

Evaluation of intercropping on the population density of some sap- sucking pests on broad bean and cow pea plants in Dakahlya Governorate

Hala E Moafi¹, Dina M Taksira², Noura F Abou-Elenien³

¹ Department of Vegetables Pests and Medicinal plants, Plant Protection Research Institute, Agriculture Research Center, Doki, Giza, Egypt

² Department of Apiculture Research, Plant Protection Research Institute, Agriculture Research Center, Doki, Giza, Egypt

³ Department of Cotton and Field crops Mite, Plant Protection Research Institute, Agriculture Research Center, Doki, Giza, Egypt

Abstract

Broad beans, (*Vicia faba*), one of the most widely grown vegetable crops in Egypt. It cultivated as a crop for human consumption and also as a cover crop. Cow pea, (*Vigna unguiculata*), in Egypt known as Lopia. It spread to Egypt in ancient times dating back thousands of years considered as popular, traditional legume consumed widely. Three experiments were done during 2025 at Mansoura University farm at Dakahlya Governorate to evaluate the effect of intercropping of broad beans and cow pea with garlic and thyme on the occurrence of sap-sucking pests and the population abundance of some predators. obtained results showed that intercropping of both broad bean and cow pea plants with garlic was an effective method of reduction in the infestation level of sap-sucking insects rather than, intercropping with thyme or the sole crop. Also infestation by *Tetranychus urticae* decreased under intercropping with garlic recording, 5.86% and 10.84% for broad bean and cow pea, respectively compared to the sole crop. These results indicated that intercropping of both broad bean and cow peas with garlic were effective strategy for managing important sap-sucking pests rather than the sole crops.

Keywords: Intercropping, broad bean, cow pea, sap, sucking pests

Introduction

Broad bean or Fava beans (*Vicia faba*), a hardy crop that can be grown in most soils. It have long tradition of cultivation in old world agriculture, being one of the most ancient plants in cultivation and its highly susceptible for early summer infestations. Sever infestation can significantly reduce yields and also discoloring of pods which, reduce their saleable values.

Cow pea (*Vigna unguiculata*), commonly known as black eyed peas cultivated as a summer field crop in Egypt. Insects considered as a major factor in the low yields of cow pea crops which affect each tissue component and developmental stage of the plant it cause over 90% loss in yield.

Intercropping is used by planting two or more crops in the same field at the same time through it, to preserve natural enemies and increase relative abundance throughout their growth period, (Zakka *et al.*, 2018^[10]; Midega *et al.*, 2018^[7] and Abd El-Gawwad, 2008)^[1], or for part of their growing season at least,(Ferreira *et al.*, 2014).

The present study aims to throw light on the role of intercropping broad bean and cow pea with garlic and thyme on the occurrence of the main insect pests and their associated natural enemies.

Materials and methods

The experiments conducted based on a randomized complete block design with four blocks, at Mansoura University farm at Dakahlya Governorate during 2025, an area of about 800 m² was divided into four blocks for each crop. Broad bean and cow pea were used as the main crop intercropped with garlic and thyme.

The experiment was designed with three treatments in each treatment had four replicate: sole broad bean/ cow pea (control), broad bean/ cow pea + garlic and broad bean/ cow pea + thyme. Each treatment consists of plot of land with 6 rowed arranged as follows: the first treatment is a row of broad bean/ cow pea followed by a row of garlic, the second treatment is a row of broad bean/ cow pea followed by thyme, while the third treatment is 6 rows of sole broad bean/ cow pea only as control.

Statistical Analysis

The percentage of infestation of insect pests and the percentage of reduction of *Tetranychus urticae* was calculated by Henderson and Tilton, 1955 as follows:

$$\%PR = (C-t) / C \times 100$$

Where C, control; t, treatment and PR= percent population reduction, to reveal the direct relationship between intercropping broad bean/ cow pea with garlic and broad bean/ cow pea with thyme, compared with sole broad bean/ cow pea.

Differences among treatment means were pared using one way analysis of variance (ANOVA). CoStat software statistical analysis system (CoStat Software, 2004)^[3] at 0.05 probabilities.

Result and Discussion

a. Population density of major sap- sucking pests at both sole and intercropped broad bean during 2025

Data showed in table (1) indicated that the mean number and infestation percentage were significantly affected among treatments. It illustrated that intercropping with garlic had the highest effect on both population and

infestation percentages followed by intercropping with thyme then the sole crop. As shown in table (1) the mean number and infestation percentage of *Amrasca biguttula* were, (5.54 & 10.45), (7.85 & 19.02) and (22.48 & 45.63)

for broad bean plants, respectively, and other insects in the experiment follow the same pattern. These results agreed with Fathi, 2022 [4], Ferreira *et al.*, 2014 and Zarei, *et al.*, 2019) [11].

Table 1: Population density of major sap- sucking pests at both sole and intercropped broad bean during 2025.

Treatments		sole broad bean	broad bean + garlic	broad bean + thyme	P- value
<i>Amrasca biguttula</i>	Mean±S.E.	22.48±6.39a	5.54±6.07b	7.85±4.94c	0.000***
	Infestation %	45.63	10.45	19.02	-----
<i>Bemisia tabaci</i>	Mean±S.E.	6.17±1.09a	0.31±0.01b	0.54±0.04b	0.0002***
	Infestation %	29.20	4.42	6.57	-----
<i>Aphis gossypii</i>	Mean±S.E.	7.12±1.34a	1.84±0.50c	2.9±0.76b	0.000***
	Infestation %	21.51	4.64	13.28	-----
<i>Nezara viridula</i>	Mean±S.E.	10.33±2.02a	3.54±0.86b	3.77±0.36b	0.0002***
	Infestation %	18.14	2.42	6.28	-----
<i>Lygus pratensis</i>	Mean±S.E.	10.16±1.59a	6.08±0.99b	7.46±0.96c	0.000***
	Infestation %	16.41	8.67	10.39	-----
<i>Spilostethus pandurus</i>	Mean±S.E.	4.36±0.61a	-----	0.69±0.29c	0.000***
	Infestation %	3.23	-----	2.50	-----

Mean value with the same letters is not significantly difference at 0.05 level of significance.

b. population density of major sap- sucking pests at both sole and intercropped cow pea during 2025

Data obtained in table (2) showed that the huge reduction of the mean number and infestation percentage when

intercropping cow pea plants with garlic comparing with intercropping with thyme and sole crop. *Aphis gossypii*, mean number and infestation percentage were, (0.31 & 1.87), (1.62 & 5.66) and (9.22 & 28.19), for cow pea with garlic, cow pea with thyme and sole cow pea, respectively. These results agreed with Fathi, 2022 [4] and Zakka *et al.*, 2018 [10].

Table 2: Population density of major sap- sucking pests at both sole and intercropped cow pea during 2025.

Treatments		sole cow pea	Cow pea + garlic	Cow pea + thyme	P- value
<i>Amrasca biguttula</i>	Mean±S.E.	16.32±2.80a	6.15±1.67c	11.08±1.98b	0.000***
	Infestation %	32.30	13.51	24.39	-----
<i>Bemisia tabaci</i>	Mean±S.E.	10.14±2.19a	1.38±0.45c	5.54±1.34b	0.000***
	Infestation %	41.92	3.75	21.10	-----
<i>Aphis gossypii</i>	Mean±S.E.	9.22±2.01a	0.31±0.04c	1.62±0.96b	0.000***
	Infestation %	28.19	1.87	5.66	-----
<i>Nezara viridula</i>	Mean±S.E.	6.48±1.04a	-----	0.46±0.01b	0.000***
	Infestation %	10.50	-----	2.06	-----

Mean value with the same letters is not significantly difference at 0.05 level of significance.

c. population density of leaf miner at both sole and intercropped broad bean and cow pea during 2025:

The percentage of infestation of leaf miner *Ophiomyia phaseolii* and *Liriomyza trifolii* as shown in table (3) was

reduced on the intercropped broad bean/ cow pea with garlic compared to sole crops. The lowest average of population of *Ophiomyia phaseolii* was, (5.38 & 3.85) for broad bean with garlic and cow pea with garlic, respectively, compared with the sole plants which was, (15.12 & 17.52), respectively. These results agreed with Mohamed *et al.*, 2021 [8], Abo-Shanab *et al.*, 2019 [2] and Pandey *et al.*, 2023 [9].

Table 3: Population density of leaf miner at both sole and intercropped broad bean and cow pea during 2025.

Treatment	<i>Ophiomyia phaseolii</i>		<i>Liriomyza trifolii</i>	
	Mean±S.E.	Infestation %	Mean±S.E.	Infestation %
sole broad bean	15.13±2.95a	52.57	14.26±2.34a	45.61
broad bean + garlic	5.38±2.17c	12.14	10.77±2.09b	31.75
broad bean + thyme	8.15±1.08b	16.91	11.03±2.10b	34.28
P- value	0.000***	-----	0.0002***	-----
sole cow pea	17.52±2.89a	64.49	10.43±1.85a	32.04
Cow pea + garlic	11.46±1.34c	9.35	2.92±0.25c	8.49
Cow pea + thyme	3.85±1.01b	22.96	8.15±1.01b	17.50
P- value	0.000***	-----	0.000***	-----

Mean value with the same letters is not significantly difference at 0.05 level of significance.

d. population density of *Tetranychus urticae* at both sole and intercropped broad bean and cow pea during 2025

Results in table (4) illustrated that their significantly effect in the average number of *Tetranychus urticae* and the percentage of infestation among treatments. The infestation percentage highly affected by intercropping strategies. The infestation percentage was, (5.86 & 10.29 and 60.58) for

broad bean with garlic, broad bean with thyme and sole broad bean, respectively. Also the cow pea plants had the same pattern which was, (10.84 & 56.70 and 71.14) for cow pea with garlic, cow pea with thyme and sole cow pea, respectively. These results agreed with Hata *et al.*, 2016^[5].

Table 4: Population density of *Tetranychus urticae* at both sole and intercropped broad bean and cow pea during 2025.

Treatment	<i>Tetranychus urticae</i>		
	Mean±S.E.	Infestation %	PROC (%)
sole broad bean	49.14±7.63a	60.58	-----
broad bean + garlic	1.89±0.65c	5.86	90.33
broad bean + thyme	4.22±0.89b	10.29	83.01
P- value	0.000***	-----	-----
sole cow pea	62.51±11.24a	71.14	-----
Cow pea + garlic	4.85±0.68c	10.84	84.76
Cow pea + thyme	39.62±6.12b	56.70	20.34
P- value	0.000***	-----	-----

Mean value with the same letters is not significantly difference at 0.05 level of significance.

PROC (%), Population reduction over control.

e. population abundance of predators at both sole and intercropped broad bean and cow pea during 2025

The presence of predators showed a highly significant difference between treatments as shown in table (5). The highly average of the abundance of *Coccinella undecimpunctata* were, (7.69 & 8.61) and for *Deraeocoris punctulatus* was, (5.12 & 9.50) for broad bean with garlic and cow pea with garlic, respectively.

Table 5: Population abundance of predators at both sole and intercropped broad bean and cow pea during 2025.

Treatment	<i>Coccinella undecimpunctata</i>	<i>Deraeocoris punctulatus</i>
	Mean±S.E.	Mean±S.E.
sole broad bean	0.77±0.35b	0.54±0.57c
broad bean + garlic	7.69±2.07a	5.12±1.19a
broad bean + thyme	7.43±2.25a	2.23±0.09b
P- value	0.0002***	0.000***
sole cow pea	4.61±1.03c	6.22±0.95b
Cow pea + garlic	8.61±1.25a	9.50±1.44a
Cow pea + thyme	7.08±0.01b	4.93±0.19c
P- value	0.000***	0.000***

Mean value with the same letters is not significantly difference at 0.05 level of significance.

Conclusion

These results proved that intercropping could be a good strategy against some of the most important sab-sucking pests on both broad bean and cow pea plants. Thus the most promising management strategy for integrated control of some sab-sucking pests on broad bean and cow pea plants intercropping with garlic.

References

1. Abd El-Gawwad SAY. Study of integrated pest management on some pests of common bean plant Ph.D. Thesis, Zoology Department, Faculty of Science of girls, Al-Azhar Univ, 2008, 409.
2. Abo-Shanab ASH, Moursi KS, Hussein HS. Effect of intercropping of coriander with tomato on sucking pest management infesting tomato in Nubariya, El-Bheira Governorate, Egypt, 2019, <https://www.researchgate.net/publication/331811722>.
3. Costat Software. Microcomputer program analysis, Version 4.20, CoHort Software, Berkely, CA, USA, 2004.
4. Fathi SAA. The role of intercrops of eggplant and cow pea on the control of *Leucinodes orbonalis* Guenee(Lepidoptera: Crambidae). *Biocontrol*,2022:67:307-317.
5. Hata FT, Ventura MU, Carvalho MG, Miguel ALA, Souza MSJ, Paula MT. Intercropping garlic plants reduces *Tetranychus urticae* in strawberry crop. *Experimental and Applied Acarology*,2016:69(3):311-321.
6. Hendrson, Tilton. Tests with acaricides against the brown wheat mite. *Journal of Economic Entomology*,1955:38:157.
7. Midega CAO, Pittchar JO, Pickett JA, Hailu GW, Khan ZR. A climate adapted push-pull system effectively controls fall armyworm, *Spodoptera frugiperda*, in maize in East Africa. *Crop protection*,2018:105:10-15.
8. Mohamed HE, Badawy AS, Abdel-Aziz SM, El-Gepaly HM. Effect of peas and garlic intercropping on population density of some pests in Sohag Governorate. *Journal of plant production, Mansoura Univ.*,2021:12(2):179-186.
9. Pandey M, Bhattarrai N, Pandey P, Chaudhary P, Katuwal DR, Khanal D. A review on biology and possible management strategies of tomato leaf

- miner, *Tuta absoluta*, Lepidoptera: Gelechiidae in Nepal. *Heliyon*,2023;9:16474.
10. Zakka U, Nwosu LC, Nkue LP. Effectiveness of maize as an intercrop in the management of insect pests of okra: is there a better intercrop pattern than random intercrop practice by farmers? *Journal of crop protection*,2018;7(1):65-72.
 11. Zarei E, Fathi SAA, Hassanpour M, Gloizadeh A. Assessment of intercropping tomato and sainfoin for the control of *Tuta absoluta* (Meyrick). *Crop protection*,2019;120:125-133.