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SUPPRESSION OF *Bemisia tabaci* (GENN), *Aphis gossypii* GLOVER AND *Spodoptera littoralis* (BOSID.) BY *Coranus africana* EL-SEBAEY (HEMIPTERA, HETEROPTERA, REDUVIIDAE) IN A TOMATO FIELD

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By
I. I. A. El-Sebaey and H. A. Abd El-Wahab

Plant Protection Research Institute, Dokki, Giza.

ABSTRACT

Mass reared reduviid, *Coranus africana* El-Sebaey was released in a tomato field plots against three tomato pests, *Bemisia tabaci* (Genn.), *Aphis gossypii* Golver and *Spodoptora littoralis* (Bosid). Control experimental plots without *C. africana* were maintained for each pest during the evalution period. *C. africana* greatly reduced the infestation of *B. tabaci* (99.1% & 92.25% for adult and immature stages respectively), *A. gossypii* (96.9 %) and *S. littoralis* (98.3 %) during the first year; opposed to (99% & 97.6 %), (98.9 %) and (98.6 %) respectively during the second year. The yield increased in the first year from 23.5 to 33.5; 27.1 to 35.7 and from 21.1 to 32.7 ton/feddan (1 feddan = 4200m^2) as a result of the biological control of *B. tabaci, A.gossypii* and *S. littoralis*, respectively. The corresponding values for the second year followed the same trend (from 24.1 to 32.5; 28.5 to 36.8 and from 23.5 to 32.9 ton/feddan.

Key words: *Aphis gossypii, Bemisia tabaci, Coranus africana , hemiptera , heteroptera, reduviidae.*

1.INTRODUCTION

Although natural predators often play a substantial role in regulating populations of insect pests, they frequently do not prevent the population of insect pests by reaching economically important levels . Therefore, it is desirable to augment them to the desired level by mass rearing and releasing (Ambrose and Claver, 1999). The periodic release of sufficient number could check the pest level so that it can not cause economic loss (Knipling 1966; Mc-Danile and Sterling 1982; Hough and Whalen 1993).

Reduviids are the abundant predatory group in several economic plants (Nyirra 1970, Fadare 1978, Ables 1978, Hafez *et al.* 1979, Schaefer and Ahmad 1987; Rosenhim and Wilson 1993, Singh *et al.*, 1997, Awadallah *et al.* 1984 and 1990 a, b El-Sebaey 1998). Several workers including (James 1994; Sahayaraj and Ambrose 1997; El-Sebaey, *et al.* 2001) emphasized the biocontrol potential of reduviid bugs and suggested that this group should be more seriously considered when developing biological control programmes.

Coranus africana El-Sebaey has recently been described from Egypt (El-Sebaey 2001a). It was found to be one of the most important predators of various insect pests of tomato, clover and maize (El-Sebaey 2001b,c and El-Sebaey *et al.* 2001).

Field trials to evalute the benefits of augmentative release of reduviid predators in economic crops in Egypt have been very meagre. Hence, the present work is an attempt to evaluate the biocontrol potential of *C. africana* against *Spodoptera littoralis (*Bosid), *Bemisia tabaci (*Genn) and *Aphis gossypii* Glover in a tomato field. The economic importance of these pests is well documented (*e.g.* Hill, 1999). This evaluation should enable growers and field consultants to a reliable utilization of this predator in an IPM programme.

2. MATERIALS AND METHODS

The predator *Coranus africana* was collected from a clover field, located in Wadi El-Natroun destrict in the western desert of Egypt. It was mass-reared in the laboratory (30 ±1C° and 70 ± 5% R.H) in plastic troughs (101) on larvae of *Anagasta kuehniella* Zell. as reported by (Claver *et al.* 1996). Laboratory emerged and mass-reared adult predators were used for assessing their biocontrol potential in a tomato field.

The experiments were conducted at Fayoum Governorate, Egypt in field plots (25 - 30 plants; plot size = 10 x 10 m) planted with tomato (Castle Rock variety). Plots were surrounded by a 1.5 m border of maize to create barrier and reduce movement of pests and predators (Biever and Chauvin, 1992). The plants were transferred after twenty days of sowing to the experimental plots. The following treatments were evaluated at separate plots:

Control (A): tomato plants infested with *B. tabaci* (3 plots)

Control (B): tomato plants infested with *A. gossypii* (3 plots)

Control (C): tomato plants infested with *S. littoralis* (3 plots)

Experment (A): tomato plants infested with *B. tabaci* with one adult predator/plant, (3 plots).

Experment (B): tomato plants infested with *A. gossypii* with one adult predator/plant, (3 plots).

Experment (C): tomato plants infested with *S. littoralis* with one adult predator/plant, (3 plots).

The total area of the present study was about half feddan. The number of pests per plant before the release is given in the corresponding tables in the results.

The infestaion levels of *B. tabaci* and *A. gossypii* were determined through the experimental peroid according to (Gameel, 1973). On the other hand, the infestation level of *S. littoralis* was evaluated by counting the larvae on a random sample of 25 plants from every replicate and the larvae were classified into different instars (Abd El-Whab, 1982).

The adult predator *C. africana* was released manually between the rows (1 adult predator/plant). After release, the plants were checked and the counts of alive *B. tabaci, A. gossypii* and *S. littoralis* were recorded weekly (Ambrose and Claver 1999).

A comparison between the yield in the experimental and control plots was determined according to Saito and Ito (1967).

The statistical equation of Henderson and Tilton (1955) was applied to calculate the reduction in populations of the three pests.

3. RESUITS AND DISCUSSION

The reduviid predator *C. africana* significantly suppressed the populations of *B. tabaci, A.gossypii* and *S. littoralis* (P>0.05) during the two years of release (1999-2001). The suppression percentage of *B. tabaci* (adult and immature stages) during the first year was (95.9 % and 88.76 %, respectively) in the first week and increased to reach (99.1 % and 100 %) in the third week. However, these values were 93.3 % and 89.4 % in the first week and 99 % and 97.6 % in the fourth week in the second year (Table 1). The reduction percentage of *A. gossypii* was 96.9 % in the first week during the first year and reached 98.9 % in the second week during the second year (Table 2). On the other hand, the population of *S. littoralis* was suppressed by 98.3 % and 98.6 % in the first and second year, respectively (Table 3).

The release of *C. africana* reduced the damage caused by *B. tabaci*, *A. gossypii* and *S. littoralis* in the total yield and it was highly significant reduced (P > 0.001). In the presence of the predator, the total yield was increased (from 23.5 to 33.1; 27.1 to 35.7 and from 21.1 to 32.71 ton/feddan), in the field infested with *B. tabaci*, *A. gossypii* ,*S. littoralis* respectively during the first year; opposed (from 24.1 to 32.5; 28.5 to 36.8 and from 32.5 to 32.9 ton / feddan respectively) during the second year. (Table 4).

Coranus africana consumed considerable numbers of *B. tabaci*, *A. gossypii* and *S. littoralis*, indicating its high potential for pest suppression (Tables 1-3). Awadallah *et al.* (1984) and Ambrose (1996) reported that the pest suppression potential by reduviids varied among species as well as from pest to pest.

It seems that reduviid bugs are a promising group of natural enemies that could be augmented for release in pest management programs. Thus, the reduction of infestation of *S. litura* , *Mytabris pustulata* and *Dysdercus cingulatus* in cotton field cages by the reduviid *Rhynocoris marginatus* F. have recently been documented by (Ambrose and Claver 1999). Also Ables 1978 reported the use of reduviid *Zelus renardii* kolenati against lepidopteran larvae in cotton plants. Ambrose (1996) reported more than 50 % suppression of *Helicoverpa armigera* Hubner, *S.litura* and *D.cingulatus* by four reduviid predators:*Acanthaspis pedestris* stal, *Catamiarus brevipennis* Serville, *R.marginatus* and *R.kumarii* Ambrose and livingstone in cotton field cages.

The reduviid *C.africana* reduced *B. tabaci, A. gossypii* and *S. littoralis* damage of the yield. The total yield increased to (33.1, 35.7 and 32.7ton / feddan, repectively in the first year opposed to 32.5,

Table (1): Supperssion of white fly *B. tabaci* by *C.africana* on tomato plant.

Treatment	No. of *B. tabaci*/ plant before release		No. of *B. tabaci*/plant after release							
			7th day		15th day		21st day		30th day	
	Adult	Immat-ure	Adult	Immat-ure	Adult	Immat-ure	Adult	Immat-ure	Adult	Immat-ure
1- First year Release	211	180	9 (95.9%)	22 (88.7%)	3 (98.6%)	17 (92.25%)	2 (99.1%)	-	-	-
Control	231	315	223	342	231	383	239	398	254	352
2. Second year Release	236	189	16 (93.3%)	35 (89.4%)	9 (96.4%)	21 (93.8%)	4 (98.5%)	12 (96.6%)	2 (99%)	7 (97.6%)
Control	241	325	248	361	256	373	286	294	224	321

Table (2): Suppression of cotton aphid *A. gossypii* by *C. africana* on tomato plants.

Treatment	No. of *A. gossypii*/plant before release	No. of *A. gossypii* /plant after release			
		7^{th} day	15^{th} day	21^{21} day	30^{th} day
1- First year					
Release	39	1 (96.9%)	-	-	-
Control	42	34	29	28	28
2. Second year					
Release	46	2 (97.2%)	1 (98.9%)	-	-
Control	42	66	83	90	76

Table (3): Suppression of cotton leafworm *S. littoralis* by *C. africana* on tomato plant.

Treatment	No. of *S. littoralis*/plant before release	No. of *S. littoralis* /plant after release			
		7^{th} day	15^{th} day	21^{21} day	30^{th} day
1- First year Release	158.8	52 (91.1%)	20 (98.3%)	-	-
Control	157.5	144.2	121.5	104.5	79.9
2. Second year Release	143.9	25 (95.9%)	18 (98.6%)	-	-
Control	146.5	136.1	114.2	87.6	69.9

Table (4): The total yield controlled by *C. africana* in tomato field plots infested with *B. tabaci*, *A. gossypii* and *S. littoralis*.

Treatment	Total yield (ton / feddan) in case of infestation with:		
	B. tabaci	***A. gossypii***	***S. littoralis***
1- First year Release	33.1± 0.16	35.7±0.78	32.7±0.69
Control	23.5±0.82	27.1±0.94	21.1±0.83
2- Second year Release	32.5±0.81	36.8±0.77	32.9±0.81
Control	24.1±0.69	28.5±0.80	23.56±0.92

36.8 and 32.9 ton / feddan, respectively in the second year (Table 4). Ambrose and Claver (1999) reported the reduction in cotton yield loss by *R.marginatus* that reduced *S. litura* leaf damage (32 %), *M. pustulata* bloom damage (35 %) and *D. cingulatus* lint damage (28 %).

Thus, the biocontrol potential of the augmentative release of *C. africana* is established. However, large-scale release is required. Efforts should be made to enhance the efficiency of economical mass production, beside developing an infrastructure that can ensure timely and adequate supplies of this natural enemy.

4. REFERENCES

Ables J. R.(1978). Feeding behaviour of an assassin bug *Zelus renrdii.* Ann. Ent. Soc. Amer. 71.476-478.

Abd-El-Wahab H. A.(1982). Biological and ecological studies on cotton leaf worm *Spodoptera littoralis* (Bosid.) (Lepidoptera: Noctuidae) on certain vegetable plants. M. Sc. Thesis, Fac. Agric., Alex. Univ.: 102 PP.

Ambrose D. P.(1996). Assassin bugs (Insecta: Heteroptera: Reduviidae) in biocontrol: Success and stratigies, a review. In: Biological and cultural Control of Insect pests: an Indian Scenario Ed. By AmBRose, D. P. Tirunel veli: Adcline pub. 262-284.

Ambrose D. P. and Claver M. A.(1999). Supperssion of cotton leaf worm *Spodoptera litura,* flower beetle *Mylabris pustuata* and red cotton bug *Dysdercus cingulatus* by *Ryhnocoris margintus* (Fabr.) (Het., Reduviidae) in cotton field cages. J. Appl. Ent. 123: 225-229.

Awadallah K. T., Afifi A. I. and El-Sebaey I. I. A (1990a). The biology of the reduviid, *Allaeocranum biannulipes* (Mont & signi), A predator of stored product insect pests. Bull. Soc. Ent. Egypt, 69: 169-181.

Awadallah K. T., Afifi A. I. and El-Sebaey I. I. A.(1990b). Population studies on meat meal insect pests and their associated natural enemies. Bull. Soc. Ent. Egypt, 69: 160-161.

Awadallah K. T.,Tawfik M. F. S. and Abdella M. M. H. (1984). Supperssion effect of the reduviid predator, *Alloeocranum* *biannulipes* (Mont. & Sign.) on populations of some stored product insect pests. Z. Ang. Ent. 97: 249-253.

Biever K. D. and Chauvin R. L. (1992). Suppression of the Colorado potato Beetle (Coleoptera: Chrysomelidae) with augmentative releases of predaceous stingbugs (Hemiptera: pentatomidae). J. Econ. Entomol. 85 (3): 720-726.

Claver M. A., Rajan K. and Ambrose D. P. (1996). Impact of mass rearing in the postembryonic development of *Rhynocoris kumarii* Ambrose & livingstone (Heteroptera: Reduviidae). Boil. and Cult. Cont. of insect pests an Indian Scenario Ed. by Ambrose, D. P. Tirunelveli: Adeline pub. 216-219.

El- Sebaey I. I. A. (1998). Biological and morphological studies on *Coranus aegytius.* (Hemiptera-Heterotera-Reduviidae). Egypt. J. Agric. Res., 76: 933-945.

El-Sebaey I. I. A (2001a). *Coranus africana* Sp. Nov., a new harpactorin (Reduviidae-Hemiptera) from Egypt. Egypt. J. Agric. Res. 80(1):211-217.

El-Sebaey I. I. A. (2001b). Biology and predation rates of the assassin bug *Coranus africana* El-Sebaey (Hemiptera: Reduviidae) on the cotton pests, *Spodoptera littoralis* Bosid. and *Agrotis ypsilon* Root., Bull. Fac. Agric. Cairo Univ., 52: 655-668.

El-Sebaey I. I. A (2001c). Biological aspects and predation of *Coranus africana* El-Sebaey (Het: Reduviidae: Harpactorinae) on the laboratory preys *Anagasta kuehniella.* and *Corcyra cephalonica.* Egypt. J. Bio. Pest Cont., 11 (2): 57-62.

El-Sebaey I. I. A.. El-Shazly M. M. and Abd El-Wahab H. A. (2001). Seasonal changes in the population density of *Coranus africana* El-Sebaey in Egypt as indicated by life table parameters. Egypt. J. Agric. Res. 80 (2).

Fadare T. A. (1978). Efficiency of *Phonoctonus* spp. (Hemiptera: Reduviidae) as regulators of populations of *Dysdercus* spp. (Hemiptera. Pyrrhocoridae). Nigerian J. Entomol. 1: 45-48.

Gameel O. I. (1973). Field evaluation of insecticides for jassid, *Empoausca lybica* (De-Berg) and whitefly *Bemisia tabaci* (Genn.) control on cotton. Bull. Ent. Soc. Egypte, Econ. Sen., 7: 113-122.

Hafez M., Fayad Y. H, and Sarhan A. A. (1979). Preliminary indication of effect of Nuvacron ULV on abundance of predators in cotton field in Egypt. Agric. Res. Rev. 55: 11-116.

Henderson C. F. and Tilton E. W. (1955). Test with acaricides against the brown wheat mite. J. Econ. Entomol., 48: 157-161.

Hill D. S. (1999). The economic importance of insects. Chapman & Hall, 22-6 Boundary Row, London SE1 8HN. 39 spp.

Hough G. J and Whalen J. (1993). Inundative release of predatory stink bugs for control of Colorado potato beetle. Biol. Cont., 3: 343-347.

James D. G. (1994). Prey consumption by *Pristhesancus plagipnnis* Walker (Hemiptera: Reduviidae) during development. Aust. Entomol., 21: 42-48.

Knipling E. F. (1966). Some basic principles in insect population suppression. Bull. Entomol. Soc. Amer. 12: 7-15.

Mc-Danile S. G. and Sterling W. L. (1982). Predation of *Heliothis virescens* (F.) eggs on cotton in East Texas. Environ. Entomol. 11, 60-66.

Nyirra Z. M. (1970). The biology and behaviour of *Rhynocoris albopunctatus* (Hemiptera: Reduviidae). Ann. Ent. Soc. Am. 63: 1224-1227.

Rosenhim J. A. and Wilson L. R.(1993). Predators that eat other predators distrupt cotton aphid control. Calif. Agric. 47: 7-9.

Sahayaraj K. and Ambrose D. P.(1997). Predatory potential of *Acanthaspis pedestris* (Hemiptera: Reduviidae) to *Helicoverpa armigera* on bhendi. Madras. Agric-J., 84: 294-295.

Saito T. and Ito H. (1967). Studies on growth and fruiting in the tomato, VIII. Physiological studies on flower formation. J. Jap. Soc. Hort. Sci., 36:79-90.

Schaefer C. W. and Ahmad I. (1987). Parasites and predators of pyrrhocoroidea (Hemiptera), and possible control of cotton stainers by *Phonoctonus* spp. (Hemiptera: Reduviidae). Entomophaga 32, 269-275.

Singh J, Sohi A. S., Brar D. S., Brara K. S. and Shenhmar M.(1997). Changing scenario of predator complex in cotton agro-ecosytem in Punjab. Ins. Environ. 2: 122-123.

مكافحة الذبابة البيضاء *Bemisia tabaci* والمن *Aphis gossypii* ودودة ورق القطن *Spodoptera littoralis* بالمفترس *Coranus africana* **El-Sebaey** (فصيلة البق السفاح ــ رتبة نصفية الأجنحة) فى حقول الطماطم

إيمان إبراهيم عبد الرحمن السباعى ــ حورية على عبد الوهاب

معهد بحوث وقاية النبات ــ الدقى ــ الجيزة

ملخص

تم الإكثار المعملى للمفترس *Coranus africana* El-Sebaey وإطلاقه لمكافحة ثلاث آفات لنباتات الطماطم هى *Bemisia tabaci* Genn والمن *Aphis gossypii* Glover ويرقات دودة ورق القطن. *Spodoptera littoralis* Bosid بالحقل واتضح من الدراسة انخفاض نسبة الإصابة بالأطوار الكاملة وغير الكاملة للذبابة البيضاء إلى ٩٩,١% ، ٩٢,٢٥% على التوالى وكانت نسبة خفض الإصابة بالمن ٩٦,٦% ودودة ورق القطن ٩٨,٦% فى العام الأول، فى المقابل كانت نسبة خفض الإصابة فى العام الثانى للثلاث آفات هى (٩٩% ، ٩٧,٦%) و(٩٨,٩%) و (٩٨,٦%).

تم أيضا تقدير المحصول الناتج بعد مكافحة الثلاث آفات *B.tabaci* و *A. gossypii* و *S. littoralis* فكان فى العام الأول ٣٣,١، ٣٥,٧، ٣٢,٧ طن/ فدان ، على التوالى وكان فى العام الثانى المحصول ٣٢,٥، ٣٦,٨، ٣٢,٩ طن/ فدان، على التوالى.