

## EFFECT OF INTERCROPPING OF SOME MEDICAL AND AROMATIC PLANTS WITH BEAN ON THEIR INFESTATION WITH SOME PESTS

Mousa G. M. <sup>1</sup> and A. G. El-Sisi <sup>2</sup>

<sup>1</sup> Plant Protect. Res. Inst., Agric. Res. Center, Dokki, Giza.

<sup>2</sup> Central Agric. Pesti. Lab., Agric. Res. Center, Dokki, Giza.

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**ABSTRACT:** Two different experiments were carried out to study the effect of intercropping of some medical and aromatic plants, namely, dill, parsley and coriander with bean plants on population density of some bean pests such as: aphids, whitefly and mite. The first experiment was carried out in spring, while the second experiment was done in summer. The study included also the effect on the occurrence of the lady bird *Coccinella undecimpunctata*.

The results indicated that, intercropping of these plants caused a high reduction in population of the studied pests to levels that do not require any type of chemical control. Also, this study proved that, population density of the natural enemy *C. undecimpunctata* was increased in the experimental field as a result of intercropping and there was a correlation between occurrence of this enemy and reduction of pests.

**Key words:** Intercropping, controlling, infestation, aphid, whitefly, spider mite, *coccinella undecimpunctata*.

### INTRODUCTION

Intercropping means cultivation of two or more crops in the same area as a method of increasing the production also as a method of reducing pest infestation therefore reducing pesticides consumption, minimizing environmental pollution and costs of pest control.

Many researchers proved that, intercropping caused a reduction in infestation of some pests on the following crops: wheat with clover (Ghabbour *et al*, 1994), tomato with faba bean, tomato with termis (Rizk and Mikhail 2000), coriander with tomato (Rizk 2000), wheat with

fabo bean (Rizk 2001) and guar with tomato (Rizk *et al*, 2002). The theory of the effect of intercropping on reducing infestation with pests is that when plants are mixed, there is a lower chance for pests to move from one plant to another plant of the same species, as it is hindered by another plant of another species. Mixed cropping may also increase the proportion of predators to pests (Ghabbour *et al*, 1994).

The aim of the present work is to study the effect of intercropping some medical and aromatic plants with bean plants on their infestation with some insect pests of sucking and mouth parts and on the predator *C. undecimpunctata* resulted from contained volatile oils with bean plants.

## MATERIALS AND METHODS

Two experiments were carried out, in the first experiment on area of 600 m<sup>2</sup> was divided into rows, then the main crop (bean) was planted into hills each have 2-3 seeds, 30 cm between each two hill, while the medical and aromatic plant seeds (secondary crop) were sown between each two rows. Cultivation was done on

March 24, 2003. The area was divided into the following plots each plot have 7 rows for 3 meter long, 3 replicate for each treatment: 1- bean 2- dill 3- parsley 4- coriander 5- bean + dill 6- bean + parsley 7- bean + coriander

Population density of the tested pests, i.e., the cotton aphid, *Aphis gossypii*, the tomato white fly, *Bemisia tabaci* and the spider mite, *Tetranychus urtica* was determined on the bean plants by the examination of 10 leaves from each plot using a binocular. Pest population were determined weekly after 2 weeks of planting and continuous until the 10<sup>th</sup> week. Whereas population density of pests in intercropping plants was determined by counting the present alive pest in 30 plants of each plots. Mean of infestation for pests was calculated for each inspection and the general mean of ten inspection was calculated then % reduction of infestation in the main crop (Bean) was calculated according to the following equation:

$$\% R = b - T / b \times 100$$

Where

R = percentage reduction.

b = mean alive number of pests in bean.

T = mean alive number of pests in other treatments

Population density of *C. undecimpunctata* was determined by visual inspection of adults and immature stages presented on 30 plants of main and intercropping crops weekly. Percentage of increase in *C. undecimpunctata* population in intercropping plots and in the plots of main crop was calculated according to this equation:

$$\% \text{ Increase} = \frac{Pt - Pm}{Pm} \times 100.$$

Where:

Pt = population in intercropping plots.

Pm = population in main crop plots.

The second experiment, was conducted on June 28, 2003 using the same procedures mentioned before in the first experiment.

## RESULTS AND DISCUSSION

### 1. Effect of intercropping on aphid population

Data in Table (1) indicated clearly that cultivation of medical and aromatic plants with bean reduced aphid infestation in the two seasons. Reduction in infestation was very obvious from the beginning until the end of observation period comparing with bean alone. According to the result recorded in Table (1) it could be

concluded that bean + parsley exhibited the lowest infestation followed by bean + dill and bean + coriander.

In the second season, bean + coriander was the lowest infested treatment followed by bean + parsley and bean + dill. Results of two seasons indicated that the intercropping reduced infestation with aphid to degree enough to bean do not require to use any type of chemical control of aphid.

### 2. Effect of intercropping on infestation with the whitefly

Results in Table (2) indicated also that, intercropping reduced the infestation of bean with the whitefly recording a similar trend with that of aphid. On the base of the mean % reduction of both seasons it seems clearly that bean + coriander showed the lowest degree of infestation followed by bean + parsley and bean + dill.

### 3. Effect of intercropping on infestation with the spider mite

Table (3) clearly show that intercropping caused a reduction in infestation of bean with *T. urticae*. Reduction increased gradually as the time after planting increased. Intercropping reduced the degree

of infestation to a low level enough to not require any type of chemical control. The degree of infestation in the second season was higher than in the first season, it may be due to climatic conditions. According to the mean % reduction of bean infestation with mites, bean + parsley was lowest infested treatment followed by bean + coriander and bean + dill, respectively.

It could be mentioned generally that intercropping of these medical and aromatic plants with bean plants caused a great reduction in the populations of the tested pests. It should be reported also that plots of medical and aromatic plants when sown singly did not infest with any of the tested pests.

These finding concerning the effect of intercropping on the infestation of bean with tested pests are in agreement with those of Afifi *et al.* (1990); Ali *et al.* (1994); Ibrahim *et al.* (1996); Rizk and Mikhail (2000); Rizk (2000); Rizk (2001) and Rizk *et al.*, (2002).

It should be mentioned that no any infestation of pests was found on intercropping plants: parsley, dill and coriander as a

result of inspection of 30 plants/ plot.

#### 4. Effect of intercropping on *C.undecimpunctata* population

Data in Table (4) show that the predator *C. undecimpunctata* (natural enemy) was found in all treatments in both seasons and its density increased gradually as the time after planting progressed. The population of *C. undecimpunctata* in the first plantation was more than that of the second one, this may be attributed to differences in climatic factors. It was noticed also that population density was increased in the intercropping plots than that of the bean alone, this may be due to the medical and aromatic plants had an ability of attraction of this natural enemy.

The effect of intercropping of these medical and aromatic plants in reducing the infestation of bean plants with these pests may be due to one or more of the follow factor (1) increasing the population of *C. undecimpunctata* (2) reduced chance for the pests to move from one plant to another of the same species (Ghabbour *et al.*, 1994). (3) containing these medical and aromatic plants of volatile repellent oils (El-shirbiny *et al.*, 1994; El-Sisi and Mahgoub, 1996 and Mousa, 2003).

Table 1: Effect of intercropping on infestation of bean with the cotton aphid, *A. gossypii*.

Treatments	No. of aphids/leaf (first plantation)										Total	Mean	%R
	7/4	14/4	21/4	28/4	5/5	12/5	21/5	26/5	2/6	9/6			
Bean	158	39.2	86.6	121.4	132.4	173.6	191.6	147.8	98.0	85.0	1091.2	109.2	---
Bean + parsley	15.6	5.2	3.0	3.6	8	4.8	2.8	1.0	0.5	0.2	44.6	4.46	95.91
Bean + dill	14.6	4.0	5.2	11.0	24.4	8.0	6.2	4.6	2.0	0.1	81	8.1	92.85
Bean + coriander	9.6	8.4	5.4	9.2	24.8	20.0	15.4	8.6	3.4	2.1	106.9	10.69	90.20

Table 1: cont.

Treatments	No. of aphids/leaf (second plantation)										Total	Mean	%R	M
	12/7	19/7	26/7	2/8	9/8	16/8	23/8	30/8	6/9	13/9				
Bean	17.3	35.2	98.3	132.2	175.3	219.3	196.3	158.2	110.1	97	1239.2	123.92	-----	-----
Bean + parsley	14.2	25.3	21.6	33.4	28.2	25.8	10.2	6.4	3.2	2.1	170.4	17.04	86.25	91.08
Bean + dill	12.0	21.3	38.4	24.6	31.3	24.6	18.3	10.0	2.5	1.2	184.2	18.42	85.14	89.00
Bean + coriander	10.3	26.6	38.4	39.6	35.4	26.3	22.1	15.6	8.4	3.5	226.2	22.6	81.76	85.98

M = Mean of % reduction of both seasons

R = reduction

**Table 2: Effect of intercropping on infestation of bean with the tomato whitefly: *B. tabaci*.**

Treatments	No. of aphids/leaf (first plantation)										Total	Mean	%R
	7/4	14/4	21/4	28/4	5/5	12/5	21/5	26/5	2/6	9/6			
Bean	5.6	11.0	28.2	75.8	83.2	134.8	163.6	198.8	211.2	171.6	1083.8	108.4	----
Bean + parsley	4.0	2.8	6.6	8.2	12.0	14.0	10.8	5.4	2.0	0.5	66.3	6.6	93.91
Bean + dill	8.6	6.2	14.6	32.8	49.6	18.4	12.6	8.2	3.4	1.0	155.4	15.5	79.61
Bean + coriander	1.0	3.4	10.2	6.4	7.6	3.4	2.2	1.6	1.0	0	36.8	3.7	96.59

**Table 2: cont.**

Treatments	No. of aphids/leaf (second plantation)										Total	Mean	%R	M
	12/7	19/7	26/7	2/8	9/8	16/8	23/8	30/8	6/9	13/9				
Bean	13.2	31.6	67.3	86.6	153.4	182.2	224.8	283	298.6	147.6	1543.3	154.3	----	---
Bean + parsley	15.4	22.6	35.4	38.2	46.4	33.1	32.0	15.4	10.2	7.3	256	25.6	83.41	88.66
Bean + dill	10.6	24.2	46.8	53.2	63.6	45.5	28.1	21.2	12.0	4.2	309.4	30.94	79.95	79.78
Bean + coriander	12.0	18.2	26.3	38.2	44.6	42.0	33.6	31.2	20.5	13.6	280.2	28.02	81.84	89.22

M = Mean of % reduction of both seasons

R = reduction

**Table 3: Effect of intercropping on infestation of bean with the spider mite: *T. urticae*.**

Treatments	No. of aphids/leaf (first plantation)										Total	Mean	%R
	7/4	14/4	21/4	28/4	5/5	12/5	21/5	26/5	2/6	9/6			
<b>Bean</b>	114.4	169.4	258.2	344.8	406.4	542.2	615.8	732.4	511.0	121.8	3816.4	381.6	----
<b>Bean + parsley</b>	95.8	112.3	28.8	36.8	22.2	38.4	35.2	21.6	12.3	6.0	409.4	40.9	89.28
<b>Bean + dill</b>	72.6	113.2	141.0	141.8	186.8	39.6	28.6	17.8	6.4	2.8	748.8	74.9	80.37
<b>Bean + coriander</b>	83.0	83.8	68.4	72.8	58.4	19.0	16.4	10.0	8.2	3.0	423	42.3	88.92

**Table 3: cont.**

Treatments	No. of aphids/leaf (second plantation)										Total	Mean	%R	M
	12/7	19/7	26/7	2/8	9/8	16/8	23/8	30/8	6/9	13/9				
<b>Bean</b>	105.2	173.4	289.2	371.4	512.6	648.6	763.2	732	621.2	606.4	4454.4	445.4	----	---
<b>Bean + parsley</b>	93.2	102.3	125.4	77.2	54.6	43.0	25.2	28.4	15.6	13.2	578.3	57.83	87.02	88.15
<b>Bean + dill</b>	86.4	99.2	122.6	193.2	216.5	88.4	53.6	35.2	20.6	15.3	979.5	97.95	78.01	79.19
<b>Bean + coriander</b>	65.4	108.2	166.4	210.6	225.8	114.3	85.5	44	23.6	16.2	1060.3	106.0	76.2	82.56

M = Mean of % reduction of both seasons

R = reduction

**Table 4: Population density of *Coccinella undecimpunctata* (alive individuals/30 plants) of main and intercropping crops**

Treatments	No. of aphids/leaf (first plantation)							Total	Mean	% R
	28/4	5/5	12/5	21/5	26/5	2/6	9/6			
Bean	1.0	2.3	5.4	9.0	11.3	14.0	17.5	60.5	8.6	---
Bean + parsley	1.8	7.0	10.0	13.5	15.0	19.4	18.4	85.1	12.2	48.84
Bean + dill	2.3	6.4	11.4	14.5	19.0	25.3	29.0	107.9	15.4	79.07
Bean + coriander	1.2	3.5	9.3	12.5	15.0	19.3	22.1	82.9	11.8	37.4
Dill	5.1	9.4	13.5	18.0	23.5	27.4	30.2	127.1	18.2	111.6
Parsley	3.1	5.3	7.2	10.0	12.5	15.1	17.4	70.6	10.1	17.44
Coriander	2.5	6.4	8.3	12.1	14.3	17.4	20.3	81.3	11.6	34.88

**Table 4: cont.**

Treatments	No. of aphids/leaf (second plantation)							Total	Mean	% R	M
	2/8	9/8	16/8	23/8	30/8	6/9	13/9				
Bean	3.4	5.2	8.2	13.2	14.2	18.3	23.0	85.5	12.2	--	---
Bean + parsley	2.0	8.4	11.3	16.2	21.3	23.0	25.2	107.4	15.3	25.41	37.13
Bean + dill	3.2	5.3	8.4	13.2	18.2	23.4	27.2	98.9	14.1	15.57	47.32
Bean + coriander	1.4	4.3	7.2	10.0	16.3	19.4	29.4	88.0	12.4	1.64	19.43
Dill	6.3	11.2	19.3	25.2	31.0	33.2	34.1	160.3	22.9	87.7	99.67
Parsley	4.3	7.2	11.3	14.2	16.3	19.4	22.0	94.7	13.5	10.66	14.05
Coriander	3.4	7.3	9.4	13.4	17.0	27.1	26.0	98.6	14.1	15.57	25.23

M = Mean of % increase of both seasons.

I = increase.



## REFERENCES

- Afifi, F.M.L.; M.F. Haydar and H.I.H. Omar.1990. Effect of different inter-cropping systems on tomato infestation with major insect pests, *Bemisia tabaci* (Genn) (Hemiptera: Aleyrodidae), *Myzus persica* Sulzer (Homoptera: Aphididae) and *Phthorimaea operculella* Zeller (Lepidoptera: Gelechiidae). Bull. Fac. Agric., Cairo University, 41 (3):885-900.
- Ali, M.A.; A.I. Shaheen ; A.M. Tantawey and E.I. Ali. 1994. Effect of density of maize plants on insect population attacking soybean intercropped with maize. Bull. Entomol. Soc. Egypt, 72:1-12.
- El-Shirbiny, A.H.; A.M. Omar, A.G. El-Sisi and M.A. Hewady.1994. Natural botanical extracts as repellents for the House sparrow, *Passer domestica* II. Efficacy under rice field conditions. Annal of Agric. Sci. Moshtohor : 1053-1063.
- El-Sisi, A.G. and S. M. Mahgoub. 1996. Effect of some volatile materials as fumigant for controlling the rice weevil, *Sitophilus oryzae* L. Egypt. J.Agric. Res., 74 (2): 299-305.
- Ghabbour, S.I.; M.A. Rizk. and W. Z. A. Mikhail.1994. Multivariate analysis of pest incidence in poly culture agro-ecosystems in Fayom Egypt. Proceeding of the international meeting "Ecology and Statistical Methods" Niort (France): 202-214.
- Ibrahim, I.L.; M.A Ali.; A.S. El-Kabouly and S.A. Nega.1996. Population census of aphidophagous insects under different intercropping systems of maize and cow pea. Bull. Entomol. Soc. Egypt, 73: 177-184.
- Mousa, G. M.2003. Efficiency of camphor and citronella oils against the cotton aphid *Aphis gossypii* and the spider mite, *Tetranychus urticae* on eggplant. Assuit J. of Agric. Sci., 34 (1):111-118.
- Rizk, M.A. 2000. The effect of certain medical plants (coriander) intercropping with tomato in reducing pest infestation in Fayoum, Egypt. Proceeding of the 8<sup>th</sup> Egypt Conference on medical and aromatic plants and 3 Millennium,: 132-152.

- Rizk, M.A. 2001. Impact of crop mosaic on soil fauna population in Fayoum Governorate, Egypt. Paper presented at second circular 44<sup>th</sup> IANS symposium, Fresising, Weihenstephan, Germany, Vegetation and ecosystem Function 29<sup>th</sup> August 2001, abstract.129.
- Rizk, M.A.; A.K.F. Iskander; L.S.S. Sourial and N.H. Habshy. 2002. Effect of intercropping (guar) Leguminasae (*Cyompois tetragonolaba*) with tomato in level of infestation of sucking pests infested tomato. 2<sup>nd</sup> inter. Conf., Plant Protec. Res. Inst., Cairo.: 36-40.
- Rizk, M.A. and W.Z.A Mikhail. 2000. Relationship of irrigation regimes and intercropping with pest infestation in Fayoum, Egypt. Egypt. J. zool., 35:361-371.

### تأثير تحميل بعض النباتات الطبية و العطرية على الفاصوليا على إصابتهم ببعض الآفات

جهاد محمد موسى<sup>1</sup> - أحمد غازي السيسى<sup>2</sup>

<sup>1</sup> معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى - جيزة

<sup>2</sup> المعمل المركزي للمبيدات - مركز البحوث الزراعية - الدقى - جيزة

أجريت تجربتين لدراسة تأثير تحميل بعض النباتات الطبية و العطرية: البقدونس، الشبث و الكزبرة مع نبات الفاصوليا على بعض آفات الفاصوليا مثل المن، الذبابة البيضاء و العنكبوت الأحمر. أجريت التجربة الأولى في الربيع بينما الثانية في الصيف. شملت الدراسة أيضا التأثير على العدو الطبيعي الموجود أبو العيد، دلت النتائج على أن تحميل هذه النباتات سبب انخفاضاً عالياً في كثافة الآفات المدروسة للحد الذي لا تحتاج معه إلى أى نوع من المكافحة الكيميائية. أيضاً أثبتت الدراسة أن كثافة العدو الطبيعي أبو العيد زادت في أرض التجربة وذلك نتيجة للتحميل وأنه يوجد علاقة بين وجود هذا العدو و الانخفاض في الآفات.