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MANGO RUST MITE *Metaculus mangiferae* (Attiah) (Acari: Eriophyidae) AS MAIN FACTOR AFFECTING THE LEAF MINERAL CONTENT OF THE MANGO TREES *Mangiferae indica* L.

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ABSTRACT

The effect of the feeding of the mango rust mite *Metaculus mangiferae* (Attiah) (Acari: Eriophyidae) on the mineral content of mango leaves *Mangiferae indica* L.(Anacardiaceae) was studied. The research was carried out on two mango cultivars: Langra and Ewesi as host plants. Nutrients were estimated in fresh plant material in control (healthy leaves) and lightly and highly infested leaves of each tested cultivar. The highest concentration of minerals was noticed in the healthy leaves. No significant differences were found in most total level of macro and micro nutrient contents between lightly infested and healthy leaves of both cultivars. The high decrease of all minerals was recorded in the injured Ewesi leaves followed by Langra when compared with the fresh material. The mango rust mite *M. mangiferae* had the strongest influence on the macro- and micronutrients of its host plants *M. indica.*

INTRODUCTION

Mango fruits are a widely grown fruit trees throughout the tropical and subtropical regions. Mango fruits are one of the most important horticultural crops and commercial value. Mango rust mite *Metaculus mangiferae* (Attiah) is an important pest of mango in Egypt (Abdallah, 2001). This mite found on upper surface and feed on young leaves and remove content cell, causing rusting spots on upper surface. Injury to leaves may stunt the growth. Symptoms are more easily seen on upper or mid-level leaves which become rusting in appearance. Al-Azzazy (2005) studied the population dynamic of *Metaculus mangiferae* for a 2-year study (2003-2004) on mango trees in Egypt exhibiting various degree of infestation. It has been reported that sucking phytophagous mites drain nutrients from their host plant and inject substances which can be toxic to plant tissues and can lead to changes in the mineral content of the plants or in the leaf phytochemical components (Rasmy *et al*. 1974; Sharma and Pande1986; Ibrahim 1988; Lee *et al*. 1988; Luczynski *et al*. 1990; Ahmed 1994; Pradhan and Saha 1997; Aggour *et al*. 2001; Abou-Zaid 2003; Hanafy 2004; Azouz 2005). Data verify a possible effect of the feeding of eriophyid on the mineral content of the mango leaves of Langra and Ewesi cultivars. The present work threw light on the influence of the Mango rust mite Metaculus mangiferae (Attiah) on the leaves mineral control of the Mango trees

MATERIALS AND METHODS

Orchard of both abandoned Langra and Ewesi mango trees in Cairo, with a history of mango rust mite *M. mangifeare* infestations were selected for

the study. Two sets of each mango cultivars were determined. Each set was replicated 10 times, with a replicate of five leaf discs, (3 square inches/ disc), were cut from heavily and lightly infested leaves approximately the same age. Leaves were picked at random from all directions and kept in polyethylene bags. Discs were inspected under the sterio- binocular microscope in the laboratory to estimate density of mite populations, and weighed immediately for fresh weight and after being dried at 107°C for 72h, for dry matter weight. Another sets of healthy (normal), heavily and lightly infested leaves were collected and taken to the mineral nutrition of plants laboratory for foliar analysis of macro and micronutrients contents. F-test was used for comparison in this study.

RESULTS AND DISCUSSION

Langra and Ewesi mango leaves measure up to 20 cm in length and 8 cm in width when fully grown. Three annual peaks of seasonal abundance of this injurious mite on Alphonso cultivar are recorded in Egypt. Its density exhibited a gradual increase throughout June, August and November and still remained at a dangerous level during these months. The lowest infestations occurred in winter. At the top level of the Alphonso trees had significantly more number of *M. mangiferae* in comparison to the middle and bottom level (Al-Azzazy2005). For the purpose of this research, leaf discs with an average of 4.86-8.65 individuals of the mite per leaf disc was considered a light infestation and those with an average of 52.1-64.3 individuals per disc a heavy infestation. Density of mites, fresh weight and dried matter weight of lightly and heavily infested mango leaf discs of both Langra and Ewesi cultivars are given in table 1. A 10.73 fold increase in the population density of *M. mangifeae* from 4.86 to 52.15 per Langra leaf disc and 7.42- fold in its population from 8.65 to 64.3 per Ewesi leaf disc, are accompanied by decrease of 69.62% and 74.24% in the fresh weight and 63.6% and 62.7% in the dry weight for the Langra and Ewesi leaves, respectively, responsible for the deterioration aspect of the heavily infested leaves.

Chemical analysis proved that there were significantly higher changes occurred in macro and micronutrient contents of heavily infested *M. mangiferae* Ewesi leaves which play an important role in the relation between the host plant and the eriophyid feeding, followed by Langra cultivar. Nutrients of healthy, lightly and highly infested mite leaves are given in Table 2. In heavily infested leaves: calcium, magnesium, nitrogen and potassium decreases were highest -54.7%, -45.4%, 44.35% and -34.4% for Langra and -56.4%, -47.05%, -46.5% and 40% for Ewesi respectively, showing in highly infested mango leaves especially Ewesi cultivar, total macronutrients decreased with increasing intensity of infested. Micronutrients decrease was also noted, mainly in the iron (-42.47%, 71.8%), copper (-41.22%, -65.4%) and manganese (-40.79%, -53.62%) contents for both Langra and Ewesi cultivars, respectively. Healthy leaves of both mango cultivars contained more concentrations of these aforementioned nutrients when compared with lightly and heavily infested leaves (Table2).

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Change in the concentration of macro-and micro-nutrients provide a higher nutritive value of the food for *M. mangiferae* mite. No significant differences were found in most total level of nutrients between lightly infested and healthy leaves of both cultivars.

The majority of the data collected are in mostly contrast with those obtained from *Acnistus cauliflorus* Schott (Solanaceae) and *Bougainvillea spectabibs* willd (Nyctaginaceae) leaves infested by the two eriophyid mites *Aceria acnisti* Keifer and *Phyllocoptus bougainvilleae* Keifer, respectively (Flechtmann and Berti-Filho 1994); also data are agree with those obtained from peanut (*Arachis hypogeae* L.) leaves infested by the leaf hopper, *Empoasca kraemeri* Ross& Morre, by Costa(1964) where a significant reduction in N, P, K, Ca, Mg and Mn leaf contents was observed. According to the same author, virus diseases also cause a decrease in the Mg content of cotton and tomato leaves, a decreases in the K content of beet leaves and in the Mn content of orange leaves. However, it is suggested that clear understanding of the nutrients removed from the mango leaves by the eriophyid mites might enable the deficiencies caused by their feeding to be made up by the application of specific fertilizers.

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الحلم الصدئى *Metaculus mangiferae* كعامل رئيسى فى التأثير على المحتوى المعدنى لأوراق أشجار المانجو *Mangiferae indica*

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تعتبر المانجو من أهم محاصيل الفاكهة إقتصاديا و تجاريا علي المستوي العالمي. تتعرض أشجار المانجو للإصابة بالافات الأكاروسية و خاصة التابعة لمجموعة الحلم رباعي الأرجل (الإريوفيدي) و الذي يسبب خسائر مباشرة علي الأوراق عن طريق إمتصاص محتويات الخلايا الورقية و خسائر غير مباشرة عن طريق خفض نسبة العناصر الكبري و الصغري من الأوراق. و يعتبر أكاروس صدأ أوراق المانجو *Metaculus mangiferae* من أخطر الافات الأكاروسية علي أشجار المانجو حيث يتسبب في خفض محتوي الأوراق من العناصر الكبري و الصغري.

تمت الدراسة علي أشجار المانجو صنفي لانجرا و عويس عن طريق أخذ عينات من الأوراق المصابة إصابة شديدة و أوراق مصابة إصابة خفيفة و أوراق سليمة ككنترول في صورة أقراص ورقية. تم تحليل العناصر الكبري و الصغري لكلا الصنفين و ذلك بعد تسجيل تعداد الأكاروسات في العينات و أخذ الوزن الطازج و الوزن الجاف للأقراص الورقية محل الدراسة .

لم يسجل فروق معنوية بين العينات المصابة إصابة خفيفة و العينات السليمة و كان هناك فروق منوية جدا بين الأوراق المصابة إصابة شديدة و الأوراق السليمة حيث إنخفضت نسبة العناصر الكبري و هي الكالسيوم و المغنسيوم و النيتروجين و البوتاسيوم الي -54,7%، -45,4% ، -44,3%، -34.4% علي التوالي و ذلك لصنف اللانجرا. كما إنخفضت نفس العناصر بنسب - 56,4%، - 47,05%، - 46.5%، - 44,35% لصنف العويس علي التوالي

كمـا إنخفضـت نسـب العناصـر الصـغري كالتـالي. انخفـض عنصـر الحديـد بنسـبة (- 42,4% ، -71,8%) و النحـــاس بنســـبة (-41,2% ، - 65,4%) و المنجنيـــز بنســـبة (- 40,7 ،- 53,6%) وذلك لصنفي اللانجرا و العويس علي التوالي. حيث إتضح من الدراسة أن أشجار المانجو صنف عويس أكثر حساسية للإصابة بحلم صدأ أوراق المانجومن صنف لانجرا.

قام بتحكيم البحث

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Table 1. Average weight of *Mangifera indica* for five leaf discs of both Langra and Ewesi cultivars, four square inches per disc, infested by *M .mangifeae*.

Lightly infested						Highly infested					
Langra cultivar			Ewesi cultivar			Langra cultivar			Ewesi cultivar		
No. mites	Fresh Weight(g)	Dry matter(g)	No. mites	Fresh Weight(g)	Dry matter(g)	No. mites	Fresh Weight(g)	Dry matter(g)	No. mites	Fresh Weight(g)	Dry matter(g)
4.7	5.42	3.00	10.12	6.14	2.37	48.20	2.10	1.07	66.14	1.17	0.60
3.8	6.11	2.94	9.65	6.18	2.20	49.70	2.11	1.09	72.17	0.90	0.67
6.1	6.17	2.48	8.17	5.92	2.22	55.64	1.71	1.00	63.22	1.22	0.75
5.7	5.89	2.16	9.29	7.01	2.88	46.18	1.89	0.93	71.20	1.73	0.95
4.8	6.23	2.19	8.41	6.22	2.71	55.19	2.11	1.05	55.39	2.00	1.05
6	6.12	2.55	7.11	6.17	2.19	60.13	1.91	0.99	47.26	1.95	0.87
4	6.23	3.04	8.47	5.84	2.47	40.18	1.45	0.85	65.18	1.97	1.01
4.6	6.42	2.97	9.23	6.32	2.51	49.50	20.0	0.87	64.49	1.82	0.92
5.1	6.59	2.88	8.18	6.11	2.39	55.51	1.71	5.60	65.27	1.66	1.11
3.8	6.74	2.57	7.90	7.00	2.50	61.27	1.82	1.21	72.89	1.79	1.17
S 48.6	61.92	26.78	86.53	62.91	24.44	521.5	18.81	9.71	643.2	16.21	9.1
X 4.86	6.192	2.678	8.65	6.29	2.44	52.15	1.881	0.971	64.3	1.621	0.91

Table 2. Average macronutrient % and micronutrient ppm in healthy and infested *Mangiferae indicae* leaves by *Metaculus mangiferae* of both Langra and Ewesi cultivars.

Langra cultivar						Ewesi cultivar					
Macro-nutrients	Healthy leaves	Lightly infested leaves	Heavily infested leaves	% decrease due to mite infestation		Macro-nutrients	Healthy leaves	Lightly infested leaves	Heavily infested leaves	% decrease due to mite infestation	
				Heavily/ lightly	Heavily/ healthy					Heavily/ lightly	Heavily/ healthy
N	1.24cb	1.18b	0.69a	-41.52	-44.35	N	1.14cb	1.10b	0.61a	-44.54	-46.49
P	0.18cb	0.16b	0.13a	-18.75	-27.77	P	0.16cb	0.16b	0.12a	-25.00	-25.00
K	1.54cb	1.48b	1.01a	-31.75	-34.41	K	1.60cb	1.46b	0.96a	-34.24	-40.00
Ca	3.42cb	3.36b	1.55a	-53.86	-54.67	Ca	3.70cb	3.60b	1.61a	-55.27	-56.48
Mg	0.22cb	0.20b	0.12a	-40.00	-45.4	Mg	0.17cb	0.16b	0.09a	-43.75	-47.05
S	0.43cb	0.42b	0.35a	-16.66	-18.60	S	0.61cb	0.58b	0.41a	-29.31	-32.78
Micro-nutrients						**Micro-nutrients**					
B	16.73c	15.20b	10.2a	-32.89	-37.69	B	14.71cb	14.20b	11.32a	-20.28	-23.04
Cu	25.18cb	24.90b	14.8a	-40.56	-41.22	Cu	19.10cb	18.70b	6.60a	-64.70	-65.44
Fe	890cb	876b	512a	-41.55	-42.47	Fe	901.6c	870.7b	253.7a	-70.86	-71.86
Mn	22.8cb	21.3b	13.5a	-36.61	-40.78	Mn	20.70cb	19.90b	9.60a	-51.75	-53.62
Zn	21.1cb	19.9b	12.51a	-37.13	-40.71	Zn	24.30cb	23.90b	16.10a	-32.63	-33.74

Different letters in horizontal columns denote significant differences (F-test, p < 0.5, p < 0.1).

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