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INFLUENCE OF BIOFERTILIZERS FOR MINIMIZING WHITEFLY, *BEMISIA* BIOTYPE (B) (HEMIPTERA: ALEYRODIDAE) POPULATION IN SQUASH, WITH EMPHASIS ON NUTRITIONAL COMPONENTS

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ABSTRACT

Squash is considered as one of the important vegetable crops in Egypt. *Bemisia tabaci* (Genn.) Biotype (B) (Hemiptera: Aleyrodidae) is one of the serious pests of squash cultivation and farmers are indiscriminately using high dose of hazardous chemicals to minimize pest damage that ultimately affecting the soil, ground water, environment and consumers health. Three squash cultivars namely Revera, Eskandarany and Mabrouka were cultivated during Nili 2011 and 2012 seasons in Qualubia Governorate to evaluate its susceptibility to the whitefly *B. tabaci* Biotype (B) infestation. Also the present work dealt with the relationship between the whitefly populations and some plant leaves nutritional components. The results indicated that the cultivar Eskandarany was the most susceptible cultivar to whitefly infestation when treated with AZ+50% NPK and cultivar Revera was tolerant when treated with AZ+B+H+50% NPK. While the cultivar Mabrouka was moderately infested when treated with NPK. This work also observed the population densities of *B. tabaci* Biotype (B) immature on the three tested cultivars was insignificantly negative with iron and manganese, On the other hand, the relationship with most bio-fertilizer treatments was insignificantly positive with phosphorous and potassium elements.

INTRODUCTION

Squash is considered as one of the important vegetable crops in Egypt (Abd-El-Kareem *et al.* , 2004). *Bemisia tabaci* Biotype (B) can cause economic damage to plants in several ways. Heavy infestations of adults and their progeny can cause seedling death, or reduction in vigor and yield of older plants, due simply to sap removal. When adult and immature whiteflies feed, they excrete honeydew, a sticky excretory waste that is composed largely of plant sugars. The honeydew can stick cotton lint together, making it more difficult to gin and therefore reducing its value. Sooty mold grows on honeydew-covered substrates, obscuring the leaf and reducing photosynthesis, and reducing fruit quality grade (Markham *et al*.,1994).

Squash silverleaf disorder is another developmental disorder caused by feeding of immature whiteflies, also first noted in Florida in 1987. This disorder affects many-Cucurbita-species, including the squashes and pumpkins of-*Cucurbita pepo*, *Cucurbita moschata*, and *Cucurbita mixta*. Feeding by immature whiteflies causes newly developing leaves, but not the leaves on which they are feeding, to take on a silvery appearance due to the separation of the upper epidermis from the underlying cell layer. The resultant air space reflects light, causing the silvery color. Fruits that develop on silvered plants may be bleached, and are of lower quality grade. Other physiological disorders caused by *Bemisia* include lettuce leaf yellowing and stem blanching, carrot light root, pepper streak,-Brassica white stem, and chlorosis of new foliage of many plants (Bi e*t al*., 2001).

Bemisia tabaci Biotype (B) attacks more than 500 species of plants (Greathead, 1986) from 63 plant families (Mound and Halsey, 1978). It is distributed in tropical and subtropical areas (Cock, 1986). Current soil management strategies are mainly dependent on inorganic chemical-based fertilizers, which caused a serious threat to human health and environment. The exploitation of beneficial microbes as a biofertilizer has become paramount importance in agriculture sector for their potential role in food safety and sustainable crop production (Bhardwaj *et al*., 2014). Biofertilizers keep the soil environment rich in all kinds of micro- and macro-nutrients via nitrogen fixation, phosphate and potassium solubalisation or mineralization,release of plant growth regulating substances, production of antibiotics and biodegradation of organic matter in the soil (Sinha *et al*., 2014).

Knowledge of the form of a plant’s nutrition, combined with the dynamics and ecology of a pest can often provide an excellent basis for successful pest management (El-Zik and Frisbie, 1991). Agronomical practices are slightly different with different regions (Mahdi,1993 and Satti *et al*., 2010). The water soluble components of vermicompost such as humic acid, growth regulators, vitamins, micronutrients and beneficial microorganism increases the availability of plant nutrients, results in increased growth, higher yield and better quality produce (Atiyeh *et al.,* 2002).

One of the most important factors influencing the performance of herbivorous insects is nitrogen level in their diet (Douglas, 1993). Potassium (K) has been considered a key component of plant nutrition that significantly influences crop growth and some pests' infestation. The more synthetic fertilizer application, especially nitrogen (N) fertilizer, the more serious insect herbivores occurrence and crop damage from these insects by reducing plant resistance (Bi *et al*., 2001 and Ge *et al*., 2003). Plant nutritional quality and plant defenses that directly act on herbivores are altered by N fertilization, and herbivorous insects can distinguish between plants receiving different N applications (Prudic *et al*., 2005 and Chen *et al*., 2008). Many studies has been done on the effect of nitrogen rates on the population density of sucking pests, but no information are available at present on the effect of combined application of nitrogen, phosphorus and potassium (Purohit and Deshponde, 1991).

The aim of this work is to study the effect of bio- fertilizers of population *B. tabaci* Biotype (B) in squash cultivars and the relationship between the whitefly populations and some plant leaves nutritional components.

MATERIALS AND METHODS

Field studies

To study the population density of *B. tabaci* Biotype (B) infesting three squash cultivars Revera, Eskandarany and Mabrouka, the experiments were carried out during Nili plantation seasons 2011 and 2012, at the experimental farm of Plant Protection Research Institute Station at Qaha region, Qualubia Governorate. During this work three bio-fertilizers were tested in 7 different mixtures (Table, 1). These bio-fertilizers, Humic acid (H) (100g/ feddan), - *Azotobacter chroococcum* (AZ) (10^9 cell/ ml) and *Bacillus polymixa* (B) (10^{10} cell/ ml).

The experiment was designed in factorial complete randomized blocks. The chosen total area was 756 m^2 divided into 24 plots main plot contain cultivar and sub-main plot consists of the bio-fertilizer treatment, every plot contains three replicates; each replicate was 10.5 m^2. The normal agricultural practices were undertaken except using bio-fertilizer and without using pesticides.

Weekly samples of 10 leaves per replicate were randomly collected. Each sample were kept in a tight closed paper bag and transferred to the laboratory in the same day for inspection using stereomicroscope. The number of *B. tabaci* Biotype (B) immature were estimated by counting the total number per 10 leaves on the lower surface of squash leaves.

Table (1): Tested bio-fertilizers mixtures on *B.tabaci* Biotype (B) infesting squash cultivars in Qualubia Governorate

No.	Tested bio-fertilizers mixtures
1.	AZ+50% NPK
2.	AZ+50% NPK
3.	B+ 50% NPK
4.	H+50% NPK
5.	H+AZ+50% NPK
6.	H+B+50% NPK
7.	H+B+ AZ+ 50%
8.	Recommended NPK fertilizer (standard)

AZ: *Azotobacter chroococcum* , B: *Bacillus polymixa,* H: Humic acid

Laboratory studies:-

This study was carried out during 2012 Nili season to determine the relationship between whitefly *B. tabaci* populations at two levels of infestations "start and peak" and seven leaf nutritional components of the three studied squash cultivars. Leaves of each sample were cleaned and washed with distilled water, then quickly dried by placing gently between filter papers to remove the excess of water; the samples were dried in an oven at 105 ^{0}C overnight, until a constant weight was obtained. The dried leaves were crushed by the aid of homogenizer to fine powder and stored in glass bottles to determine total nitrogen and potassium contents according to the methods of AOAC (1995); the phosphorous content was determined according to the method described by David (1966).

Statistical analysis:

Data for all experiments were analyzed according to SAS program (1988) which was run under WIN computer system and mean separation was conducted by using Duncan's multiple rang in this program (Duncan, 1955).

RESULTS AND DISCUSSION

Efficacy of biofertilizers on whitefly, *Bemisia tabaci* Biotype (B) population in different cultivars of squash.

First season (2011):

Table (2) showed that population of immature stages *B. tabaci* Biotype (B) was reached maximum during Oct. 1st with mean number 48.12, 45.02 and 35.70 individuals/10 leaves for Eskandarany, Mabrouka and Revera in standard fertilization while when the cultivars fertilized by H+B+AZ+50%NPK . The population of whiteflies reduced to 35.70, 32.60 and 23.28/ individuals 10 leaves and reached maximum when fertilizer by AZ+50% NPK fert. 60.54, 55.89 and 48.12/ individuals 10 leaves for Eskandarany, Mabrouka and Revera cultivars, respectively. The population of whiteflies also reduced ascendingly when fertilization H+B+50% NPK fert., H+AZ+50% NPK fert., H+50% NPK fert. B+50%fert. And B+AZ+50% NPK fert.

The mean numbers of immature stages of whitefly reached maximum in Eskandarany cultivar when fertilized by AZ+50% NPK (32.67individuals/ 10 leaves) and reduced minimum when fertilized by H+B+AZ50% NPK (17.72 individuals/ 10 leaves). The results indicated that whiteflies reduced extremely to 9.43 individuals/ 10 leaves when fertilized by H+B+AZ50% NPK if comparing with standard fertilization 15.49 individuals/ 10 leaves in cultivar Revera while in cultivar Mabrouka the mean number was 14.53 individuals/ 10 leaves if comparing with standard fertilization 21.84 individuals/ 10 leaves.

Second season (2012):

The obtained results in Table (3) revealed that population of immature stages *B. tabaci* Biotype (B) was reached maximum during Oct. 1st with mean number 38.50, 36.02 and 18.63 individuals/10 leaves for Eskandarany, Mabrouka and Revera in standard fertilization while when the cultivars fertilized by H+B+AZ+50% NPK . The population of whiteflies reduced to 28.56, 26.08 and 18.63 individuals/ 10 leaves and reached maximum when fertilizer by AZ+50% NPK fert. 48.43, 44.71 and 38.50 individuals/ 10 leaves for Eskandarany, Mabrouka and Revera cultivars, respectively. The population of whiteflies also reduced ascendingly when fertilization H+B+50% NPK fert., H+AZ+50% NPK fert., H+50% NPK fert. B+50% NPK fert. And B+AZ+50% NPK fert.

The mean numbers of immature stages of whitefly reached maximum in Eskandarany cultivar when fertilized by AZ+50% NPK (25.49individuals/ 10 leaves) and reduced minimum when fertilized by H+B+AZ50% NPK (14.69 individuals/ 10 leaves). The results indicated that whiteflies reduced extremely to 8.51 individuals/ 10 leaves when fertilized by H+B+AZ50% NPK if comparing with standard fertilization 12.77 individuals/ 10 leaves in cultivar Revera while in cultivar Mabrouka the mean number was 12.13 individuals/ 10 leaves if comparing with standard fertilization 15.22 individuals/ 10 leaves.

Analysis of variance of the obtained results revealed that significance occurred between mean number of immature/ 10 leaves of the tested cultivars in both seasons, F values were 210.67, 231.29 and LSD 2.14, 1.58, during the first (2011)and second (2012) years, respectively.

The biofertilizer caused negative effect in the population of the whitefly for the reduction of the oviposition. In that way, that product can be efficient in the handling of the whitefly in bean plantings (Almeida *et al*., 2008). Ravi *et al.* (2006) also recorded reduced incidence of sucking pest namely whitefly and leaf hopper under organic manures (FYM and vermicompost) and biofertilizer treated plots and concluded that organic amendments comparatively increased the total phenols in the plants and also the activity of the enzymes like polyphenol oxidase and peroxidase, which might be responsible for the reduced pest incidence. Here biofertilization by mixture of AZ+H+B+ 50%NBK the population of whitefly B.tabaci Biotype (B) reduced extremely to 8.51 individuaes /10 leaves in Revera cultivar (Tables, 2&3).

Relationship between *B. tabaci* infestation and nutritional components of squash leaves:

Results in Table (4) indicated that the fertilized mixture (H+B+AZ+50% NPK) reduced the population of immature whitefly to 16.14 individuals / 10 leaves for Eskandarany cultivar with nutritional components with N (6.265), P (0.2595), K (2.655), CU (3.785), ZN (27.485), MN (209.885) and FE (55.015); 13.97 individuals / 10 leaves for Mabrouka with N (4.08), P(0.2365) ,K (2.54), CU (4.06), ZN (32.65), MN(139.165) and FE (68.4) and 10.015 individuals / 10 leaves for Revera with N (3.235), P (0.3265), K (2.245), CU (4.895), ZN (39.46), MN (289.245) and FE (60.965).

These results if comparing with the standard fertilization , it is obvious that the nutritional components for Eskandarany cultivar (23.595 individuals / 10 leaves) was N (5.84), P (0.3465), K (2.045), CU (3.74), ZN (36.66), MN (211.67) and FE (47.965), for Mabrouka cultivar (21.425 individuals / 10 leaves) was N (5.115), P (0.2755), K (2.835), CU (3.84), ZN (43.17), MN (180.105) and FE (58.54) and for Revera cultivar (14.9 individuals / 10 leaves) was N (3.5), P (0.2995), K (2.94), CU (4.06), ZN (37.57), MN (178.825) and FE (64.285).

Godase and Patel (2002) in brinjal they reported that incidence of whitefly was significantly higher at higher level of nitrogenous fertilizer compared to organic manures amended plots. These results agree with our findings the population of immature stages of *B. tabaci* biotype (B) was 29.1 individuals/ 10 leaves when the Nitrogen was 4.24%.

El-Zahi *et al.* (2012) studied the important role of phosphorus fertilizer in cotton plants infestation with *B. tabaci*. In both seasons of study, cotton plant treated with phosphorus element only was infested with the lowest *B. tabaci* population density and the same direction occurred in case of combination of phosphorus and potassium. *B. tabaci* population density was significantly and positively affected by nitrogen fertilization either alone or in combined treatments.

During the present work the population of *B. tabaci* Biotype (B) reduced extremely 10.015 individuals / 10 leaves of Revera cultivar when fertilized by H+B+AZ+50% NPK after nutritional components analysis of leaf, with phosphorous 0.3265. Buttur *et al.* (1996) agree with our findings. They stated that soil application of phosphorus at 30 kg/ha considerably reduced the mean population of whitefly nymphs and adults.

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3

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Bi *et al.* (2003) observed a positive response between N application rates and the numbers of adult and immature whiteflies appearing during population peaks. Ahmed *et al.* (2007) found that the highest rates of nitrogen resulted in the highest per leaf mean population of whitefly. While in our results the population of whitefly, *B.tabaci* Biotype (B) was extremely highest (29.18 individuals/10 leaves) when Eskandarany cultivar fertilized by AZ=50%NPK with nutritional components P (0.245), K (1.445), and N (5.425).

It is concluded that the cultivar Eskandarany was the most susceptible cultivar to whitefly infestation when treated with AZ+50% NPK and cultivar Revera was tolerant when treated with AZ+B+H+50% NPK. While the cultivar Mabrouka was moderately infested when treated with NPK. This work also observed the relationship between the population densities of *B. tabaci* Biotype (B) immature on the three tested cultivars was insignificantly negative with iron and manganese, On the other hand, the relationship with most bio-fertilizer treatments was insignificantly positive with phosphorous and potassium elements.

REFERENCES

Abd-El-Kareem, F.; El-Mougy, N. S.; El-Gamal, N.G.and Fotouh, Y.O. (2004): Induction of resistance in squash plants against powdery mildew and alternaria leaf spot diseases using chemical inducers as protective or therapeutic treatments.Egypt. J. Phytopathol., Vol. 32, No. 1-2, pp. 65-76 .

Ahmed S.; Habibullah S. S. and Ali C.M. (2007): Effect of different doses of nitrogen fertilizer on sucking insect pests of cotton *Gossypium hirsutum*. J. Agric. Res. (Lahore), 45(1): 43-48.

Almeida,G.D.de; Pratissoli,D.; Holtz,A.M.; Vicentini,V.B. (2008): Biofertilizer as inductor of resistance to the colonization of against the whitefly in the bean plant. Idesia: 1, 29-32.

AOAC. (1995): Method of analysis. Association of official Agriculture Chemists. 16ted, Washington D.C. USA.

Atiyeh, R.M., Lee, S.S., Edwards, C.A., Arancon, N.Q. and Metzger, J. (2002): The influence of humic acid derived from earthworm-processed organic waste on plant growth, Bioresource Technology 84: 7–14.

Bhardwaj, D. ; Ansari, M. W. ; Sahoo, R. K. and Tuteja , N. (2014): Biofertilizers function as key player in sustainable agriculture by improving soil fertility, plant tolerance and crop productivity. Microbial Cell Factories , 13:66:1-10.

Bi, J.L.; Ballmer, G.R.; Hendrix, D.L.; Henneberry, T.J. and Toscano, N.C.(2001):Effect of cotton nitrogen fertilization on *Bemisia argentifolii* populations and honeydew production. Entomologia Experimentalis et Applicata, 99(1): 25-36.

Buttur, N.S.; Vir, B.K.; Kular, J.S.; Brar, A.S. and Nagi, P.S. (1996): Relationship of plant nutrients and whitefly, *Bemisia tabaci* in upland cotton. Indian J. Intomol., 58(1): 1-6.

Chen, Y. and Ruberson, J.R., 2008. Impact of variable nitrogen fertilisation on arthropods in cotton in Georgia, USA. Agric. Ecosyst. Environ., 126: 281-288.

Cock, M. J. W. Ed. (1986): *Bemisia tabaci*, A Literature Survey on the Cotton Whitefly with an Annotated Bibliography. Food and Agriculture Organization of the U.N., C.A.B. Int. Inst. Biol. Cont. 121 pages.

David, G. (1966): Determination of organic phosphorous compounds by phosphate analysis. Methods of Biochemical analysis Vol. III, Interscience publishers Ltd. London, New York.

Douglas, A.E. (1993):The nutritional quality of phloem sap utilized by natural aphid populations.Ecol. Entomol., 18: 31-38.

Duncan, D. B. (1955). Multiple ranges and multiple F- test. Biometrics, 11: 1-42.

El-Zahi, E.S.; Arif, S.A.; El-Naggar, J. B.A. and El-Dewy, M. E.H. (2012): Inorganic fertilization of cotton field-plants in relation to sucking insects and yield production components of cotton plants. Journal of American Science, 8(2): 509-517.

El-Zik, K.M. and Frisbie, R.E.N. (1991): Integrated crop management systems for pest control. In: Pimental, D. (Ed.), Handbook of Pest Management on Agriculture CRC Press,Boca Raton, FL.

Ge, F.; Liu, X.; Li, H.; Men, X. and Su, J. (2003): Effect of nitrogen fertilizer on pest population and cotton production. Chin. J. Appl. Ecol., 14:1735-1738.

Godase, S.K. and Patel. C.B. (2002): Studies on the influence of organic manures and fertilizers doses on the intensity of white fly on brinjal. Plant Protection Bulletin , 54(1/2):3-6.

Greathead, A. H. (1986): Host Plants. Chapter 3, pp. 17-25. In: *Bemisia tabaci* - a literature survey on the cotton whitefly with an annotated bibliography (Ed. M.J.W. Cock). CAB International Institute of Biological Control, Ascot, UK. 121 pp.

Mahdi, A.A. (1993): Biofertilizer research in the Sudan. A review. University of Khartoum Journal of Agricultural Sciences 1 :137 -151.

Markham, P.G.; Bedford, I.D.; Liu, S. and Pinner, M.S. (1994): The transmission of geminiviruses by *Bemisia tabaci*. Pesticide Science ,42, 123-128.

Mound L. A. and Halsey, S. H. (1978): *Bemisia tabaci* (Gennadius). pp. 118-124. In Whitefly of the World, A Systematic Catalog of the Aleyrodidae (Homoptera) with Host Plant and Natural Enemy Data. British Museum (Natural History) and John Wiley & Sons, Chichester, New York, Brisbane, Toronto. 340 pp.

Prudic, K.L.; Oliver, J.C. and Bowers, M.D.(2005): Soil nutrient effects on oviposition preference, larval performance and chemical defense of a specialist insect herbivore. Oecolgia, 143:578-587.

Purohit, M.S. and Deshpande, A.D.(1991): Effect of inorganic fertilizers and insecticides on population density of cotton whitefly, *Bemisia tabaci.* Indian J. Agric. Sci. 61(9): 696-698.

Ravi, N., Dhandatani, N., Sathiah, N. and Murugan, M. (2006): Influence of organic manures and fertilizers on the incidence of sucking pest of sunflower. Annals of Plant Protection Sciences, 14(1):41-44.

SAS Institute. (1988): SAS/STAT software. Release 9.1. SAS Institute, Cary,N.C.

Satti, A. A. ; Elnasikh, M. H. ; Elamin, A. Y. ; Nasr, O. E. and Salih, S. M. (2010): Evaluation of some organic materials and a biofertilizer on different aspects of Snap Bean (*Phaseolus vulgaris* L.) under heavy soil of Sudan. Agric. Biol. J. N. Am., 1(4): 541-547.

Sinha, R.K.; Valani , D.; Chauhan, K and Agarwal, S.(2014): Embarking on a second green revolution for sustainable agriculture by vermiculture biotechnology using earthworms: reviving the dreams of Sir Charles Darwin. Int. J. Agric. Health Saf., 1:50–64.

تأثير الأسمدة الحيوية على تقليل تعداد ذبابة القطن و الطماطم البيضاء السلالة ب على الكوسة مع الأهتمام بمكونات عناصر البنات الغذائية

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يعتبر نبات الكوسة من اهم انواع الخضر فى مصر. ذبابة القطن والطماطم البيضاء من أخطر الآفات التى تصيب الكوسة و المزارعون يقومون بأستخدام المبيدات التى تقلل من ضرر الآفات ولكن تؤدي الي تلوث التربة والمياه و ايضا البيئة المحيطة بالأنسان . تضمن هذا العمل زراعة ثلاث أصناف من نبات الكوسة وهم الأسكندرانى و مبروكة و ريفيرا خلال عامى 2011-2012 لدراسة حساسية الأصابة بذبابة القطن والطماطم البيضاء السلاله البيولوجية ب فى محافظة القليوبية. أيضا تم عمل دراسة على العلاقة بين تعداد الذباب الأبيض و مكونات النبات الغذائية . وقد اشارات النتائج ان صنف الأسكندرانى اكثر حساسية للأصابة بالذباب الأبيض عندما تم تسميده بالمخلوط AZ+50% NPK

بينما صنف الريفيرا كان أكثر الأصناف تحملا للأصابة بالذباب الأبيض عندما تم تسميده بالمخلوط AZ+B+H+50% NPK

أما صنف مبروكة كان متوسط الأصابة بالذباب الأبيض عندما تم تسميده ببرنامج التسميد NPK الموصي به

هذا العمل تضمن ايضا دراسة العلاقة بين الاصابة بالذباب الابيض و مكونات النبات الغذائية و اتضح من هذ ه الدراسة ان اصناف الكوسة الثلاثة التى تم تسميدها بالاسمدة الحيوية كانت العلاقة ايجابية مع عنصرى الفوسفور و البوتاسيوم وسالبة مع عنصرى الحديد و المنجنيز.

Table (2): Effect of bio-fertilizers on *Bemisia tabaci* Biotype (B) infestation in squash cultivars during 2011.

Inspect date	Az+50% NPK fert			B+Az+50% NPK fert			B+50% NPK fert			H+50% NPK fert			Standard			H+Az+50% NPK fert			H+B+50% NPK fert			H+B+Az+50% NPK fert		
	Esk	Mab	Rev	Esk	Mab	Rev	Esk	Mab	Rev	Esk	Mab	Rev	Esk	Mab	Rev	Esk	Mab	Rev	Esk	Mab	Rev	Esk	Mab	Rev
27Aug	12.42	9.31	5.43	12.42	10.09	7.76	12.42	10.86	8.53	9.31	7.76	6.98	10.86	8.53	0.00	8.54	6.98	4.65	7.76	5.43	2.32	4.65	2.32	0.00
3 Sep	16.74	13.19	10.09	17.07	13.97	10.86	14.74	13.19	10.09	11.64	10.09	8.21	12.42	9.31	3.55	10.87	9.31	6.21	10.09	6.98	6.21	6.21	3.88	2.30
10	28.18	24.85	21.42	27.40	23.85	14.74	17.85	14.74	13.19	13.97	13.19	11.31	14.74	11.64	9.21	14.75	10.86	9.31	13.19	9.31	8.53	8.53	6.98	4.55
17	45.02	41.91	32.60	43.47	37.26	34.15	40.36	34.15	32.60	35.70	32.60	29.39	37.26	32.60	27.18	34.16	26.39	23.28	29.49	24.84	21.73	23.28	20.18	12.31
24	52.78	49.68	41.91	48.12	41.91	38.81	45.02	38.81	35.70	41.91	38.81	34.05	41.91	37.26	26.39	38.81	32.60	29.49	34.15	29.49	26.39	31.05	26.39	17.07
1 Oct	60.54	55.89	48.12	52.78	48.12	43.47	49.68	43.47	40.36	48.12	43.47	38.81	48.12	45.02	35.70	45.02	35.70	32.60	40.36	35.70	32.60	35.70	32.60	23.28
8	53.57	48.36	42.19	46.29	36.22	33.12	38.29	32.08	28.98	37.26	33.12	31.94	37.26	34.15	30.01	34.16	27.94	24.84	32.08	27.94	24.84	27.94	24.84	18.63
15	38.29	34.15	30.01	34.15	32.08	26.91	35.19	27.94	25.87	33.12	32.08	25.73	33.12	28.98	21.73	28.98	24.84	20.70	28.98	22.77	20.70	24.84	20.70	14.49
22	33.12	27.94	22.77	27.94	26.91	22.77	30.01	23.80	21.73	28.98	26.91	18.63	26.91	25.87	16.56	23.81	19.66	17.59	23.80	18.63	16.56	21.73	18.63	11.38
29	21.73	18.63	13.19	17.85	16.30	13.19	20.18	13.97	11.64	17.85	16.30	9.31	17.07	13.19	9.31	13.97	12.42	9.31	14.74	10.86	9.31	13.19	10.86	6.21
5 Nov	17.07	13.97	9.31	14.74	13.19	8.53	16.30	10.09	7.76	14.74	12.42	3.88	13.97	10.86	5.43	10.09	8.53	6.21	11.64	6.21	4.65	9.31	5.43	2.32
12	12.42	10.09	6.21	12.42	9.31	5.43	12.42	6.21	3.10	11.64	9.31	0.00	6.98	4.65	0.77	6.99	5.43	3.10	6.21	2.32	0.00	6.21	1.55	0.60
MEAN	32.67[a]	28.99[b]	23.60[egf]	29.55[b]	25.77[cd]	21.65[hgi]	27.705[cb]	22.44[hg]	19.96[ji]	25.35[ed]	23.01[hgf]	18.19[kj]	25.05[edf]	21.84[hgi]	15.49[nm]	22.51[hg]	18.39[kj]	15.61[nlm]	21.04[hi]	16.71[klm]	14.49[n]	17.72[kl]	14.53[n]	9.43[o]
F	210.67																							
LSD	2.14																							

Means followed by the same letter are not significantly different at 5% based on L.S.D. test.

H: Humic acid, AZ: *Azotobacter chroococcum* , B: *Bacillus polymixa,* Esk: Eskandarany, Mab: Mabrouka, Rev: Revera, F: Values , LSD : Least Significant Difference

Table (3): Effect of bio-fertilizers on *Bemisia tabaci* Biotype (B) infestation in squash cultivars during 2012.

Inspection date	Az+50% NPK fert.			B+Az+50% NPK fert.			B+50% NPK fert.			H+50% NPK fert.			Standard			H+Az+50% NPK fert.			H+B+50% NPK fert.			H+B+Az+50% NPK fert.		
	Esk	Mab	Rev	Esk	Mab	Rev	Esk	Mab	Rev	Esk	Mab	Rev	Esk	Mab	Rev	Esk	Mab	Rev	Esk	Mab	Rev	Esk	Mab	Rev
27-Aug	9.93	7.45	4.34	9.93	8.07	6.21	9.93	6.21	6.83	7.45	8.69	5.58	8.69	6.83	3.72	6.83	5.58	1.10	6.21	4.34	1.86	3.72	1.86	0.40
3-Sep	11.79	10.55	8.07	13.66	11.17	8.69	11.79	8.07	8.07	9.31	10.55	4.96	9.93	7.45	4.96	8.69	7.45	3.24	8.07	5.58	4.96	4.96	3.10	1.20
10	22.26	20.40	18.05	21.64	20.40	17.91	20.40	16.67	16.67	17.29	17.91	13.57	17.91	15.43	13.57	17.91	14.81	16.08	16.67	13.57	12.95	12.95	11.70	9.76
17	36.01	33.53	26.08	34.77	29.80	27.32	32.29	26.08	26.08	28.56	27.32	21.11	29.80	26.08	18.63	27.32	21.11	16.14	23.59	19.87	17.38	18.63	16.14	11.45
24	42.22	39.74	33.53	38.50	33.53	31.05	36.02	31.05	28.56	33.53	31.05	24.84	33.53	29.80	23.59	31.05	26.08	21.11	27.32	23.59	21.11	24.84	21.11	13.66
1-Oct	48.43	44.71	38.50	42.22	38.50	34.77	39.74	34.77	32.29	38.50	34.77	31.05	38.50	36.02	26.08	36.01	28.56	28.56	32.29	28.56	26.08	28.56	26.08	18.63
8	37.26	32.29	28.15	30.63	28.98	26.49	30.63	26.49	23.18	29.80	25.66	22.35	29.80	27.32	19.87	27.32	22.35	24.02	25.66	22.35	19.87	22.35	19.87	14.90
15	30.63	27.32	24.01	27.32	25.66	21.52	28.15	25.66	20.70	26.49	22.35	17.38	26.49	23.18	16.56	23.18	19.87	17.38	23.18	18.21	16.56	19.87	16.56	11.59
22	26.49	22.35	18.21	22.35	21.52	18.21	24.01	21.52	17.38	23.18	19.04	14.90	21.52	20.70	14.07	19.04	15.73	13.24	19.04	14.90	13.24	17.38	14.90	9.11
29	17.38	14.90	10.55	14.28	13.04	10.55	16.14	13.04	9.31	14.28	11.17	7.45	13.66	10.55	7.45	11.17	9.93	7.45	11.79	8.69	7.45	10.55	8.69	5.96
5-Nov	13.66	11.17	7.45	11.79	10.55	6.83	13.04	9.93	6.21	11.79	8.07	3.10	11.17	8.69	4.96	8.07	6.83	4.34	9.31	4.96	3.72	7.45	4.34	3.86
12	9.93	8.07	4.96	9.93	7.45	4.34	9.93	7.45	2.48	9.31	4.96	0.00	5.58	3.72	2.48	5.58	4.34	0.62	4.96	1.86	0.00	4.96	1.24	1.60
MEAN	25.49^{a}	22.71^{b}	18.49^{d}	23.09^{b}	20.72^{c}	17.82^{ed}	22.67^{b}	18.91^{d}	16.48^{ef}	20.79^{c}	18.46^{d}	13.85^{gh}	20.54^{c}	17.98^{ed}	12.99^{ih}	18.51^{d}	15.22^{gf}	12.77^{ih}	17.34^{ed}	13.87^{gh}	12.09^{i}	14.69^{g}	12.13^{i}	8.51^{j}
F	231.29																							
LSD	1.58																							

Means followed by the same letter are not significantly different at 5% based on L.S.D. test.

H: Humic acid, AZ: *Azotobacter chroococcum* , B: *Bacillus polymixa,* Esk: Eskandarany, Mab: Mabrouka, Rev: Revera, F: Values , LSD : Least Significant Difference

Table (4): Relationship between *Bemisia tabaci* Biotype (B) infestation and phytochemical components of squash leaves

Treat.	Cult..		*Bemisia tabaci* Imm	N%	P(mg/dl)	K(g/100g)	CU (ppm)	ZN (ppm)	MN (ppm)	FE (ppm)
Az+50% Fert	ESK.	Mean	29.18[a]	5.425[a]	0.2115[a]	1.445[b]	3.21[b]	29.38[b]	239.38[a]	57.815[a]
		(r) values		-0.095	0.1395	0.1364	-0.01654	-0.1975	-0.1114	-0.1118
	MAB.	Mean	26.08[a]	3.98[a]	0.2515[a]	1.845[ba]	3.75[a]	37.52[a]	208.325[a]	54.285[b]
		(r) values		-0.146	-0.05	0.105	0.096	-0.165	-0.425	-0.341
	REV.	Mean	22.92[a]	3.64[b]	0.366[a]	2.925[a]	4.34[a]	49.105[a]	181.17[b]	69.61[a]
		(r) values		-0.36	0.013	-0.119	-0.668	-0.14	-0.099	-0.0547
B+50% Fert	ESK.	Mean	24.135[a]	4.14[a]	0.2455[a]	1.67[b]	4.385[a]	29.14[b]	221.93[a]	47.815[c]
		(r) values		-0.256	-0.158	0.0469	-0.5117	-0.1284	-0.2733	-0.0944
	MAB.	Mean	20.99[a]	4.435[a]	0.2555[a]	1.995[ba]	3.94[b]	33.24[b]	211.93[a]	57.765[b]
		(r) values		-0.039	0.0889	0.159	0.152	-0.431	-0.402	0.0719
	REV.	Mean	19.56[a]	4.015[a]	0.2555[a]	2.295[a]	3.385[c]	39.14[a]	186.93[b]	67.765[a]
		(r) values		0.177	0.052	-0.275	-0.46	-0.12	0.362	-0.061
Az+B+50% Fert	ESK.	Mean	25.03[a]	4.565[a]	0.2705[a]	1.8[b]	4.485[a]	29.25[b]	215.4[a]	52.175[b]
		(r) values		-0.107	0.0691	0.09519	-0.64	-0.5142	-0.812	0.07545
	MAB.	Mean	22.785[a]	4.59[a]	0.275[a]	2.165[ba]	4.21[a]	39.75[a]	209.125[ba]	59.615[ba]
		(r) values		0.01	-0.0053	-0.186	0.67	-0.455	-0.746	-0.074
	REV.	Mean	20.49[a]	4.59[a]	0.2765[a]	2.645[a]	3.845[b]	40.61[a]	193.66[b]	68.39[a]
		(r) values		-0.627	-0.133	0.645	-0.417	-0.59	-0.587	-0.431
H+50% Fert	ESK..	Mean	22.975	4.96[a]	0.3025[b]	2.03[b]	4.095[b]	36.82[a]	224.96[ba]	50.775[a]
		(r) values		0.9157	0.454	0.6565	0.417	0.135	-0.885	-0.498
	MAB.	Mean	20.73	3.515[a]	0.3085[ba]	3.13[a]	4.065[b]	40.535[a]	231.27[a]	60.7[a]
		(r) values		0.484	-0.624	0.013	0.286	-0.538	-0.902	-0.739
	REV.	Mean	18.32	4.56[a]	0.353[a]	2.575[b]	4.59[a]	41.21[a]	216.16[b]	59.55[a]
		(r) values		-0.757	-0.248	-0.121	0.332	-0.135	-0.967	-0.375
Az+H+50% Fert	ESK.	Mean	21.42[a]	4.24[a]	0.3065[a]	2.24[b]	4.21[a]	27.52[b]	218.325[a]	44.285[c]
		(r) values		-0.329	-0.048	0.464	-0.536	-0.0232	-0.272	-0.33
	MAB.	Mean	17.07[a]	4.265[b]	0.2515[a]	3.24[a]	5.065[a]	38.885[a]	214.38[b]	56.315[a]
		(r) values		0.02	-0.304	0.413	-0.289	0.0278	-0.82	-0.203
	REV.	Mean	15.83[a]	4.015[b]	0.2765[a]	2.59[b]	3.615[c]	42.385[a]	212.38[b]	61.315[a]
		(r) values		-0.135	0.646	-0.166	-0.233	0.054	-0.537	0.007
H+B+50% Fert	ESK.	Mean	19.25[a]	5.18[a]	0.3025[a]	2.39[b]	4.53[ba]	30.325[b]	282.795[a]	66.585[a]
		(r) values		-0.005	-0.475	-0.156	0.901	-0.551	-0.652	-0.34
	MAB.	Mean	16.45[a]	4.99[a]	0.262[a]	2.045[c]	4.705[a]	51.605[a]	220.01[b]	60.065[a]
		(r) values		0.0075	0.149	-0.224	0.707	-0.508	-0.774	-0.116
	REV.	Mean	14.47[a]	4.435[a]	0.2895[a]	2.785[a]	4.09[b]	52.5[a]	210.8[b]	62.665[a]
		(r) values		0.013	0.766	-0.002	0.302	-0.539	-0.729	0.01
Az+H+B+50% Fert	ESK.	Mean	16.14[a]	6.265[a]	0.2595[a]	2.655[a]	3.785	27.485[b]	209.885[b]	55.015b
		(r) values		0.08	0.098	0.195	0.446	0.04	-0.798	-0.0395
	MAB.	Mean	13.97[a]	4.08[b]	0.2365[a]	2.54[a]	4.06	32.65[ba]	139.165[c]	68.4[a]
		(r) values		-0.033	-0.568	0.879	0.35	-0.667	-0.063	-0.359
	REV.	Mean	10.015[a]	3.235[a]	0.3265[a]	2.245[a]	4.895[a]	39.46[a]	289.245[a]	60.965[ba]
		(r) values		-0.373	0.646	0.413	0.691	-0.704	-0.163	-0.349
Standard	ESK.	Mean	23.595[a]	5.84[a]	0.3465[ba]	2.045[b]	3.74[b]	36.66[b]	211.67[a]	47.965[c]
		(r) values		-0.129	-0.04	0.999	0.469	-0.202	-0.725	-0.539
	MAB.	Mean	21.425[a]	5.115[a]	0.2755[b]	2.835[a]	3.84[ba]	43.17[ba]	180.105[b]	58.54[b]
		(r) values		0.002	-0.265	0.358	0.564	-0.836	-0.372	-0.325
	REV.	Mean	14.9[a]	3.5[b]	0.2995[a]	2.94[a]	4.06	37.57[a]	178.825[b]	64.285[a]
		(r) values		0.036	0.05	-0.085	0.455	-0.386	-0.704	-0.139