tawfik (1996) recorded significant decreases of N%. Navel and Valencia orange varieties reached 28.62 and 22.87 %, respectively as result of infestation with *L. beckii* Mohamed (1999) recorded a reduction in N% of olive leaves, when infested with *H. latania* by 28.91%, compared with the uninfested ones. Mohamed and Asfoor (2004) recorded reduction of 10.45 and 13.81% in nitrogen of two oranges varieties as a result of sever infestation by *A. aurantii*.

Data in Table (2) show monthly counts of *P. psidii, H. latania* and *I. sychellarum* on each leaf and branch sample of guava trees(one year before harvest) during 2005-2006 at El-Mansouria,Giza Governorate. The count insects on guava trees began from Nov., 2005 to Oct., 2006.Total monthly counts of *P. psidii* ranged between 71.69- 32.71 (mean 52.39) while the counts total monthly counts of *H. latania* ranged between 146.99- 69.00 (mean 116.84) and the total

monthly counts of *I. sychellarum* ranged between 101.12- 51.58 (mean 76.58). Its worthy to note that, the highest infested by the three insects in August month and the lower infested in February month, so that, these insects must be resistance before August month and prefer that in February.

Table (1): Effect of *P. psidii, H. latania* and *I. sychellarum* on leaf area, branch length, leaf dry weight and the nitrogen percentage in leaves of guava seedlings.

Treatments	Leaf area (cm^2)			Branch length (cm)			Leaf dry weight (mg)			N%		
	Mean		Loss %	Mean		Loss %	Mean		Loss %	Mean		Loss %
Uninfested seedling	49.20	a	-	28.43	a	-	623.3	a	-	1.76	a	-
Infested with *P. psidii*	47.17	c	4.1	27.03	a	2.29	491.3	c	21.2	1.51	c	14.0
Infested with *H. latania*	48.13	b	2.2	25.63	c	7.03	557.0	b	10.6	1.64	b	6.6
Infested with *I.sychellarum*	46.03	d	6.4	26.43	bc	9.85	445.3	c	28.6	1.45	c	17.3

Results in Table 3 indicated that, the decrease in fruit weight (gm) were 10.87, 7.10 and 14.25% due to infestation by *P. psidii, H. latania* and *I. sychellarum*, respectively. In this respect, Tawfik (1996) recorded reduction in fruit weight of two citrus varieties (Navel and Valencia) as a result of sever infestation by *L. beckii* being, of 26.82 and 12.94% respectively, Mohamed (2004) mentioned that, fruit weight of apple trees was reduced as result of infestation levels (Low 9.3, medium 26.8 and heavy 56.8) with *P. oleae*. the reduction was 19.23, 37.42 and 46.23, respectively. Mohamed and Asfoor (2004) recorded reduction 2.4 and 18.25% in fruit weight of two oranges varieties as a result of sever infestation by *A. aurantii.*

Table (2): Mean counts of *P. psidii and I. sychellarum* on each leaf and branch, *H. latania* on each leaf guava trees during 2005-2006

Date	Alive insects (pre-adult and adult females)		
	P. psidii	*H. latania*	*I. sychellarum*
Nov.2005	69.75	133.12	98.66
Dec.2005	60.42	107.13	86.8
Jan.2006	56.55	106.55	81.88
Feb.2006	32.71	69.00	51.58
Mar.2006	39.59	86.43	60.32
Apr.2006	42.67	127.78	64.24
May.2006	48.92	113.11	72.18
Jun.2006	45.81	121.12	68.22
Jul.2006	38.76	129.25	59.26
Aug.2006	71.69	146.99	101.12
Sep.2006	63.96	139.39	91.3
Oct.2006	57.78	122.24	83.44
Mean	52.39	116.84	76.58

Table(3):Effect of *P. psidii, H. latania* and *I. sychellarum* on fruit weight, yield per tree, juice volume, ascorbic acid of guava trees.

Treatments	Fruit weight (gm)			Yield per tree (kg)			Juice volume (ml / fruit)			Ascorbic acid (mg / 100ml) Juice		
	Mean		Loss %	Mean		Loss %	Mean		Loss %	Mean		Loss %
Uninfested tree	119.27	a	-	58.68	a	-	24.45	a	-	68.77	a	-
Infested with *P. psidii*	106.30	c	10.87	49.66	c	15.37	22.51	c	7.93	58.97	c	14.25
Infested with *H. latania*	110.80	b	7.10	55.26	b	5.83	23.59	b	3.52	65.77	b	4.36
Infested with *I. sychellarum.*	102.27	d	14.25	47.33	d	19.34	21.63	d	11.53	57.60	d	16.24

The highest mean of yield per tree (58.68 kg) was obtained from the uninfested trees, followed by the ones infested by *H. latania* (55.26 kg),then that infested by *P. psidii* (49.66 kg). the lowest mean of yield was obtained from the infested trees by *I. sychellarum* (47.33 kg).Mohamed (2004) reported significant reduction in yield of apple trees as result of infestation with *P. oleae*. This reduction reached 49.39%. Yield reduction was collaborated with the levels of infestation (three levels) Mohamed and Asfoor (2004) mentioned that yield per tree of two oranges varieties infested by *A. aurantii* were reduced by 27.2 and 31.1%.

Table (3) included the loss percent of juice volume (ml/fruit) and ascorbic acid (mg/l00 ml of juice) of Guava fruits. The loss percent were (7.93, 3.52 and 11.53), (14.25, 4.36 and 16.24) in trees infested by *P. psidii, H. latania* and *I sychellarum*, respectively. Tawfik (1996) reported that, the reduction of juice volume and ascorbic acid of Navel and Valencia orange varieties infested by *L. beckii* were (20, 89 and 12. 94 %) and (13 and 8.38 %), respectively. The same results obtained by Mohamed and Asfoor (2004) on two orange varieties infested by *A. aurantii,* where the reduction of both characters was (25.2 and 26.6) and (12.66 and 13.86), respectively.

The effect of infestation on internal structure of stem seedling:

1- Effect of *P. psidii*:

The present observations represent the effect of infestation by *P. psidii* on the internal structure of the stem (Table 4 and Fig. 1). The diameter of the whole section decreased from 3557.4 µ for uninfested stem to 1956.9 µ for infested one. This reduction was accompanied by decrease in periderm thickness, cortex layers, vascular cylinder and pith.

Compared to the uninfested plant, plant resists the infestation by two ways. The first is increasing the thickness of defers layers cambium from 81.3 to 103.2 µ (fig.2) as in case of infested by *P.psidii*, cambium was very active to divide. Cambium increasing was accompanied with reduction in the outer phloem thickness (-33.8%). The second is increasing the inner phloem thickness (71.1%).

In this connection, Chen *et al.* (2003) were study the bark anatomy of *Kerria lacca* and showed that the periderm, cortex and phloem layers were thin

in addition to smallest sieve tube density in the infested stem compared with the uninfested one.

Chen *et al.* (2004) working on lacca insect to host branch in foraging and the results showed that decreaseing in periderm, cortex, vascular cylinder but increasing in the layer of sclereids and fibres.

2- Effect of *I. sychollarum*.

It is clear from Table (4) and Fig. (1) that the infestation by *I. sychollarum* decrease diameter of whole section due to the reduction of thickness of priderm, cortex, vascular cylinder and pith thickness of pith.

The reduction of vascular cylinder was recorded due to the decreasing in thickness of xylem, outer phloem and cambium layers (fig. 2). Thickness of inner phloem was increased (+56.5%) compared with uninfested stem. to compensate the absorbed sap.

Table (4): Means of different anatomical parameters of guava stem seedlings infested with *P. psidii* and *I. sychellarum*

Parameters (In micron)	Control	*P. psidii*	± % to control	*I. sychellarum*	± % to control
Diameter of whole section	3557.4	1956.9	- 45.0	1748.0	- 50.9
Thickness of priderme	273.4	98.0	- 64.2	64.0	-76.6
Thickness of cortex	100.0	82.0	- 18.0	72.0	- 28.0
Thickness of vascularcylinder	3184.0	1821.0	-42.8	1768.0	- 44.5
Thickness of xylem	1730.7	472.0	- 72.7	573.9	- 66.8
Thickness of outer phloem	128.0	84.8	- 33.8	64.0	- 50.0
Thickness of inner phloem	76.0	130.0	+ 71.1	118.9	+ 56.5
Thickness of cambium	81.3	103.2	+ 39.2	43.2	- 46.9
Thickness of pith	1168.0	1048.0	-10. 3	960.9	- 17.7

It is worthy to notice that, infestation by *I. sychollarum* produced stems with lower diameter of the whole section and thickness vascular cylinder compared with that infested by *P. psidii*. Supporting the previous results, Ecale and Backus (1995) observed that the infestation of alfalfa (Lucerne) stems by *Empoasca fabae* lead-to reduction in size, quantity and total cross-sectional area of mature treachery elements of xylem tissue.

The effect of infestation on internal structure of leaf seedling:

1-Effect of *P. psidii*:

The thickness of midrib increased due to increment in thickness of upper cholenchyma, upper and lower phloem to resistant the infestation by *P. psidii* but the decreasing of cholenchyma thickness lower midvein as a result to more infestation on the lower surface, which encourage the insects to absorb more sap. Infested by *P. psidii* lead to decreasing in midivein length as a result of reduction in xylem thickness (Fig.3).

It is clear from Table (5) and Fig. (3) that infested by *P. psidii* decrease the blade thickness (-14.2%) due to decrease in lower thickness of mesophyll (-22.4%). The multiepidermes was not affected by infestation, may be due to concentrate the infection on midrib.

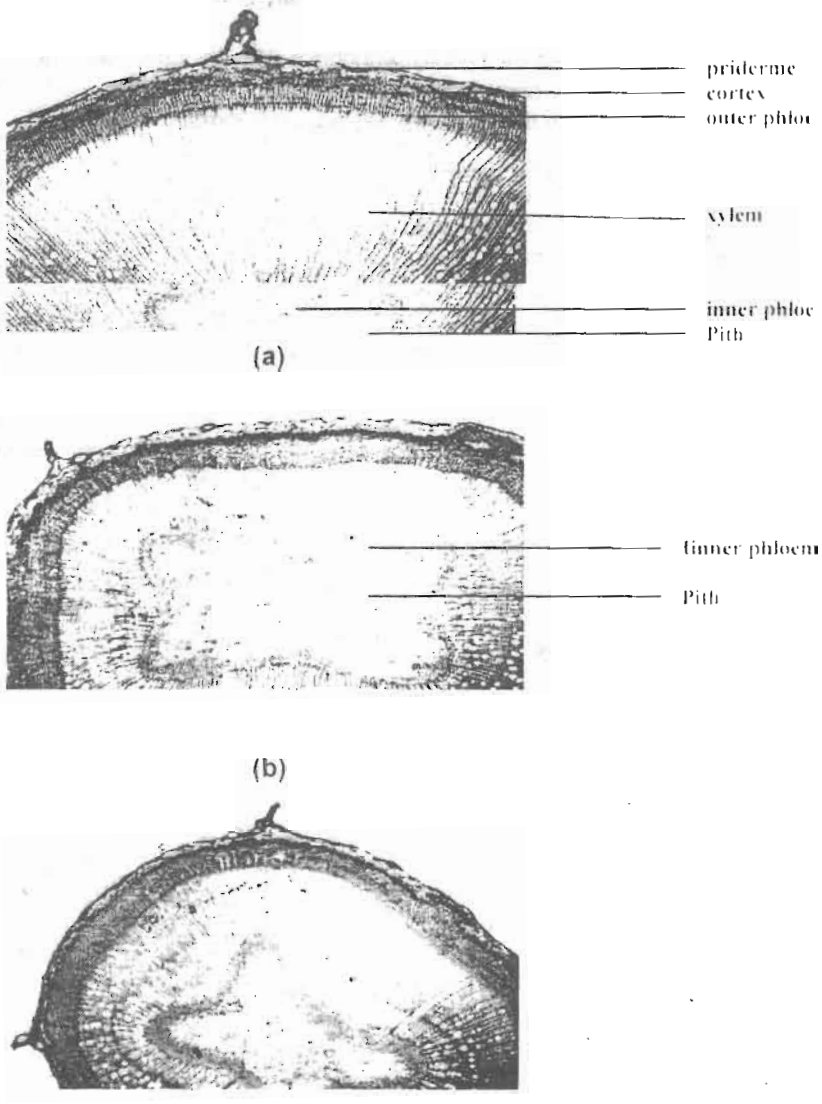

Fig. (1): Transverse section of guava stem as affected by infestation with scale insects. (X40)
a: Uninfested b. infested by *P. psidii* c: infested by *L. sychellarum*

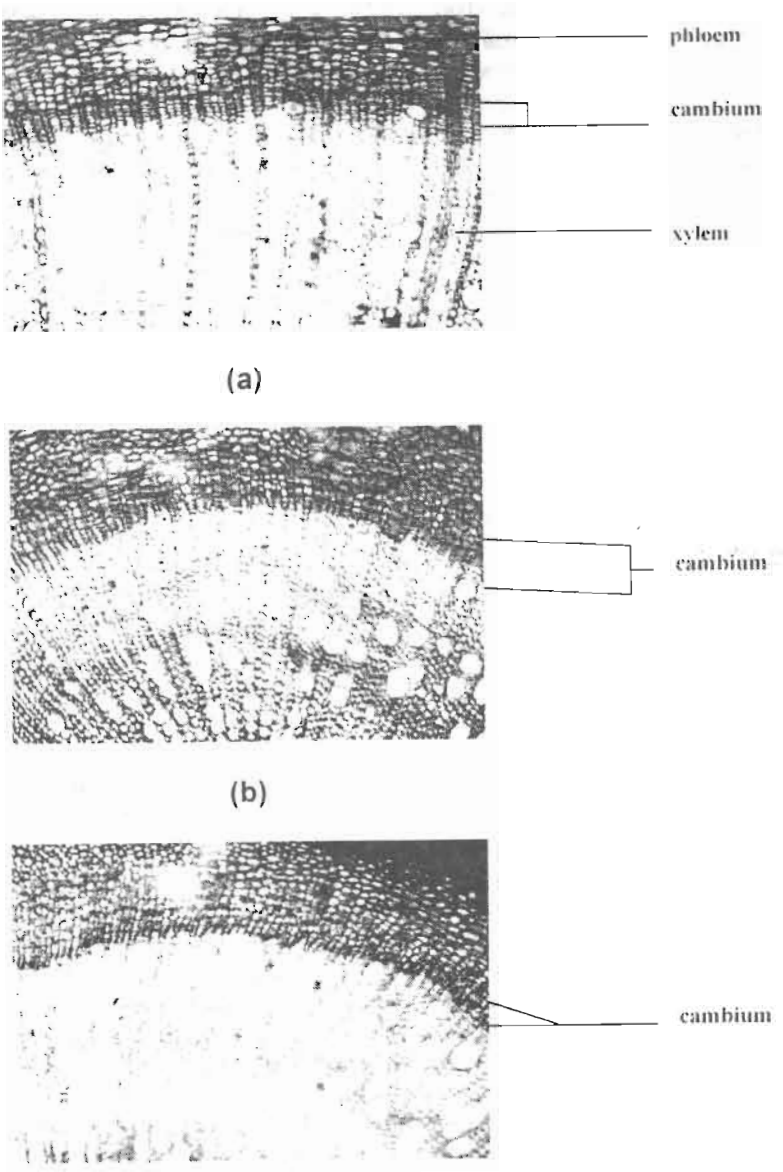

Fig. (2): Transverse section of guava stem as affected by infestation with scale insects. (X100)

a. Uninfested b: infested by *P. psidii* c: infested by *I. sychellarum*

In this connection Tort (2004) was investigate the insertion and penetration of stylets *P. psidii* on the criteria leaves and found that, length of the stylets inserted into the leaves ranged from 33.83 µ to 540.93 µ , the stylets reached greater depths in the leaves at 540.93 µ , as compared to 498.67 µ in the branches. It was reported that three stylets reached xylem in the leaves as compared to one in the branches.

Table (5): Means of different anatomical parameters of guava leaf seedlings infested with *P. psidii, H. latania* and *I. sychellarum*

Parameters (in micron)	Control	*P. psidii*	± % to control	*H. latania*	± % to control	*I. sychellarum*	± % to control
Thickness of midrib	1589.0	1843.0	+ 16.1	1283.0	- 19.3	1342.0	- 15.5
Width of midrib	1627.0	1662.5	+ 2.2	1575.0	- 3.2	1855.0	+ 14.0
Dimension of midvein:							
- Length	612.5	560.0	- 8.6	358.0	- 41.6	437.5	- 28.6
- Width	1137.5	1125.0	+ 7.7	910.0	- 20.0	1347.5	+ 18.5
-Xylem thickness	210.0	192.5	- 8.3	175.0	- 16.7	157.5	- 25.0
-Outer phloem thickness	87.5	227.5	+ 160.0	140.0	+ 60.0	87.5	---
-Inner phloem thickness	87.5	140.0	+ 60.0	70.0	- 1.4	87.5	---
Cholenchymatous:							
- Upper	240.0	420.0	+ 75.5	210.0	- 12.5	330.0	+ 37.5
- Lower	348.0	300.0	- 13.8	300.0	- 13.8	240.0	- 31.0
Thickness of blade	204.0	175.0	- 14.2	173.0	- 15.2	155.0	- 24.0
Multi epidermis	51.0	51.0	---	43.4	- 14.9	40.0	- 21.6
Thickness of mesophyll	147.0	114.8	- 22.4	116.9	- 20.5	110.0	- 25.2

2- Effect of *H.lataniae*.

Histological measurements of different leaf lamina tissues of the uninfested and infested by *H.lataniae* are presented in Table (5) and Figs. (3).

The midrib thickness was decreased, being 1843.0 and 1283.0 µ for control and infested by *H.lataniae* respectively. Length and width of leaf vascular bundle showed decrements to be 385.0 and 910.0 µ for *H.lataniae* compared to 612.5 and 1137.5 µ which were recorded in the uninfested plants (Fig.3). Infested by *H.lataniae* decreased blade thickness than the control from 204 to 173 µ, this was accompanied by decrements in thickness of mesophyll tissue (palisade and spongy tissues) being 147.0 and 116.9 µ in the same order. Also, the multiepidermis thickness decrease (43.4 µ) due to infested as compared with the control (51 µ).

In this connection, Mohamed and Ibrahim (2001) noticed that infestation with *H. latania* caused decrease in leaf blade (pallsade layers and spongy layers) and midvien thickness (xylem and phloem)compared with uninfested ones in olive trees, can be attributed to the insects slow sucking of plant sap over the life cycle and the lower ability of the plant to compensated.

3- Effect of *I. sychellarum*.

The infestation by *I. sychollarum* lead to decreasing in midrib thickness as a result of midvein length, xylem thickness and lower cholenchymatous, while thickness of upper cholanchyma increment (+37.5%) to compensate the reduction in thickness of both xylem tissue and lower cholanchyma(Fig.3).

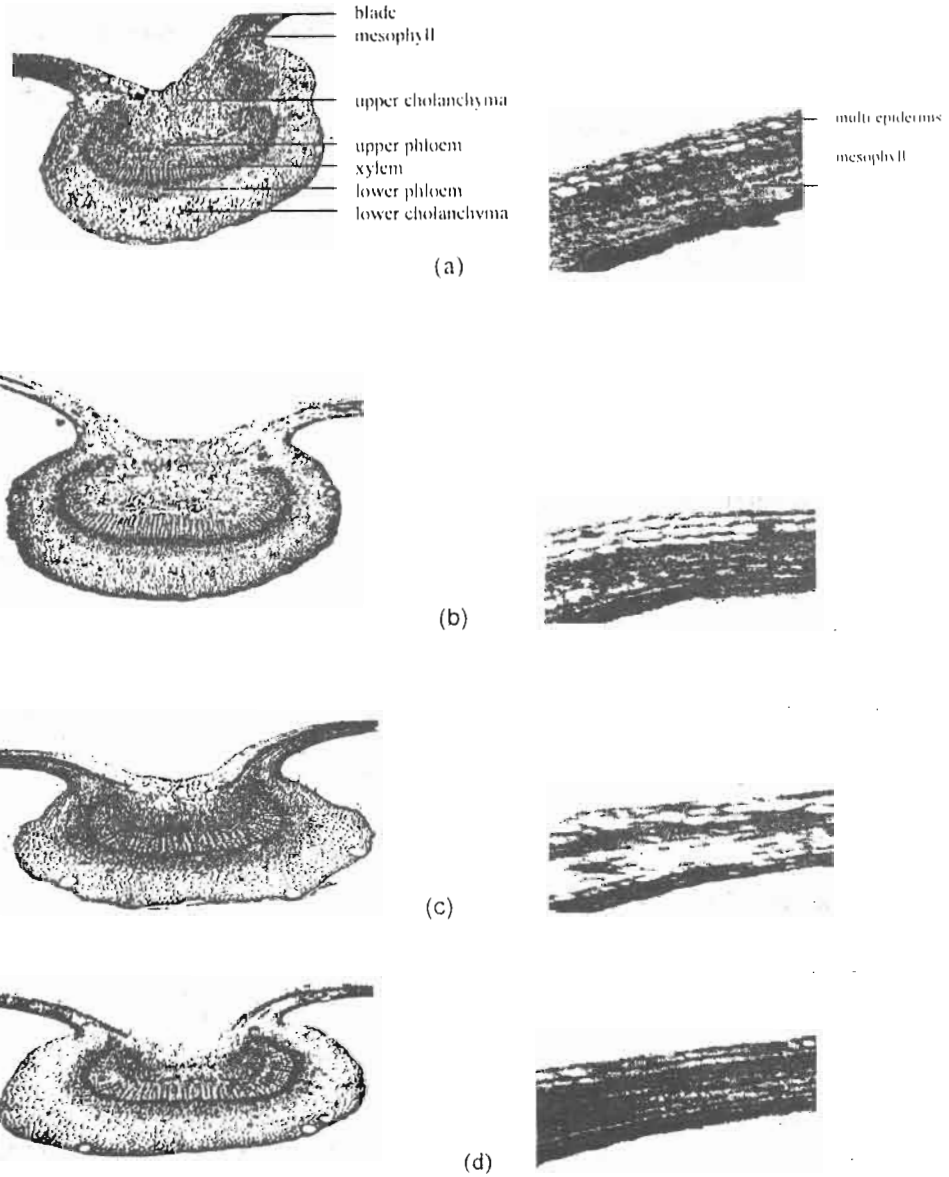

Fig. (3): Transverse section of guava leaf midrib (X40) and mirgen blade(X100) as affected by infestation with scale insects.
a: non-infested b: infested by *P. psidii* c: infested by *H. lataniae* d: infested by *I. sychellarum*

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تأثير ثلاثة أنواع من فوق فصيلة كوكوئيديا على أشجار و شتلات الجوافة

جمال الدين حسين محمد * والهام فوزي جمعة **

*** معهد بحوث وقاية النباتات – الدقى – الجيزة – 12618 – مصر.**

****قسم النبات الزراعى – كلية الزراعة – جامعة القاهرة – الجيزة – مصر.**

اجريت تجربتان بالمنصورية بمحافظة الجيزة خلال الفترة من نوفمبر 2005 و حتى أكتوبر 2006 لدراسة تأثير ثلاثة أنواع من حشرات فوق فصيلة كوكوئيديا (حشرة الجوافة الرخوة ، حشرة العنب القشرية ، حشرة بق السشيلارم الدقيقى) على بعض صفات النمو الخضرى و نسبة النيتروجين للشتلات المصابة مقارنة بالشتلات السليمة و كذلك بعض الصفات النوعية و انتاج أشجار الجوافة المصابة مقارنة بالأشجار السليمة.

ويمكن ايجاز أهم النتائج المتحصل عليها فيما يلى:

1- وجد نقص فى طول الشتلات المصابة مقارنة بالشتلات السليمة حيث كان هناك نقص معنوى فى كل من حشرة الجوافة الرخوة و حشرة بق السشيلارم الدقيقى بينما كان النقص غير معنوى فى حشرة العنب القشرية ، و كان هناك نقص معنوى نتيجة الاصابة بالحشرات الثلاثة على مساحة الورقة و وزن الأوراق الجافة و نسبة النيتروجين للشتلات المصابة مقارنة بالشتلات السليمة.

2- سجلت النتائج نقص معنوى فى وزن الثمرة و حجم العصير و نسبة فيتامين (ج) و وزن المحصول الكلى للشجرة نتيجة الاصابة بالحشرات الثلاثة مقارنة بالاشجار السليمة.

3- اظهرت القطاعات العرضية لساق شتلات الجوافة المصابة بحشرة الجوافة الرخوة و حشرة بق السشيلارم الدقيقى انخفاض فى قطر الساق و سمك البريدرم و القشرة والاسطوانة الوعائية مقارنة بساق الشتلات الغير مصابة ، بينما أدت الاصابة بالحشرتين السابقتين لزيادة سمك كل من اللحاء الداخلى و طبقات الكامبيوم الوعائى.

4- أوضحت القطاعات العرضية فى أوراق شتلات الجوافة أن الاصابة بكل من حشرة العنب القشرية و حشرة بق السشيلارم الدقيقى أدى الى نقص فى سمك العرق الوسطى و الكولنشيمة السفلية و الحزمة الوعائية وكذلك سمك النصل ، أما الاصابة بحشرة الجوافة الرخوة نتج عنه زيادة فى سمك العرق الوسطى ترجع الى زيادة الكولنشيمة العلوية و الحزمة الوعائية.