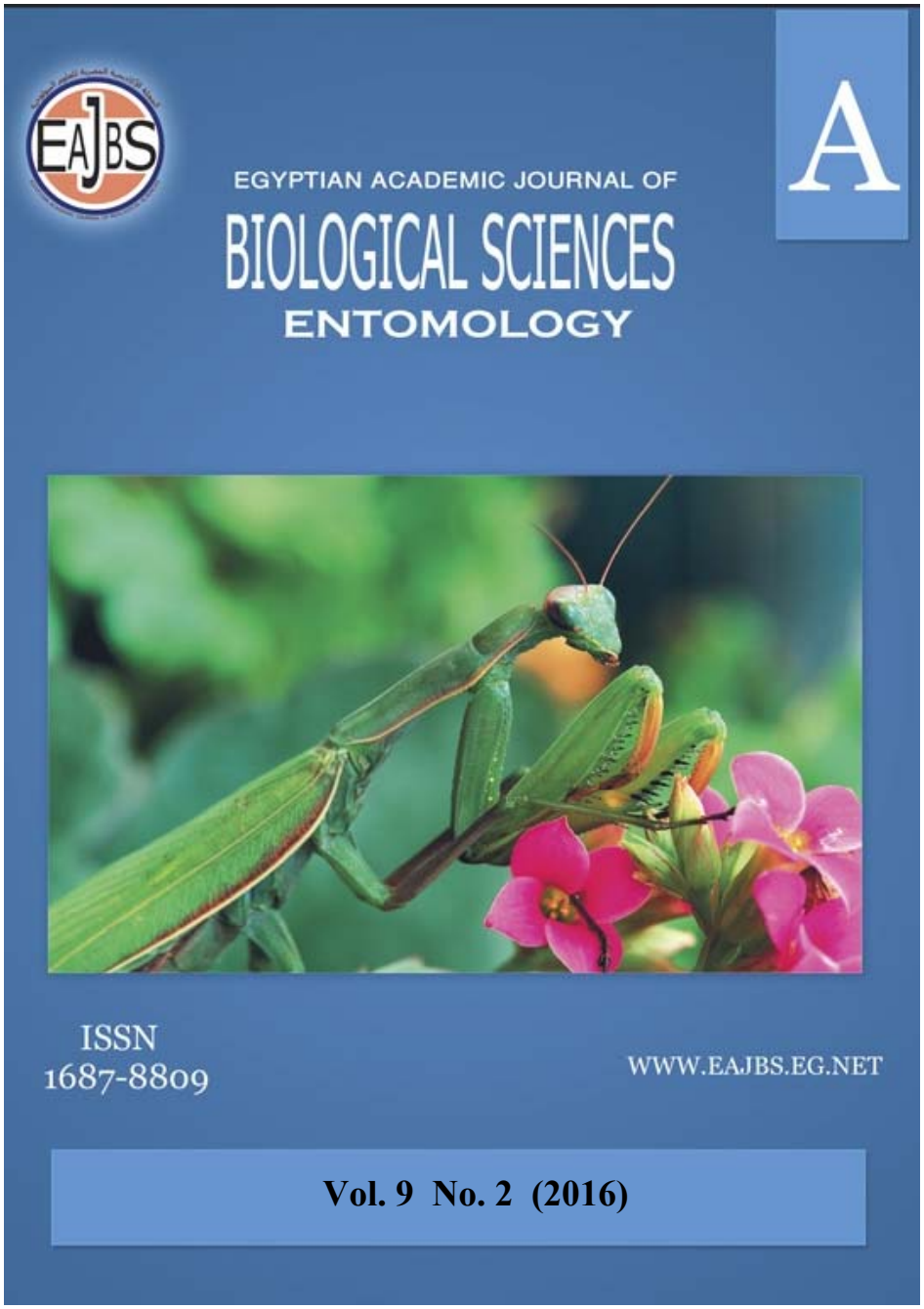

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Effect of Different Fertilization Types on the Population Dynamics of Mites Inhabiting Soil Underneath Cotton Plants in Giza Governorate, Egypt.

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ABSTRACT

The fertilization have an important role in the abundance and population of different mite species associated with different agricultural crops. As a result of experiment and investigation on the population of mites inhabiting soil underneath Cotton (*Gossypium barbadense* L.) in Giza Governorate, (Kerdasa region) during April to September 2014 and 2015 to study the effect of applying lay soil with the rice straw as organic wastes with the inoculation with Humic acid both separately or together on the population of different soil mites. The obtained results revealed the presence of 17 different mite species belonging to 11 families related to four suborders, Prostigmata (Actinedida), Mesostigmata (Gamasida), Astigmata (Acaridida) and Cryptostigmata (Oribatida) associated with soil of cotton plants treated with different types of fertilizers. The percentage of collected four soil mites suborders, the actinedids were higher in the abundance inhabiting cotton plants soil in comparison with other three collected mite groups, followed by oribatid mites, followed by acaridid mites but the gamasid mites abundance was the lower category in all three tested methods of fertilization. The obtained data demonstrated that the mean number of collected mites in case of using recommended + humic acid fertilization method was higher than those recorded in recommended only and in case of recommended + humic + rice collectively. The study also indicated that the collected different mites during 2015 cultivated season were higher in number than those obtained during the first season 2014. The obtained data also demonstrated that September 2014 was the most study period harbored collected mites in all different methods of fertilization.

INTRODUCTION

Cotton (*Gossypium barbadense* L.) is considered the main fibre crop through industry in Egypt as well as in the world. In Egypt, it was always and stills the main cash crop for most growers. It is grown mainly for its fibre, but cotton seed products are also of economic importance. Cotton seed is presently the main source of edible oil and meal for livestock in Egypt.

The cultivated area of cotton is going lower year by year, in spite of its importance for national economy, textile industry, food oil and animal feed production and also its role in increasing and maintenance of soil fertility. Fertilizer management is one of the most important factors in successful cultivation of crops affecting yield quality and quantity. Applications of mineral fertilizers have unfavorable impacts on our environment and health. External agricultural inputs such as mineral fertilizers, organic amendments, microbial inoculants, and pesticides are applied with the ultimate goal of maximizing productivity and economic returns, while side effects on soil organisms are often neglected, Bunemann *et al*., (2006). The authors noticed that organic amendments such as manure, compost, biosolids, and humic substances provide a direct source of C for soil organisms as well as an indirect C source via increased plant growth and plant residue returns. Effects of fertilization on the soil system and especially on the soil organisms are poorly known. It was assumed that the nitrogen fertilizers stimulate the growth of the microorganism and thus, indirectly, the soil fauna feeding on them, Sabbour (2006). In Egypt, cotton requires approximately seven months from planting to harvest. During this growing season, fertilization has a major direct impact on cotton growth, and influences both yield and quality characters. Nitrogen and potassium are important elements for effective production of cotton. Low soil N is one of the major constraints to crop production in Egypt. The co-existence of mites and other invertebrates in a varity of habitats not only provides the opportunity for predation between the groups, but also affords ideal conditions for the development of more complex association such as commensalism and parasitism (Evans *et al.,* 1961). Many predacious soil mite species are considered beneficial to man since they feed on harmful species (Axtell 1963; Rodriguez *et al.,* 1970; Berry, 1973; Shereef *et al.,* 1980; Zaher 1986; Darwish *et al.,* 1990). In their study about effects of different compost amendments on soil biotic and faunal feeding activity in an organic farming system, Pfotzera and Schülera (1997) mentioned that the soil microbial and faunal feeding activity responded to the compost amendment with higher activity rates than with mineral fertilization. Highest values of both were found after application of biogenic waste compost. However, additional application of hornmeal in the farmyard compost treatment did not result in higher activity rates throughout the year.

The biological insecticides (bacteria, fungi, viruses and plant extract) have been widely use to their high specificity without harmful side effect on the surroundings (Sabbour, 1992).Unfortunately, the studies of mites inhabiting soil underneath cotton plants have been greatly hampered by the lack of modern reference works from which they can be identified. However, this great lack stimulated my attentions to launch just this study. Therefore, this work was carried out to investigate some ecological aspects related to the mites inhabiting soil under cotton plantation. Also, to evaluate the effects of different fertilization types.

MATERIALS AND METHODS

This experiment was carried out at untreated cotton (*Gossypium barbadense* L.) field in Kerdasa region, Giza Governorate. Cultivation was carried out in April until harvest in September 2014 and 2015. Soil samples under cotton plants were collected at fortnight intervals from each plot; each sample about 1000 g of soil was gathered and placed in a plastic bag. Bags were transport immediately in the same day to the laboratory of Plant Protection Research Institute, A.R.C. The samples were placed in Tullgren funnels, upon a wire screed insert (30 diameter, 6 mesh openings).

A 40–watt bulb on top of each funnel served as the heat light source to drive the arthropods downward into a 200 ml glass jar containing 70 % ethyl alcohol.

The following fertilizers treatments were used in this study:

The recommended fertilizers used in this study were ammonium nitrate 33% N, superphosphate 15 % P_2O_5 and potassium sulphate 48 % K_2O as sources of nitrogen (N), phosphorus (P) and potassium (K), respectively. The recommended units of each fertilizer kind per feddan representing N: P: K ratio of 66:30:24 were applied.

Humic acid. Humic acid is one of the major components of humic substances. Humic matter is formed through the chemical and biological humification of plant and animal matter and through the biological activities of microorganisms (Anonymous, 2010). Humic acid is formed by the biodegradation of dead organic matter and is a major component of soil humus (Stevenson 1991). In this study, 30 gm humic acid per 100 seeds of cotton plants *G. barbadense* L.

Rice straw: It was collected from South El-Hossinia Res. Farm Station (El-Sharkia Governorate).It was anaerobically.The rice straw application was occupied the main plot as a main factor with two levels (with rice straw, without rice straw), while the others fertilizers treatments were distributed randomly in the sub plots, net plot size was 3 x 3.6 m with proper irrigation channels. Rice straw was applied and mixed thoroughly the main plots at sowing.

All others agricultural practices were applied normally without using insecticidal treatments. The complete randomized blocks design with four replicates was adopted.

RESULTS AND DISCUSSION

The data tabulated in Table (1) showed that there was 17 different collected mite species belonging to 11 families associated with soil of cotton plants treated with different types of fertilizers at Giza governorate in two seasons 2014 and 2015.

Table 1: The different soil mites inhabiting cotton plants during 2014 and 2015 cultivated seasons at Giza Governorate

Suborder	Family	Species	Behviour	tiliz.	Abu.
Prostigmata	Cunaxidae	*Cunaxa capreolous* (Berlese)	Predator	R., R. +Humic	+++
		Neocunaxoides andrei (Baker & Hofmann)	Predator	All fertil. kinds	+++
	Cheyletidae	*Cheyletus badreyi* Zaher & Hassan	Predator	R., R. +Humic	+
		Acaropsellina docta (Berlese)	Predator	R., R. +Humic	++
		Cheyletus eruditus (Schrank)	Predator	All fertil. kinds	+++
	Tydeidae	*Orthotydeus californicus* (Banks)	Miscellaneous	R.	+++
		Orthotydeus kochi (Oudemans)	Predator	R., R. +Humic	+++
	Bdellidae	*Spinibdella. bifurcata* Atyeo	Predator	All fertil. kinds	+
	Tarsonemidae	*Tarsonemus* sp.	Fungivorous	R.	+++
Mesostigmata	Parasitidae	*Parasitus consanguineous* (Oudemans &Voigts)	Predator	R.	++
	Uropodidae	*Urobovella krantzi* Zaher &Afifi	Fungivorous	R.	+
	Ascidae	*Blattisocius tarsalis* (Berlese)	Predator	R.	+
		Proctolaelaps aegyptiacus Nasr	Predator	R., R. +Humic	++
	Laelapidae	*Androlalelaps casalis* (Berlese)	Predator	R.	++
Astigmata	Acaridae	*Tyrophagus putrescentiae* (Schrank)	Fungivorous	All fertil. kinds	+++
		Rhizoglyphus robini Claparede	Fungivorous	All fertil. kinds	+
Cryptostigmata	Oppiidae	*Oppia sticta* Popp	Fungivorous	All fertil. kinds	+++

+ = rare (less than 3 mites) ++ = moderate (4-8 mites) +++ = high (more than 9 mites).
R. = Recommended fertilizers

The mites surveyed in the cotton fields were classified into three groups, predators, fungivorous and miscellaneous mites. The mites belonging to suborder Prostigmata were 9 species in five families, Cunaxidae, Cheyletidae, Tydeidae,

Bdellidae and Tarsonemidae, while those belonging to suborder Mesostigmata were 5 different species in 4 mite families. On the other hand the mites belonging to suborder Astigmata were 2 species in one family, but suborder Cryptostigmata was represented in this study by one species in one family only, Table (1).

The same previously mentioned table showed also the relation between the kind of mite species and the types of fertilization, as the different astigmatid and cryptostigmatid mites were collected in the presence of the all tested kinds of fertilization. As shown in Table (2), the actinedid (prostigmatid) mites were higher in the abundance inhabiting cotton soil in comparison with other collected mite groups, followed by oribatid mites, followed by acaridid (astigmatid mites) mites but the gamasid (mesostigmatid) mites abundance was the lower category in all three tested methods of fertilization.The mean number of collected prostigmatid mites in case recommended (control 100 %) was 47 different mites, changed to recorded 55 mites in case of recommended + humic acid application and slightly decreased in case of recommended + humic + rice fertilization method which represented by 50 prostigmatid mites.

However, the mean number of collected gamasid, acaridid and oribatid mites was 11, 13 and 27 different mites in case using mineral recommended fertilization during 2014 season. On the other hand, the number of collected mites in case of using recommended + humic acid fertilization recorded 24, 28 and 41 different mites which changed to recorded 20, 24, and 23 different mites when using recommended + humic + rice fertilization method during 2014 cultivation season. Revealed data in Table (2) indicated that the collected different mites during 2015 cultivated season were higher in number than those obtained during the first season 2014.The number of collected actinedid mites in case of mineral recommended fertilization method was 58 mites followed by the oribatid mites (37 individuals) and acaridid mites (23mites) and gamasid mites 22 different mites in case of the same fertilization method.

Table 2: The effect of fertilizers on the population of the different soil mite inhabiting cotton plants at Giza Governorate.

Mite suborder	2014 season																							**Mean**
	Recommended (control 100%)							50 % Recommended +Humic							50 % Recommended +Humic + Rice									
	April	May	June	July	Aug.	Sep.	Mean	April	May	June	July	Aug.	Sep.	Mean	April	May	June	July	Aug.	Sep.	Mean			
Prostigmata	21	33	49	52	57	70	47	32	39	56	57	65	80	55	25	35	52	55	62	74	50			51
Mesostigmata	7	9	13	11	13	15	11	16	18	22	25	27	34	24	13	15	18	21	23	28	20			19
Astigmata	7	10	17	18	12	15	13	17	21	27	35	32	35	28	15	17	23	28	28	30	24			22
ptostigmata	17	20	24	28	31	40	27	22	30	32	46	53	63	41	22	25	18	36	45	53	23			30
Mean	13	18	26	27	28	35	25	22	27	34	41	44	53	37	19	23	28	35	40	46	31			31
2015 season																								
Prostigmata	31	43	59	62	68	58	58	42	49	65	67	71	91	64	35	45	62	64	72	84	60			61
Mesostigmata	15	20	25	23	24	22	22	26	28	33	36	37	44	34	21	23	27	29	31	36	28			28
Astigmata	17	20	27	28	22	23	23	29	31	37	45	42	47	39	22	24	30	35	37	39	31			31
yptostigmata	27	30	35	38	44	37	37	32	35	47	60	67	74	53	27	35	38	46	55	63	44			45
Mean	23	28	37	38	40	35	35	32	36	46	52	54	64	47	26	32	39	44	49	56	41			41

As shown in obtained data in Table (2) the mean number of collected mites in case of using recommended + humic acid fertilization method was higher than those recorded in recommended only and in case of recommended + humic + rice collectively. The mean number of the collected mites was (50, 20, 24 and 23 different mites, when using recommended + humic acid + rice straw fertilization method in for prostigmatid, mesostigmatid, astigmatid and cryptostigmatid mites, respectively during 2014 season and 60, 28, 31 and 44 mites during 2015 season, respectively. The obtained data also demonstrated that September 2014 was the most study period harbored collected mites in all different methods of fertilization and the method of recommended + humic acid was the most abundant contain mites. On the other hand

it was found that August 2015 was more harbored mites in case of using recommended method (68 mites), but during September 2015 the mites were higher number than any other time when using recommended + humic acid and or Recommended + humic acid + rice straw fertilization method (91, 84 mites, respectively).

As shown in Table (3), the cultivated season 2015 was more abundant for mites then 2014 season in all the four collected mite groups, as, the mean number of collected mite was 187.9, 44.9, 52.4 and 104.8 actinedid, gamasid, acaridid and oribatid mites, respectively during 2014 cultivated season. On the other hand, the mean number of colleted mites was 194.6, 50.7, 57.7 and 112.0 actinedid, gamasid, acaridid and cryptostigmatid mites, respectively during 2015 cultivated season. Dun Xiao *et al*., (1995) studied the variation of community structures of soil Acari under different fertilizers conditions and noticed that the fluctuation of diversity, richness and evenness of mites was higher in chemical fertilizers than in organically fertilized soil. El-Nenaey (1998) mentioned that actinedid mites represented the highest number of mites depended on the quantitative and qualitative of organic manure fertilizes. Yassin and Sallam (2008) proved that the total numbers of soil mites in chemical treated soil plots were more than of plots treated with biofertilizers once, with the exception of mesostigmatid mites were higher in biofertilizers soybean soil.

Table 3: The effect of fertilizers on different mites during two seasons

Mite Suborder	2014 season fertilizers			Mean	2015 season fertilizers			Mean
	Recommended (control 100%	50 % Recommended +Humic	50 % Recommended +Humic + Rice		Recommended (control 100%	50 % Recommended +Humic	50 % Recommended +Humic + Rice	
Prostigmata	114.3	279	170.5	187.9	116.7	290	177	194.6
Mesostigmata	24	70.3	40.3	44.9	28	75	49	50.7
Astigmata	30.3	82	45	52.4	35	89	55	57.7
Cryptostigmata	54	170.3	90	104.8	60	177	99	112
Mean	55.7	150.0	86.5	97.5	59.9	157.8	95	104.3

L.S.D. at 0.05
Actinedida = 4.9
Gamasida = 2.0
Acaridida = 3.7
Oribatida = 4.0

REFERENCES

Anonymous (2010). Humic and fulvic acids: The black gold of agriculture ?http:// www.humintech.com/pdf/humicfulvicaids.pdf

Axtell, R.C. (1963). Acarina occurring in domestic animal manure. Ann. Ent Soc. Amer., 56 (5): 628-633.

Berry, R.E. 1973. Biology of the predaceous mite *Pergamasus quisquiliarum*, on the garden symphylan, *Scutigerella immaculata*, in the laboratory. Ann. Entomol. Soc. Am., 66, 1354–1356.

Bunemann, E. K.; G. D. Schwenke and L. Van Zwieten 2006. Impact of agricultural inputs on soil organisms—a review.*Soil Research* 44(4) 379–406.

Darwish, T. E.; A. M. Zaki and A.A. Osman 1990. The effect of feeding system on diptererous flies and predacious mites inhabiting dung of farm animals. Biocontrol of Arthropods affecting livestock and poultry. West view studies in insect biology. Boulder, San Francisco & Oxford: 153-168.

DunXiao, H.; X. Yunlong and W. ShanMel 1995.Study on the variation of community structures of soil Acari under different fertilizer conditions. Acta Agriculturae,

Universitatis Pekinesis, China, 21 (4): 417-423.
El-Nenaey, H. M.A. 1998. The distribution of certain predaceous mites and their role in balance of some insect population. Ph. D. Thesis, Fac. Agric. Menofia Univ., Egypt, 216 pp.
Evans, G.O.; J. G. Sheals and D. Macfarlans 1961.The terrestrial Acari of the British Isles. An introduction to their morphology, biology and classification. Bull. British Mus. (Nat. His. Zool., London, 9 (1): 166-185.
Pfotzera G. H. and C. Schülera 1997. Effects of different compost amendments on soil biotic and faunal feeding activity in an organic farming system. An International Journal for Sustainable Production Systems. 15 (1-4): 177-173.
Rodriguez, J. G.; P. Singh and B. Tylor 1970. Manure mites and their role in fly control. J. Med. Entomol., 7: 335-341.
Sabbour, M. M. 1992. Biology of some stored products pests as affected by microbial control agents. M.Sc. Thesis, Fac. Sc. Cairo Univ., pp 167
……..2006.Effect of some fertilizers mixed with bioinsecticides on the potato tuber moth *Phthorimaea operculella* infesting potato in the field and store. Pakistan J. Boil. Sc., 9 (10): 1929-1934.
Shereef, G. M.; M. A. Zaher and A. M. Afifi 1980. Mites inhabiting organic manure in Egypt. Roc.1st Conf. Plant Prot. Res. Institute, 3; 107- 120.
Stevenson, F. J. 1991. Organic matter—micronutrient reactions in soil In: Mortvedt J.J., Cox FR, Shuman LM, Welch RM (Eds.) Micronutrients in agriculture, soil science society of America, Madison, pp. 145–186.
Yassin, E. M. A. and G.M. E. Sallam 2008. Fertililization as a factor affecting the population of different mites and true spiders inhabiting soybean plants. J. Adv. Agric. Res., 13 (2): 325-338.
Zaher. M. A. 1986. Predacious and non-phytophagus mites in Egypt. (Nile Valley and delta) PL. 480 programme. USA project No. EG. ARS. 30, Grant No. FG. Eg. 139 P: 567.

ARABIC SUMMERY

تاثير انواع التسميد المختلفة على التذبذب العددى للاكاروسات فى تربة نباتات القطن بمحافظة الجيزة – مصر

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يلعب نوع التسميد دورا هاما فى وجود الاكاروسات المختلفة والمرتبطة بتربة المحاصيل الزراعية المختلفة والهدف من اجراء هذه الدراسة هو التعرف على دور التسميد بطرق مختلفة على انواع وتعداد الاكاروسات المختلفة المرتبطة بتربة نباتات القطن بمحافظة الجيزة (منطقة كرداسة) فى موسمى الدراسة ٢٠١٤و ٢٠١٥ حيث اوضحت النتائج المتحصل عليها ان هناك ١٧ نوع من الاكاروسات تنمتى الى ١١ فصيلة تابعة ل ٤ تحت رتب اكاروسية وهى تحت رتبة الاكاروسات الامامية الثغر (Prostigmata) Actinedida وهى ممثلة بخمسة فصائل كالاتى : Cunaxidae و Cheyletidae و Tydeidae وBdellidae و Tarsonemidae وتحت رتبة الاكاروسات متوسطة الثغر التنفسى (Mesostigmata) Gamasida وبها العائلات الاربع الاتية Parasitidae و Uropodidae و Ascidae و Laelapidae وتحت رتبة الاكاروسات عديمة الثغر (Astigmata) Acaridida وبها عائلة واحدة وهى Acaridae وتحت رتبة الحلم الخنفسى (Cryptostigmata) Oribatida وبها عائلة واحدة وهى Oppiidae . ولقد وجد ان الاكاروسات المنتمية الى تحت رتبة ذات الثغر الامامى كانت اعلى فى التواجد فى تربة نباتات القطن بمحافظة الجيزة بالمقارنة بالمجاميع الاخرى من الاكاروسات يليها فى التعداد مجموعة الاكاروسات ذات الحلم الخنفسى ثم الاكاروسات عديمة الثغر وكانت الاكاروسات ذات الثغر المتوسط اقل المجاميع الاكاروسية تواجدا فى جميع انواع المخصبات الزراعية التى استخدمت فى منطقة الدراسة. ودلت النتائج المتحصل عليها ايضا ان الاكاروسات التى تم جمعها فى الموسم الاول ٢٠١٤ كانت اقل عددا من التى تم جمعها فى الموسم الثانى ٢٠١٥ وان النظام الثانى للمخصبات وهو (الموصى به ٥٠% + حمض الهيوميك) كان اكثر الانظمة احتواء ا للاكاروس اكثر منه فى النظامين (الموصى به منفردا) او (الموصى به ٥٠% + حمض الهيوميك + قش الارز) كما تشير النتائج المتحصل عليها ان شهر سبتمبر ٢٠١٤ كان اكثر مواعيد الدراسة احتواءا للاكاروسات اكثر من اى فترة اخرى.