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Primary observations on *Gonatopus lunatus* Klug (Hym., Dryinidae), a parasitoid of leafhoppers

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Summary

The parasitoid, ***Gonatopus lunatus*** Klug (Hym.: Dryinidae), was found to be associated with ***Circulifer haematoceps*** complex (M.&R.) in Ereğli (Konya) in 1991. Some laboratory and field observations were conducted to enlighten its role in controlling ***C. haematoceps*** complex, vector of at least two important plant pathogens: the sugar beet curly top virus and the causal agent of citrus stubborn disease, ***Spiroplasma citri*** Saglio et al.

G. lunatus preferred the fourth and fifth nymph stages of ***C. haematoceps*** for parasitization and younger nymphs were fed on. Hosts were grasped by the wingless parasitoid, paralysed and either feeding or oviposition starts. The parasitization was recognizable by a dark sac protruding from the lefhopper abdomen. The pupae of ***G. lunatus*** was spun outside the host and the pupal stage lasted 28 days at 25 °C.

In September 1991, about 70 % of all ***C. haematoceps*** adults were parasitized by ***G. lunatus*** on sugar beets in Ereğli. However, in 1992 no parasitization was observed, due to unknown reasons. This result clearly indicates that further studies are needed to judge its role in controlling this important leafhopper pest.

Introduction

The leafhoppers, ***Circulifer tenellus*** complex (Baker) and ***Circulifer haematoceps*** complex (M.&R.) (Homoptera: Cicadellidae), are common on sugar beet in Central Anatolia (Başpınar et al., 1993). Both species are vectors of at least two important plant pathogens: the sugar beet curly top virus (Bennett and Tanrısever, 1958; Kheyri, 1969) and the mollicute ***Spiroplasma citri*** Saglio et al., the causal agent of

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citrus stubborn disease (Fos et al., 1986; Oldfield, 1987; Kersting and Şengonca, 1992). Both diseases are of great economic importance in USA and many countries of the Mediterranean area and Near East.

Since leafhoppers are active and mobile insects, and capable of migrating long distances, it is difficult to develop control strategies for these pests. Parasites might play an important role in keeping the leafhopper populations under economic threshold (Lindberg, 1950). Many egg and nymphal parasitoids are known to parasitize up to 100 % of local leafhopper populations. Seven families in Diptera, Hymenoptera, and Lepidoptera are parasitoids of Cicadellidae, of which Dryinidae (Hymenoptera: Chrysidoidea) is a specific parasitoids of Cicadellidae, in general of the subfamily Euscelinae (Freytag, 1985). Many publications dealing with these parasitoids are of taxonomic nature, and recently, the family Dryinidae was revised by Olmi (1989 a).

Very few is known on Dryinidae in the Turkish fauna. Olmi (1989 a) sampled some species in Turkey, but no information on the impact of Dryinidae in the control of economic important leafhoppers is available.

Herein, we present some field and laboratory imformation on ***Gonatopus lunatus*** Klug (Hym.: Dryinidae) reared from ***C. haematoceps*** complex.

Material and Method

Samplings were done on sugar beet by a D-Vac vacuum machine in Ereğli plain, Konya in 1991. After separating ***Circulifer*** spp. with an aspirator, all individuals were enclosed with sugar beet plants.

In laboratory, parasitized individuals were separated and transferred into the leaf cages on sugar beet plants till the parasitoid hatched. The adult parasitoids were enclosed single with different nymph stages of ***C. haematoceps*** and ***Asymmetrasca decedens*** (Paoli) in small glass vials, and the parasitization behaviour was observed.

Results and Discussion

Parasitized ***C. haematoceps*** nymphs were recognizable by a dark sac protruding from the abdomen. The adult leafhopper was killed by the parasitoid just before the apod larva left the host. Following hatching, the dryinid larva was moving around for a few hours, searching a place to spun the cocoon. In case of our experiments all cocoons were developed at the edge of the leaf cage, however in nature the larvae will spin the cocoon at plant parts or in litter (Waloff, 1974).

At 30 °C, the pupal stage lasted about 25 days. All adults recovered from the pupae were wingless females, average 3.2 mm size (Fig. 1). These individuals were determined as ***Gonatopus lunatus*** Klug by Dr. Olmi (Viterbo-Italy). Because the females of this parasitoid are apterous, they must rely on their dispersing hosts for the colonization of new habitats (Raatikanien, 1967).

Newly hatched adults started to clean their body before they became active and run around to search for hosts. It was observed that ***G. lunatus*** preferred fourth and fifth nymph stages as hosts for parasitization. ***G. lunatus*** grasped ***C. haematoceps*** nymphs, kept them in a steady grip of the front legs and pressed the apex of its abdomen close up against the body of the leafhopper and oviposited the egg.

It was not observed that ***G. lunatus*** parasitized a host more than one times within the observation period of 30 minutes. Waloff (1974) stated that the Dryinidae she studied on were not able to distinguish between parasitized and non-parasitized leafhopper nymphs, if offered as host and different occasions. If all elder stages had been parasitized, the 3rd stages were chosen as hosts. During the parasitization, which may last up to one or two minutes, the host nymph stayed motionless for two to four minutes, depending on size of the nymph. This indicated that it was paralyzed by ***G. lunatus.***

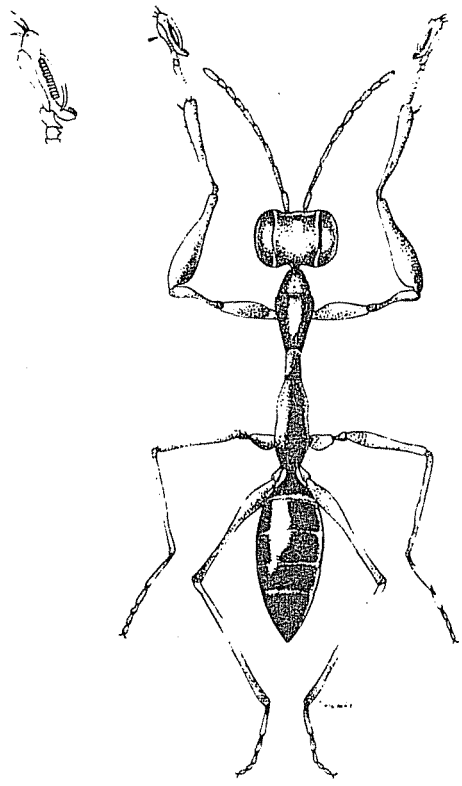

Fig 1. A wingless adult female of ***Gonatopus lunatus*** and its chela.

Attempts of *G. lunatus* to oviposit eggs into *A. decedens* were observed in laboratory, but it is not known whether eggs were laid. Only the dryinid, *Aphelopus* sp. is known to parasitize Typhlocybinae, but no other species of Dryinidae (Jervis, 1980). However, *G. lunatus* fed on the nymphs of *A. decedens*. For most of the dryinid it is stated that they are both, really predators and parasitoids (Waloff, 1974).

In addition, the cicadellids, *Recilia schimidtgeni* (Wagn.), *Psammotettix striatus* (L.), *Adarrus multinotatus* (Both.), *Artianus manderstjernai* (Kbm.), *Macrosteles* sp., and *Arthaldeus pascuellus* (Fallen) were mentioned as hosts of *G. lunatus*, and in general the genus *Gonatopus* breeds on Euscelinae (Cicadelloidea). (Freytag, 1985; Olmi, 1989 b). Olmi (1989 b) reared *G. lunatus* from the cicadellids collected Italy, Greece and Turkey (Nevşehir and İzmir) and this species is reported from Europe, several Asian and Mediterranean countries, the Azores and Madeira.

Field Observations

In September 1991, by end of season, an overall parasitization rate of *Circulifer* spp. of as much as 70 % was observed on sugar beet in Ereğli. This observation clearly indicated the high potential of *G. lunatus* in suppressing *Circulifer* spp. populations. However, no parasitization was observed at the same locations one year later, in September 1992. Although several sugar beet fields were sampled no parasitized individual was discovered. At the same time, the population density of *Circulifer* spp. was very low, comparing to 1991.

According to literature the parasitization rate of Dryinidae is generally low (less than 20 %) (Waloff, 1980). It has been proposed that nymphal parasitoids have a stabilizing effect on host populations and that they play a role in synchronizing generations of hoppers by sterilizing most adults and limiting ovipozition (Waloff, 1980).

Our observations showed that the parasitization rate of *G. lunatus* may be much higher, at least in certain years. Thus, the potantial of Dryinidae as a biological control agent is yet poorly understood. More basic studies are needed to accurately depict the bionomic of Dryinidae and the interactions with its leafhopper hosts, before it will be possible to judge its role in controlling leafhopper populations.

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Özet

Cüce Ağustosböceklerinin bir parazitoidi olan *Gonatopus lunatus* Klug (Hym., Dryinidae) üzerinde bazı gözlemler

Cüce ağustosböceklerinin parazitoidi olan ***Gonatopus lunatus*** Klug Ereğli (Konya)' de 1991 yılında ***Circulifer haematoceps*** (M.&R.) üzerinde saptanmıştır. Şeker pancarı tepe kıvırcıklık virüsü ve turunçgillerde Stubborn hastalık etmeni ***Spiroplasma citri*** Saglio et al. ' nin vektörü olan ***C. haematoceps*** ' in baskı altına alınmasında bu parazitoid türün rolünün ne olabileceği gerek laboratuvar ve gerekse doğada bazı gözlemler yapılarak incelenmiştir.

G. lunatus ' un parazitlemek için dördüncü ve beşinci nimf dönemindeki ***C. haematoceps*** bireylerini tercih ettiği, daha küçük dönemdeki diğer bireyler üzerinde ise beslendiği saptanmıştır. Konukçular önce kanatsız parazitoid dişileri tarafından yakalanmakta ve paralize edilmekte, daha sonra konukçunun dönemine göre parazitoid tarafından ya yumurta bırakılmakta veya yenilmektedir. Parazitli ***C. haematoceps*** bireyleri abdomende parazitoid larvasının oluşturduğu siyah keseciklerin varlığıyla kolayca farkedilmektedirler. Olgun larva dönemine gelen parazitoidlerin ise konukçuyu terkederek konukçu dışında bir kokon içerisinde pupa oldukları ve pupa döneminin 25 °C ' da 28 gün olduğu belirlenmiştir.

Parazitoidlerin tarafımızdan ilk olarak saptandığı Eylül (1991) ayında ***C. haematoceps*** erginlerinin % 70 kadarının parazitli olduğu belirlenmiş, ancak bir yıl sonra herhangi bir parazitli bireye rastlanılmamıştır. Bu sonuçtan da anlaşılacağı gibi, parazitoid tür ***G. lunatus*** ' un ***C. haematoceps*** populasyonlarını baskı altına almadaki rolünün daha iyi anlaşılması için parazitoid ile zararlı arasındaki ilişkilerin daha ayrıntılı bir şekilde incelenmesi gerektiği söylenebilir.

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