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New Record Of Hymenopterous Parasitoids In Rice Fields

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ABSTRACT

Rice ecosystems are rich in natural enemies, particularly parasitoids. The current investigation was carried out at the experimental farm of Rice Research and Training Center (RRTC), Sakha, Kafr El-Sheikh during 2014 and 2015 rice seasons. The objective was to survey hymenopterous parasitoids occurring in rice fields. Specimens were collected from rice nursery and paddy field by sweep net, pitfall trap, water pan trap, light trap and D-vac machine. Thirty-nine species of parasitoids were recorded, belonging to fifteen families. Sixteen parasitoid species, in four families are recorded herein for the first time in the Egyptian rice fields. The most abundant species were Dipriidae (3 species) and *Gronotoma* sp. (Figitidae). While, *Opius hediqusti* Fish., *Aphenogomus* sp., *Camptoptera* sp. *Callitula* sp. *Trissolcus* sp., *Telenomus* sp., and *Oligosita* sp. The rest of 23 species were less numbers during the two seasons.

Keywords: Parasitoids, Hymenoptera, rice nursery, paddy field, Egypt.

INTRODUCTION

The surveyed insects from rice fields were found belonging to a wide range of insect orders, from which are stem borer, leaf miner and leafhoppers and planthoppers, these insects were surveyed worldwide attacking rice plants (Nault and Ammar 1989, Wilson and Claridge, 1991, Sherif *et al*. 2008, Prayana et al. 2013 and Hendawy and El-Habashy, 2014).

Hymenoptrous parasitoid have an important role in managing rice insect pests. Thus, these beneficial arthropods constitute an essential component of integrated pest management system.

Rice fields are complex agro-ecosystem, containing many natural enemies species (Hendawy *et al*. 2005 and Hendawy *et al*. 2016).

Egg parasitoids such as *Trichogramma* spp. have been widely utilized as biocontrol agents (Abbas 1998, Anonymous 2002). In Egypt, release of *Trichogramma evanescens* West. achieved a good control to the rice stem borer, *Chilo agamemnon* Bles. (Soliman and Ewaise, 1997 and Sherif *et al*. 2008). The hymenopterous egg parasitoids; *Oligosita* sp. (Trichogrammatidae) and *Anagrus* sp. (Mymaridae) performed 29-91% control of brown planthoppes (Claridge *et al.* 1999). These parasitoids parasitized on a variety of hosts, thus, killing far more pests than commercial insecticides do (Abdulai and Shepard 2003).

Biological control using parasitoids is an alternative pest control strategy that is currently being developed to replace the role of pesticides that tend to harm the environment and public health. Practical and more rational methods of biological control have been introduced to enhance the role of parasitoid complex through habitat management (Yaherwandi, 2012). The Egyptian rice fields were found rich with natural enemies Hendawy (2001). In Egypt, Sherif *et al*. (2005) indicated that the biological control component is highly emphasized at (RRTC). About 12% of *H. prosternalis* larvae were killed by the parasitoid, *Opius hedqusti* (El-Habashy, 2003). Eggs of leafhoppers and planthoppers are parasitized by *Oligosita* spp., *Paracentrobia* spp., *Anagrus* spp., *Gonatocerus* spp. and *Camptoptera* spp. (Hendawy, 2001). Species of Trichogrammatidae, Braconidae and Eulophidae are considered of economic importance. It is very often are obtain egg parasitoids such as *Trichogramma* spp., *Anagrus* spp. And *Telenomus* spp. emerging stem borer egg mass and hoppers (leaf - planthoppers). Parasitoids are occurring in rice fields, and signify an important component of paddy fields either as insect pests or as natural enemies (Ooi and Shepard. 1994). From the bioagent point of view, it is necessary to maximize the role of hymenopterous parasitoids to control the insect pests in rice ecosystem (Yaherwandi, 2012). Therefore, this study aimed to study the diversity and abundance of hymenopterous parasitoids associated with the main insect pests attacking rice nursery and paddy field.

MATERIALS AND METHODS

1. Experimental Field:

This experiment was conducted out at the experimental farm of Rice Research and Training Center (RRTC), Sakha Agricultural Research Station, Kafr El-Sheikh**.**

Rice nursery (about 200 m2) was sown on May 5th, 2012 and 2013 with the seeds of Giza 178 rice cultivar, and transplanting was done in one- feddan area one month later (June 5th) at 20X20 cm spacing between rows and hills, with 2-3 seedlings/hill. Thiobencarb (Saturn) herbicide at a rate of 2 L/fed was applied for weed control five days after transplanting. No other pesticides were used during the experimental period either in the experimental field or in the surrounding areas, at least 10m-wide. All other cultural practices were adopted as recommended.

2. Sampling technique

Throughout the period extending from May up to September, 2014 and 2015 seasons, both rice nursery and permanent field were sampled to collect occurring parasitoids, using:

Sweep net :

Parasitoids were collected using a sweep net of 30 cm. in diameter and 55 cm. deep. At samples, 10 and 50 double strokes at rice nursery and at permanent field, respectively was taken by walking diagonally. Collected insects were transferred to plastic bags, and transferred directly to the laboratory for further studies.

Pitfall trap:

Five plastic jars (9 cm diameter and 12 cm height) were fixed at each site at 10 m. distance in an alternating pattern along the length of rice nursery bunds in the selected fields. Each trap was provided with water to a height of 8 cm. in addition, the trap was provided with 3% formalin and a detergent. Pitfall traps were embedded in the dikes of nursery and paddy field. The traps were emptied once every three days and once a week, in the nursery and permanent field respectively and the catches were kept in ethanol (75%).

Water pan trap:

Five plastic plates, 15 cm in diameter and 8 cm deep, were set floating on water without covers and filled with water to 5 cm height. Formalin 3% was used as preservative plus some drops of detergent added to break the surface tension. The traps were set continuously and emptied once every three days and weekly, in the nursery and permanent field, respectively. The trapped insects were sieved through a fine textile and collected.

Light trap:

It consists of two main parts; a source of light and recipient to collect the attracted insects. The insects, attracted by light, lie in the recipient that is provided with water and alcohol. The source of light was fixed 5-10 cm. above the fluid. The trap is operated by switching the lamp on for 4 hours after sunset, and the trapped insects are collected every morning. Sampling began 10 days after rice sowing, and continued every three days till transplanting. The height of the tarp was adjusted according to height of the rice plants.

D-Vac Machine:

Sampling began 25 days after rice transplanting, in the permanent field and continued every month till harvest. D-vac machine was operated for two minutes in the whole area of the nursery, and five minutes in the rice (permanent) field.

3. Preservation and identification of collected insects:

Captured arthropods were introduced into a wide - mouthed cyanide jar with a closed cap, and transferred to the laboratory. Specimens were sorted into parasitoids, insect predators and true spiders, and kept in glass vials containing 70% ethyl alcohol. Specimens were sorted and identified at Entomology laboratory at Rice Research and Training Center (RRTC), Sakha Agricultural Research Station . Two complementary references were used to identify and confirm identifications of collected parasitoids ; Barrion and Litsinger reference (1994) and Hendawy's Collection kept at RRTC.

RESULTS AND DISCUSSION

Data in Table (1) present the parasitoids collected by pitfall trap, water pan trap, D- vac. and sweep net from rice nursery and paddy field during 2014 season. The captured parasitoids were 705 individuals belonging to 15 families; 31 species were identified but one was not identified. The most abundant species were Dipriidae species (150 indiv.) followed by *Gronotoma* sp. (78 indiv.). Seven species were abundant; *Opius hediqusti* Fish., *Aphenogomus* sp., *Camptoptera* sp. *Callitula* sp. *Trissolcus* sp., *Telenomus* sp., and *Oligosita* sp., and 23 species were less abundant.

In the second season, 2015 (Table 1) The captured parasitoids were 803 individuals belonging to 15 families; 35 species were identified but one was not. The most abundant species were diapriids (210 indiv.) followed by *Gronotoma* sp. (84 indiv.). There were 7 abundant species; *Opius hediqusti* Fish., *Aphenogomus* sp., *Camptoptera* sp. *Callitula* sp. *Trissolcus* sp., *Telenomus* sp., and *Oligosita* sp. and 25 species were less abundant.

These results are in agreement with those of Hendawy (2001) in Egypt, who surveyed five hymenopterous species as egg parasitoids, *Anagrus* spp., *Gonatocerus* spp., *Camptoptera* sp. (Mymaridae), *Oligosita* spp. and *Paracentrobia* sp. (Trichogrammatidae) were reared from leafhopper and planthopper eggs. Larvae of dryinid wasps, *Echthrodelphax migratorius* Benoit were detected from *Sogatella vibix* (Haupt) and *S. furcifera* Horv. nymphs.

Hidrayani *et al*. (2013), in Indonesia, determined the species diversity of lepidopteran egg parasitoids in paddy fields. The species found were *Telenomus* sp., *Tetrastichus* sp., and *Trichogramma japonicum* parasitizing *Scirpophaga incertulas* with parasitization levels of 29.54; 13.02; and 2.05%, respectively and they found that the most abundant species of lepidopteran egg parasitoids were *Telenomus* sp. and *Trichogrammatoidea* sp. Liljesthröm *et al*. (2014) and Mita *et al*. (2015) reported that egg masses of *Nezara viridula* (L.) are commonly parasitized by *Trissolcus basalis* (Woll.). Nacro and Nenon (2009) in Burkina Faso, identified two common parasitoids associated with family Cecidomyiidae. These are *Platygaster diplosisae* Risbec (Hymenoptera: Platygastridae) and *Aprostocetus procerae* Risbec (Hymenoptera: Eulophidae). These two parasitoids are the primary biological control agents. *P. diplosisae* is a gregarious larval parasitoid whereas *A. procerae* is a solitary pupal parasitoid of the Cecidomyiidae.

Egg parasitoids of stem borer and leaf folder such as *Trichogramma* and *Telenomus*; egg parasitoids of leaf and planthoppers like *Oligoseta* sp., *Paracentrobia* sp. *Anagrus* and *Gonatocerus,* and larval parasitoids such as *Opius* sp., *Cotesia sp. and Apanteles* play very important roles in pest suppression under natural field conditions.

Thirty-eight species were recorded, belonging to fifteen families (Table 1), as well as four families and sixteen parasitoid species were found as first record in the Egyptian rice fields. Species occurring in rice fields in two seasons, by all methods of collection in this study, indicated that the most occurring parasitoids were belonging to Diapriidae (21.28 and 26.15 % in 2014 and 2015 seasons, respectively); followed by Figitidae (11.06 and 10.46% in 2014 and 2015 seasons, respectively).

Thirty-eight parasitoid species were surveyed in both seasons (Table 1). All species were found in 2015, while 33 species were surveyed in 2014 season.

The parasitoids, *Goniozus* sp., *Hemiptarsenus* sp., *Aprostocetus* sp., *Pediobius* sp. and *Temelucha* sp. were found in the second season only (2015).

Spider eggs suffer high mortality from some organisms such as wasps (Austin 1985). *Idris* sp. and *Baeus* sp. attack spider eggs. *Idris flavicornis* Foerster has been reared from the eggs of lycosid spidsrs, Arctosa perita (Latreille) and Pardosa spp. (Huggert, 1979). *Baeus* is strongly associated with eggs of two spider families, Araneidae and Theridiidae (Austin , 1985).

able (1): Hymenopterous parasitoids occurring in rice fields, and their relative occurrence .

Family	Species	Host(s)	Host stage(s) attacked	2014		2015	
				No.	Occurrence %	No.	Occurrence %
Bethylidae*	*Parsierola* sp.*	Lepidoptera	Larvae	19	2.69	20	2.49
	Goniozus sp.*	Lepidoptera	Larvae	0	0	3	0.37
	Apanteles sp.	RSB	Larvae	9	1.28	3	0.37
Braconidae	*Opius hediqusti* Fisher	RLM	Larvae	28	3.97	**33**	4.11
	Cotesia sp.	RSB	Larvae	19	2.69	16	1.99
Ceraphronidae*	*Aphanogmus* sp.*	Hyperparasitoid	Larvae	39	5.53	45	5.60
Diapriidae	*Loxotropa* sp. *Psilus* sp. *Trichopria* sp.	Dipterous insects	Larvae	**150**	**21.28**	**210**	**26.15**
Dryinidae	*Echthrodelphax migratorius* Benoit	*Sogatella* sp.	Nymph and Adult	4	0.57	5	0.62
Encyrtidae*	Unidentified male*	Unknown	Unknown	3	0.43	4	0.49
Eurytomidae*	*Eurytoma* sp.*	Unknown	Larvae	10	1.42	6	0.75
	Tetrastichus sp.	Unknown	Larvae	15	2.13	20	2.49
	Chrysocharis sp.*	Agr. flies	Larvae	11	1.56	9	1.12
	Hemiptarsenus sp.	Agr. flies	Larvae	0	0	1	0.12
Eulophidae	*Pinigalio* sp.*	Agr. flies	Larvae	17	2.41	15	1.87
	Elasmus sp.	Lepidoptera	Larvae	14	1.98	10	1.25
	Aprostocetus sp.*	Unknown	Larvae	0	0	1	0.12
	Pediobius sp.*	Unknown	Larvae	0	0	1	0.12
Figitidae	*Gronotoma* sp.	Unknown	Larvae	**78**	11.06	84	10.46
Ichneumonidae	*Gelis* sp.*	Hyperparasitoid	Larvae	7	0.99	3	0.37
	Temelucha sp.	RSB	Larvae	0	0	1	0.12
	Camptoptera sp.	Unknown	Egg	29	4.11	34	4.23
Mymaridae	*Gonatocerus* sp.	L & P	Egg	13	1.84	11	1.37
	Anagrus sp.	L & P	Egg	17	2.41	14	1.74
	Homoporus sp.*	Lepidoptera	Larvae	19	2.69	20	2.49
Pteromalidae	*Pteromalus* sp.*	Lepidoptera	Pupae	11	1.56	10	1.25
	Callitula sp.*	Lepidoptera	Larvae	24	3.40	31	3.86
	Spalangia sp.*	Dipterous insects	pupae	3	0.43	2	0.25
	Trissolcus basalis (Wol)	*Nezara viridula*	Egg	27	3.83	32	3.99
Scelionidae	*Telenomus* sp.	Lepidoptera	Egg	47	6.67	55	6.85
	Idris sp.*	Unknown	Spider eggs	16	2.27	19	2.37
	Platyscelio sp.	Unknown	Egg	5	0.71	8	0.99
	Baeus sp.*	Unknown	Spider eggs	5	0.71	7	0.87
Trichogram-matidae	*Trichogramma evanescens* (Westwood)	Lepidoptera	Egg	15	2.13	13	1.62
	Oligosita sp.	L & P	Egg	31	4.39	33	4.11
	Paracentrobia sp.	L & P	Egg	11	1.56	14	1.74
Platygastridae	*Platygaster* sp.	Gall midge	Eggs/Larvae	9	1.28	10	1.25
Total				705	100	803	100

*** Families and Species are recorded for the first time in rice fields in Egypt, RSB= Rice stem borer, RLM = Rice leaf miner=, L & P = Leaf and planthoppers, Agr. flies =Agromized flies**

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تسجيل جديد لأشباه الطفيليات من رتبة غشائية الأجنحة في حقول الأرز

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(٢) قسم الحشرات الاقتصادية - كلية الزراعة - جامعة المنصورة

أجريت الدراسة الحالية في كل من مزرعة ومعمل مركز البحوث والتدريب في الأرز – محطة البحوث الزراعية بسخا – كفر الشيخ خلال موسمي 2014 و 2015. كان الهدف من الدراسة هو حصر أنواع طفيليات غشائية الأجنحة المرتبطة بالآفات التي تهاجم محصول الأرز في كل من المشتل والحقل المستديم. أستخدم لجمع الطفيليات ، شبكة جمع الحشرات ، مصائد الحفرة ، المصائد المائية ، آلة شفط الحشرات و المصيدة الضوئية. سجل ثلاثون طفيليا في الموسم الأول (2014) وهناك نوع آخر لم يتعرف عليه ، بينما تم تعريف 15 عائله و 35 نوعا من الطفيليات في الموسم الثاني (2015). سجل في هذه الدراسة أربع عائلات و 16 نوعا من الطفيليات لأول مرة في حقول الأرز بمصر وكانت الطفيليات الأكثر وفرة في التعداد تابعة لعائلة Diapriidae (ثلاثة أنواع). وطفيل *Gronotoma* sp. من عائلة (Figitidae) كما كان هناك سبعة أنواع متواجدة بوفرة وهي *Opius hediqusti* Fish., *Aphanogmus* sp., *Camptoptera* sp. *Callitula* sp. *Trissolcus* sp., *Telenomus* sp. و *Oligosita* sp.. في حين كانت الأنواع الباقية من الطفيليات أقل وفرة في خلال الموسمين.