

## THE IMPACT OF INTERCROPPING COTTON AND COWPEA ON PEST INFESTATION

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### Abstract

Field trials were conducted at Etay El-Baroud Experimental Station during the two seasons 1989 and 1990. The effect of the two intercropping systems of cotton and cowpea on the population density of target pests; aphid, *Aphis gossypii* Glover; jassid, *Empoasca decipiens* Paoli; whitefly, *Bemisia tabaci* (Genn.); spider mite, *Tetranychus arabisicus* Attiah and bollworm, *pectinophora gossypiella* (Saunders) was studied.

The intensity of attack to cotton and cowpea differed during the two seasons. Cowpea as a monocrop was more attractive than cotton to pests infestation. The two intercropping patterns (1:1) and (1:2) of cotton with cowpea significantly influenced the density of *A. gossypii* and *E. decipiens* suggesting that the presence of cowpea plant in the two cropping patterns had reduced the population build-up on cotton. Population reduction of the two insects was greater with the intercropping pattern (1:2) than the intercropping pattern (1:1). On the other hand, the presence of cowpea as a preferable plant in the two cropping systems had resulted in a slight increase of *B. tabaci* and *T. arabisicus* population on cotton. The population increase was higher at the intercropping pattern (1:2) than the intercropping pattern (1:1). The cotton bollworm *P. gossypiella* did not follow any regular pattern in either system.

### INTRODUCTION

Cotton plant has various characteristics which attract insects such as the green succulent leaves, open flowers, nectaries on every leaf and flower, and a considerable number of bolls. The major insect pests of cotton in Egypt are the leaf-

worm and the bollworms. The most popular vegetable crop of the family Leguminosae in Egypt is cowpea. The increase in cowpea cultivation during the last decade has drawn the attention to its serious economic pests. Field observations showed that the spider mite, *Tetranychus arabicus* Attiah, aphid, *Aphis gossypii* (Glover); Jassid, *Empoasca decipiens* paoli cause much troubles especially in spring and summer.

Several investigators had studied the advantages of intercropping over monocropping with regard to pest infestation (Matteson 1982; Atta *et al.*, 1983; Ezueh and Taylor 1984; Dash *et al.*, 1987).

The present work is an attempt to study the effect of two patterns of cotton intercropping with cowpea on cotton pests. This would help understand the advantage of intercropping over monocropping with regard to pest abundance on cotton.

## MATERIALS AND METHODS

Two experiments were conducted at Etay El-Baroud Research Station in 1989 and 1990 seasons to study the effect of intercropping cotton and cowpea on the population density of cotton pests. Cowpea, (*Vigna sinensis*) was examined under to intercropping patterns with cotton Giza 70. The first pattern consisted of one ridge of cowpea alternated with one ridge of cotton (1:1). The second consisted of one ridge of cotton alternated with two ridges of cowpea (1:2). The two intercropping systems were compared with cotton and cowpea planted as monoculture. Each treatment was replicated four times in a randomized complete block design. Cowpea was spaced at 25cm apart within the ridges, whereas cotton was spaced at 20cm on ridges 60 cm apart. The plot comprised 4 ridges 5 m long. Both cotton and cowpea were seeded at the same time on the 1st of April in both seasons, received nitrogenous fertilizer at a rate of 90kg N/f and phosphate at the level of 30kg P<sub>2</sub> O<sub>5</sub>/f.

Samples of 10 leaflets of cowpea and 10 leaves of cotton per plot were randomly taken at 7 day intervals when the age of the plants was 6 weeks. All active forms of *A. gossypii*, *E. decipiens* and adults of *B. tabaci* were recorded on the lower surface of leaflets. *T. arabicus* active forms per 2 random square inches were also recorded. Ten bolls of cotton were collected at random and kept in a paper bag prior to immediate inspection of *P. gossypiella* larvae. All data were statistically analysed by the standard method of Atta *et al.* (1983).

## RESULTS AND DISCUSSION

### Aphids

The intensity of attack of cotton plants by *A. gossypii* differed in the two experimental seasons (Tables 1 and 2). The levels of infestation in cotton under the monocrop system reached 649.33 individuals /10 leaves in 1989 season compared with 852.22 individuals in 1990 season. Cowpea under the monocrop system was more attractive to *A. gossypii* infestation. The infestation level of cowpea reached 826.6 and 1243 individuals in 1989 and 1990 seasons, respectively. This showed levels of infestation that were 1.75 and 1.5 times those of cotton. On the other hand lower infestation by aphids on cotton was observed under the two patterns of intercropping. In 1990 the infestation of cowpea was 1286 individuals at the intercropping pattern 1:1 and 1304 individuals at the intercropping pattern 1:2. Infestation on cotton however was 610 and 600 individuals, respectively. During 1989 season, the infestation of cowpea was 842 at the intercropping pattern (1:1) and 818.2 individuals at the intercropping pattern (1:2). Infestation of cotton was 608.2 and 551 individuals in respect. It was clear then that cotton infestation in 1990 season was reduced by 39.7% at the intercropping pattern (1:1) and 41.87 at the intercropping pattern (1:2). The corresponding values for the year 1989 were 5.9 and 15.4%.

### Jassids

As shown in Tables 1 and 2 the levels of infestation by *E. decipiens* in cotton alone reached 577.5 individuals in 1990 season and 339.0 individuals in 1989 season. Cowpea alone was more attractive than cotton to *E. decipiens* infestation. This was expressed by 1040.0 individuals in 1990 season and 838.2 individuals in 1989 season. This showed that cowpea infestation was 3.51 and 1.80 times that of cotton in 1990 and 1989 seasons, respectively. The infestation of cotton under the intercropping system was significantly lower than with cotton alone. The number of jassids on cowpea was 1107.9 at the intercropping pattern (1:1) and 1143.6 at the intercropping pattern (1:2). The corresponding values on cotton were 413.2 and 401.8 individuals, respectively. In 1989 season, the number of jassids on cowpea was 842.5 at the intercropping pattern (1:1) and 800 at the intercropping pattern (1:2). The corresponding values for cotton were 268.7 and 258.1. This indicated

Table 1. The effect of intercropping cotton with cowpea on the rate of infestation with cotton pests (1989 season).

| Planting Pattern      | Accumulative mean of individuals during the season |                 |                       |                 |                    |                 |                      |               |                         |        |
|-----------------------|----------------------------------------------------|-----------------|-----------------------|-----------------|--------------------|-----------------|----------------------|---------------|-------------------------|--------|
|                       | <i>A. gossypii</i> /                               |                 | <i>E. decipiens</i> / |                 | <i>B. tabaci</i> / |                 | <i>T. arabicus</i> / |               | <i>P. gossypiella</i> / |        |
|                       | 10                                                 |                 | 10                    |                 | 10                 |                 | 2                    |               | 10                      |        |
|                       | leaves cotton                                      | Leaflets cowpea | leaves cotton         | Leaflets cowpea | leaves cotton      | Leaflets cowpea | sq. inch cotton      | sq. in Cowpea | Bolls cotton            | Cowpea |
| Cotton - alone        | 649.3 b                                            | --              | 339.0 b               | --              | 341.3 a            | --              | 164.9 a              | --            | 4.88 a                  | --     |
| Cotton - Cowpea (1:1) | 608.2 b                                            | 842.0 c         | 268.7 a               | 842.5 b         | 388.9 b            | 548.4 d         | 175.5 a              | 842.0 b       | 4.66 a                  | --     |
| Cotton - Cowpea (1:2) | 551.0 a                                            | 818.2 c         | 258.1 a               | 800.0 a         | 408.1 b            | 515.6 d         | 180.4 a              | 818.2 b       | 4.55 a                  | --     |
| Cowpea alone          | --                                                 | 826.6 c         | --                    | 838.2 b         | --                 | 464.4 c         | --                   | 826.6 b       | --                      | --     |

Means followed by the same letter are not significantly different at  $P < 0.05$ .

Table 2. The effect of intercropping cotton with cowpea on the rate of infestation with cotton pests (1990 season).

| Planting Pattern      | Accumulative mean of individuals during the season |                    |                       |                    |                    |                    |                      |                 |
|-----------------------|----------------------------------------------------|--------------------|-----------------------|--------------------|--------------------|--------------------|----------------------|-----------------|
|                       | <i>A. gossypii</i> /                               |                    | <i>E. decipiens</i> / |                    | <i>B. tabaci</i> / |                    | <i>T. arabicus</i> / |                 |
|                       | 10 leaves cotton                                   | 10 Leaflets cowpea | 10 leaves cotton      | 10 Leaflets cowpea | 10 leaves cotton   | 10 Leaflets cowpea | 2 sq. in cotton      | 2 sq. in Cowpea |
| Cotton - alone        | 852.22 b                                           | --                 | 577.4 b               | --                 | 452.0 a            | --                 | 185.0 a              | --              |
| Cotton - Cowpea (1:1) | 600.0 a                                            | 1286.0 c           | 413.2 a               | 1107.9d            | 462.4 a            | 604.2 b            | 204.5 a              | 1104 b          |
| Cotton - Cowpea (1:2) | 610.0 a                                            | 1304.0 c           | 401.8 a               | 1143.6d            | 473.4 a            | 612.0 b            | 210.0 a              | 1084 b          |
| Cowpea alone          | --                                                 | 1243.0 c           | --                    | 1040.0             | --                 | 632.0 b            | --                   | 1063 b          |
|                       |                                                    |                    |                       |                    |                    |                    | 4.9 a                | 5.0 a           |
|                       |                                                    |                    |                       |                    |                    |                    |                      | 5.4 a           |
|                       |                                                    |                    |                       |                    |                    |                    |                      | --              |
|                       |                                                    |                    |                       |                    |                    |                    |                      | --              |

Means followed by the same letter are not significantly different at  $P < 0.05$ .

that infestation of cotton in 1990 season decreased by 39.64% at the intercropping pattern (1:1) and to 43.85% at the intercropping pattern (1:2). In 1989 however, it decreased by 18.16 % and 31.34%, respectively. Similar results were found by Dash *et al.* (1987) who found the lowest damage to cotton bolls by *Earias Vitella* was in the cotton - rice combination.

### Whitefly

The intensity of attack by the whitefly is shown in Tables 1 and 2 . The levels of *B. tabaci* infestation on cotton alone reached 347.3 individuals /10 leaves in 1989 season and 452.0 individuals in 1990 season. Cowpea alone was more attractive than cotton to *B. tabaci* infestation . The number of individuals reached 632.0 in 1990 season, and 464.4 in 1989 season. This indicated that cowpea alone had more infestation than cotton alone in 1990 and 1989 seasons as indicated by 1.35 and 1.36 times, respectively. The infestation of cotton under the cotton-cowpea system was slightly higher than that of cotton alone. The number of *B. tabaci* on cowpea was 604.2 at the intercropping pattern (1:1) and 612.0 at the intercropping pattern (1:2). In 1990, infestation on cotton was 462.4 and 473.4 individuals at the intercropping patterns (1:1) and (1:2), respectively . During 1989 season, the number was 548.4 at the intercropping pattern (1:1) and 515.6 at the intercropping pattern (1:2) . The numbers for cotton were 388.6 and 408.10, respectively. This indicated that cotton infestation by *B. tabaci* increased by 20.8 % at the intercropping pattern (1:1) and by 4.44% at the intercropping pattern (1:2) in 1990 season. The respective values for 1989 season were 12.27 and 16.57%.

### Spider mite

The intensity of cotton attack by *T. Arabicus* reached 164.9 and 185.0 active forms/2 square inches in 1989 and 1990 season, respectively. Cowpea alone was more attractive to infestation than cotton. The number of individuals reached 826.6 and 1063.0 in 1989 and 1990 seasons, respectively. Cowpea infestation was therefore 5.74 times that of cotton in 1990 season and 5.01 times in 1989 season.

The population of *T. arabicus* on cotton under intercropping showed slight increase than with cotton alone. Infestation of cowpea was 1104/2 sq. inches at the intercropping pattern (1:1) and 1084 at the intercropping pattern (1:2) (1990 season). The population on cotton was 204.5/2 sq. inches and 210.0 at the intercrop-

ping patterns (1:1) and (1:2), respectively. During 1989 season, the population on cowpea was 842.0 at the intercropping pattern (1:1) and 818.22/2 sq. inches at the intercropping pattern (1:2). The population on cotton was 175.5 and 180.4 at the intercropping patterns (1:1) and (1:2), respectively. It seems that the population of *T. arabicus* on cotton under the intercropping system increased by 9.29% at the pattern (1:1) and 11.90 % at the pattern (1:2) in 1990 season. The corresponding values of 1989 season were 6.11% and 8.59%

It is clear that cowpea as a preferable host had increased *B. tabaci* and *T. arabicus* colonization on cotton (Tables 1 and 2)

#### Pink bollworm

The intensity of attack by the pink bollworm to cotton under both systems was not significant. The percentages of attack in cotton alone were 4.9% in 1990 season and 4.88% in 1989 season. *P. gossypiella* did not follow any regular pattern in either system. Percentages of attack were 4.66 at the intercropping pattern (1:1) and 4.55 at the intercropping pattern (1:2) in 1989 season. The values in 1990 season were 5.0% and 5.4%, respectively.

Similar results were found by Atta *et al.* (1983) against *Marcua testulalis* (Greyer).

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## دراسات حشرية علي تحميل اللوبيا علي نباتات القطن

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معهد بحوث وقاية النباتات ، مركز البحوث الزراعية ، الدقي.

أجريت اختبارات حقليه بمحطه البحوث الزراعيه بايتاي البارود خلال العامين الزراعيين ١٩٨٩، ١٩٩٠ لدراسة تأثير نظامين لتحميل اللوبيا علي القطن بكثافة (١:١) ، (١:٢) علي التوالي علي الكثافة العددية لخمسة آفات هامة هي: من القطن والبطيخ *Aphis gossypii* Glover ، العنكبوت الأحمر *Tetranychus arabicus* Attiah ، ودودة اللوز القرنفلية *Pectinophora gossypiella* (Saund).

ودلت النتائج علي اختلاف شدة الإصابة بهذه الآفات علي نباتات القطن واللوبيا خلال عامي الدراسة وأن نباتات اللوبيا منفردة ( غير محملة ) كانت أكثر جذباً للآفات المذكورة.

ولقد أظهرت التحميل بالنظامين المختبرين تأثيراً معنوياً علي شدة الإصابة بحشري المن والجاسيد مما يدعو إلي الإعتقاد بأن وجود نباتات اللوبيا محملة علي نباتات القطن يخفض من تعداد الحشريتين المذكورتين علي نباتات القطن ، وأن هذا الخفض كان أكبر في حالة النظام (١:٢) عنه في حالة النظام (١:١).

ومن ناحية أخرى دلت النتائج علي أن وجود اللوبيا وهي العائل المفضل للذبابة البيضاء والعنكبوت الأحمر بين نباتات القطن تحت نظامي التحميل المختبرين قد أدت الي زيادة طفيفة لتعدادهما علي نباتات القطن ، وكان هذه الزيادة أكبر في نظام التحميل (١:٢) عنه في حالة النظام (١:١) وأوضحت نتائج البحث أن الإصابة بدودة اللوز القرنفلية لم يسر وفق نظام معين ولم يكن لنظامي التحميل المختبرين أثر معنوي علي شدة الإصابة بها.