

**SUSCEPTIBILITY OF SOME MANGO VARIETIES TO THE
BUD MITE *ERIOPHYTES MANGIFERAE* (SAYED) AND MAL-
FORMATION DISEASE AND THE RELATION OF MITE
INFESTATION TO MALFORMATION DISEASE**

[33]

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ABSTRACT

In field study, Eleven mango varieties, (*Mangiferae indica* L.) at Sharkia, Ismailia, and Fayoum Governorates, were examined to estimate the population fluctuation of the bud mite *Eriophyes mangiferae* Sayed, their susceptibility to mite infestation, the relation between the mite infestation and chemical contents of mango buds and the correlation between the bud mite and malformation disease. The highest population occurred during Sept. to Jan. or Feb. and the lowest population was existed during Mar. to Jun. Temperature and relative humidity had no significant effect on the mite population. The highest level of mite infestation was recorded at Sharkia followed by Fayoum and Ismailia Governorates. Mango varieties were differed in their susceptibility to *E. mangiferae* infestation. Zebda, Taimour, Ewais and Arnaba were the most susceptible varieties, while Mabrouka, Company, Excellent Succari and White Succari were the least susceptible ones. On the other hand Mesk, Geolck and Alphonse varieties showed moderate susceptibility to mite infestation. Buds of some high susceptible varieties possessed a lower values of total carbohydrates and total soluble sugars than some moderate or susceptible varieties to mite infestation. Phenol contents recorded a higher levels in the most of susceptible varieties while a lower levels were found in the most of moderate and low susceptible varieties. The total soluble proteins and amino acids recorded a higher values in some susceptible varieties. The susceptible characteristic was positively correlated with total soluble proteins and amino acids while negatively correlated with the total carbohydrates and total soluble sugars. However the phenol content showed no clear trend. Obtained results also revealed that mango varieties had varying degrees of floral malformation, Company, Alphonse and Geolck were the most susceptible varieties, while Zebda var. was the most resistant one. Statistical analysis showed a negative correlation between the eriophid bud mite and the incidence of malformation disease. Zebda var. harboured the highest number of mites but exhibited the lowest percentages of malformation, whereas the opposite trend was observed with company var.

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(Received November 26, 2005)

(Accepted December 7, 2005)

Key Words: Mango, Eriophyid, *Eriophyes mangiferae*, Chemical composition, Plant resistance, Malformation.

INTRODUCTION

During the few last decades mango plantations in Egypt, extended to cover wide areas of the new reclaimed lands. Arthropod pests are considered one of the factors limiting mango production, phytophagous mites are one of these pests. In Egypt, survey of phytophagous mites inhabiting different mango varieties revealed that the occurrence of *Eriophyes mangiferae* (Sayed), *Vasates mangiferae* (Atiah) and *Oligonychus mangiferus* (R. and S.). However *A. mangiferae* was found to be the most important pest as it destroyed the inflorescences (Zaher and Osman 1970). *E. mangiferae* played a great role in the deterioration of mango trees and consequently producing a poor crop (Wafa *et al* 1970). The mango bud mites causes necrosis of the tender tissues. When mite population is high, the bud may be killed (Bindra and Bakhetia, 1971). Mango bud mite caused a sever damage to both old and young trees and considered a pest of economic importance in nurseries (Doreste, 1984). Moreover the bud mites one of the most important pests and consider to be the vector of the fungus *Ceratocystis fimbriata* that causes die-back disease. (Yamashiro and Myazaki, 1985), and fungus *Fusarium subglutinans* [*Gibberella fujikuroi* var. *subglutinans*] the causal agent of mango malformation (Labuschagne *et al* 1993). Mango varieties are so varying to their susceptibility to eriophyid bud mite. (Kodirah 1969; Zaher & Osman 1970; Wahba *et al* 1984 & Suresh and Moha-

nasundaram, 1995). Many studies were done on the relationship between the mite or insect infestation and chemical contents of their host plants. (Atwa *et al* 1987; Weibull 1988 and Zaki, 1991). Mango varieties had varying degree of floral malformation, however malformation of both floral and vegetative organs causes a deterioration of the trees as well as crop (Shawky & Dahshan 1978; Wahba *et al* 1984 and Dahshan 1987a). Moreover, Ploetz *et al* (1999) mentioned that a significant impediment to increase mango production in Egypt is the malformation. Furthermore, mango malformation is an economically important disease of *Mangifera indica* globally (Britz *et al* 2002). Shibnath and Chakrabarti (1988) mentioned that differences in the amount of phenolic and steroidal compounds in healthy and malformed florets of *M. indica*, resulting from the hypersensitive responses in the host species to the fungal disease. Analysis of stem mango seedling showed that malformed plants contained approximately twice as much total nitrogen, protein, and amino acids as healthy plants (Singh *et al* 1989).

In the present investigation field study were carried out at Sharkia, Ismailia, and Fayoum Governorates where mango plantation are widespread in Egypt, to evaluate the population fluctuation of eriophyid bud mite *E. mangiferae* on the most important mango varieties, the susceptibility of them to mite infestation, the relation between the infestation and chemical contents and the correlation between the eriophyid bud mite and malformation disease.

MATERIAL and METHODS

Mango varieties were chosen from three different locations represent different climatic conditions. Five trees from each mango variety were chosen under ordinary cultural practices. Each tree was considered as a replicate and a complete randomized plot design was followed. Six buds from each tree of each variety were monthly taken for counting the eriophid bud mite *E. mangiferae* during the period from Sept. 2002 till June 2003. The locations and mango varieties were as following:

Locations

Mango varieties

Sharkia (Abohamad Elsanagra)	Company, Goleck, Mesk and Arnaba
Ismailia (Fayed-Eldabeia)	Alphonse, White Succri and Excellent Succri
Fayoum (Ibshawai-Sinaro)	Alphonse, Taimour and Mabrouka

Ewais and Zebda varieties were sampled from all locations

1. Counting the eriophyid bud mites

The collected mango buds were dissected and examined by means of a dissecting microscope and the mites inside each bud were counted separately.

2. Estimation of malformation

Percentages of malformed flowers to the total number of flowers carried by each tree of each variety were calculated.

3. Chemical Analysis

A randomly mango buds from each mango varieties (except Excellent Succari) were collected at the beginning of the differentiation period (by the end of Feb. and the beginning of March) for chemical analysis.

Determination of the following components

a. Total Carbohydrates

One g sample of mango buds was taken and added to 30 ml HCL 2N. The tubes were placed in a boiling water bath for 6 h. After cooling, each sample was transferred into a calibrated flask (100-ml). Total carbohydrates was estimated by the alkaline potassium ferricyanide method (Shales and Schales, 1945).

b. Total Soluble Sugars

One g. sample of mango buds was ground in a mortar with ethanol 80% for 3 times. The extracts were combined and evaporated till dryness. The dried film was dissolved in 50 ml of 10 % aqueous isopropanol. Total soluble sugars determination was carried out according to the method of Shales and Schales (1945).

c. Soluble Protein

One g. sample was dried and mixed with 5 ml of extraction buffer (0.125 M tris borate, ph 8.9) then shaken for one hour and filtered. The supernatant contained the soluble protein. A colorimetric determination of soluble protein was carried out by using the method of Bradford (1976).

d. Phenols

1. Extraction

One g. fresh weight of buds was taken and extracted with 80% cold methanol (v/v) for three times at 0 °C. The combined extract was filtered (Wt. No. 1) and its volume was made up to 25 ml with cold methanol.

2. Analysis

Phenols determination was carried out according to **Daniale and George (1972)**. One ml extract was added to 0.5 ml Folin & Ciocalteu's Phenol Reagent, shaken and allowed to stand for 3 min. Then one ml saturated sodium carbonate (25%, w/v) was added to each tube, followed by 10 ml distilled water, shaken and allowed to stand for 60 min. the optical density was determined at 730 nm using spectrophotometer (Shimadzu UV-160A). Amount of total phenolic compound was calculated according to standard curve of pyrogallol (99.5%) and expressed as equivalent microgram of pyrogallol per gram of fresh weight.

f. Free Amino Acids

Total amino nitrogen (free amino acids) was determined according to methods of **Plummer (1978)**. Amino acids were extracted from 0.5 gm fresh weight with 25 ml hot 80% ethanol at 70 °C for at least three times. The extracts were collected and evaporated to dryness at 55 °C. The dried film was dissolved in 100 ml of 10% aqueous isopropanol.

For assay, one ml of sample was pipetted out into a series of test tubes, and then total volume made up to 4 ml with distilled water. One ml of ninhydrin reagent (4%) was added to each tube,

mixed well, and the tubes were kept in a boiling water bath for 15 minutes. Then the tubes were cooled and the volume was made up to 10 ml in measuring flask with 50% ethanol. The pink color developed was measured using a Spectrophotometer (Spectronic 21) at 570 nm DL-isoleucin. The concentration of total amino nitrogen as DL-isoleucin was calculated from the standard curve.

Statistical Analysis

The collected data were subjected to the proper statistical analysis of complete randomized design according to procedure outlined by **Snedecor and Cochran (1980)**, L. S. D. at 1 and 5% level of probability was used to compare between means according to **Waller and Duncan (1969)**. Simple correlation between the malformation percentages and number of mites existing buds of mango varieties was calculated. Also population estimation was correlated with temperature and relative humidity records available from Metrological Stations.

RESULTS

1. Population fluctuation of eriophyid bud mite *E. mangiferae*

The monthly population of *E. mangiferae* found inside the buds of different mango varieties at different locations under study are shown in Table (1) and Fig. (1)

A. Effect of sampling period on the population fluctuation of *E. mangiferae* over all

The highest average numbers of *E. mangiferae* were recorded during Oct.,

Dec. and Nov. (40.67, 40.61 and 40.42 mite/bud) respectively, followed by Sept. and Jan. (34.53 and 34.43 mite/bud) respectively. While the lowest numbers were recorded during Apr., May and Jun. (5.94, 8.29 and 10.63 mite/bud) respectively. A moderate number was recorded during Feb.

B. Effect of mango varieties and the sampling period on the population fluctuation of *E. mangiferae* at different locations

The obtained data indicated that all different mango varieties were infested with *E. mangiferae* with a wide range of variations in numbers depending on mango varieties as well as sampling period. The maximum mean number of mites per bud of Ewais var. were (80.54, 70.42 and 46.06) during Jun., Nov. and Sept. while the lowest ones were (2.08, 3.85 and 7.33) during May at Ismailia, Sharkia and Fayoum Governorates respectively. Zebda var. was on the same trend, the highest numbers of mites per bud were (81.02, 68.31 and 61.91) during Nov., Jan. and Nov. while the lowest ones were (3.57, 2.43 and 11.57) during Jun., May and Apr. at Sharkia, Ismailia and Fayoum Governorates respectively. Regarding to Alphonse var. the highest numbers of mite were recorded during Jan. (63.35) and Sept. (41.52) mite per bud, while the lowest ones were (6.75 and 1.70) mite per bud during May at Fayoum and Ismailia Governorates respectively.

Concerning the mango varieties which were sampled only from one location, the highest and the lowest numbers of mite were as following, (71.79 and 1.81 mite/bud) during Dec. and Mar. of Arnaba var.; (53.65 and 6.86 mite/bud)

during Nov. and Feb. of Mesk var.; (41.49 and 6.25 mite/bud) during Jan. and Mar. of Goelck var. while (33.35 and 5.06 mite/bud) during Nov. and Apr. of Company var. respectively at Sharkia Governorate.

The highest and the lowest numbers of mite were (23.63 and 1.56 mite/bud) recorded during Dec. and May respectively of Excellent Succri var., whereas (34.07 and 0.80 mite/bud) recorded during Jan. and Apr. respectively of White Succri at Ismailia Governorate. Similarly in Fayoum Governorate, Taimour var. harboured the highest number of mite (86.82 mite/bud) during Jan. On the other hand the maximum and minimum numbers of mite inhabited Mabrouka var. were (46.03 and 4.50 mite/bud) during Oct. and Apr. respectively.

C. Effect of locations and the sampling period on the population fluctuation of *E. mangiferae*

Comparative population fluctuation study of *E. mangiferae*, data presented in Table (1) and Fig. (1), revealed that the highest peaks of mite population occurred during the period of Sept. through Feb. whereas the lowest peaks occurred during the period of Mar. through Jun. at all locations. However the population density of mite infestation significantly was varied within months of each location as well as between the locations.

The highest and the lowest averages numbers of *E. mangiferae* inhabited mango buds ranged from (35.33 to 55.19 and 5.77 to 10.30 mite/bud); (34.06 to 46.35 and 1.92 to 8.66 mite/bud) and (32.34 to 36.8 and 8.61 to 13.23 mite/bud) at Sharkia, Ismailia and Fayoum Governorates during the period of

Table 1. Fluctuation of the eriophyid bud mite, *E. mangiferae* infesting some different mango varieties at different locations in Egypt during the period from Sep. 2002 till Jun. 2003.

Location	Mango varieties	Mean No. of <i>E. mangiferae</i> / bud during the period from Sep. 2002 till Jun. 2003.										Average
		Sep. 2002	Oct.	Nov.	Dec.	Jan. 2003	Feb.	Mar.	Apr.	May	Jun. 2003	
Sharkia	Ewais	34.08	64.63	70.42	67.86	23.15	19.67	18	5.81	3.85	11.11	31.86c
	Zebda	54.68	75.21	81.02	80.65	21.63	14.32	13.19	6.59	7.86	3.57	35.87a
	Company	21.24	22.12	33.35	8.25	29.36	11.23	5.79	5.06	7.27	11.98	15.56i
	Goeleck	20.07	19.98	37.26	41.19	41.49	18.57	6.25	7.15	9.79	13.13	21.49g
	Mesk	24.17	49.81	55.65	29.46	10.61	6.86	19.32	8.01	9.02	13.88	22.68f
	Arnaba	57.77	46.6	53.45	71.79	11.01	2.48	1.81	2.03	27.37	8.15	28.25d
Ismailia	Ewais	35.82	48.06	34.61	66.94	80.54	20.05	9.79	5.84	2.08	11.06	31.48c
	Zebda	44.65	56.98	38.92	56.62	68.31	22.11	19.34	6.37	2.43	15.62	33.13b
	Alphonse	41.52	41.2	24.76	27.32	32.54	8.96	6.86	2.48	1.7	7.61	19.49h
	Excellent Succari	22.66	19.47	19.75	23.67	16.27	14.19	4.64	1.86	1.57	5.12	12.92j
	White Succri	25.66	27.29	23.79	32.54	34.07	8.31	2.66	0.8	1.84	3.33	16.03i
Fayoum	Ewais	46.06	40.1	43.87	29.88	23.76	20.52	16.46	9.5	7.33	21	25.85e
	Zebda	16.61	28.56	61.91	45.12	28.28	37.81	16.37	11.57	19.53	16.93	28.27d
	Alphonse	20.34	20.62	30.94	28.75	63.35	11.04	9.57	6.75	13.3	10.86	21.55g
	Taimour	43.3	44.11	22.34	26.34	53.79	86.82	18.87	10.72	10.81	10.52	32.76bc
	Mabrouka	43.87	46.03	14.59	13.33	12.72	5.52	4.86	4.5	6.98	6.17	15.86i
Average	Over all	34.53B	40.67A	40.42A	40.61A	34.43B	19.28C	10.86D	5.94F	8.29E	10.63D	24.57
	Sharkia	35.33	46.39	55.19	49.87	22.87	12.19	10.73	5.77	10.86	10.3	25.95A
	Ismailia	34.06	38.6	28.37	41.42	46.35	14.72	8.66	3.47	1.92	8.55	22.61C
	Fayoum	34.04	35.88	34.73	28.68	36.38	32.34	13.23	8.61	11.59	13.1	24.86B

Means with the same litter within each column or row are not significantly different

LSD	0.05%	0.01%
Samplig period (monthes)	0.88	1.16
Varieties	1.12	1.47
Interaction (Var. x S. period)	3.53	4.63
Locations	0.55	0.73
Interaction (Loc. x S period)	1	1.32
Sharkia	1.12	
Ismailia	1.36	
Fayoum	2.07	

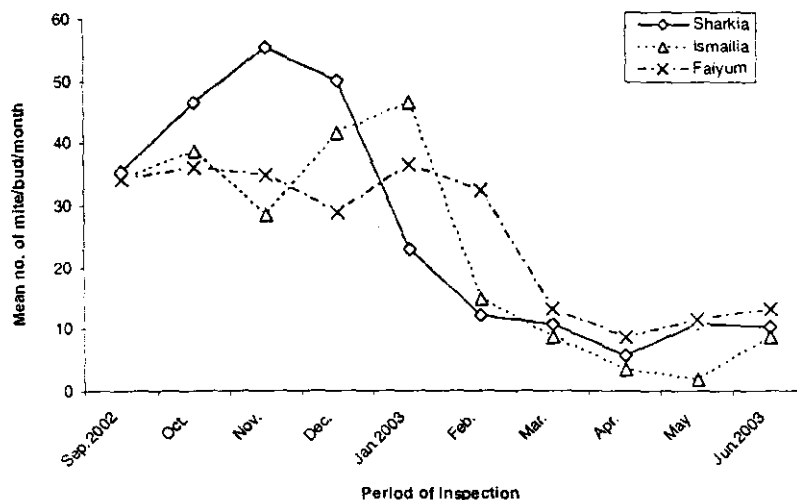


Fig. 1. Population fluctuation of *E. mangiferae* on mango cultivars at Sharkia, Ismailia and Faiyum Governorates during the period from Sept. 2002-Jun. 2003

Sept. through Feb. and Mar. through Jun. respectively.

D. Effect of temperature and relative humidity on the population fluctuation of *E. mangiferae*

Statistical analysis showed that a negative correlation ($r = -0.002$ and -0.003) was found between the mite population and degrees of temperature at Sharkia and Fayoum Governorates, while a slightly positive correlation ($r = 0.6$) at Ismailia Governorate. A negative correlation ($r = -0.4$) also was found between the mite population and the relative humidity at Ismailia Governorate, on the other hand a slightly and strongly positive correlation ($r = 0.6$ and 0.8) at Sharkia and Fayoum Governorates respectively. However regardless the locations, correlation between the mite population and degrees of temperature & relative humidity were ($r = 0.2$ and -0.1) respectively.

2. Levels of the bud mite infestation of mango varieties at different locations

The highest level of mite infestation was recorded at Sharkia Governorate with an average of 25.95 mite/bud, followed by Fayoum and Ismailia Governorates with an averages of 24.86 and 22.61 mite/bud respectively (Table 1).

3. Susceptibility of different mango varieties to *E. mangiferae* infestation

Statistical analysis showed occurrence of highly significant differences between the mango varieties to mite infestation. However Zebda, Taimour, Ewais and Arnaba varieties were more susceptible, the average number of mite per bud were (35.87, 32.76, 31.86 and 28.25) respectively. While Excellent Succari, White

Succari, Mabrouka and Company varieties were more resistant, the average numbers of mite per bud ranged from (12.92 to 15.56). On the other hand Alphonse, Geolck and Mesk varieties were moderate in their susceptibility, the average number of mite per bud ranged from (19.49 to 22.68). It is worth noting that Zebda and Ewais varieties are the most susceptible ones of all locations.

4. Chemical constituents of mango buds

Data in Table (2) revealed that the different mango varieties were significantly varied in their bud chemical compositions. The obtained results could be summarized as following.

Total carbohydrates

The highest values of total carbohydrates were found in the buds of Mesk, Company and Mabrouka varieties (42.72, 40.07 and 38.58 mg/g) respectively. While the lowest values were recorded in White Succri var. (28.07 mg/g) and Zebda var. (18.81 mg/g).

Soluble Sugars

Total soluble sugars concentrations recorded markedly the highest levels in the buds of Alphonse, White Succri varieties (71.22 and 60.45 mg) respectively. Whereas the lowest concentrations ranged from (39.20 to 43.38 mg/g) of Mabrouka, Taimour, Arnaba and Company varieties.

Phenol content

The buds of White Succari, Arnaba, Zebda and Alphonse varieties contained a

highly significant levels of phenolic contents which averaged between (2.31 to 2.48 mg/g). On the other hand, the lowest level (1.82 mg/g) was recorded in Mesk var.

Free amino acids

The highest concentrations of free amino acids were (1.09 and 0.85 mg/g) recorded in the buds of Arnaba and Mesk varieties. Whereas the lowest levels were averaged between (0.28 to 0.33 mg/g) found in Company, Ewais and Taimour varieties.

Soluble proteins

The soluble proteins recorded a high values averaged between (3.94 to 4.26 mg/g) in the buds of most mango varieties under study. However the lowest value was (3.35 mg/g) of Company var. The mango varieties of Ewais, Zebda, and Alphonse located in different Governorates showed a slightly differences or may be not in their chemical contents under investigation.

5. Severity of malformation related to mite infection

As shown in Table (3) percentage of floral malformation was the highest in Company var. (36.60%) at Sharkia governorate, followed by Alphonse var. (29.00 %) at Ismailia Governorate and Geolck var. (25.40 %) at Sharkia Governorate. The lowest percentage of malformation was observed in Zebda var. ranged from (1.80% to 3.84%) at all locations, followed by Mabrouka var. (8.80%) at Fayoum Governorate and White Succari (11.80%) at Ismailia

Table 2. Chemical composition of the vegetative buds of some different mango varieties at different locations in Egypt.

Location	Mango varieties	Chemical composition of mango buds mg/g of F. W.				
		Total Carbohy- drates	Total soluble sugars	Phenols Phenols	Free amino nacids	Soluble proteins
Sharkia	Ewais	34.94e	48.18de	2.06d	0.63c	3.99abcd
	Zebda	18.81i	47.26f	2.39ab	0.33h	3.58e
	Company	40.07b	43.38h	2.12d	0.28i	3.35e
	Goeleck	37.96d	49.58c	2.12d	0.59cde	4.16abc
	Mesk	42.72a	46.18g	1.82e	0.85b	3.86cd
	Arnaba	30.47h	41.86i	2.47a	1.09a	3.94bcd
Ismailia	Ewais	35.07e	48.42d	2.09d	0.6cd	4.05abcd
	Zebda	19.17j	47.7ef	2.18cd	0.37gh	3.84d
	Alphonse	33.15f	70.92a	2.31bc	0.54e	3.96bcd
	White Succri	28.07i	60.45b	2.48a	0.41fg	4.22ab
Fayoum	Ewais	35.07e	48.42d	2.09d	0.6cd	4.05abcd
	Zebda	19.17j	47.7ef	2.18cd	0.37gh	3.84d
	Alphonse	32.98f	71.22a	2.35ab	0.55de	3.99abcd
	Taimour	31.39g	40.28j	2.47a	0.37gh	4.26a
	Mabrouka	38.58c	39.2k	2.04d	0.44f	4.18ab

Means with the same litter within each column are not significantly different

LSD

0.05%	0.56	0.49	0.14	0.05	0.26
0.01%	0.75	0.66	0.19	0.07	0.34

Table 3. The relationship between the number of *E. mangiferae* and the malformation percentage of different mango varieties at different locations in Egypt during the period from Sept. 2002 till Jun. 2003.

Locations	Mango varieties	Average No. of	
		<i>A. mangiferae</i> / bud/ month	Malformation %
Sharkia	Ewais	31.86	21.4cd
	Zebda	35.87	3.84g
	Company	15.56	36.6a
	Goeleck	21.49	25.4bc
	Mesk	22.68	15.4de
	Arnaba	28.25	21.2cd
Ismailia	Ewais	31.48	17.8de
	Zebda	33.13	2g
	Alphonse	19.49	29b
	White Succri	16.03	11.8ef
	Excellent Succri	12.92	16.4de
Fayoum	Ewais	25.85	15.2de
	Zebda	28.27	1.8g
	Alphonse	21.55	15.4de
	Taimour	32.76	17.4de
	Mabrouka	15.86	8.8f

Means with the same litter are not significantly different

LSD 0.05%

4.09

Correlation

$r = -0.4$

Governorate. On the other hand, the malformation percentage was varied significantly between the same varieties at different locations.

Regarding to the relationship between the malformation disease and *E. mangiferae*. Statistical analysis showed a nega-

tive correlation (-0.4) between both of them. However it is worth noting that Zebda var. harboured the highest numbers of mite but exhibited the lowest percentage of malformation, whereas the opposite trend was observed with company var.

DISCUSSION

Tracing the normal distribution of *E. mangiferae* throughout the period from Sept. 2002 to Jun. 2003, the obtained results in Table (1) clearly revealed that peaks of this pest population occurred during the period from Sept. to Jan. or Feb. and the lowest population existed during Mar. to Jun. of all mango varieties at all different locations. Moreover the temperature and relative humidity had no significant effect on the mite population. However this finding strongly supported the obtained results by (Kodirah 1969; Zaher & Osman 1970 and Wahba *et al* 1984).

Regarding to the differences between the mite population during the different seasons. Sawires *et al* (1989) and Zaki (1991) stated that the highest existence of tetranychid and tenuipalpid mites on citrus and stone fruit trees were mainly observed throughout Spring, Summer and Autumn than in Winter. Similar observation was recorded by Zaher and Osman (1970) to the *Oligonychus mangiferus* (R. and S.) and the eriophid mites *Vasates mangiferae* (Attiah) on mango leaves. Those authors attributed the highest existence of phytophagous mites to the abundant values of nutritional components, also the hot and warm weathers which necessary to mite propagation during these seasons. However this could be agree with our finding in the Autumn but totally disagree during the Winter. On the other hand Kodirah (1969) found the density of mango eriophyid bud mite *E. mangiferae* is more correlated with the state of buds whether are closed or open than averages of temperature or relative humidity, this strongly supported our results.

The research effort expanded to elucidate the problems of resistance to Acari is increasing, mostly in the case of spider mite (Karban and English 1988). In spite of growing economic importance of damage done by some eriophyid mites, only is known about resistance to these phytophagous mites (Westphal *et al* 1996). However in the present study data in Table (1) illustrated that mango varieties were differed in their susceptibility to *E. mangiferae* infestation. Zebda, Taimour and Ewais were the most susceptible varieties followed by Arnaba Var. while Mabrouka, Company, excellent Succari and White Succari were the least susceptible ones. On the other hand Mesk, Geolck and Alphonse varieties were moderate susceptibility of mite infestation. The aforementioned results confirmed by (Kodirah 1969; Zaher & Osman 1970 and Wahba *et al* 1984) who reported that Zebda and Taimour varieties were the most susceptible, Hindi, Company and Bezrah varieties were moderate while Mabrouka, Romance, Dabsha and KalbEltour were the least in their susceptibility to mite infestation.

The chemical contents of the host plants are known to have some effect on the phytophagous arthropods therefore play an important role in plant defense. Data in Table (2) revealed that buds of Zebda and Ewais (high susceptible varieties) possessed a lower values of total carbohydrates and total soluble sugars than Mesk and Alphonse (moderate susceptible varieties) or Company, White Succari and Mabrouka (the lowest susceptible varieties) of mite infestation. The present results contradict with the finding of Atwa *et al* (1987) who found that total carbohydrates positively correlated with

the period of immature and fecundity of female of some tetranychid mites. Moreover **Chen *et al* (1996)**, found that reducing sugar content was lower in resistant tea cultivars than susceptible ones against to pink tea rust mite. On the other hand, phenol contents recorded a higher levels in the most of susceptible varieties (Taimour, Ewais and Arnaba), while a lower ones recorded in the most moderate and low susceptible varieties (Goelck, Mesk, Company and Mabrouka). The previous results agree with the finding of **Mahgoob (2004)** who found that *Citrus aurantifolia* contained a higher concentration of phenols but susceptible to *Tetranychus urticae* Koch but *Duranta pulmieri* and *Pittosporum tobira* contained lower content of phenols but resistant to the same mite. However differences in some phenolic compounds have been reported between *Ribes* varieties known to be resistant or susceptible to the gall mite *Cecidophyopsis ribis* (Westw.) (**Herr, 1987 and 1988**). The total soluble proteins and amino acids recorded the highest values in some susceptible varieties (Taimour and Arnaba), followed by the White Succari var. (low susceptible) and Mesk var. (moderate susceptible). Similar results were recorded by **Swaires *et al* (1989)** who found that the mite infestation of citrus trees were positively correlated with protein and nitrogen content, also **Atwa *et al* (1987)** reported that amino acids were positively correlated with the period of immature and fecundity of female *Tetranychus urticae* Koch and *Eutetranychus annecki* Meyer. However **Weibull (1988)** suggested that the concentration and composition of amino acids are factors that mediate aphid resistance in the plant genotypes and restrict the host plant range of aphids. The previ-

ous results revealed that mite infestation positively correlated with total soluble proteins and amino acids and negatively with total carbohydrates and total soluble sugars. However phenol content had no clear effect except in the variety of White Succari (low susceptible).

The present investigation obviously revealed that mango varieties had varying degrees of floral malformation. Company, Alphonse and Geolck varieties were the most susceptible, while Zebda var. was the most resistant. However the other varieties were moderate in their susceptibility. The previous observation strongly supported by the finding of **Shawky & Dahshan (1978)**; **Wahba *et al* (1984)** and **Dahshan (1987b)**, who found that Hindi be Sinnara, Dabsha and Taimour varieties are highly susceptible, while Zebda var. proved to be most resistant one, but Ewais moderate Susceptible. Furthermore **Sanjay *et al* (1994 and 1999)** mentioned that forty two mango germplasm lines and 20 mango varieties were examined and none were found to be free from floral malformation.

Statistical analysis showed a negative correlation between the eriophyid bud mite and the incidence of malformation disease. However it is worth noting that Zebda var. harboured the highest numbers of mite but exhibited the lowest percentages of malformation, whereas the opposite trend was observed with company var. The obtained results suggested that this mite cannot be incriminated as the sole causative agent of this phenomenon, similar observation found by **Wahba *et al* (1984)** and strongly supported by **Labuschagne *et al* (1993)** who mentioned that the fungus *Fusarium subglutinans* [*Gibberella fujkuroi* var. *subglutinans*] was isolated from plant tissues and

mites, and in turn used as an inoculate. The results confirmed, *Gibberella fujikuroi* var. *subglutinans* as the causal agent of mango malformation. Although it was shown that *E. mangiferae* can serve as a vector for fungus. It was not improved that the presence of mite increased the incidence of malformation. However the etiology of mango malformation has been controversial and has been attributed to bacteria, viruses, phytoplasm, eriophyid mites (*E. mangiferae*) and physiological factors. Although information on many aspects remains inconclusive, most evidence points to the fungus *Fusarium moniliforme* [*Gibberella fujikuroi*] var. *subglutinans* as a causal agent (Salzar 1995 and Sant *et al* 1999). Finally an effective control of the eriophyid bud mite should, therefore, ensure better growth of mango trees and may in addition, reduce the incidence of malformation or at least restrict its spread if the mite acting as vector.

ACKNOWLEDGEMENT

The author would like to express his gratitude to Prof. Dr. Assem Shaltout (Dept. of Horticulture, Fact. Of Agric. Ain. Shams Univ.) for his helpful suggestions throughout this investigation and Prof. Dr. Samir . El-Deeb (Dept. Plant Pathology, Fact. Of Agric. Ain. Shams Univ.), for his assistance to estimate the percentages malformation disease of mango trees. Financial support provided by the project entitled "National Program for Promoting the Productivity and Exportability of Some Horticulture Crops" Coordinated, financed by French Food Aid Counterpart Fund (BLAFE), is greatly appreciated.

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مجلة اتحاد الجامعات العربية للدراسات والبحوث الزراعية، جامعة عين شمس، القاهرة، ١٤(١)، ٤٩١-٥٠٦، ٢٠٠٦

حساسية بعض أصناف المانجو لحلم البراعم *Eriophyes mangiferae*

(Sayed) ومرض التشوة وعلاقة الإصابة بالحلم بمرض التشوة

[٣٣]

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١- قسم وقاية النبات - كلية الزراعة - جامعة عين شمس - شبرا الخيمة- القاهرة - مصر

- ٢- اختلفت حساسية الاصابة لأصناف المانجو بالحلم كالآتي:-
- أصناف شديدة الحساسية:- زبدة- تيمور- عويس- مبروكة
- أصناف متوسطة الحساسية :- مسك- جوك - ألفونس.
- أصناف قليلة الحساسية :- كوبانية - سكرى ممتاز - سكرى أبيض.
- ٣- أحتوت بعض الأصناف شديدة الحساسية على مستوى منخفض من الكربوهيدرات والسكر الذائب وذلك مقارنة ببعض الأصناف متوسطة الحساسية أو الأصناف قليلة الحساسية.
- أحتوت بعض الأصناف عالية الحساسية على مستوى عالى من الفينولات بينما معظم الاصناف متوسطة ومنخفضة الحساسية على مستوى منخفض من هذه الفينولات.
- أحتوت بعض الأصناف عالية الحساسية على مستوى عالى من البروتين الذائب والأحماض الأمينية.
- فى دراسة حقلىة خلال الفترة من سبتمبر ٢٠٠٢ الى يونيو ٢٠٠٣ تم اختبار ١١ صنف من المانجو توجد فى محافظات الشرقية-الاسماعيلية والفيوم وذلك لدراسة تذبذب تعداد الحلم عليها خلال هذه الفترة، حساسية هذه الاصناف للإصابة بالحلم، تأثير التركيب الكيماوى للبراعم الخضريه على تعداد الحلم، حساسية هذه الأصناف لمرض التشوة وكذلك علاقة مرض التشوة بتعداد الحلم. وكانت النتائج المتحصل عليها كالآتى.
- ١- كان أعلى تعداد للحلم خلال الفترة من سبتمبر الى يناير أو فبراير. و أقل تعداد فى الفترة من مارس حتى يونيو وذلك على جميع الاصناف المختبرة فى جميع المحافظات.
- عموما لا يوجد تأثير معنوى لدرجة الحرارة والرطوبة النسبية على تعداد الحلم.
- أعلى نسبة اصابة بالحلم سجلت فى محافظة الشرقية وأقلها فى الاسماعيلية.

- أرتبطت شدة الإصابة بالحلم بزيادة محتوى البروتين الذائب و الأحماض الأمينية فى الأصناف شديدة الحساسية. بينما لا يوجد أى تأثير واضح لمحتوى الفينول بالنسبة لصفة المقاومة فيما عدا صنف واحد هو سكرى أبيض (قليل الحساسية).
- ٤ - أختلفت شدة الإصابة بمرض التشوة فى أصناف المانجو كالأتى:-
- أصناف شديدة الحساسية:- كوبانية- ألفونس- جولك.
- أصناف متوسطة الحساسية:- عويس- سكرى أبيض- سكرى ممتاز- تيمور- مبروكة- مسك- أرنية.
- أصناف شديدة المقاومة :- زبدة.
- ٥- أظهر التحليل الأحصائى أن العلاقة بين الإصابة بحلم البراعم ومرض التشوة علاقة سلبية حيث أن الصنف زبدة شديد الإصابة بالحلم فى حين أنه شديد المقاومة لمرض التشوة، بينما الصنف كوبانية متوسط الإصابة بالحلم فى حين أنه شديد الإصابة بمرض التشوة.

تحكيم: ا.د شريف مصطفى حافظ

ا.د زينهم رمضان سليمان