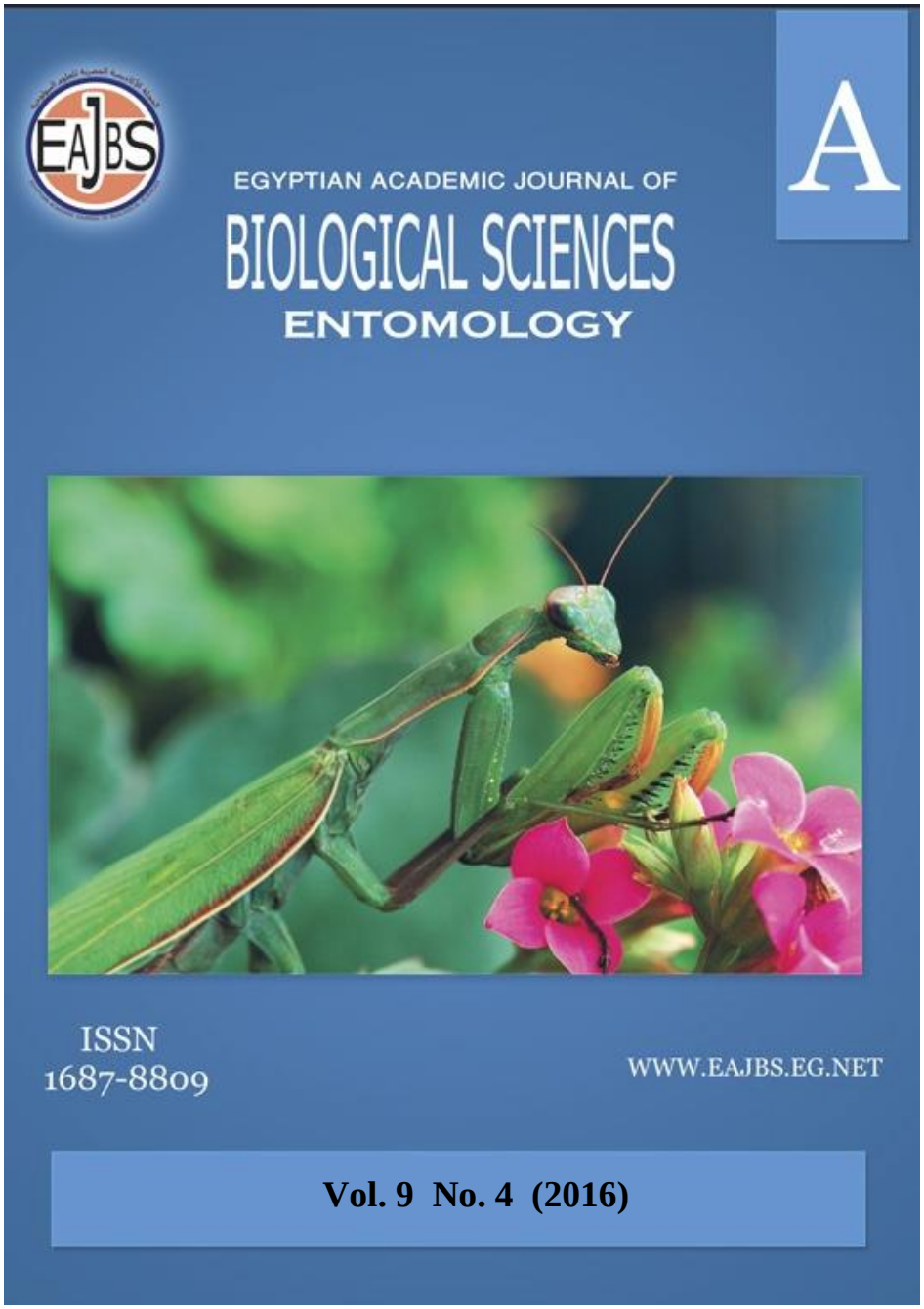

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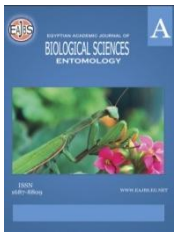

Interaction Between Intercropping System and Agricultural Ecosystems on The Level Infestation of Some Pests Associated With Bean Plants

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ABSTRACT

Effect of different intercropping systems of sweet basil (*Ocimum basilicum*) plants and spraying with sweet basil oils on population of Green bean (*Phaseolus vulgaris*) L. pests *(Bemisia tabaci* (Genn.), *Liriomyza trifolii* (Burg.) and *Tetrenchys urticae* (Koch)) under three agricultural ecosystems namely; plastic greenhouse, scaffold net greenhouse and open field, an experiment was carried out inside greenhouse experimental area at Dokki, Giza Governorate during 2012. According to interaction between of intercropping system and agricultural ecosystems on the level infestation with certain green bean pests, it is clear that, plastic greenhouse harboured the highest number of pests infesting green bean plants while the open field had the lowest number of pests whereas, the scaffold net greenhouse was intermediate as a result to spraying with basil oil is the best method to reduction the number of pests attacking green bean irrespective of intercropping with basil plants or cultivating under plastic or scaffold net greenhouse.

INTRODUCTION

Greenhouse form an important input for industrial investment in agricultural production field, especially vegetables produced in the non-timely Times, thanks to new technologies and evolving adopted by these plantations and the good level of production through the air special circumstances of control in agriculture in terms of temperature, humidity and lighting. Green house agricultural many vegetables such as beans are attacked by serious pests which reduce productivity and quality such as, The whitefly, *Bemisia tabaci* Genn., the leafhopper *Empoasca decipiens* (Lind.) and aphid, *Aphis craccivora* (Koch) are considered the main insect pests infesting common bean and cause great losses not only in quantity but also in quality of the bean yield The leafminer, *Liriomyza trifolii* (Burgess) also, considered a very important insect pest, which cause yellowish and dryness of leaves leading to the weakness of metabolism and consequently lack in crop .The spider mite, *Tetranychus urticae* was considered the major pest of vegetables causing great losses in yield, the effect of which is reduce photosynthesis, transpiration.

The majorities pests polyphagous and have a wide range of hosts. (Hildebrand *et al*. 1986, Shalaby, 2004 Shaalan, 2005 and Mangoud, 2007,). This study aimed to Interaction between study the intercropping system and agricultural ecosystems on the level infestation of some green bean pests.

MATERIALS AND METHODS

For studying the effect of intercropping sweet basil (*Ocimum basilicum*) plants and spraying with sweet basil oils on population of green bean pests under three agricultural ecosystems namely; plastic greenhouse, scaffold net greenhouse and open field. Experiment was carried out inside greenhouse experimental area at Dokki, Giza Governorate during 2012. The experiment includes on three ecosystems; the under scaffold net greenhouse (120 Hole/ cm^2); plastic greenhouse and the open field conditions. Each ecosystem experimental area was $96m^2$ includes three treatments, first cultivated by Samantha variety of green bean alone as control, the second cultivated by Samantha variety of green bean intercropping by basil plants, the third cultivated by Samantha variety of green bean alone as well as sprayed with basil oil. Each treatment about ($32m^{2)}$ divided into three replicates, each replicate about 10.5 m^2.

Seeds of green bean (Samantha) variety were sown on 27th September 2012, nursery plants of basil plant (*Ocimum basilicum* Linn.) (Family: Lamiaceae) were sown on 30th September, application of intercropping took place by planting basil plants in row alternated with Samantha rows. The borders rows were planted by bean plant. On the other hand, the second treatment was sprayed with essential sweet basil oils (2ml/ one litter water) (linalol (54.95%), methylchavikol (11.98%), methylcinnamat (7.24%), and linolen (0.14%). It is treatment received two sprays 1st on October 15th and 2nd on November 12th. Third treatment cultivated by Samantha plant without intercropping by basil plant and without spraying as control. All the experimental plots received the same normal agriculture practices.

Sampling technique:

After three weeks for open field bean plants cultivation, scaffold net greenhouse and plastic greenhouse ten randomly leaves taken chosen from different levels of plants and picked up from each treatment then kept in tightly closed paper bags and transferred to the laboratory at the same day for examination and identify with the aid of a stereomicroscope. The sampling was taken 7 days intervals continued until 12 weeks for all treatments.

RESULTS AND DISCUSSION

Obtained data and statistical analysis revealed that the population densities were affected by both the different agricultural ecosystems (without intercropping system).

The low infestation rate was, generally observed under the open field which received the few number of pests (the whitefly, *Bemisia tabaci* Genn., the leaf miner, *Liriomyza trifolii* (Burgess), in addition to the spider mite, *Tetranychus urticae*) 136.2 individuals/120 leaves. While, the plastic greenhouse harboured the highest number of pests 472.6 of individuals/120 leaves and scaffold net greenhouse come intermediate with mean number 390.50 individuals/120 leaves. Statistical analysis revealed that there was significant differences between three agricultural ecosystems, whereas F value = 28.65 and L.S.D. = 20 individual pests, the tested ecosystem could be arranged according to the abundance of pests into three ecosystem. Table 1.

Data presented. Showed the different between agricultural ecosystems and intercropping by basil plants. Statistical analysis revealed that the population densities were affected by both the intercropping system and the different agricultural ecosystems. The low infestation rates were, generally observed with open field, which received the lowest number of pest 63.42 individuals/120 leaves. While, the plastic greenhouse harboured the highest number of pests 90.52 of individuals/120 leaves, scaffold net greenhouse come intermediate with mean number 88.3 individuals/120 leaves. Statistical analysis revealed there is a

significant differences between three agricultural ecosystems, whereas F value = 9.32 and L.S.D. = 3.55 individual of the after mentioned pests, the tested ecosystem could be arranged according to the abundance of pests into two ecosystem, Table 1.

Table 1: General weekly mean number of pests infesting green bean var. Samantha at Giza Governorate during 2012 under three agricultural ecosystems and three intercropping systems.

Agricultural ecosystems. / **Intercropping systems**	**open field**	**Plastic greenhouse**	**Scaffold net**	**Total**	**F value**	**p**	**L.S.D.**
Intercropping by basil plant	63.4	90.5	88.3	**242.2**	9.32 ***	0.001	3.55
Spray by basil plant	55.5	72.8	66.2	**194.5**	0.56 insig.		
Control	136.2	472.6	390.5	**999.3**	28.65***	0.001	20.0
Total	**255.1**	**635.9**	**545.0**	**1436.0**			

F value between intercropping systems = 27.50*** sig. at 0.001 L.S.D. = 19.78 individuals/120 leaves pests
F value between agricultural ecosystems = 20.11*** sig. at 0.001 L.S.D. =17.01individuals/120 leaves pest.

Obtained data and statistical analysis revealed that the population densities were affected by both the spraying (basil oil) and the different agricultural ecosystems whereas, the open field received the lowest number of pest 55.5 individuals/120 leaves. While, the plastic greenhouse harboured the highest number of pests 72.8 of individuals/120 leaves, whereas the scaffold net greenhouse come intermediate with mean number 66.2 individuals/120 leaves. Statistical analysis revealed insignificant differences between three agricultural ecosystems, whereas (F value=0.56). The basil oil had highly toxic for all pests, therefore the rest numbers of different pests were lowest in the same range under three treatments. So the difference between three ecosystems disappeared. Table 1.

Obtained results and statistical analysis revealed that the population densities were affected by both the intercropping system and the different agricultural ecosystems. The highest level infestation were, generally observed (on control) or green bean plants alone without intercropping which received 999.3 individuals from different pests (irrespective of agricultural ecosystems). While in the second treatment (green bean intercropping with basil plant harboured 242.2 individuals from different pests (irrespective of agricultural ecosystems). The low numbers of population densities were occurred with the third treatment which sprayed with sweet basil oil with general mean numbers of 194.5 individuals of different pests (irrespective of agricultural ecosystems). According to "F" value was 27.50 and L.S.D value equal 19.78 could be divided statistically into three groups. Table (1) and Fig. (1)

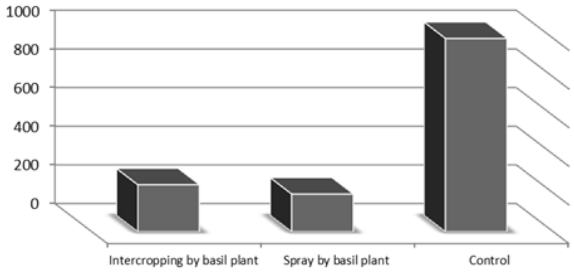

Fig. 1: General weekly mean number of pests infesting green bean var. Samantha at Giza Governorate during 2012 under and three intercropping systems.

On the other hand, open field received the lowest number of pest 255.1 individuals, irrespective of intercropping system. While, the plastic greenhouse harboured the highest number of pests 635.9 of individuals and scaffold net greenhouse come intermediate with mean number 545.0 individuals. Statistical analysis revealed significant differences between

three agricultural ecosystems, whereas "F" value 20.11 and L.S.D. = 17.01 individual, the tested ecosystem could be arranged according to the abundance of pests into three ecosystem. Table (1) and Fig. (2).

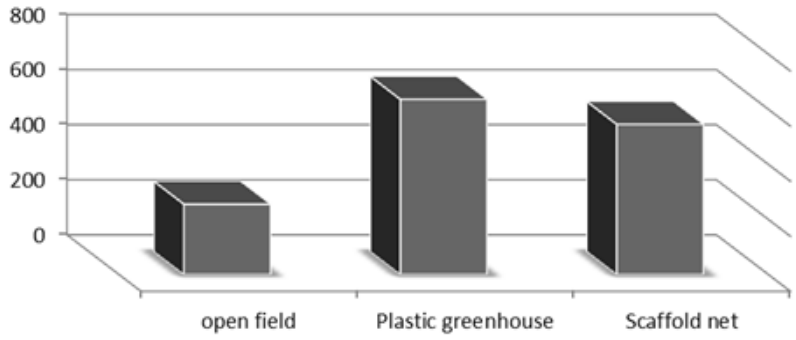

Fig. 2: General weekly mean number of pests infesting green bean var. Samantha at Giza Governorate during 2012 under three agricultural ecosystems.

The previously explained data clearly that plastic greenhouse harboured the highest number of pests infesting green bean plants, may be the microenvironment was most suitable for pests. Open field had the lowest number of pests infesting the bean plants. Spraying with basil oil is the best method to reduction the number of pests attacking green bean and better than of intercropping with basil plants or cultivating under plastic & scaffold net greenhouse.

The obtained data are in harmony with those previously reported by Mansour *et al.* (1986) in Egypt, who studied the effects of essential oils from 14 species of Labiatae on adult females of *Tetranychus cinnabarinus* in the laboratory. Bean leaf discs freshly sprayed with concentrations of the acetonic solutions of the oils from 0.1 to 2%, caused mortality and induced repellency within 48 hour of placing adult females on the discs, and consequently egg-laying was reduced. Also, seven-day-old residues still had some activity. The most effective oils (and their EC 50 in brackets) were *Lavandula angustifolia L. latifolia* (0.09%), *L. angustifolia* (0.1%), *Melissa officinalis* (0.12%), *Mentha piperita* (1.3%), *Salvia fruticos*a (1.4%), *Ocimum basilicum* (1.4%) and rosemary (2.2%). El- Halawany and Sawires (1988) in Egypt, compared that the toxicity effect of six natural active products as volatile oils namely: Cumin (*Cuminum cyminum),* Citronella (*Citrus* sp.*),* Spearmint (*Mentha arvensis*), Thyme (*Thymus vulgaris*), Marjoram (*Margorama hortensis*) and Rosemary (*Romarinus officinalis*) on the egg and adult stages of spider mite, *Tetranychus urticae*. They found that, Cumin oil was more toxic than the other oils for egg and adult stages. Percentage of mortality reached about 90%, when immatures were reared on treated leaves with Citronella oil, and generation period of the survived mites was increased from 11.5 to 20.7 days. Moreover, females' fecundity was also reduced by about 95%. Momen *et al.* (2001) in Egypt, studied that the deterrent and toxicity effects of mint, *Mentha viridis* (*M. spicata*) and peppermint, *M. piperita* essential oils on *T. urticae* under laboratory conditions. The result indicated that, *M. viridis* was more potent than *M. piperita*, with a significant increase in repellency. Leaf discs treated with increasing concentrations of essential oils from both materials showed reduction in the total number of eggs laid by *T. urticae* and a high percentage of *T. urticae* mortality was recorded with *M. viridis*. They also suggested from the chemically and biologically results obtained, that the higher percentage of the hydrocarbons of *M. viridis* were responsible for the toxic effect. Refaat *et al*. (2002)

in Egypt, used two essential oils, namely *Ocimum basilicum* L. and *Lavandula officinalis* (*L. angustifolia*) Chaix, for their repellency, toxicity and oviposition deterrence against two tetranychid mites, *Tetranychus urticae* (Koch) and *Eutetranychus orientalis* (Klein). For both oils, they found a significant reduction in the total number of eggs laid by both tetranychid species at all concentrations used. A high percentage of *Eutetranychus orientalis* mortality was recorded for both materials while oil of sweet basil was more effective than French lavender oil in case of *T. urticae*. They also suggested that, the results obtained chemically and biologically may explain the fact that the dominant occurrence of the oxygenated hydrocarbon compounds (91.172% of oil content) in sweet basil were responsible for the toxic effect**.** Aslan *et al*. (2004) in Turkey, evaluated essential oil vapors from *Satureja hortensis*, *Ocimum basilicum* and *Thymus vulgaris* for their toxicities against the nymphs and adults of *T. urticae*, and adults of *Bemisia tabaci*. *S. hortensis* was the most effective compared with the other two species. It can be concluded that essential oils from these three plants are potential control agents against *T. urticae* and *B. tabaci* under greenhouse conditions. Habibullah Bahar (2007) found that the botanical extracts showed significant effect on the numbers of live aphids. Tobacco leaf extract had inflicted consistently the maximum level of aphid mortality; about 74-90% of the aphids, the extract of neem followed the extract of tobacco. Garlic extract showed similar performance to that of neem, also eucalyptus and mahogany reduced aphid population. Allam (2011) on Kidney bean plants in Egypt recorded that mean numbers of *Tetranychus urticae* Koch were reduced in Mint, Fennel and Black cumin intercropped with Kidney bean plants. Mohamed *et al.* (2013) in Egypt on okra plants found that mean numbers of the pests (*Bemisia tabaci* Gen. and *Tetranychus urticae* Koch) were reduced in roselle intercropped with okra.

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ARABIC SUMMERY

التأثير المشترك لانظمه التحميل مع بعض الانظمه البيئية الزراعية على مستوى الاصابة والآفات المرتبطة بنباتات الفاصوليا

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٣- المعامل المركزى لمناخ الزراعى – مركز البحوث الزراعية

أجريت التجربة بمنطقة الصوب بالدقى – الجيزة لدراسة تأثير تحميل الريحان على نباتات الفاصوليا والرش بزيت الريحان واثرها على تعداد الذبابة البيضاء ، صانعات الانفاق و العنكبوت الاحمر ذو البقعتين تحت تاثير ثلاث انظمة بيئية مختلفة وهى الصوب البلاستيكية ، الصوب الشبك و الزراعة فى الارض المكشوفة (الحقل) وذلك خلال موسم (٢٠١٢) اوضحت الدراسة بالنسبة لتتداخل بين انظمة التحميل و الانظمة البيئية المختلفة من خلال الاصابات بالآفات المختلفة ان نظام الصوب البلاستيكية هو اكثر تعداد بالاصابة من الآفات التى تصيب بناتات الفاصوليا بينما كان نظام الارض المكشوفة هو الاقل تعداد من الآفات محل الدراسة ، بينما كان نظام الصوب الشبك يحتل المرتبة المتوسطة بين النظامين فى شدة الاصابة بالآفات . كان تاثير الرش بالزيت الريحان افضل طريقة من خلال خفض التعداد الموجود على نباتات الفاصوليا فى الانظمة البيئية المختلفة.