

MONITORING THE TRIANGULAR RELATIONSHIP BETWEEN MAIZE, COTTON AND THE INFESTATION OF THE AMERICAN BOLLWORM (ABW), *HELICOVERPA ARMIGERA* (HB.) AND THE SPINY BOLLWORM (SBW), *EARIAS INSULANA* (BOISD.)

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ABSTRACT : Field trail were carried out to study the intercropping system effect between cotton, *Gossypium* spp., and maize, *Zea mays* L. known to attract moths and determine if the close plantings (= intercropping) they affecting the infestation figures of both, the american bollworm (ABW), *Helicoverpa armigera* (Hb.) and the spiny bollworm (SBW), *Earias insulana* (Boisd.) in cotton fields during two successive cotton growing seasons 2000 and 2001 at El-Gemmeiza Agricultural Research Station, Gharbia governorate and Aga district (private farm), Dakahlia governorate.

The ABW infestation, started during June up to May in both years at each of Gemmeiza and Aga, respectively, while the SBW infestation observed during May at the two localities during the two growing seasons. Reliable infestations by both insect pests were detected in maize field in July at both 2000 and 2001 at the two experimental maize growing areas. The highest infestation expressed as percentage with ABW was 38.0 % recorded on cotton field at Aga during June 2001, while the lowest percentage was 0.4 % occurred in September 2000 and 2001 at Aga and Gemmeiza, respectively. The highest infestation (25.25 %) with SBW attacking maize was recorded during August 2001, while the lowest (0.25 %) was reached during July 2000 in cotton field at Aga district.

The highest infestation with both worms was 13.48 % recorded in June and 9.80% in August at Aga and Gemmeiza, respectively, while the lowest was 0.64 % and 0.93 recorded in May at Gemmeiza and Aga, respectively. The highest infestation percentage (10.02 %) was found at Aga 2001, whereas the lowest (6.72 %) was found at Gemmeiza in the same growing season. Mono-culture cotton plants harboured reliable infestation percentages than that planted frontier maize; it was (7.08 and 7.03 %) in mono-culture cotton at Gemmeiza during both seasons, while it was (7.18 & 9.72 %) at Aga, respectively. The infestation percentage on cotton that was planted frontier maize (under poly-culture techniques) was (4.65 & 4.31 %) at Gemmeiza during both seasons, while, it was (5.03 and 7.22 %) at Aga, respectively. The infestation percentages on maize was (10.7 & 8.85 %) at Gemmeiza in both 2000-2001 and (10.5 & 13.12 %) at Aga in the both growing seasons.

As a result, poly-culture techniques maize and cotton reduced the infestation on cotton with bollworms by 34.32 & 38.69 % at Gemmeiza with an average of 36%. For Aga it was 29.94 & 25.72 % with an average of 26%.

INTRODUCTION

Thai cotton growers yearly suffered from serious pest problems consisting of heavily infestation associated with resistance to pesticides leading to expensive and harmful pest control practices. Field observations during the outbreak of cotton bollworm in cotton in 1925 indicated that the infestation had begun when practically no corn in silk stage was available as a preferment host plant.

Intercropping maize in cotton fields based on considering corn as a trap crop to avoid cotton from heavily injury by the bollworm has been widely recommended (Abo-el-Nor, 1989, Henk van den Berg, 1993, Li Long et al., 2001, El-Saadany, et al 2003, Zhang and Li, 2003) because as is well known fresh corn silks are particularly acting as ovipositing sites for bollworm moths (Isely 1935, Coaker 1959, Reed 1965). Lincoln and Isely (1947) found that corn in silk appeared to be attractive moths away from cotton, but if scattered stalks or single rows of corn were planted in cotton fields, moths were attracted and deposited eggs not only on the corn but also on nearby cotton plants. Robert et al., 1972 found that planting corn, alfalfa, sorghum, and peanuts adjacent to cotton increased the percent damaged squares over the check. It appears that planting sorghum in strip-cropping system with cotton could be advantageous not only by encouraging and protecting beneficial insects but also by offering other desirable treatment effects.

In view of these conflicting reports, it seemed apparent that work should be done to determine the effects of planting maize in close association with cotton (poly culture technique) on the infestation percentages of, the american bollworm (ABW), *Helicoverpa armigera* (Hb.) and the spiny bollworm (SBW), *Earias insulana* (Boisd.).

MATERIALS AND METHODS

Field trail were carried out in El-Gemmeiza Agricultural Research Station, Gharbia governorate and in Soliman Farm, Aga district, Dakahlia governorate for two successive growing seasons 2000 and 2001.

Two farms (3 kms separate between each). Cotton seeds were sown on March 25th while maize seeds were sown on May 20th. The cultivated area of one feddan was selected for each farm. Only one farm (one feddan area, frontier to cotton in one farm). The second farm was planted with cotton served as control area. The normal agricultural practices were followed.

A sample of one hundred green bolls was weekly picked at random from July 6th. Samples of twenty-five maize ears were randomly collected every week from (the beginning of silk appearance) July 2nd until the harvesting date. The samples (bolls & ears) were separately kept in paper bags, transferred to the laboratory and checked for bollworms occurrence. The obtained data were statistically analyzed to determine the significance of the differences among treatments.

RESULTS AND DISCUSSION

Data in Tables (1 & 2) confirmed that maize and cotton plants are infested with two bollworms; American bollworm namely, *Helicoverpa armigera* and spiny bollworm, *Earias insulana*. Tabulated data showed that the infestation in cotton with the american bollworm started in June 2000 and May 2001 at Gemmeiza and Aga localities; for the spiny bollworm was first appeared in May throughout the two

growing seasons for both locations. The highest infestation figure was 38.0 % with the american bollworm occurred on mono cotton fields at Aga in June 2001, while the lowest percentage was 0.4 % teacake place in September 2000 & 2001 on cotton frontier maize. Concerning the infestation percentage with the spiny bollworm, the highest level (22.6 %) was recorded on maize in August 2000, while the lowest percentage (0.25 %) was observed on cotton frontier maize in July 2000 at Aga locality.

Spiny bollworm infestation percentages for the two experimental regions in the former growing seasons, reveals that the highest percentage 10.2 % was noticed at Aga in 2001 season, while the lowest one 6.72 % was noticed at Gemmeiza in 2000. The remaining values ranged between 7.48 % and 7.57 % with an average of 7% at both Gemmeiza and Aga in 2000. Data checked that the highest bollworm infestation (13.48 %) was recorded in June 2001 at Aga district while the lowest one (0.64 %) was recorded in May 2000 at Gemmeiza.

Data in the same tables also show that the infestation figures on the mono culture of cotton demonstrates a higher degree of infestation than that on the cotton frontier maize. The infestation percentages in the first case were 7.08 & 7.03 % at Gemmeiza and 7.18 & 9.72 % at Aga throughout the two seasons, respectively. The infestation percentages on the cotton frontier maize were 4.65 & 4.31 % at Gemmeiza and 5.03 & 7.22 % at Aga, respectively.

Maize infestation with the two bollworms started in July at the two localities. Data proved that maize plants harboured the highest number of bollworms. The infestation percentages on maize with bollworms showed a scarcely level of infestation at Gemmeiza and Aga (10.71 and 10.5%) for the 1st season, while in the 2nd a comparatively higher degree of an averaged infestation 10.98% was recorded.

Abdel-Salam et al. (1994) found that SBW has 6 successive and overlapping generation/year. The first 3 generations and the last one were relatively low in numbers, while the 4th and the 5th generation, from August to October, were much higher abundance of about 78% of the population associated with the increase in cotton fruit numbers, especially green bolls, and large maize ears. Megahed and El-Nahal (1958) reported that the moths of spiny bollworms resulting from larvae reared in cotton bolls become attracted to the silking maize plants during September and first half of October.

Hamblton (1944) and Wille (1951), in Peru, found that planting of corn within cotton field or adjacent to them restored conditions favorable for the propagation of natural enemies and, consequently, ultimate in the rate of infestation of cotton plants with *Hiliothis viresceus* F. Shalaby et al. (1983) reported that planting maize within or surrounded cotton rows attracted more insect predators. Shalaby et al. (1986) found that intercropping maize with cotton plants attracted higher numbers of *S. littoralis* parasites. . Smith & Carter (1997) found that maize grown in a strip intercrop with alfalfa produced yields 6% higher in 40-ft wide strips, 11% higher in 20-ft wide strips, and 17% higher in 10-ft wide strips. May be due to extra light in border rows of maize plus reduced weed populations in intercrops would effectively increase resource supply.

Henk 1993, Studies intercropping cotton with maize or sorghum are promising and most feasible, because maize and sorghum may strongly affect natural enemy

populations and pest infestation levels, while such methods stimulate sustainable agriculture in smallholdings. However, there will only be a brief period when the trap crop is attractive to oviposition moths. A careful choice of varieties and planting dates might ensure the maximum effectiveness of trap crops. For cotton, where oviposition is extended over a period of three months, planting of trap crops at regular intervals may be required, but a trap crop may be most crucial early in the season, because of its potential role to attract natural enemies into fields.

Therefore, this poly culture technique for intercropping maize with cotton may be, considered as a recommended method for minimizing the infestation with the selected bollworms, thus the wide use of insecticides, and increasing the numbers of parasites and predators

Table (1). Infestation percentage of cotton and corn plants with bollworms during the growing seasons 2000 and 2001 in Gemmeiza district, Gharbia governorate.

Month of inspection	Infestation percentages (%)												Mean of bollworms
	Season, 2000						Season, 2001						
	Cotton		Maize		Check		Cotton		Maize		Check		
ABW*	SBW	ABW	SBW	ABW	SBW	ABW	SBW	ABW	SBW	ABW	SBW	SBW	
May	0.0	0.80	-	-	0.0	0.60	0.50	1.50	-	-	0.0	1.75	0.64
June	17.75	2.75	-	-	16.50	3.25	8.25	4.25	-	-	12.00	4.75	8.69
July	8.60	0.75	9.60	2.00	14.20	1.75	5.60	2.00	5.80	2.50	10.80	3.50	5.68
Aug.	5.00	3.00	28.75	8.50	8.50	9.50	2.25	5.60	16.50	11.60	7.75	10.75	9.80
Sept.	0.80	7.00	6.00	9.50	2.75	13.75	0.40	12.75	8.80	7.75	3.50	15.50	7.38
Mean	6.43	2.86	14.75	6.67	8.39	5.77	3.40	5.22	10.37	7.28	6.81	7.25	
	4.65		10.71		7.08		4.31		8.83		7.03		
L.S.D.	2.314						2.115						
	7.48						6.72						
Reduction	34.32 %				-		38.64 %				-		

* ABW : American bollworm, *Helicoverpa armigera* (Hb.); SBW : Spiny bollworm, *Earias insulana* (Boisd.)

- No significant differences at L.S.D. 5 %

Table (2). Infestation percentage of cotton and corn plants with bollworms during the growing seasons 2000 and 2001 in Aga district, Dakahlia governorate.

Month of inspection	Infestation percentages (%)												Mean of bollworms
	Season, 2000						Season, 2001						
	Cotton		Maize		Check		Cotton		Maize		Check		
ABW*	SBW	ABW	SBW	ABW	SBW	ABW	SBW	ABW	SBW	ABW	SBW	SBW	
May	0.0	2.00	-	-	0.0	1.75	1.50	0.60	-	-	1.00	0.60	0.93
June	8.25	7.60	-	-	11.00	6.75	30.00	2.50	-	-	38.00	3.75	13.48
July	10.20	0.25	12.80	1.75	15.80	2.75	12.50	1.50	13.75	2.75	15.80	3.00	7.74
Aug.	3.00	4.60	16.00	17.50	6.50	9.75	4.50	5.80	22.60	25.25	8.75	9.75	11.17
Sept.	0.40	14.00	5.20	9.75	1.50	16.00	0.80	12.50	6.60	7.75	1.50	15.00	6.43
Mean	4.37	5.69	11.33	9.67	6.94	7.40	9.86	4.58	14.32	11.92	13.01	6.42	
	5.03		10.5		7.18		7.22		13.12		9.72		
L.S.D.	2.114						1.838						
	7.57						10.02						
Reduction	29.94 %				-		25.72 %						

* ABW : American bollworm, *Helicoverpa armigera* (Hb.); SBW : Spiny bollworm, *Earias insulana* (Boisd.)

- No significant differences at L.S.D. 5 %

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تأثير زراعة نبات الذرة بجوار نباتات القطن على نسبة أصابة القطن بدودتى اللوز الأمريكية والشوكية

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معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى

أجريت هذه الدراسة فى منطقتين هما محطة البحوث الزراعية بالجميزة (محافظة الغربية) ومزرعة خاصة بمركز أجا (محافظة الدقهلية) خلال موسمى قطن ٢٠٠٠، ٢٠٠١ لدراسة قدرة نباتات الذرة المنزرعة بجوار نباتات القطن على جذب ديدان اللوز لها وخفض نسبة الإصابة بهما فى نباتات القطن. وأوضحت النتائج أن إصابة نباتات القطن بدودة اللوز الأمريكية *Helicoverpa armigera* بدأت فى شهر يونيو ٢٠٠٠، مايو ٢٠٠١ فى كل من منطقتى الجميزة وأجا على الترتيب، فى حين بدأت الإصابة بدودة اللوز الشوكية *Earias insulana* فى شهر مايو خلال الموسمين فى كلا المنطقتين كما بدأت إصابة نباتات الذرة بدودتى اللوز الأمريكية والشوكية فى شهر يوليو فى كلا من منطقتى التجارب خلال موسمى الدراسة.

سجلت أعلى نسبة إصابة بدودة اللوز الأمريكية (٣٨,٥٪) على القطن فى أجا فى شهر يونيو ٢٠٠١، بينما سجلت أقل نسبة إصابة (٤,٠٪) فى شهر سبتمبر ٢٠٠٠ و ٢٠٠١ فى كل من أجا والجميزة على الترتيب. وبالنسبة لدودة اللوز الشوكية فقد سجلت أعلى نسبة إصابة (٢٥,٢٥٪) فى شهر أغسطس ٢٠٠١ على الذرة، فى حين سجلت أقل نسبة إصابة (٢٥,٠٪) فى شهر يوليو ٢٠٠٠ على القطن فى أجا عموماً سجلت أعلى نسبة إصابة بديدان اللوز (١٣,٤٨٪) خلال شهر يونيو ٢٠٠١ فى منطقة أجا وأقلها (٦٤,٠٪) فى شهر مايو ٢٠٠٠ فى الجميزة. عند المقارنة بين النسب المثوية للإصابة بديدان اللوز فى منطقتى التجارب خلال موسمى الزراعة، سجلت أعلى نسبة إصابة (١٠,٢٪) فى مزرعة أجا وأقل نسبة (٦,٧٢٪) فى محطة الجميزة خلال موسم ٢٠٠١. وأوضحت النتائج أيضاً أن النسبة المثوية للإصابة بديدان اللوز فى حقل القطن (المقارنة) كانت أعلى من مثيلتها فى حقل القطن المجاور لحقل الذرة، ففى محطة الجميزة كانت نسبة الإصابة (٧,٠٨، ٣,٠٧) فى نباتات الحقل الأول بينما كانت فى نباتات القطن المجاور للذرة (٤,٦٥، ٤,٣١٪) فى موسمى الزراعة على الترتيب فى مزرعة أجا كانت نسبة الإصابة فى قطن المقارنة (٧,١٨، ٩,٧٢٪) وفى القطن المجاور للذرة (٣,٠٣، ٥,٢٢، ٧٪) خلال موسمى الزراعة على الترتيب. ومن ناحية أخرى اثبتت النتائج قدرة نباتات الذرة على جذب ديدان اللوز حيث سجلت عليها نسبة إصابة (٨,٨٥، ١٠,٧٪) فى محطة بحوث الجميزة و (١٠,٥، ١٢,١٣٪) فى مزرعة أجا خلال نفس الموسمين على الترتيب.

كما سبق يمكن القول أن زراعة نباتات الذرة بجوار نباتات القطن أدى إلى انخفاض فى نسب إصابة نباتات القطن بكل من دودتى اللوز الأمريكية والشوكية بمعدل (٣٢، ٣٤، ٦٩، ٣٨٪)، وبمعدل (٢٩، ٢٩، ٢٥٪) فى الجميزة وأجا خلال موسمى الدراسة ٢٠٠٠، ٢٠٠١.