

RELATION BETWEEN PHYTOCHEMICAL COMPONENTS OF SOME CUCUMBER VARIETIES AND THEIR INFESTATION BY TETRANYCHUS URTICAE KOCH

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ABSTRACT : This study aimed to study the relative susceptibility of four cucumber varieties (Babylon, Brinse, super Dalila and Thamine) to *Tetranychus urticae* infestation in Qaliyobia Governorate during (2001 and 2002) seasons. Results indicated that, during 2001, the highest population of *T. urticae* 15.98 individual/sq. inch was occurred on Thamine variety, while the lowest population 3.37 individual/sq. inch was on Babylon variety. During 2002, the highest population 10.21 individual/sq. inch was on Thamine variety and the lowest population 2.87 individual/sq. inch was on Babylon variety.

These results also revealed that there was a significant difference between these varieties in their infestation with *T. urticae* and their phytochemical components of some elements nitrogen, carbohydrate, total sugar, reduced sugar and phosphorus (N, C, T.s., R.s., and P) in leaves of these varieties during the three vegetation periods seedling, flowering and yielding. As for (N) during the seedling stage the variety Babylon was the lowest and Thamine was the highest one in its (N) content, while in flowering the variety Super Dalila was the highest and variety Brinse was the lowest. In yielding stage variety Thamine was the highest one. For (C), the varieties Babylon recorded the highest (C) content while Brinse has the lowest (C) content during seedling period. While in the flowering and yielding periods Thamine and Babylon varieties showed the highest (C) content, respectively. Considering (T.s.) the varieties Babylon the lowest during seedling and yielding stages and the highest during flowering period, while the variety Thamine was opposite to Babylon variety in its (T.s.) content. In case of (R.s.) the variety Babylon was the highest during seedling and flowering and was the lowest during yielding stage while Super Dalila was the highest during the last stage. For (P) content, the variety Babylon was the highest during the three vegetation periods while Brinse was the lowest during the two last stages.

INTRODUCTION

Cucumber plants in Egypt are subjected infestation by many pests to which the two-spotted spider mite, *T. urticae* Koch is considered one of the most important pests. It feeds on the plant sap causing serious damage varying according to the degree of infestation, at the end of growing season in case of severe infestation. So one of the agents that reducing this infestation is the use of resistant plants where plant breeding and genetic are considered an important resistant agent to mites. Also, the use of predaceous mites can be considered one of these agents, as it play an important role in the biological control of these associated pests in different habitats i.e. aerial and soil organisms.

Thus the aim of this investigation is to throw some light on the chemical analysis of some phytochemical elements in leaves of some cucumber varieties and the relation between these phytochemical components and *T. urticae* infestation.

Rodriguez (1951) found that the lower population of *T. urticae* associated with high nitrogen level in tomato plants. On cucumber, LeRoux (1954) stated that there was a positive correlation between nitrogen level and mite increase, nearly through fecundity. Fritzsche (1959) reported the important of reducing sugar and carbohydrates for the rate of reproduction in *T. urticae* and suggested that this species may have special nutritional requirements and carbohydrate metabolism may posses some unusual features. Waston (1964) found that phosphorus deficiency reduced fecundity of *T. urticae* even more than did a deficiency of nitrogen or potassium. Harris (1966) observed less production but greater damage by *T. urticae* on phosphorus-deficient trees. Tomczyk *et al.*, (1987) evaluated the susceptibility of six varieties of strawberry, four varieties of cucumber, two of tomato, two of French bean (*Phaseolus vulgaris*) and five of chrysanthemum to the infestation with *T. urticae* and *T. cinnabarinus*. They also studied the role of leaf structure and its content of alkaloids, glycosides, terpenoids, phenolic compounds, sugars, amino acids and soluble proteins in the resistance varieties. In Poland, Kielkewicz and Tomczyk (1987) stated that the highest fecundity of *T. urticae* was observed on the cucumber variety Replike and the lowest on Wilanowski. The fecundity of *T. cinnabarinus* was similar on all tomato varieties, which studied. Sawires (1992) reported that the clutiver Composed - 45 was the most susceptible variety and he also found a significant positive relationship between mite infestation and nitrogen and protein contents of the plant and this relation was negative with moisture content.

In Egypt, Ahmed (1994) investigated the susceptibility of six cultivars of cucumber to infestation by *Aphis gossypii*, *Tetranychus urticae* and *Bemisia tabasi* during two successive years in field and suggested that the resistance might be attributed to the low protein and amino acid contents of leaves, which provided a less nutritive diet for the pests. In Poland, Kropczynsha *et al.*, (1996) stated that *T. cinnabarinus* populations showed nine similar densities on both cultivars while *T. urticae* predominated on cv. Bendigo. In Egypt, Megali (1997) stated that CIAT-1, CIAT-2 and Giza-6 varieties were tolerant to mite and aphids, because of the high density of leaf hairs. She also studied the yielding potential and the characteristics of pods. Doss *et al.*, (1997) revealed that, the population dynamics of spider mites infestation in the six cultivars appeared in few numbers during the period of October until February. The infestation increased during March and reached the maxi-

mum during April and then decreased. Kilany (1997) studied the distribution pattern of *T. urticae* infestation on some cucumber varieties during two years. He stated that the infestations varied depending on the situation of the plants and on the variety used. In Egypt, Habashy (2000) found that the highest population of *T. urticae* occurred on Kentucky Blue cv. and Branco cv. while the lowest number occurred on Monunert (Navy) cv. for *T. urticae* while for *T. cucurbitacearum* the highest population was on Kentucky, Blue cv. and the lowest one was on Sontae cv. On the other hand for the twenty-coupea cultivars. Iskandar, *et al.*, (2002) revealed that both groups of pepper, i.e. sweet pepper and hot pepper were subjected to infestation with the two-spotted mite moving stages in both localities but with different levels and sweet pepper varieties harbored higher numbers of mite moving stages than that of hot pepper.

MATERIALS AND METHODS

Leave samples were picked up during the three vegetation stages, i.e., seedling, flowering and yielding, leaves of each sample were cleaned and washed with distilled water. The fresh weight was determined, then leaves were put in a drying oven at 60 C for one day. The dry powder of leaves was stored in glass bottles to devote for total nitrogen (N), carbohydrate (C), sugar (total sugar (T.S) and reduced sugar (R.S.)) and phosphorus (P). Nitrogen content was determined according to the method of Pregl (1945), also, to determine the sugar contents the method of Smith *et al.*, (1956) was followed. On the other hand the determination of phosphorus and carbohydrates were made according to the methods of A. O. A. C. (1970).

RESULTS

1- Chemical analysis of some phytochemical elements in leaves of some cucumber varieties:

1-a- Total Nitrogen (N): Data presented in Table (1) and illustrated in Fig. (1) show the difference between the four tested varieties and their (N) content during their vegetation stages. For the first stage, seedling, there was no significant difference between the tested cultivars (L.S.D. at 0.05 = 1.2260) as they were similar in their (N) content. They recorded 5.75, 6.43, 6.47 and 6.15mg/g for Bablyion, Brinse, super Dalila and Thamine, respectively. In the second stage, Flowering Duncan's multiple range test classified the four varieties into three groups: the first one was the cultivar Super Dalila as the (N) content in its dry leave was 3.94mg/g. the second group was the two cultivars Bablyion and Thamine with value 3.54, 3.45mg/g, respectively. On the other hand, the cultivar Brinse record the lowest (N) content with value 2.54mg/g (L.S.D. at 0.05 = 0.3153). considering the yielding stage, there was a significant difference between the variety Thamine and the other three varieties but there was no significant difference between these varieties (L.S.D. at 0.05 = 0.6422), the (N) content for varieties, Bablyion, Brinse, Super Dalila and Thamine were 2.34, 2.82, 2.42, 3.14mg/g, respectively.

1-b- Carbohydrate (C): It seems obvious from the statistical analysis of the date obtained from the chemical analysis of the leaves content of the four varieties considering carbohydrate that was a highly significant difference between them, Table (2) and Fig. (2). Regarding to the first stage the highest carbohydrate content 192.09mg/g was for the cultivar Bablyion and the lowest one was Super Dalila cultivar with 53.67mg/g. On the other

hand, Thamine cultivar record 122.99mg/g followed by Brinse cultivar with value 58.14mg/g. (L.S.D. at 0.05 = 2.380). Duncan's multiple range test for the carbohydrate content classified the flowering stage into three categories the first one included Thamine cultivar 72.6mg/g, the second one included two varieties Bablyion and Super Dalila with (C) content 60.38 and 58.24mg/g, respectively. The last variety in this test was Brinse with value 51.43mg/g (L.S.D. at 0.05 = 2.3920). The determination of the carbohydrate (C) content of the leaves of the four tested varieties during their third vegetation stage, yielding are shown in Table (2) and illustrated in Fig. (2). The statistical analysis shows that there was highly significant difference between these varieties (L.S.D. at 0.05 = 0.9720). As the highest one was Bablyion 78.70mg/g flowed by Brinse, Super Dalila with (C) content 69.32 and 53.64mg/g, respectively. On the other hand, the lowest one was Thamine as it has 41.37mg/g in its (C) content.

1-c- Sugar (S):

1-c-1- Total sugar (T.s.): The chemical analysis of the leaves of the four cucumber varieties for determination of their total sugar (T.s.) are tabulated in Table (3) and illustrated in Fig. (3). From these data their statistical analysis show that during the seedling stage there was a highly significant difference between these varieties, (L.S.D. at 0.05 = 0.6047) as the cultivar Thamine was the highly one in its content of (T.s.) 14.61mg/g, while the cultivar Bablyion was lowest one as it recorded 7.62mg/g, on the other hand the other two varieties are similar (T.s.) content. On contrary of the seedling stage, the analysis of (T.s.) in the flowering stage shows that the cultivar Bablyion was the highly one with value 15.56mg/g, while the cultivar Thamine was the lowest in its (T.s.), 11.43mg/g, (L.S.D. at 0.05 = 0.3805). As similar as the first stage, the third vegetation stage of these four varieties can be classified as, the lowest one was Bablyion cultivar, 5.98mg/g and the height was Thamine cultivar with (T.s.) 12.39mg/g. (L.S.D. at 0.05 = 1.5920).

1-c-2- Reduced sugar (R.s.): The chemical analysis of the reduced sugar (R.s.) contents of the four tested cucumber cultivars are shown in Table (4) and illustrated in Fig. (4). The statistical analysis of the data show that during the first stage, seedling, there was a highly significant difference between the four varieties (L.S.D. at 0.05 = 0.1804) as the first variety which have a highly (R.s.) content was Bablyion cultivar, 3.18mg/g, while the second one was the variety Super Dalila as it recorded, 2.51mg/g. On the other hand, the other two cultivars equaled in their (R.s.) content. In the second vegetation stage, cultivar Bablyion have the highly (R.s.) content, 6.67mg/g, while the lowest was the cultivar Brinse 4.76mg/g, while during the third stage the cultivar Super Dalila was the first one in its (R.s.) content as it recorded 6.67mg/g, (L.S.D. at 0.05 = 0.1584). On the other hand, the cultivars Bablyion and Brinse take the last group in Duncan's multiple test for their (R.s.) content as they recorder 4.06 and 4.45mg/g, respectively. The statistical analysis stated there was a highly significant difference between the four cultivar (L.S.D. at 0.05 = 0.6112).

1-d- Phosphorus (P): A number of workers have found phosphorus levels have significant effect on mite reproduction. The determination of the phosphorus (P) content for the four test cucumber cultivars during the three vegetation stages, seedling, flowering and yielding are shown in Table (5) and illustrated in Fig. (5). In the first stage, seedling, Duncan's multiple range test shows two groups: the first one includes two cultivars Bablyion and

Brinse with mean value 0.17 and 0.16mg/g, respectively. While the second group includes the other two cultivars Super Dalila and Thamine with mean value 0.11mg/g, (L.S.D. at 0.05 = 0.0471). The statistical analysis show that there was a significant difference between the cultivar Brinse 0.14mg/g and the other three cultivars during the second stage, flowering, but there was no significant difference between these varieties Bablyion, Super Dalila and Thamine, (L.S.D. at 0.05 = 0.0282), as recorded mean values 0.21, 0.21 and 0.20mg/g, respectively. As with seedling stage, the statistical analysis of the mean values of (P) content for the four varieties in the yielding stage shows two groups: the first and the highest one includes the two cultivars Bablyion and Super Dalila values 0.23 and 0.21mg/g, respectively. While the second and the last group includes the two varieties Brinse and Thamine with mean values 0.14 and 0.15mg/g. (L.S.D. at 0.05 = 0.0231).

2- Relation between phytochemical components of cucumber varieties leaves and Tetra-nychus urticae infestation:

The relation between phytochemical components of some cucumber varieties and their infestation *T. urticae* during season 2001 are tabulated in Table (6). While the data in Table (7), show the simple correlation between the phytochemical contents of the host variety i.e., nitrogen (N), carbohydrate (C), sugar (total sugar (T.s.) and reduced sugar (R.s.)) and phosphorous (P).

Nitrogen (N):

The simple correlation analysis showed that there was a negative relation between (N) content and the mean number of *T. urticae* relationship during the vegetation periods for the varieties tested.

Carbohydrate (C):

Concerning the estimated carbohydrate content in the dried leaves of the varieties, the general trend showed a negative relationship between the carbohydrate content in leaves of the three varieties (Bablyion, Brinse and Thamine) and rate of *T. urticae* stages infestation, while this relation was positive in the variety Super Dalila.

Total sugar (T.s.):

From the results given in Tables (6 and 7), it is obvious that the relation between (T.s.) and the mean number of *T. urticae* infesting the cucumber varieties, is positive for the three varieties (Bablyion, Brinse, and Super Dalila) while it was negative for the fourth one, Thamine.

Reducing sugar (R.s.):

On contrary to (T.s.), Thamine variety showed a positive relationship as Brinse and Super Dalila as this variety recorded 4.34mg/g and its average infestation with *T. urticae* was 18.11 individual/sq.inch.

On the other hand, the variety Bablyion recorded a negative relation between (R.s.) which was 9.72mg/g and the infestation of *T. urticae* was 3.38 individual/sq.inch.

Phosphorus (P):

As it is obvious from Tables (6 and 7) that phosphorus content effect on the infestation with *T. urticae* was positive for the varieties Bablyion, Super Dalila and Thamine, but it was significant in case of Thamine variety. On contrary of this, the relation was negative for Brinse variety.

DISCUSSION

The evaluation of the susceptibility of four cucumber varieties to *T. urticae* infestation under field condition showed that the variety Thamine is the highest susceptible to infestation with the two-spotted spider mite, while the highest infestation occurred on Bablyion variety. The previous results are generally in agreement with results conducted before to evaluate the susceptibility of cucumber varieties to the red spider mite infestation, i.e., Tomczyk (1987) stated that there are difference between the studied varieties; Kielkewicz and Tomczyk (1987) reported that the highest fecundity of *T. urticae* was observed on Replike and the lowest on Wilanowski; Ahmed (1994) stated that Sweet Crunsh Fiti Sakata cultivar was most resistant while Super Dominus-hy was the lowest one; Kilany (1997) who stated that the infestation varied depending on the situation of the plants and on the variety used, on the other hand the varieties Katia, Celebrity and Afdal had high level of infestation.

The results of the photochemical components also indicated that there is a negative relation between (N) and the infestation of *T. urticae*, this result as the same obtained by Rodriguez (1951), while it is on contrast with that stated by LeRoux (1954), while in case of (P) the relation was insignificant positive in case of Super Dalila and Bablyion and significant positive in Thamine variety. On contrary of that for the variety Brinse this relation was negative. This results is in the same direction of that reported by Harries (1966) and are opposite to that formed by Rodriguez (1951) and Waston (1964).

Generally, the varieties differed in their susceptibility for *T. urticae* and this may be attributed to anatomical or chemical varieties in leaves or some biotic or abiotic factors or perhaps, due to a combination of all of these factors together.

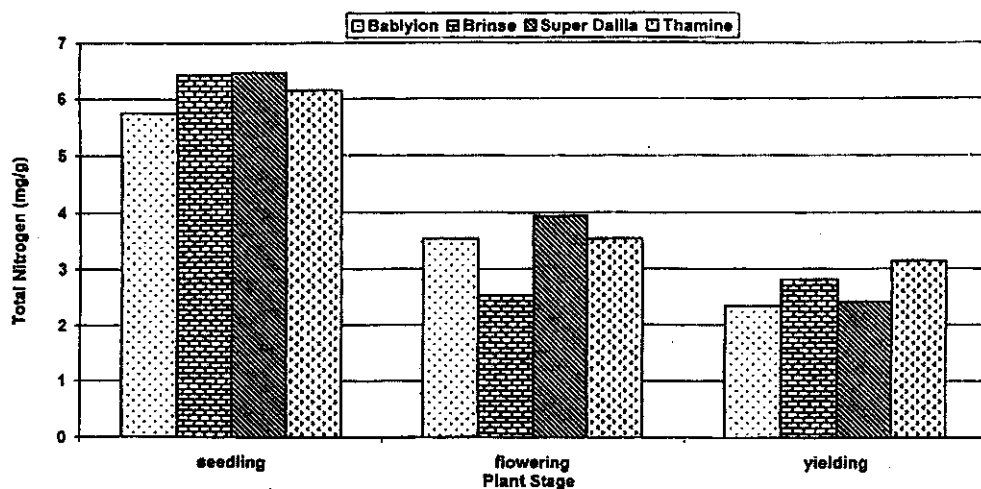


Fig. (1): The difference between total nitrogen content mg/g in different cucumber varieties during their vegetation periods.

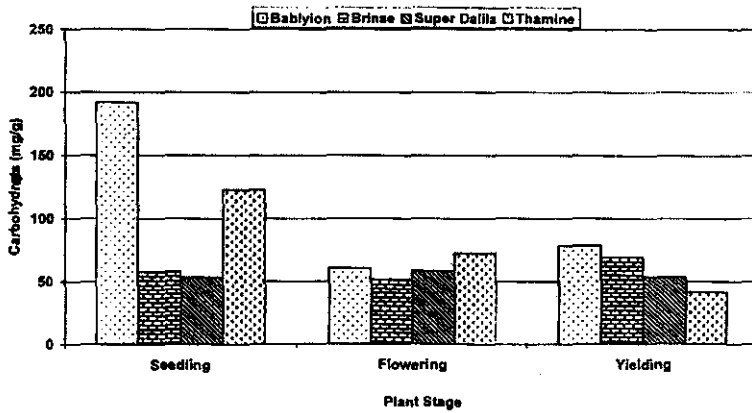


Fig. (2): The difference between carbohydrates content mg/g in different cucumber varieties during their vegetation periods.

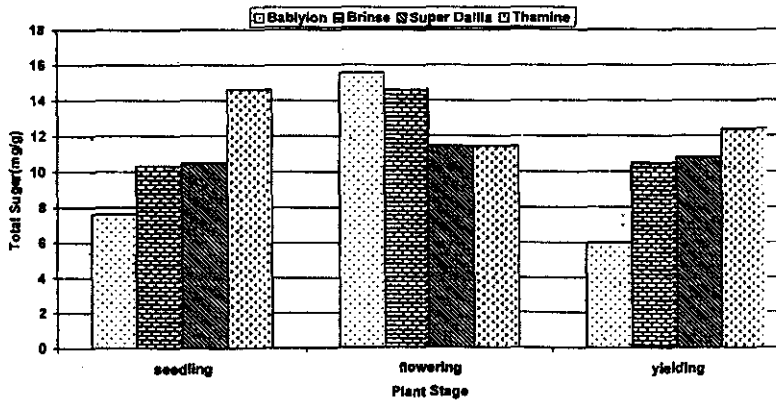


Fig. (3): The difference between total sugar content mg/g in different cucumber varieties during their vegetation periods.

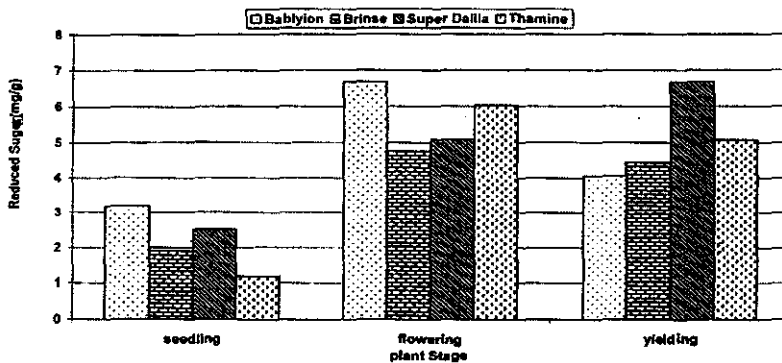


Fig. (4): The difference between reduced sugar content mg/g in different cucumber varieties during their vegetation periods.

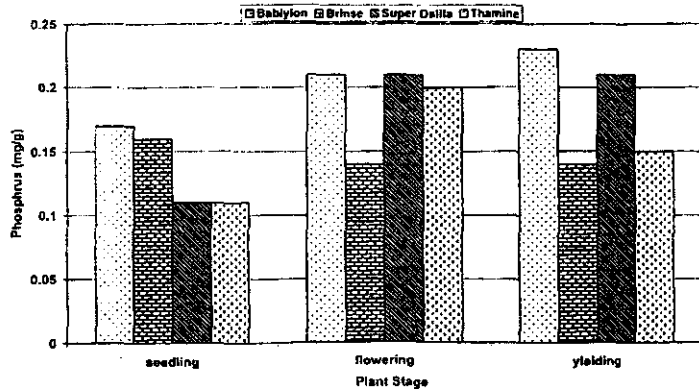


Fig. (5): The difference between phosphorus content mg/g in different cucumber varieties during their vegetation periods.

Table (1): The differences between total nitrogen content mg/g in different cucumber varieties during their vegetation periods.

Plant stage \ Varieties	Seedling	Flowering	Yielding
Boblyion	5.75 a	3.54 b	2.34 b
Brinse	6.43 a	2.54 c	2.82 ab
Super Dalila	6.47 a	3.94 a	2.42 b
Thamine	6.15 a	3.54 b	3.14 a
L.S.D.	1.2260	0.3153	0.6422

Columns with the same letters are not significantly different at 0.05

Table (2): The differences between carbohydrate content mg/g in different cucumber varieties during their vegetation periods.

Plant stage \ Varieties	Seedling	Flowering	Yielding
Boblyion	192.09 a	60.38 b	78.70 a
Brinse	58.14 c	51.43 c	69.32 b
Super Dalila	53.67 d	58.24 b	53.64 c
Thamine	122.99 d	72.6 a	41.37 d
L.S.D.	2.3920	2.3920	0.972

Columns with the same letters are not significantly different at

Table (3): The differences between total sugar content mg/g in different cucumber varieties during their vegetation periods.

Plant stage Varieties	Seedling	Flowering	Yielding
Bobyion	7.62 c	15.56 a	5.98 c
Brinse	10.32 b	14.61b	10.48 b
Super Dalila	10.48 b	11.43 c	10.80 a
Thamine	14.61 a	11.43 c	12.39 a
L.S.D.	0.6047	0.3805	1.5920

Columns with the same letters are not significantly different at level 0.05 % level.

Table (4): The differences between reduced sugar content mg/g in different cucumber varieties during their vegetation periods.

Plant stage Varieties	Seedling	Flowering	Yielding
Bobyion	3.18 a	6.67 a	4.06 c
Brinse	1.91 c	4.76 d	4.45 c
Super Dalila	2.51 b	5.08 c	6.67 a
Thamine	1.91 c	6.03 b	5.08 b
L.S.D.	0.1804	0.1584	0.6112

Columns with the same letters are significantly different at 0.05% level.

Table (5): The differences between phosphorus content mg/g in different cucumber varieties during their vegetation periods.

Plant stage Varieties	Seedling	Flowering	Yielding
Bobyion	0.17 a	0.21 a	0.23 a
Brinse	0.16 a	0.14 b	0.14 b
Super Dalila	0.11 b	0.20 a	0.21 a
Thamine	0.11 b	0.20 a	0.15 b
L.S.D.	0.0471	0.0282	0.0231

Columns with the same letters are not significantly different at 0.05 level.

Table (6): Relation between phytochemical components of some cucumber varieties and their infestation by *T. urticae* during season 2001.

Plant stage	Babylon					Mean no. of T.u.	Brinse					Mean no. of T.u.	Super Dalila					Mean no. of T.u.	Thamire					Mean no. of T.u.
	T.N.	P	C	Sugar			T.N.	P	C	Sugar			T.N.	P	C	Sugar			T.N.	P	C	Sugar		
				T.S.	R.S.					T.S.	R.S.					T.S.	R.S.					T.S.	R.S.	
Seedling	5.78	0.17	192.89	7.83	3.18	1.76	6.43	0.16	121.14	10.31	1.91	2.76	6.47	0.11	121.67	10.48	2.91	1.59	6.15	0.31	121.99	14.41	1.91	2.84
Flowering	3.54	0.21	69.38	15.66	6.67	5.38	2.54	0.14	61.43	14.61	4.76	6.43	3.94	0.21	101.51	11.41	5.98	11.68	3.54	0.20	72.6	11.43	6.03	34.34
Yielding	3.34	0.23	78.7	1.98	4.06	3.0	2.83	0.14	69.32	18.48	4.45	1.62	2.42	0.11	53.64	18.4	6.67	8.9	3.14	0.15	41.37	12.39	8.08	17.99
Mean	3.88	0.20	114.39	5.72	4.64	3.38	4.06	0.15	59.43	11.8	3.71	3.60	4.28	0.18	55.18	10.90	4.75	6.39	4.28	0.15	78.99	12.81	4.34	18.18

T.N. = Total nitrogen (mg/g)
 P. = Phosphors (mg/g)
 C. = Carbohydrate (mg/g)
 T.S. = Total sugar (mg/g)
 R.S. = Reduced sugar (mg/g)

Table (7): Correlation coefficient between phytochemical components of cucumber varieties leaves and *T. urticae* infestation.

Varieties Phyto. Compo.	Babylon	Brinse	Super Dalila	Thiamine
N	-0.49	-0.39	-0.55	-0.79
C	-0.83	-0.91	0.92	-0.60
T.S.	0.87	0.97	0.99	-0.97
R.S.	-0.16	0.97	0.54	0.95
P	0.51	-0.29	0.82	0.99*

* Significant at 1% level.

N. = Nitrogen
 P. = Phosphors
 C. = Carbohydrates
 T.S. = Total sugar
 R.S. = Reduced sugar

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العلاقة بين المحتويات الكيميائية لأوراق بعض أصناف الخيار.

والإصابة بالعنكبوت الأحمر العادي تيترانكس يورتيكا

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١- قسم الحيوان الزراعي والنيماطودا _ كلية الزراعة _ جامعة الأزهر.

٢- قسم علم الحيوان - كلية العلوم _ جامعة الأزهر - فرع البنات.

٣-٤- قسم بحوث أكاروس الخضر _ معهد بحوث وقاية النباتات.

تم عمل تحليل كيميائي لأوراق أصناف معينة من الخيار وذلك لدراسة العلاقة بين هذه الأصناف والعناصر الموجودة بها وذلك لربطها بتعداد العنكبوت ومعرفة سبب زيادة الإصابة من عدمه.

ولقد أظهرت النتائج الفروق بين محتوى أوراق هذه الأصناف من النيتروجين ، الكربوهيدرات ، السكريات الكلية ، السكريات المختزلة والفسفور والمقارنة بينها وكانت النتائج كما يلي:-

١- بالنسبة للمحتوى النيتروجيني تساوت الأربعة أصناف في مرحلة الإنبات ولكن في مرحلة التزهير كان الصنف سوبر دليلية هو أعلاهم والصف برنس هو أقلهم أما في مرحلة الإثمار كان أعلى هذه الأصناف هو الصنف ثامين بينما تساوت الثلاثة أصناف الأخرى.

٢- أما محتوى الأوراق من الكربوهيدرات فقد كان الصنف بابليون هو الأعلى أما الصنف سوبر دليلية هو أقل هذه الأصناف وذلك في مرحلة الإنبات أما في مرحلتي الإزهار والإثمار فقد كان أعلى الأصناف هو الصنف ثامين وبابليون وأقلهم هو برنس وسوبر دليلية على الترتيب.

٣- واتضح أيضاً من النتائج ومن خلال مراحل الإنبات والإزهار والإثمار أن أعلى هذه الأصناف هو الصنف ثامين وبابليون وسوبر دليلية على الترتيب من حيث محتوى الأوراق للسكريات الكلية.

٤- عندما تم تقدير السكريات المختزلة لهذه الأصناف خلال الثلاث مراحل السابقة . فقد وجد أن الصنف بابليون هو الأعلى خلال المرحلتين الأولى والثانية أما الصنف سوبر دليلية فهو أعلى هذه الأصناف خلال المرحلة الثالثة وهي الإثمار.

٥- وأخيراً بالنسبة للفسفور فقد وجد أن الصنف بابليون هو الأعلى خلال الثلاث مراحل المختلفة للنبات أما الصنف سوبر دليلية فقد كان أقل الأصناف في مرحلة الإنبات والصف برنس في المرحلتين الأخيرتين من عمر النبات.

أثبتت النتائج وجود علاقة بين تعداد *T. urticae* وكمية المواد الموجودة في محتوى أوراق الأصناف:- حيث كانت هناك علاقة سالبة بين المحتوى النيتروجيني وبين الإصابة في جميع الأصناف المختبرة. بينما كانت العلاقة سالبة بين كمية الكربوهيدرات وبين التعداد في الأصناف (بابليون ، برنس وثامين) وموجبة في حالة الصنف الرابع سوبر دليلية.

ومن ناحية أخرى بالنسبة للسكريات الكلية فقد كانت هناك علاقة موجبة بينها وبين الإصابة في حالة بابليون وبرنس وسوبر دليلية أما الصنف ثامين فقد كانت العلاقة بين شدة الإصابة وبين السكريات المختزلة وبين الإصابة بالعنكبوت الأحمر سالبة في حالة الصنف بابليون وموجبة في باقي الأصناف.

وأخيراً كانت العلاقة بين الإصابة بالأكاروس وبين المحتوى الورقي للفسفور موجبة في حالة الأصناف سوبر دليلية وبابليون وثامين بينما كانت سالبة في حالة الصنف برنس.

وبصفة عامة يمكن إرجع الاختلاف في حساسية الأصناف للإصابة بالعنكبوت الأحمر إلى الاختلاف