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Introduction of two parasitoids of braconid wasps on the sugar beet moth, *Scrobipalpa ocellatella* Boyd. (Lep.: Gelechidae) from Khorasan-e-Razavi province, Iran

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ABSTRACT

The sugar beet moth, *Scrobipalpa ocellatella* Boyd. (Lep.: Gelechidae) is the specific pest of beet. The aim of the present study was to identify the parasitoids of the moth. Therefore, sampling was conducted in fields of Khorasan-e-Razavi Province, Iran from early July until October in 2010. Larvae and pupa were collected along with tubers of sugar beet and then, they were reared under controlled conditions, 25±2°C, 65±5% relative humidity and 14:10 day/night duration until the emergence of parasitoid adults. Tubers were investigated daily and the emerged parasitoids were collected. These parasitoids were put in alcohol 75%. In this study, two species of larval parasitoids were collected and identified including *Bracon intercessor* Nees and *Microchelonus subcontractus* Abdinbekova both of which belong to Braconidae family. *B. intercessor* is larval parasitoid and *M. subcontractus* is larva-pupal parasitoid. Paratype samples of the collected parasitoids are maintained in Laboratory of Entomology, Shahed University of Tehran, Iran.

Keywords: Braconid wasps, Parasitoid, *Scrobipalpa ocellatella*, Sugar beet

INTRODUCTION

Sugar beet moth (*Scrobipalpa ocellatella* Boyd.) is a specific pest of sugar beet that only attacks sugar beet, fodder beet and wild beet and is found almost in all sugar beet growing regions of Iran (Kheiri 1991). This moth is more observed in hot and semi-hot regions and in regions with very hot summers (Esmaeli et al. 1996). The feeding of the age-1 and age-2 larvae of this moth from the edge of the young leaves cause them to get curly and turn black, but the next ages larvae feed on the terminal of petioles and central shoot which is the main inhabitant of this pest and leave excrement and fibers. The central shoot turns black and sticks as the result of feeding by larvae and mixing their excrements with plant sap. When central shoots are fully rotted and destroyed, the larvae penetrate into the core of the plant and make tunnels in the apex of the roots and the parts that are out of the soil surface. This pest cease the growth of the plants and so, root weight and sugar content as well as sugar extraction percentage are decreased. Most weak plants are turned yellow and wilt by this pest. Furthermore, the feeding by this pest facilitates the penetration of fungal factors resulting in heavy damages (Kheiri 1991).

Studies show that the farms in Khorasan Province, Iran, are widely infected with sugar beet moth and this pest causes heavy losses on beets. However, there is no thorough knowledge of the pest in this province.

Few studies carried out on sugar beet moth (*S. ocellatella*) in Iran show that the outbreak of sugar beet moth in different regions of Iran depends on the region and that the pest in these regions has 3-6 generations. In addition, the pest is more pre-

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vailing in southern, hotter regions so that the loss sometimes sums up to 100% in these regions. Furthermore, farms which are planted later or earlier than normal are more apt to this pest than farms planted at the normal time (Kheiri 1991). The major loss is imposed by the third generation of the pest (in June-August) in Khorasan and in July-August in Isfahan provinces, Iran. In other regions, the infection starts from the initiation of the second generation of the pest (at 5-6-leaf stage). Low, under-zero temperature in winter reduces the population of larvae (Kheiri 1991).

Studies in Serbia show that higher temperature in summer results in higher activity of sugar beet moth and that natural enemy plays a major role in the management of the pest. In addition, high plant population and leaf number are effective in reducing the population of the pest. The increase in perimeter moisture, too, increases the activity of the pathogenic factors, predators, and parasitoids and consequently, reduces the population of the pest (Tribel and Deryugin 1993). It was found that the essential oil of coriander, chamomile and Chinaberry can control the larvae of sugar beet moth (Shalaby et al. 2005). There are few reports about the natural enemies of sugar beet moth. Parasitoid wasp [Agathisfuscipennis (Zetterstedt) (Hymenoptera Braconidae)] was reported as a domestic parasitoid in Italy (Loni et al. 2011). Also, the species *Microchelonus subcontractus* Abdinbekova and *Bracon intercessor* Nees from the family of Braconidae and *Diadegmapusio* (Holmgren) from the family of Ichneumonidae were identified in Iran for the first time (Abbasipour et al. 2010a,b). The level of parasitism of these species is unknown.

Given the fact that the butterflies of this pest are active at night and lay their eggs individually around the crown or young leaves after mating. If the activity of species and the parasitoid efficiency of *Trichogramma spp.* egg are identified at this stage, the eggs of this pest can be successfully controlled. After the emergence, the larvae begin feeding on the edge of the young leaves at which stage it is possible to exploit the wasps of Braconidae family if their species are identified and collected.

Materials and Methods

To collect sugar beet moth parasitoids for the present study, the farms that had not been sprayed by pesticide during the activity season of this pest were regularly sampled. The sampled farms were located in Torbat-e Heydarieh, Fariman, Torbat-e Jam and Chenaran. For this purpose, the infected plants were sampled from the farms attacked by sugar beet moth and were transferred to the laboratory where their leaves and the parts not required were removed. Afterwards, the samples were carefully checked by binocular to make sure that they have no other pests than sugar beet moth. Then, they were placed in containers and their lids were covered by a net. The moths had enough food (beet tuber) to grow. The containers of larvae and pupae of sugar beet moth which contained tubers too were kept at the temperature of 25±2°C, relative humidity of 65±5% and day/night duration of 14/10 hours until the emergence of mature insects of the possible parasitoids. Then, wasps and butterflies of sugar beet moth were appeared in some containers 30-40 days later. Afterwards, the containers were daily inspected and when the population of butterflies and wasps became constant, the insects were killed by spraying and then, the net hatches were opened. Next, the number of mature insects, butterflies, pupae, larvae and wasps was counted.

The collected wasp samples were sent to plant protection laboratory of Department of Agriculture of Shahed University in glasses containing alcohol 75% for their identification. Studies in this laboratory confirmed their similarity to the samples existed in the laboratory.

Results

Identification of active parasitoid wasps on pest

Two species of parasitoid wasp were collected from sugar beet moth colonies in sugar beet farms of Khorasan province whose scientific names and key characteristics are as follows:

1. Bracon intercessor Nees *(Hym.: Braconidae)* parasitoid wasp

It is an ectoparasitoid of larvae which has been reported on the larvae of Lepidoptera, some Coleoptera, Diptera and wasps in most parts of the world. It is the parasitoid of the larvae of Curculionidae weevils (specially the species of Anthonomus and Lixus), Attelabidae and Lepidoptera of Momphidae and Tortricidae and even the wasps of Eurytomidae (Tobias 1986). It has been reported as the parasitoid of the larvae of Agpanthia villosoviri-descens deGeer in the Netherlands, too (Achterberg et al. 1990).

Some morphological characteristics of *B. intecessor* are as follows: the length of body is 4-6 mm in males and 3-4 mm in females; the general color of the body is black in some samples with yellowish-brown spots in other samples; the antenna is fiber-like with 39-42 segments (in both sexes); the length of the third segment is 1.2 times the fourth segment; eyes have some short setae; frons has a median groove; clypeus is flat and smooth; the length of mesosoma is 1.5 times its height; episternalscrobe is round and deep; the surface of propoedum is smooth but with medio-posteriorly with some short oblique rugae; propodeal spiracle is round, situated just behind the middle of propodeum. Hind coxa is smooth with long setae. The length of femur, tibia and basitarsus of hind leg are 3.4, 8.6 and 5.4 times their width, respectively. Hind coxa is black, and the terminal part of ankle, tegulae and the claw of hind leg are black or yellowish-brown. The length of fore wing is 4-5 mm that is ovipositor straightly with ventral teeth. The length of ovipositor sheath is 0.43-0.54 times fore wing whose apical third is upcurved (Achterberg et al. 1990).

This wasp has been reported in Palearctic regions and in Austria, Caucasus, UK, France, Germany, Hungry, Italy, the Kazakh Republic, Lithuania, Poland, Sweden, Syria, Turkey and Yugoslavia (Papp 1968; Shenefelt 1978; Tobias 1995). It was first detected in Iran by Abbasipour et al. (2010b) and was identified in Entomology Institute in the Republic of Czech (Abbasipour et al. 2010b).

2. Parasitoid wasp icrochelonus (Chelonus) subcontractus Abdinbekova *(Hym.: Braconidae)*

The species *M. subcontractus* is a larval-egg endoparasitoid which has been reported on the larvae of some species of Lepidoptera (specially the genus *Elachista*, the species *Phthorimaea* perculellaand the species *Stagmatophora extremella*) (Shenefelt 1973; Tobias 1986). It belongs to the family of Cheloninae.

Some characteristics of *M. subcontractus* wasps are as follows: the length of the body is 2.4 mm, the color of the body is black, only the color of pterostigma, flagellomere and basitarsus of leg is light brown, the antenna is fiber-like, the head is transversely narrowed rearwardly, the width of cheek is 2.5 times the base of upper jaw, the face has concave tiny spots, the under-frons part is shiny with tiny spots, nape has horizontal stripes, the eye is ovoid combined, the eye is simple and small, the antenna is fiber-like and shorter than the body, the length of the first segment of the antenna is twice its width, the other segments of the antenna are narrowed and shortened gradually to the end. Mesosoma is short, notauli is unclear, scutellumis quite curved with tougher base, the median part of mesonotumis cell-like and quite corrugate, propodeal has teeth in rear part, the length of the segments of rear leg is greater than their width, fore wings are shorter than the body, metasoma is longer than mesosoma, it is ovoid with irregular longitudinal stripes, and ovipositor is quite visible (Beyarslan 1995). This wasp has been reportedly observed in most parts of the world including Azerbaijan, Georgia, Greece, Hungary, the Kazakh Republic, Lithuania, Moldova, Mongolia, Poland, Romania, Southern and Central Russia, Slovakia, Turkey and Ukraine (Tobias, 1986; Papp, 1990).

It was first detected in Iran by Abbasipour et al. (2010b) and was identified in Entomology Institute in the Republic of Czech (Abbasipour et al. 2010b).

Discussion

Braconidae family belongs to the subfamily of Ichneumonoidea, suborder of Apocrita or Parasitica and the order of Hymenoptera. This family includes a large, useful group of parasitoid wasps. The mature insects are rather small. The biology of Braconidae wasps is very diverse. It includes both internal and external parasitoid wasps. The present study investigated larval ectoparasitoid and endoparasitoid. Unfortunately, no extensive studies have been carried out on the parasitism and the efficiency of these parasitoids to compare the results of the present study with them.

Studies show that a mixture of biological control factors can reduce the population of this pest. Studies on the efficiency of egg parasitoid wasps of *Trichogrammae vanescens* species in 1998-2001 showed that the microbial herbicides Dipel 2x (*Bacillus thuringiensis* var. Kurstaki) and Biofly (*Beauveria bassiana*) were effective in controlling sugar beet pests (Camprag et al. 2004).

The application of biological control agents in Egypt for controlling sugar beet moth by the aid of *Trichogrammae vanescens* parasitoid wasps resulted in significant reduction of the pests population in the farms (Marie 2004). Also, the concurrent application of *T. evanescens* wasps and *Bacillus thuringiensis* var. Kurstaki bacteria as well as *Beauveria bassiana* pathogenic fungus reduces the population of the pests in sugar beet farms (Camprag et al. 2004).

Studies in Egypt showed that the application of *Beauveria bassiana*, *Metarhizium anisopliae* and *Paecilomyces lilacinus* pathogenic fungi can control the pest (Mesbah et al. 2004).

References

Abbasipour H, Mahmoudvand M, Basij M, Lozan A. Report of the parasitoid wasps, *Microchelonus* (*Chelonus*) *subcontractus* Abdinbekova and *Bracon intercessor* Nees (Hym.: Braconidae), from Iran. *Journal of Entomological Society of Iran*.(In press). 2010a.

Abbasipour H, Mahmoudvand M, Basij M, Lozan A. Report of the parasitoid wasp, *Bracon intercessor* Nees (Hym.: Braconidae), from Iran. *Journal of Entomological Society of Iran*.(In press); 2010b.

Achterberg C van, Hemminga MA, van Soelen J. New host record of *Bracon intercessor* Nees f. *megasomides* Strand (Hymenoptera: Braconidae), a parasite of *Agapanthia villosoviri-descens* DeGeer (Coleoptera: Cerambycidae) in salt marshes. *Zoologische Mededelingen*; 1990. 64: 25-29.

Beyarslan A**.** Für die Fauna der Türkei neu festgestellte Arten der Gattung *Microchelonus* SZEPLIGETI 1908 (Hymenoptera, Braconidae, Cheloninae), *Entomofauna*. 16(6): 121-136. (English Summary)

Camprag D, Sekulic R, Keresi T. Population dynamics of major sugarbeet pests in the Vojvodina province in the period 1961-2003, Razprave – Razred za Naravoslovne Vede, Slovenska Akademija Znanosti in Umetnosti; 2004. 45(1): 37-48.

El-Husseini MM, Marie SS, Mesbah A, El-Zoghby AA, Ali SS, Omar NAM, Agamy EA, Bakr HEA, Nada MS, Tamer S, Kamal HM, Ibrahim AM. Isolation, production and use of entomopathogenic fungi for controlling the sugar beet insect pests in Egypt. *Egyptian Journal of Biological Pest Control*; 2004. 14(1): 265-275.

Esmaeli M, Mirkarimi A, Azmaieshfard P. Agricultural Entomology. University of Tehran publication, third edition; 1996. 556 p. (in Persian)

Kheiri M. Important pests of sugar beet and their control. Agriculture Ministry, Agricultural extension organization, Kalameh publication Institute, Tehran; 1991. 126 p. (in Persian)

Loni A, Rossi E, Van Achterberg K. First report of *Agathis fuscipennis*as parasitoid of the tomato leafminer, *Tutaabsoluta* in Europe. *Bulletin of Insectology*; 2011.64 (1): 115-117.

Marie SS. Use of the egg parasitoid *Trichogramma evanescens* West. for controlling the rib miner, *Scrobipalpa ocellatella* Boyd (Lepidoptera: Gelechiidae) in sugar beet in Egypt. *Egyptian Journal of Biological Pest Control*; 2004. 14(2): 371-374.

Mesbah II, Abou-Attia FA, Metwally SM, Bassvouni AM, Shalaby GA. Utilization of biological control agents for controlling some sugar beet insect pests at Kafr El-Sheikh Region. *Egyptian Journal of Biological Pest Control*; 2004. 14(1): 195-199.

Papp J.A Synopsis of the *Bracon* Fabr. Species of the Carpathian Basin, Central Europe (Hymenoptera, Braconidae), II.Subgenus *Bracon* Fabricius. Annales Historico-Naturales Musei *Nationalis Hungarici*; 1968. 60: 195-211.

PappJ**.** A revision of Thomson's *Microchelonus* species (Hymenoptera: Braconidae, Cheloninae). *Acta Zoologica Hungarica*; 1990. 36 (33-4): 295-317.

Shalaby GA, Bassyouni AM, Metwally MM. Effectiveness of certain plant extracts against insect pests and predators in sugar beet fields. *Egyptian Journal of Agricultural Research*; 2005. 83(3): 1191-1198.

Tribel SA, Deryugin VA. Biocoenotic mechanisms in the limitation of injuriousness. *Sakharnaya Svekla*; 1993. 3: 19-21.

Shenefelt RD. *Microchelonus* SZEPLIGETI (Hym.: Braconidae) Hymenopterorum Catalogus, Pars 10. The Hague (W. JUNK); 1973. pp. 873-907.

Shenefelt RD. Hymenopterum Catalogus (nov. ed.). Pars 15-Braconidae 10, Junk, S- Gravenhage; 1978.10: 1459-1638.

Tobias VI.Opredelitel nasekomych evropeiskoi tsasmi SSSR, vol. 3. Hymenoptera pt. 4. Opred. Faun. SSR; 1986. 145:1-501, 1-263.

Tobias VI. Bestimmungsbuch der Insekten des europäischen Teils der UdSSR. Band III. Hymenopteren IV. Teil. - Nauka, Leningrad; 1986.

Tobias VI. Keys of the Insects of the European Part of the USSR. Volume 3, Hymenoptera, Part 4, Science Publishers, Lebanon, New Hampshire, USA; 1995.xvi+883 pages. (English Summary)