Population Status of Biological Control Agent: *Sphegigaster* spp (SPINO.) (Hymenoptera, Pteromalidae) as a Parasitoid on Soybean Stem Fly *Melanagromyza sojae* (ZEHNT.) (Diptera, Agromyzidae) in the Nubaria Region of Egypt

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ABSTRACT

The soybean stem fly (SSF), *Melanagromyza sojae* (Zehntner) (Diptera: Agromyzidae), is highly polyphagous and attacks various host plant species in the family Fabaceae, such as soybean and other beans. A field survey was conducted during the 2016 and 2017 seasons at the Nubaria Agriculture Research Station, Egypt, to follow populations of the SSF on soybean cultures. The parasitoid *Sphegigaster* spp was identified and recorded for the first time as a solitary parasitoid on SSF pupa. The parasitoid's morphology was studied by using The scanning electron observations of the morphology confirms the genus of the parasitoid. The insect injurious stage of SSF on soybean plantations was larva that feeds inside the plant stem then convert to pupa during Jun.-Sept. (2016-2017). The level of SSF infestation was severe compared with insect pests orders Hemiptera and Lepidoptera. The infested plants by *M. sojae* and the level of parasitism (non-parasitized and parasitized SSF pupae) were estimated during 2016 and 2017 seasons. The results indicate that the exit hole of *M. sojae* is associated with the entry of the parasitoid into a pupa. The Parasitism percentages on SSF pupae by *Sphegigaster* parasitoid increased gradually up to 38.7% in August 2016, while it is 34.3% in August 2017. In September 2016 and 2017, respectively and then started to decrease in September where it was 16.7%, 22.2% in two successive seasons. Finally, the average of parasitism percentages on SSF pupae by their parasitoids *Sphegigaster* spp was 23.4% in 2016, while it is 26.7% in 2017. The *Sphegigaster* spp sex ratios were male biased, being respectively 52% (14 females and 15 males) in 2016 and 62% (12 females and 20 males) in 2017. The result point to the first record of the parasitoid *Sphegigaster* spp in Egypt on SSF pupae offers a promising opportunity for a biocontrol of soybean stem fly under local agronomic and climate conditions. Therefore, the presence of the parasitoids of *M. sojae* in Egypt was useful for the development of biocontrol methods to limit its impact on regional soybean production.

Keywords: Soybean Stem Fly, *Sphegigaster* spp wasp, biocontrol agent, leguminous protection.

INTRODUCTION

Soybean (*Glycine max* L.) Merrill is one of the most economical and valuable agricultural commodities because of its unique chemical composition among cereal and other leguminous species (Liu, 1997). Egypt alone cultivates about 9,000,000 ha of soybean per year (FAO, 2017).

The soybean stem fly (SSF), *Melanagromyza sojae* (Zehntner) (Diptera: Agromyzidae) has been reported in diverse global regions (Dempewolf, 2004). This pest is highly polyphagous and attacks various host plant species in the family Fabaceae, such as soybean and other beans. Soybean stem fly is one of the most important pests of soybean in Brazil and Africa (Arnemann *et al.*, 2016a), parts of Russia (Strakhova *et al.*, 2013), Asia (China and India) (Wang and Gai, 2001; Thapa, 2012). In Northern Australia, SSF was also recorded as the major pest in soybean, increasing percentage of infestation from 13% in 2007 to 30% in 2009 (Guedes *et al.*, 2017; Singh *et al.* 2013). Moreover, an outbreak of larvae of *M. sojae* in Paraguay was recorded as it infested 100% of soybean plants and tunneling in almost 70% of stems (Guedes *et al.*, 2017).

The *M. sojae* is also a very destructive pest in Egypt, frequently causing 100% infestation of soybean plants, affecting different crop growth stages (Abdallah *et al.*, 2014). Larvae damage the soybean stem, thereby impacting plant growth, leading to reduced soybean yield to 35% in Nubaria and 30% in Benha (Hanan Alfy *et al.*, 2016; and Hanan Alfy, 2017).

Biological control could be significant in managing of this dangerous insect pest (Naik *et al.* 2013; Gaur *et al.* 2015; Arnemann *et al.* 2016a,b). Generally, the management strategies result in early sowing dates. However, biological control is done in some part of the world, as it was emphasized as an important remediation

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strategy to control pest outbreaks by many entomologists (Singh *et al.,* 1991; Shanower *et al.,* 1998; Tiwari *et al.,* 2006; Beche *et al.* 2018). The most abundant biological control is parasitism by the parasitoid wasp *Syntomopus parisii* (Hymenoptera: Pteromalidae) in Brazil and Paraguay, but this beneficial insect is not already mass cultured (Beche *et al.,* 2018).

Many species of *Sphegigaster* parasitoids are known as biological control agent of family Agromyzidae (Diptera) and solitary parasitoid on SSF pupa. Identifying a local parasitoid of SSF would be of major interest because its use will not unbalance natural and agronomic trophic chains, and it will be acclimated to local conditions. The aim of the present study is to examine a collection of SSF pupae from the field cultivated with soybean during two successive years to record emerging parasitoid.

MATERIALS AND METHODS

Soybean planting

This survey was carried out in an experimental farm of the Nubaria Agriculture Research Station, 46 Km Cairo-Alexandria Road, Egypt, during mid of May 2016 and 2017 soybean seasons. The soybean variety Giza III was planted on an area of 1200 m^2. The regular management practices were adopted as per recommendations without insecticidal treatments.

Grades of SSF infestation

Grades of infestation plants experimental were carried out by random collection of soybean plants (50 plants) after forty-five days from planting, were collected monthly for four months (June, July, August and September) from Nubaria farm in Egypt during two seasons (2016 and 2017). Grades or levels of infestation were computed according to the formula of (Zaghloul *et al.*1998) classified into three grades of infestation according to the number of every insect separately from soybean plant. Three orders of insect pests (Diptera, Hemiptera and Lepidoptera) were inspected due to relate with soybean plantations. In this experimental, the insect injurious stage, time of occurrence, degree of occurrence and level of infestation of each previous insect pests orders was studied. Grades of infestation were divided into 3 grades (levels): grade A: representing low infestation, (L) grade B: showing moderate infestation (M), grade C: expressing severe infestation (S).

Inspection of collected samples

The samples of soybean (50 plants) were collected monthly and randomly after forty-five days from planting for general survey. The samples collected in June, July, August and September from Nubaria farm in Egypt during two seasons (2016 and 2017). The collected plants were dissected in the laboratory to separate SSF pupae that transferred to small cups tightly covered with a cotton tissue by means of a rubber band. The pupae were observed daily until the emergence of *Melanagromyza sojae* adults and/or parasitoids. Parasitoids were preserved separately in 70% ethanol. The number of infested plants by *M. sojae* and level of parasitism by parasitoid *Sphegigaster* spp (non-parasitized and parasitized SSF pupa), were calculated.

Scanning Electron Microscope (SEM):

Specimens were examined under scanning Electron Microscope to identify key morphological features of the parasitoid as the following steps (Tahmasebi *et al.*, 2015). Small pieces of fresh specimens of *Melanagromyza sojae* pupa and their parasitoid were removed and fixed by immersing them immediately in 4F1G (Fixative, phosphate buffer solution) PH=7.4 at 4°C for 3 hours.

1. Specimens were then postfixed in 2% Osmium tetroxide (OsO4) in the same buffer at 4°C for 2 hours.
2. Samples were washed in the buffer and dehydrated at 4°C through a graded series of ethanol.
3. The *Melanagromyza sojae* pupa and their parasitoid samples were dried by means of a critical point method, mounted using carbon paste on an AL- stub and coated with gold up to a thickness of 400 A in a sputter – coating unit (JFC-1100 E) .

The morphological observations were performed in a Jeol JSM- 5300 Scanning Electron Microscope (operated between 15 and 20 KeV).

The above procedures were conducted in the Electron Microscopy Unit, Faculty of Sciences, University of Alexandria.

Parasitoid as biological control agent:

The parasitoid *Sphegigaster* spp (SPINOLA) (Pteromalidae: Hymenoptera) was identified and recorded for the first time at Nubaria farm Egypt as a solitary parasitoid on SSF pupa that collected from soybean plantations. The parasitoid's morphology was studied by using the scanning electron micrographs (SEM), all specimens were assigned to the genus *Sphegigaster*, family Pteromalidae, sub family Pteromalinae. The *Sphegigaster* spp sex ratios were studied; males were identified as individuals devoid of an ovipositor. The identity of parasitoid was confirmed by literature according to (Graham 1969, Boucek 1988, Boucek and Rasplus 1991, Gibson *et al*., 1993, Sureshan 2003, Sureshan and Narendran 2004), on the other hand, the identification of the parasitoid to species under study and remains to be done in our next study.

Statistical analysis

Statistical analysis was fulfilled using (ANOVA) one-way F-test and calculated the LSD test statistically significant at $p \leq 0.05$.

RESULTS

The damages of soybean stem fly on soybean

The soybean plantations at Nubaria farm, Egypt, infected by many important insect pests in two seasons (2016 and 2017). Table 1 showed that the three orders of insect pests (Diptera, Hemiptera and Lepidoptera) were associated with soybean plantations at Nubaria farm, this study noted also the insect injurious stage, time of occurrence, degree of occurrence and level of infestation of each previous orders were also recorded. The insect injurious stage on soybean plantations at Nubaria farm were larva from Diptera that feeds inside soybean stems, while adult and nymph from Hemiptera and the larva from Lepidoptera. *M. sojae* larva develops to pupa inside the soybean stems as shown in Figure 1 that illustrates the typical *M. sojae* pupae and emergence hole of both SSF and parasitoids. The time of occurrence of infestation on soybean plantations were between Jun. and Aug. (2016 and 2017) for Diptera (soybean stem fly), while for Hemiptera and Lepidoptera all over the seasons. The degree of infestation was abundant for soybean stem fly and frequent for Hemiptera and Lepidoptera. The level of infestation was severe with soybean stem fly (Diptera), weak to moderate (Hemiptera) and moderate (Lepidoptera). The data in Table 1, showed that *Melanagromyza sojae* (soybean stem fly, Diptera) was highly existence compared with other insect pests in orders Hemiptera and Lepidoptera.

Parasitoid *Sphegigaster* spp and *M. sojae* pupa ultrastructure

All specimens were assigned to the genus *Sphegigaster*, family Pteromalidae, sub family Pteromalinae. The parasitoid's morphology, parasitoid length is 1.5-2 mm. Body is shiny black, cylinder, with brown legs. Antennae have transverse funicular segments; F1 shorter than pedicel; gaster oval, shorter than mesosoma; petiole length nearly 3X width; hind margin of T1 with middle portion truncate. Males were identified as individuals devoid of an ovipositor. Figure (2) showed the *Melanagromyza sojae* pupa (A, B and C) and its parasitoid *Sphegigaster* spp (D, E, F and G) by using the Scanning Electron Micrographs (TEM), A; whole pupa, B; pupa after emerging adult female, C; pupa after exit the parasitoid, D; whole parasitoid, E; antenna with abdominal view, F; lateral view for front body, G; lateral view for gaster part.

Sphegigaster spp wasp as biological control agent:

After forty-five days of planting soybean plant, 50 plants were collected monthly for four months during two successive seasons 2016 and 2017 to study many parameters as shown in Table (2). The number of infested plants by *Melanagromyza sojae* and levels of parasitism in soybean field samples were recorded. In season 2016, the total infested plants by *M. sojae* were 54 plants. Each infested plant contained inside two or three SSF pupae, indicated that the SSF pupae in plants were 124 plants. The amount of parasitism measured by calculation the non-parasitized and parasitized SSF pupae by parasitoid, *Sphegigaster* spp (Figure 3), which belong to family Pteromalidae, order Hymenoptera were 95 and 29 pupae, respectively. In 2017, the total infested plants by *M. sojae* were 60 plants from 200 collected plants and the SSF pupae in plants were 120 pupae. The non-parasitized and parasitized SSF pupae by the parasitoid *Sphegigaster* spp were 88 and 32 pupae, respectively.

Parasitism on soybean stem fly pupa

The parasitism on SSF pupae by *Sphegigaster* parasitoid was calculated monthly from June to September during two seasons 2016 and 2017. The data in Table (3) show the parasitism percentages on SSF pupae by *Sphegigaster* parasitoid increased gradually up to 38.7% in August 2016, while increased also gradually to 34.3% in August 2017. In September 2016 and 2017, the parasitism percentages on SSF pupae decreased to 16.7% and 22.2%, in respect. The rise of the parasitism percentages on SSF pupae by *Sphegigaster* parasitoid was related to the increase of the SSF population on soybean plants during June, July, August and September in 2016-2017 seasons. (Tables 1 and 3).

Table 1.Insect pests associated with soybean plantations at Nubaria farm in seasons 2016 and 2017

Order	Family	Insect injurious stage	Time of occurrence	Degree of occurrence	Level of infestation
Order: Diptera					
Melanagromyza sojae (Zehnt.) (soybean stem fly)	Agromyzidae	Larva	Jun.-Aug.	Abundant	Severe
Order: Hemiptera					
Bemisia tabaci (Gennadius) (whitefly)	Aleyrodidae	Adult & nymph	All over the season	Frequent	Weak - Moderate
Nezara viridula L. (Green stink bug)	Pentatomidae				
Aphis craccivora Koch (legume aphid)	Aphididae				
Order: Lepidoptera					
Lampides boeticus L. (Pea blue butterfly)	Lycaenidae	Larva	All over the season	Frequent	Moderate
Etiella zinckenella Trei. (Pea pod borer)	Pyralidae				
Spodoptera littoralis (Boisd.) (Egyptian cotton leafworm)	Noctuidae				

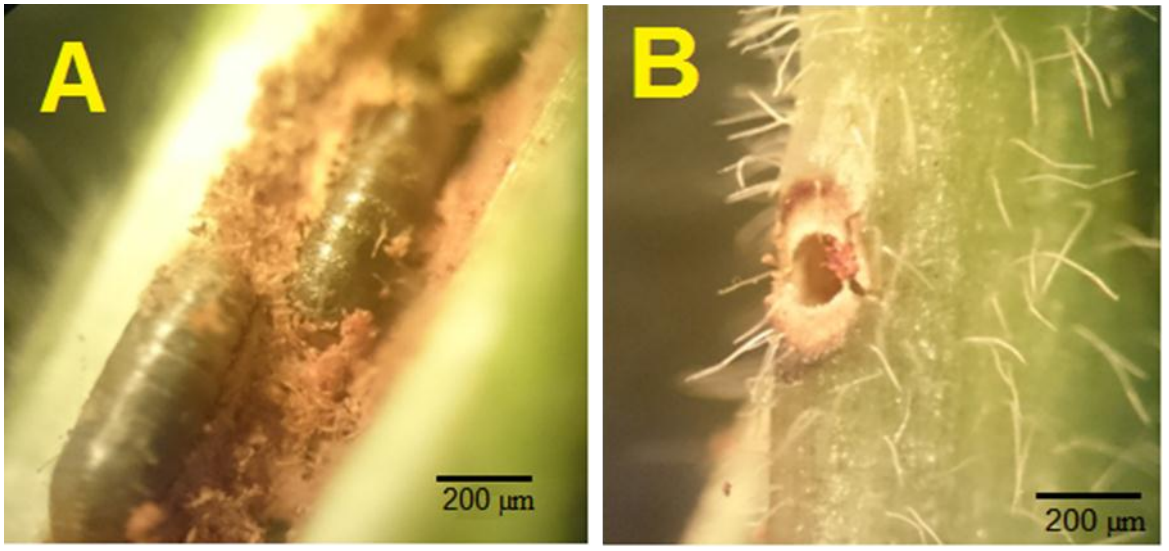

Figure 1. A: Light microscope of *Melanagromyza sojae* pupae, in B: showing the opening where the *M. sojae* adult and also their parasitoid *Sphegigaster* spp exit from soybean stem

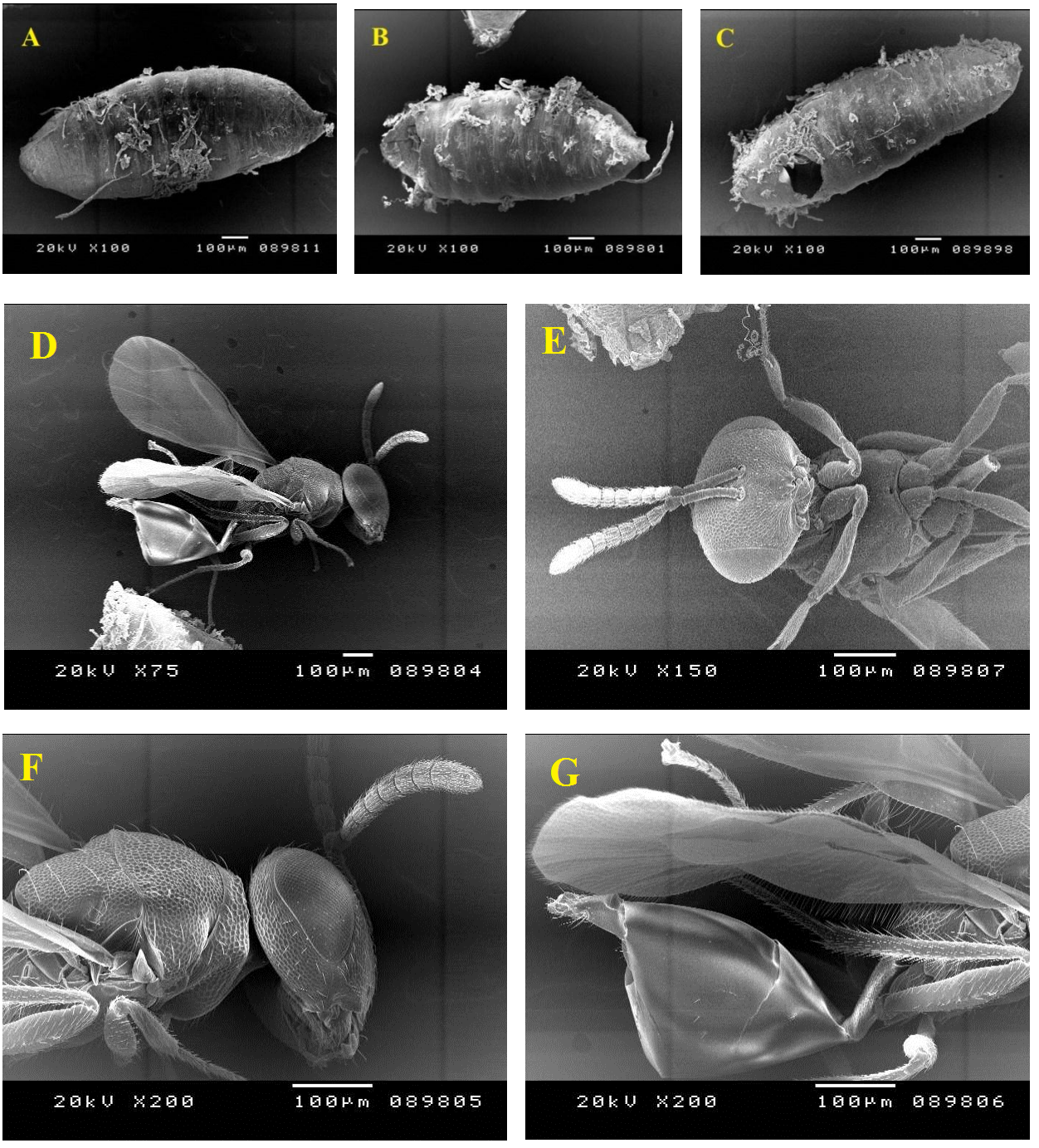

Figure 2. Scanning Electron Micrographs (SEM) of *Melanagromyza sojae* pupa (A, B and C) and its parasitoid *Sphegigaster* spp (D, E, F and G). A: whole pupa; B: pupa after emerging adult female; C: pupa after exit the parasitoid; D: whole parasitoid; E: antenna with abdominal view; F: lateral view for front body; G: lateral view for gaster part

Table 2. The infestation of soybean plants by *Melanagromyza sojae* and percentage of parasitism by *Sphegigaster* spp

Season	Total collected plants	Total infested plants	Infestation plants (%)	Soybean Stem Fly pupae in plants	Non-parasitized pupae	Parasitized pupae (%)	Number of exit holes on plants
2016	200	54	27	124	95	29 (23.4%)	124
2017	200	60	30	120	88	32 (26.7%)	120

Figure 3. Light microscope of *Sphegigaster* spp adult male

Table 3. Parasitism percentages on *M. sojae* pupae by *Sphegigaster* parasitoid calculated during four months of the soybean culture of 2016-2017 seasons

Month	2016 season			2017 season		
	No. of pupae/ infested plants	No. of Parasitized SSF pupae	Parasitism % on SSF pupae mean±SD	No. of pupae/ infested plants	No. of Parasitized SSF pupae	Parasitism % on SSF pupae mean±SD
June	29/12	4	13.8±3.5^{c}	26/14	3	11.5±.4.4^{c}
July	46/20	10	21.7±6.2^{b}	50/25	15	30.0±8.4^{a}
August	31/14	12	38.7±10.7^{a}	35/15	12	34.3±11.5^{a}
September	18/8	3	16.7±5.8^{c}	9/6	2	22.2±7.8^{b}
Total	124/54	29	23.4	120/60	32	26.7

Sex ratios of *Sphegigaster* spp

The previous data in Tables (2) and (3), confirmed that the SSF is also the most injurious because it prevents plant to complete growth and reduce plant yield. Parasitism percentages on SSF pupae by the parasitoid *Sphegigaster* spp was 23.4% in 2016, while 26.7% in 2017, that means the parasitism percentages on SSF pupae increased from season to the following season that to support the natural enemies to determinate the biological control and reduction SSF population at Nubaria farm in Egypt. The numbers of exit holes on plants were recorded 124 and 120 in 2016 and 2017, respectively. The *Sphegigaster* spp is solitary parasitoids, therefore the numbers of exit holes were equal to the numbers of fly pupae, regardless of parasitism. Parasitism levels increased with host density and remained high until just before harvest as shown in Table (3). Sex ratios of *Sphegigaster* spp were male biased, being respectively 52% (14 females, 15 males) in 2016 and 62% (12 females, 20 males) in 2017.

DISCUSSION

The insect injurious stage was larva in SSF (Diptera), adult and nymph in Hemiptera, and larva in Lepidoptera. The time of occurrence the infestation on soybean plantations was June to August in 2016 and 2017 for Diptera (SSF), while Hemiptera and Lepidoptera were found in all over the seasons. The degree of occurrence the infestation was abundant with SSF, frequent with Hemiptera and Lepidoptera. The level of

infestation were severe with SSF (Diptera), weak-moderate (Hemiptera), moderate (Lepidoptera). From our observation data, the soybean stem fly (Diptera) is highly polyphagous than Hemiptera and Lepidoptera on soybean plantations in Egypt. These observations have also been reported by the literature suggests that stem fly activity is favored by warm temperatures, rainfall and high humidity, which are the optimal conditions and where available in Egypt and other countries of Africa, Middle East, and Southern Europe. The present results were somewhat in agreement with Abdallah *et al*., (2014), Hanan Alfy *et al.,* (2016) and Hanan Alfy, (2017) who studied the damage of SSF. SSF is a very destructive pest in Egypt, frequently causing 100% infestation of soybean plants, affecting different crop growth stages. Larval damage of soybean stem by affect plant growth, leading to reduced soybean yield to 35% in Nubaria and 30% in Benha.

Soybean stem fly have been reported outbreak in a lot of areas so the identification of natural enemies such as parasitoids became very important to apply biological control against their populations. Identification of *Sphegigaster* spp by morphological tools revealed a high rate of parasitism. A field collection during two seasons in Egypt showed that soybean stem fly is the unique pest found inside soybean stems, and its unique parasitoid is *Sphegigaster spp*, therefore, the parasitism percentages on SSF pupae by *Sphegigaster* parasitoid increased gradually up to 38.7% and 34.3% in August of 2016 and 2017, in respect. In September 2016 and 2017, the parasitism percentages decreased to 16.7% and 22.2%, in respect. The rise of the parasitism percentages on SSF pupae by *Sphegigaster* parasitoid was related to the increase of the SSF population when the soybean planted during two seasons 2016 and 2017 especially in June, July and September. The present results are in accordance with those of Fand *et al.,* (2018) who found the same parasitoid, *Sphegigaster* spp in India, and similarly with Jayappa *et al.,* (2002) who reported that the *Sphegigaster* spp was one of five parasitoid species on *M. sojae* recorded from soybean fields at Bangalore in India, but prevalence was only 3%. The distribution of this insect in India was pointed out by Sureshan (2011) and Van Den Berg *et al.* (1995) who reported that the *Gronotoma* sp (Figitidae) as the most prevalent species in field sites in Aceh, North Sumatra, and West Sumatra provinces, Indonesia, reported by Shepard and Barrion 1998 in which *Sphegigaster* sp one among nine parasitoid species on *M. sojae* on the islands of Java, Sumatra, Sulawesi, and Bali in Indonesia.

The results indicate that the exit hole of *M. sojae* is associated with the exit of the parasitoid from the pupa. *Sphegigaster* sp is solitary parasitoid (Charnov and Stephens 1988) and (Quicke, 1997). Female lay one egg inside the puparium of the fly, at the surface of the pupa, this obtained results were confirmed by the numbers of exit holes were equal to the numbers of fly pupae, regardless of parasitism. Parasitism levels increased with host density and remained high until just before harvest.

For a maintain of parasitism, inducing an actual biocontrol of pest flies, the population of the parasitoid must be stable. The parasitism percentages on SSF pupae were 23.4% in 2016, while 26.7% in 2017, it means the parasitism percentages on SSF pupae increased from season to other season that to support the natural enemies to determine the biological control and reduction SSF population at Nubaria farm in Egypt environmental conditions should be undertaken. The *Sphegigaster* spp sex ratios were male biased, being respectively 52% (14 females, 15 males) in 2016 and 62% (12 females, 20 males) in 2017, because the most reproductive behavior of hymenoptera is being arrhenotokous parthenogenesis, where females are issued from the fertilization of an oocyte by a spermatozoon, while males develop from haploid oocytes. The offspring sex ratio is directly dependant on the sperm in the spermathecae of females (Chevrier and Bressac, 2002). Moreover, when females lay eggs on a host, sex ratio of the offspring could vary in function of the quality of the host perceived by females (Charnov and Stephens, 1988). Hence, two hypotheses may rise from sex ratios obtained in field collection. One is that *Sphegigaster* egg-laying females were not well inseminated, it could be due to many factors including male availability and conditions of mating. The other is that SSF on cultured soybean is not the usual host of the parasitoid, which would explain why it might be perceived as not optimal. To test this hypothesis, it is necessary to collect the SSF on other plants, cultivated or wild, and to sample other pupae of Diptera likely to be hosts for *Sphegigaster*.

Many species of *Sphegigaster* spp parasitoids were know as parasitoids of family Agromyzidae (Diptera), not all of them were identified (Mircea-Dan, 2008), due to lack of sufficient data for the morphology, ecology and biology of this genus (Noyes, 2012).

The first record of genus *Sphegigaster* parasitoid was in United Kingdom, China, France, Turkey, Italy, Sweden, Bulgaria, Romania, Iran and Greece in 1969, 1990, 1993, 1995, 2000, 2003, 2004, 2004, 2011 and 2013, respectively (Noyes, 2012, Partsinevelos *et al.*, 2013). The study of the first generation of parasitoids would be of interest to favor the initial invasion in such pests having only one generation because of the seasonality of the host plant.

CONCLUSION

While *Melanagromyza sojae* larvae are seemingly well protected from natural enemies as they are hidden inside stems, parasitism by the wasp *Sphegigaster* have been recorded for the first time in Egypt on soybean crop. This first record of the parasitoid *Sphegigaster* spp in Egypt offers a promising opportunity for a biocontrol of soybean stem fly under local agronomic and climate conditions. A better knowledge of the biology of this parasitoid in natural conditions is needed to use it as an efficient biocontrol agent. However, the presence of the parasitoids of *M. sojae* in Egypt was as a basis for the development of biocontrol methods to limit its impact on regional soybean production. Many parasitoids wasps were identified only in genus and no species name was resolved because there is lack difference between taxonomic traits that needs further studies by barcoding gene and others in our future research, therefore, the identification of *Sphegigaster* spp parasitoid to species needs specialist in taxonomy and remains to be done under study in British museum.

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الملخص العربي

الكثافة العددية لأحد عوامل المكافحة الحيوية: *Sphegigaster* spp (SPINO.) (Hymenoptera,Pteromalidae) كطفيل على ذبابة ساق فول الصويا *Melanagromyza sojae* (ZEHNT.) (Diptera, Agromyzidae) في منطقة النوبارية بمصر

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تعتبر ذبابة ساق فول الصويا (SSF) (ZEHNT.) (Diptera, Agromyzidae) *Melanagromyza sojae* متعددة التغذية و لها مدى واسع من الانواع النباتية في العائلة البقولية كفول الصويا و غيرها من البقوليات الاخرى. تم إجراء مسح ميداني خلال مواسم ٢٠١٦ و ٢٠١٧ في محطة البحوث الزراعية بالنوبارية– مصر، لتتبع عشائر ذبابة ساق فول الصويا (SSF) في زراعات فول الصويا. حيث تم التعرف و تسجيل طفيل *Sphegigaster* spp **(Hymenoptera,Pteromalidae)** و دراسته موفولوجياً بإستخدام الميكروسكوب الإلكتروني الماسح للتعرف على جنس *Sphegigaster*. يعتبر طور اليرقة لذبابة ساق فول الصويا (SSF) هو الطور الحشري الضار على نباتات فول الصويا بمزرعة النوبارية و ذلك لأن اليرقة تتغذى داخل ساق النبات ثم تتحول إلى عذراء خلال الفترة من يونيو إلى سبتمبر (٢٠١٦–٢٠١٧). حيث كانت مستوى الإصابة بذبابة ساق فول الصويا (SSF)(من ثنائية الأجنحة) حادة أكثر من الآفات الحشرية الأخرى التابعة لرتبتي نصفية و حرشفية الأجنحة و التى تم دراستها. أثناء موسمي ٢٠١٦–٢٠١٧ تم دراسة و إختبار عينات فول الصويا المصرية و أخذ عينات منها لفحص النباتات المصابة بذبابة ساق فول الصويا (*M. sojae*) ومستوى التطفل (النسبة بين عذارى SSF المُتطفل عليها و غير المُتطفل عليها). تُشير النتائج إلى أن ثقب خروج *M. sojae* مرتبطة بإدخال الطفيل للعذراء. إزدادت النسبة المئوية لتطفل طُفيل *Sphegigaster* spp على عذارى ذبابة ساق فول الصويا (SSF) تدريجياً إلى ٣٨,٧% في أغسطس ٢٠١٦، بينما ٣٤,٣% في أغسطس ٢٠١٧، وفي سبتمبر ٢٠١٦ و ٢٠١٧ قلت النسبة المئوية للتطفل على عذارى SSF إلى ١٦,٧% و ٢٢,٢%، على الترتيب. على أي حال فإن متوسط النسبة المئوية للتطفل على عذارى SSF كان ٢٣,٤% في ٢٠١٦، بينما ٢٦,٧% في ٢٠١٧. و كانت النسبة الجنسية لطفيل *Sphegigaster* spp في الافراد الناتجة من عملية التطفل منحازة للذكور حيث كانت ٥٢% (١٤ أنثى، ١٥ ذكر) في ٢٠١٦ و ٦٢% (١٢ أنثى، ٢٠ ذكر) في ٢٠١٧. يُقدم التسجيل الاول لطفيل *Sphegigaster* spp في مصر على عذارى ذبابة ساق فول الصويا (SSF) فرصة واعدة في مجال المكافحة البيولوجية لذبابة ساق فول الصويا تحت الزراعة المحلية و الظروف المناخية. على أي حال، فإن وجود طُفيل ذبابة ساق فول الصويا *M. sojae* في مصر يعتبر بمثابة أساس لتطوير أساليب المكافحة الحيوية للحد من تأثير ذبابة ساق فول الصويا على إنتاج فول الصويا الإقليمي.