

STUDIES ON THE EFFECT OF TRADITIONAL INTERCROPPING CUCUMBER WITH COTTON OR KIDNEY BEAN ON APHIDS AND WHITEFLY ABUNDANCE

GABR, A.M. AND LOUISE S. SOURIAL

Plant Protection Research Institute, Agricultural Research Centre, Dokki, Giza, Egypt.

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Abstract

The effect of intercropping cucumber with cotton or kidney bean on the population density of aphids and whitefly was studied. Field trials were conducted at El-Fayoum during two successive years (1996 and 1997). It was pointed out that populations of the two tested insects revealed the same trend throughout the experimental period, although the population level was slightly lower in the second year. The obtained results revealed that intercropping cucumber with cotton reduced aphid population, while population of whitefly was insignificantly higher than monocultured cucumber. Meanwhile, when cucumber was intercropped with kidney bean, aphid population was insignificantly higher, but whitefly was significantly increased.

INTRODUCTION

Mixed or intercropping is a common practice in most developing countries, whereby two or more crops and/or wild plants are grown simultaneously in the same field. Recently, in Egypt, farmers grow certain crops together to increase their economic income per unit area especially during the early stages of cotton.

The increase in cucumber cultivation during the last decade has drawn the attention to study its serious economic pests. Field observations showed that it is liable to be infested by piercing and sucking insects, especially aphids and whitefly.

Several advantages have been attributed to this polyculture system, one of them being lower susceptibility to pests and disease (Trenbath, 1974; Altieri *et al.*, 1978; Dissemmond and Hindorf, 1990; Perrin and Phillips, 1978).

Disadvantages of intercropping was reported by Tantawi *et al.* (1990) who reported that certain crop combinations in the intercropping system may increase damage.

In Egypt, insect prevalence under different intercropping systems has been discussed by many authors (Omar *et al.*, 1993; Sharaf El Din *et al.*, 1993; Ali *et al.*,

1994; El Khouly *et al.*, 1994).

It has also been reported by Helenius (1990) that the incidences of natural enemies were not significantly affected by mixed cropping. On the other hand, Ibrahim *et al.* (1995) showed that polyculture increased the population density of aphidophagous insects than in monocropping, while Shalaby and Abdel-Gawad (1986) found that intercropping maize in cotton plots proved to increase percentage of parasitism.

The main object of the present work is to clarify the advantages of intercropping cucumber with cotton or kidney bean over monocropping with regards to infestation with aphids and whitefly.

MATERIALS AND METHODS

The present study was undertaken in farmers' fields at El-Hadka in Fayoum Governorate during two successive years (1996 and 1997) to study the effect of intercropping cucumber var. Madina with kidney bean var. Narina and cotton var. Giza 85, on the population dynamics of piercing and sucking insects (aphids and whitefly) in the absence of any pesticide treatments.

Cucumber was seeded in first of March, kidney bean a week later and finally cotton was seeded by middle of March. One faddan was divided to 12 plots (210 m) consisted of about 250 raw, 80 cm wide and 3.125 m. long.

The experiment was conducted in a randomized pattern with 4 replicates and 3 treatments:

1. Cucumber as monoculture
2. Cucumber intercropped with cotton
3. Cucumber intercropped with kidney bean

Numbers of aphids and whiteflies were recorded by examining 25 plants per plot randomly at weekly intervals from 21 March to end of May. The two intercropping systems were compared with monocultures of cucumber. The analysis of variance (F test) and Duncan's multiple range were used for data analysis as described by Snedecor (1970).

RESULTS AND DISCUSSION

1. Effect of intercropping on population density of aphids

Cucumber was infested with 3 species of aphids namely *Aphis craccivora*, *Aphis gossypii* and *Myzus perscae* in different percentages throughout the experiment.

Table 1 represents the total seasonal fluctuations of aphid population throughout the two seasons 1996 and 1997. Although the population levels were slightly lower in the second season as shown in Table 1 and illustrated in Figs. 1 and 2 for 1996 and 1997, respectively, it could be found that aphid populations revealed the same trend throughout the experimental period. The insects appeared first by end of March with low numbers and gradually increased showing a peak by mid May reaching 17.44 and 16.20 individuals for 1996 and 1997, respectively.

It could be also pointed out that aphids behaved similarly under different systems regardless of any applied cropping system. The average number of aphids per plant was high when cucumber was intercropped with kidney bean (9.99 and 8.90) than with sole cucumber (8.58 and 7.70) for the two experimental seasons, but no significant difference occurred. On the other hand, when cucumber was interplanted with cotton, aphid numbers (6.025 and 5.47) were reduced and were significantly different.

The aforementioned results lead to the conclusion that intercropping may or may not induce infestation according to the cropping system employed. These results are in agreement to some extent with those reported by Tantawi *et al.* (1992) who found that certain combinations in the intercropping system significantly reduced the attack to sugarcane with sugarcane borers, whereas certain other combinations increase damage.

Other results were, however, given by El-Khouly *et al.* (1994) who reported that intercropping maize with cowpea in different row systems was suitable for reducing the infestation of cowpea with *Aphis craccivora* and maize with *Rhopalosiphum maidis*.

2. Effect of intercropping on the population density of whitefly

The whitefly *Bemisia tabaci* (Genn.) has become a major pest of a wide range of warm climate crops in many parts of the world. The population dynamics of the pest is affected by multiple crop interactions. Data obtained for *B. tabaci* revealed the occurrence of two peaks of whitefly population. The first peak (9.68, 14.44 and 15.36

Table 1. Effect of intercropping cucumber with cotton and kidney bean on the population density of aphids.

Cropping system	Year	Total number of aphids in the following sampling dates														Mean
		21/3	28/3	4/4	11/4	18/4	25/4	2/5	9/5	16/5	23/5	30/5	30/5			
Cucumber	1996	0.84	1.16	1.72	3.28	4.36	9.16	13.8	14.68	19.44	14.96	11.64	8.58**			
	1997	0.76	0.92	1.52	3.40	4.48	7.88	12.12	13.16	16.20	13.92	10.36	7.70**			
Cucumber/ Cotton	1996	0.44	0.48	1.28	2.28	3.36	6.80	9.48	10.72	12.68	9.96	8.80	6.025**			
	1997	0.40	0.36	1.08	1.96	3.80	5.52	9.08	8.88	11.44	9.28	8.40	5.47**			
Cucumber/ Kidney bean	1996	1.36	1.96	2.36	3.68	5.44	11.08	14.84	16.24	22.00	17.28	13.64	9.99			
	1997	1.16	1.52	2.00	3.00	4.60	9.32	13.36	15.56	19.88	16.12	11.40	8.90			

F (1996) = 20.441

F (1997) = 16.229

L.S.D. (1996) at 0.05 = 2.263

at 0.01 = 3.921

L.S.D. (1997) at 0.05 = 2.193

at 0.01 = 3.799

* Significant at 0.05 level

** Highly significant at 0.01 level

Table 2. Effect of intercropping cucumber with cotton and kidney bean on the population density of whitefly.

Cropping system	Year	Total number of whitefly in the following sampling dates												Mean
		21/3	28/3	4/4	11/4	18/4	25/4	2/5	9/5	16/5	23/5	30/5		
Cucumber	1996	5.12	9.68	8.96	5.12	5.64	4.20	5.16	6.60	5.12	5.08	4.24	5.90	
	1997	3.20	8.56	7.40	3.72	3.16	3.52	4.88	4.12	3.88	4.32	3.64	4.58	
Cucumber/	1996	7.04	14.44	11.28	6.96	5.88	5.28	6.72	9.60	4.92	7.20	5.04	7.67	
Cotton	1997	4.08	12.16	7.88	4.68	3.72	4.32	5.44	6.28	8.24	5.72	4.84	6.12	
Cucumber/	1996	6.12	15.36	13.68	11.24	9.96	7.44	9.84	14.04	13.32	10.76	6.88	10.79	
Kidney bean	1997	3.64	12.72	10.92	8.20	6.52	5.24	7.56	9.64	11.64	8.16	5.05	8.12	

F (1996) = 34.069

F (1997) = 26.420

L.S.D. (1996) at 0.05 = 2.151

L.S.D. (1997) at 0.05 = 1.752

at 0.01 = 3.726

at 0.01 = 3.036

* Significant at 0.05 level

** Highly significant at 0.01 level

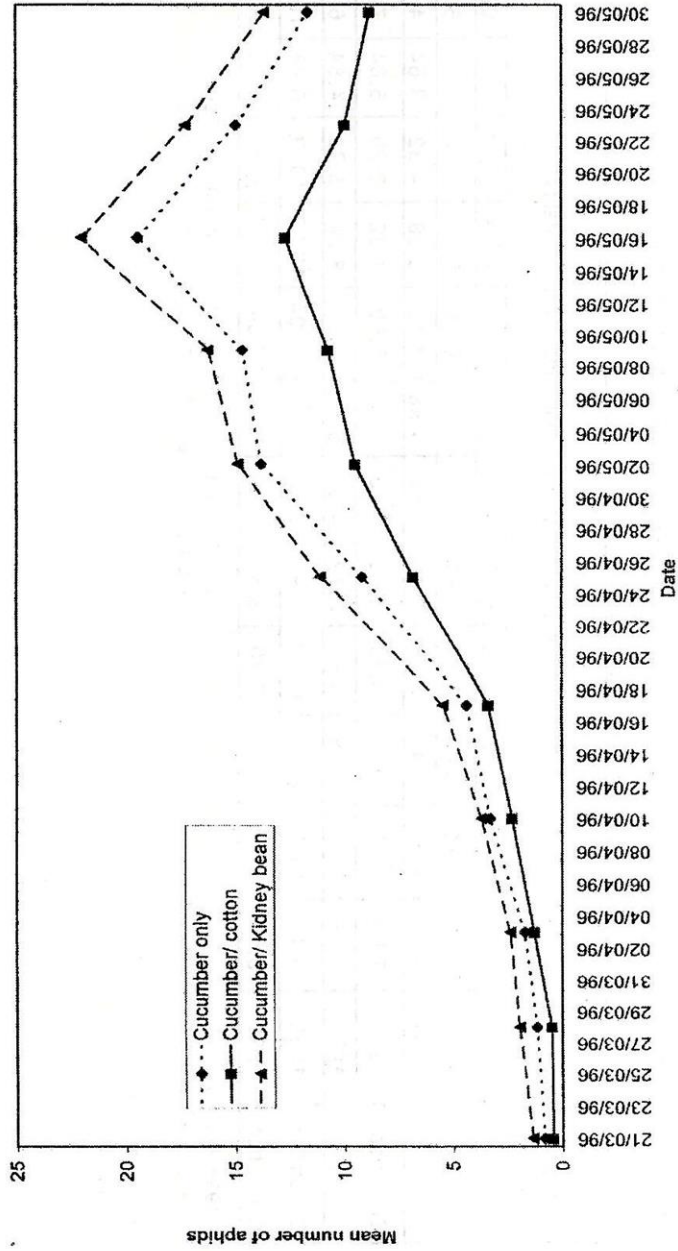


Fig. 1. Effect of intercropping cucumber with cotton and kidney bean on population density of aphids (1996).

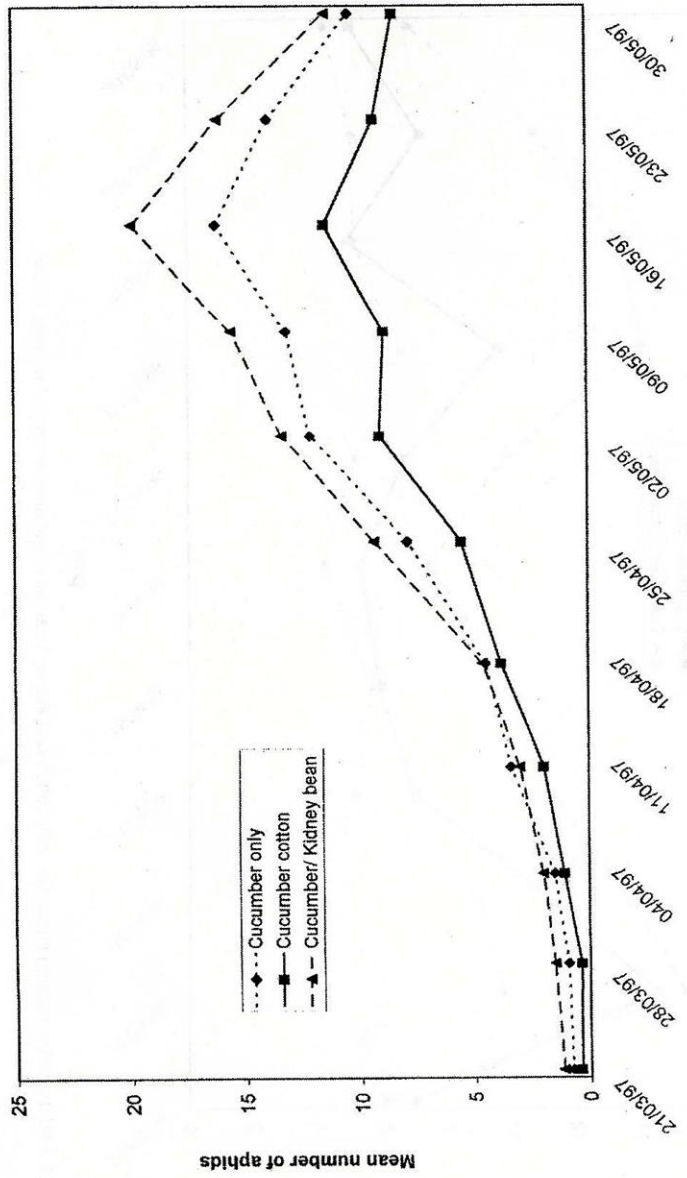


Fig. 2. Effect of intercropping cucumber with cotton and kidney bean on population density of aphids (1997).

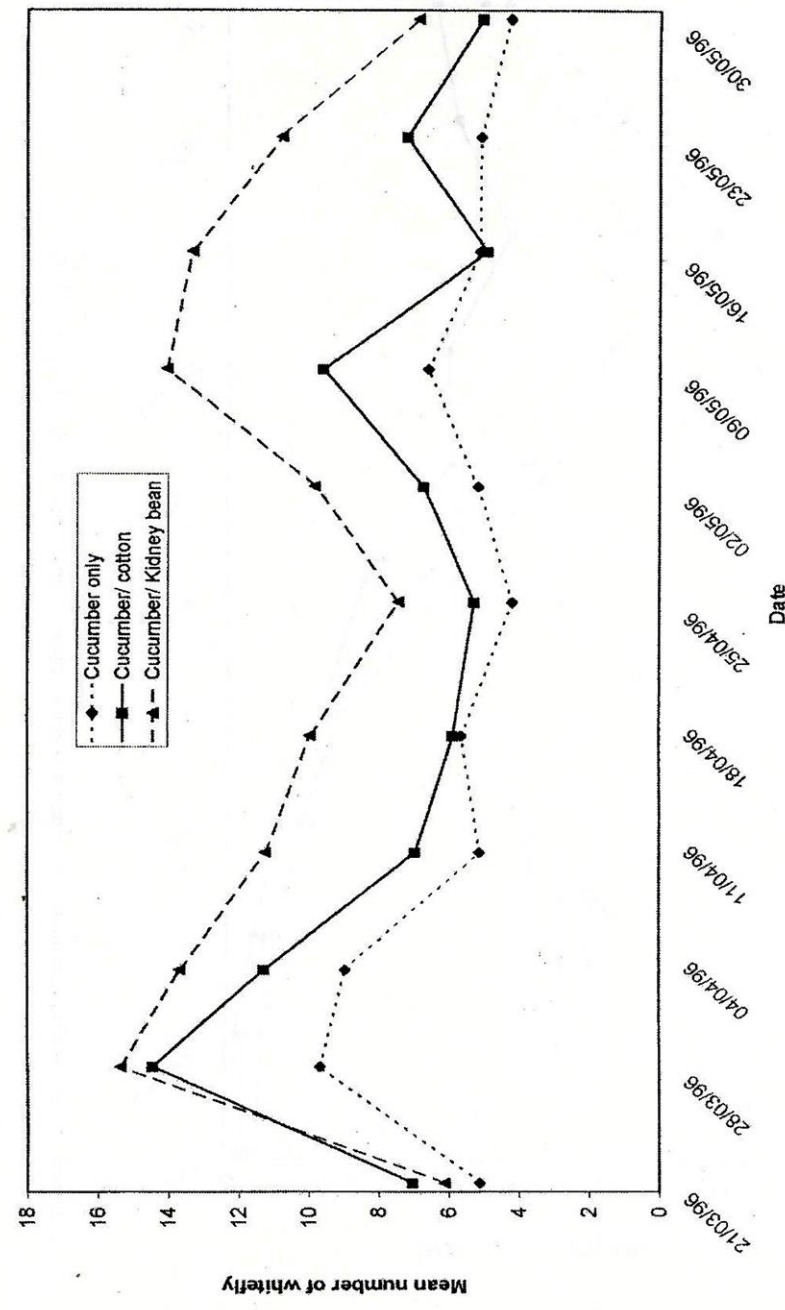


Fig. 3. Effect of intercropping cucumber with cotton and kidney bean on population density of whitefly (1996).

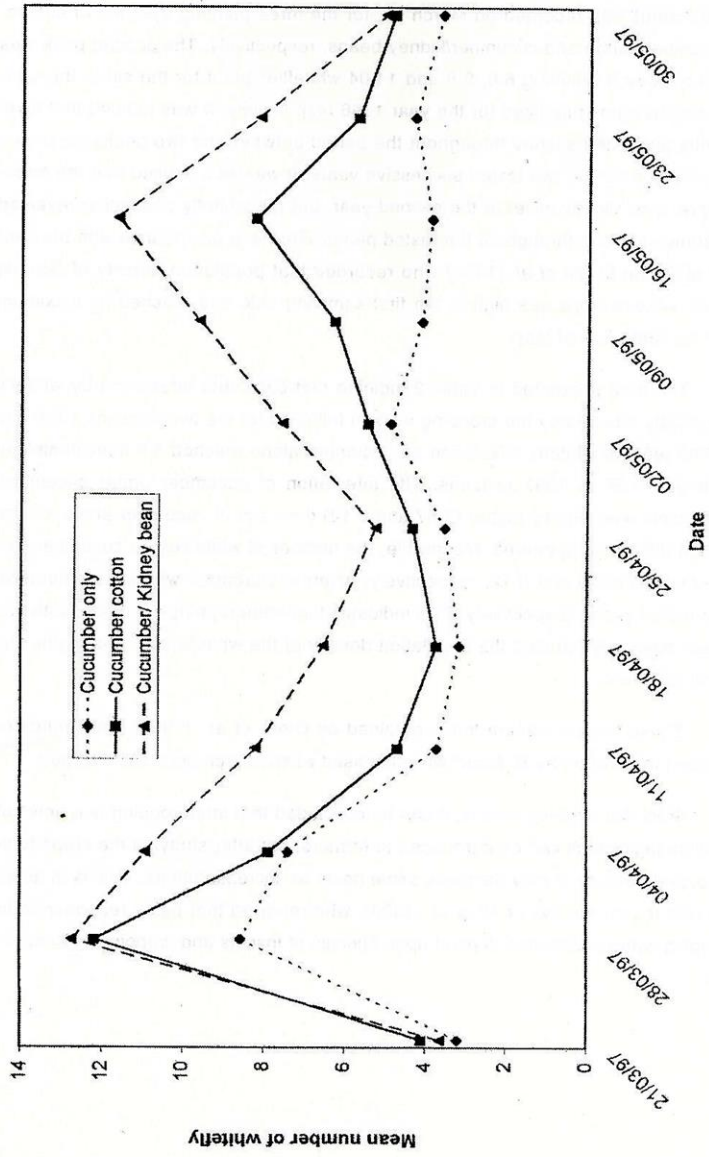


Fig. 4. Effect of intercropping cucumber with cotton and kidney bean on population density of whitefly (1997).

whiteflies/plant) was recorded on March 28, for the three planting systems of cucumber, cucumber/cotton and cucumber/kidney beans, respectively. The second peak was reached on May 9 resulting 6.6, 9.6 and 14.04 whiteflies/plant for the same three intercropping systems practiced for the year 1996, respectively. It was noticed that level of whitefly fluctuated slightly throughout the period between the two peaks as shown in Figs. 3 and 4 for the two tested successive years. It was also noticed that the population level was slightly lower in the second year, but the whitefly population revealed no difference in trend throughout the tested period. This is in accordance with the conclusion of Sharaf El Din *et al.* (1993) who recorded that population density of *Bemisia tabaci* on various crops was high in the first sampling date and reached its maximum peak in the first week of May.

The data presented in Table 2 indicate that cucumber infestation by whitefly was markedly affected by the cropping system followed for the two seasons 1996 and 1997. The level of whitefly infestation on cucumber alone reached 5.9 individuals/leaf in 1996 and 4.58 in 1997 seasons. The infestation of cucumber under cucumber/cotton system was slightly higher (7.67 and 6.12) than that of cucumber alone and no significant difference appeared. Meanwhile, the number of whiteflies on cucumber was nearly double (10.79 and 8.12, respectively) when intercropped with kidney bean for the two tested years, respectively. This indicates that intercropping cucumber with kidney bean obviously affected the population density of the whitefly and was highly significantly different.

These results confirm those obtained by Omar *et al.*, (1993) who indicated that cotton infestation by *B. tabaci* was increased when intercropped with cowpea.

From the forgoing results, it can be concluded that intercropping is a new culture technology which can be introduced to farmers, but after studying the crops to be intercropped because it may decrease some pests or increase others. This is in accordance with the conclusion of Ali *et al.* (1993), who reported that pests response to intercropping was variable and depend upon species of insects and cropping system employed.

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دراسة حول تأثير التحميل التقليدي للخيار مع القطن أو الفاصوليا على أعداد حشرات المن والذبابة البيضاء

أحمد معوض جبر ، لوئيس صليب سوريال

معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقي - الجيزة

تم دراسة تأثير تحميل الخيار مع كل من القطن أو الفاصوليا على الكثافة العددية لكل من حشرات المن والذبابة البيضاء. وقد أجريت التجارب الحقلية في الفيووم لمدة سنتين متتاليتين ١٩٩٦ و ١٩٩٧ .

أشارت النتائج إلي أن تعداد الحشرات المختبرة كان لها نفس الاتجاه خلال فترة التجربة بالرغم من أن مستوى الإصابة كان أقل في السنة الثانية. كذلك دلت النتائج علي أن تحميل الخيار علي القطن نتج عنه خفض الإصابة بالمن في حين أن الزيادة في الكثافة العددية للذبابة البيضاء كانت غير معنوية بالمقارنة بزراعة الخيار منفردا.

وفي نفس الوقت عندما تم تحميل الخيار مع الفاصوليا كانت الزيادة في الكثافة العددية للمن غير معنوية في حين أن الزيادة في الذبابة البيضاء كانت معنوية.