Distribution and New Host Plants of Seed Beetles (Col.: Chrysomelidae: Bruchinae) from Iran


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Abstract

This report is part of a national project for gathering and classifying the arthropod seed feeders in different provinces of Iran between 2008-2014. In this paper, nineteen host species with their areas of distribution are presented for twelve species of seed beetles (Chrysomelidae: Bruchinae). Most of the identified host plants (84%) belong to the family Fabaceae (Leguminosae). In addition, all known hosts for these beetles are discussed. The identified species in this study were confirmed by Dr. Alex Delobel in the Natural history Museum of Paris.

The studied material is deposited in the arthropod collection of Research Institute of Forests and Rangelands.

Key words: Seed beetles, Bruchinae, Leguminosae, host plants, Rangelands

Introduction

The beetles of the subfamily Bruchinae belong to the family Chrysomelidae. Their larvae feed on the seeds of plants, especially legumes. Many species are considered as economically important pests for legume seeds and have the potential to be natural enemies for these plants (Derbel et al., 2007).

They prevent the natural revival of rangeland plants by destroying their seeds. That is why during the past three decades Bruchinae subfamily is considered as one of the most important pests of rangeland plants (Kingsolver, 2004). In this subfamily, about 30 species are important pests and at least 9 of them are noxious throughout the world because of their serious damages (Kingsolver, 2004).

Bruchidius Schilsky, 1905, with about 300 described species, is one of the largest and most diversified genera of this subfamily in the old world (Stojanova, 2010). Most Bruchinae species in Iran belong to this genus (about 54 species) which is about 50% of all Bruchinae recorded in Iran. Larval instars of most species of this genus feed inside of the seeds of
legumes (Fabaceae). Other species feed on the seeds of Caesalpiniaeae, Apiaceae and Asteraceae plants. Due to the damages caused by some of these species to the economically important plants, they are considered as pests (Stojanova, 2010).

Borowiec, in 1985 proposed a new group called Astragali-species for insects of Bruchidius genus which are morphologically similar to Bruchidius astragali (Boheman, 1829) and feed from seeds of various Astragalus species (Delobel et al., 2004).

According to Johnson (1970), approximately 84% of the known hosts of Bruchinae belong to the family Leguminosae and the rest are of 31 other families (Kingsolver, 2004). In the most comprehensive study in Iran, about 1400 Bruchidae specimens were collected during three Czechoslovak-Iranian expeditions in 1970, 1973 and 1977 including 80 species, of which 22 were new Bruchidae species for Iran (Anton, 1998). According to the previous studies on the host plants of Bruchinae (Johnson, 1970; Anton, 1998; Kingsolver, 2004; Delobel et al., 2004) and also the results of this paper, it seems that the genus Astragalus Linnaeus is a common host for Bruchinae in Iran. This genus, with more than 840 species, is the largest genus of the flora of Iran (Ranjbar and Karamian, 2003). One of the main goals of this study is determining which plant species or even families are under threat of seed beetles. In other words, it was supposed to find out the favorite diet of seed beetles. Also, the fauna of seed feeders of rangeland plants in different geographical regions of Iran and their related host plants and distribution were investigated.

Materials and methods

This study was carried out during 2008-2011 in Iranian rangelands. As the areas covered by the research project are situated in different ecological zones of the country (Fig. 1), sampling times for collecting seeds were different and depended on climate conditions of each zone.

For identifying or confirming scientific names of host plants, herbarium voucher samples of beetle host plants were collected, prepared and then transferred to botanists of the botanical department of the Research Institute of Forests and Rangelands. The seeds collected in different geographical zones of the country were sent to the Entomological laboratory of the Research Institute of Forests and Rangelands in Tehran. About 60 series of these samples were studied in this paper.

The collected seeds of each plant from every province (ecological zones) were kept in separated plastic boxes in laboratory conditions. Emerged adult insects from the seeds were killed using cyanide and transferred to 70% ethanol.

A preliminary identification of the subfamily Bruchinae based on the external morphology of adult beetles and male and female genitalia was carried out by the first author, using available keys by Anton et al., 1997; Arora (1977); Anton (1998), and Borowiec (1987) (Fig. 2). The herbarium samples were sent to the botany laboratory for identification. Bruchinae beetles were identified and confirmed by Dr. Alex Delobel in Natural History Museum of Paris. As an example, Fig. 2. 1-5 illustrates a general view of the external body and genitalia of Bruchidius astragali.

Results

Nineteen new host plants for the subfamily Bruchinae are recorded. All of them were collected on the seeds of rangeland plants and about half of them from Astragalus species. These plants are hosts for 12 reported species of the subfamily Bruchinae. Six of them belong to the genus Bruchidius, among which three species, namely Bruchidius virgatus Fahraeus (1839), Bruchidius astragali Boheman (1829) and Bruchidius tragacanthae Olivier (1795) are members of the Bruchidius astragali-species group.

New host plants for some of the species of the subfamily Bruchinae with their locations in Iran are reported below (Fig. 3.)
**Fig. 1.** Distribution of host plants.

Bruchidius Schilsky

Astragalus comphylorrhynchos Fisch. & C. Mey was identified as a new host for Bruchidius poecilus Germar in Qom province.

A. citrinus Bunge, A. neo-mobayenii Maassoumi and A. ovinus Boiss. collected from North Khorasan, East Azarbayjan, and Qazvin provinces, respectively, are new host plants for B. virgatus.

Onobrychis vicieifolia Scop is reported as a new host plant for B. lutescens Blanchard from Qazvin province.

Prosopis farnesiana (L.) Willd. is reported as a new host plant for B. raddiana C. A. Mey from Qazvin province.

The only new host plant for B. tragacanthae is Astragalus kirrindicus Boiss that was collected in Qom & Yazd provinces.

Paleoacanthoscelides Gyllenhal

Astragalus hedisarianus L. and A. podocarpus C. A. Mey from Qazvin province and Onobrychis viciaefolia Sirj from Razavi Khorasan province are reported as new host plants for Paleoacanthoscelides gilvus Gyllenhal.

Spermophagus Schoenherr

S. calystegiae Lukjanovitsh & Ter- Minassian, was reared from Vicia sp. a new host plant for this beetle from Kohgiluyeh and Boyer-Ahmad province.

S. canus Baudi was reared from Convolvulus fruticosus Pall, a new host plant from Yazd province.

S. caricus Decelle was reared from C. leiocalycinus Boiss. a new host plant for this beetle from Yazd province.
S. decellei Borowiec was reared from C. fruticosus, a new host plant for this species from Yazd province.

**Caryedon Schoenherr**

Prangos ferulacea (L.) Lindl and Prosopis koelziana Burkart are reported as new host plants for Caryedon mesra Johnson from Damavand and Bushehr Provinces, respectively.

**Discussion**

In this study, the family Fabaceae (Leguminosae), with 25 species, is hosting about 84% of seed beetles, similarly to Johnson (1970) who estimated that approximately 84% of the known hosts of the subfamily Bruchinae belong to this plant family.

One new host plant, Astragalus compylorrhynchus, is recorded for Bruchidius poecilus in this study. But Astragalus contortuplicatus L. was previously reported as a host for this species in France and Italy (Delobel et al., 2004; Kergoat et al., 2005a). It seems that the insect has a limited host plant diet and can be considered as a monophagous species.

Three species from Astragalus, A. citrinus Bunge, A. neo-mobayeni Maassoumi and A. ovinaus Boiss, are recorded as new host plants for B. virgatus in this paper. Anton (1998) recorded Astragalus talyshensis as a host plant for this species from: Caucasus, Turkey, north of Iran (Alborz & Damavand), Syria, and Lebanon. Also Astragalus monspessulanus L., A. sieversianus Pall, and A. pinetorum Boiss have been reported as hosts (Delobel et al., 2004). As far as all of the host species belong to the genus Astragalus the insect is considered a monophagous species.

Bruchidius lutescens was previously collected from Onobrychis caput-galli L. (Anton, 1998; Delobel, 2004). O. viciaefolia is a new host for this monophagous insect.

B. raddianae is one of the African species in the B. centromaculatus group (Anton & Delobel, 2003). The insect has never been reported on the Prosopis genus before. It has already been reported on Acacia tortilis Forsk. in Senegal and Yemen and on A. gerrardii Benth and A.ehrenbergiana Hayne (Anton & Delobel, 2003; Kergoat et al., 2005b; Alvarez et al., 2006). It should be noted that according to Anton and Delobel (2003) several samples of A. senegal (L.), A. sieberiana DC. and Dichrostachys cinerea (L.) collected in Senegal did not host B. raddianae. Based on the new found genus, Prosopis, of the family Fabaceae, it seems that it should be considered as an oligaphagous insect.

Three new host species from Astragalus genus are reported for Bruchidius astragali in our study. The insect has been reported on Astragalus mollis M. Bieb, A. ponticus Pall. and A. testiculatus Pall. (Delobel et al., 2004). As far as host plants of this beetle are limited to one plant genus, it can be considered as a monophagous species.

There is nothing mentioned in Borowiec, 1985 and Anton, 1998, regarding the specific species of Astragalus genus which are attacked by Bruchidius tragacanthae. Also, A. kirrindicus is here reported as the insect’s host plant for the first time. Borowiec, (1987, 1985) and Anton, (1998), reported that the distribution of this insect was only in Iran, and mentioned the genus Astragalus as its host plant and classified it in the Bruchidius astragali group. Delobel (et al., 2004) believed that some species of seed beetles like B. lucifugus Bohemann, B. tragacanthae and B. virgatoides Lukjanovitch & Ter-Min were not reared from Astragalus seeds, and maybe only the adults feed on them and are caught on Astragalus plants. But as the insect species emerged from several seed samples of the genus Astragalus in different parts of the country in this study, it can be said that this is a host for the monophagous insect.

It should be noted that the adult bruchines are attracted to flowers of some plants. Therefore, collecting them from these plants does not mean that these plants are hosts for the insect’s larva (Decelle & Lodos, 1989).

Several plant species, including Hedysarum capitatum Burn. in Algeria, H.coronarium L.,
Onobrychis vaginalis C.A. Mey., and O. vicifolia Scop. in Sicily, H. spinosissimum L. in France, O. radiata Desf. O.sativa Lam., O. schahuensis Bornm. in Iraq, and unidentified plants in Tajikistan and France have been reported as hosts of the species Paleoacanthoscelides gilvus (Anton, 1998; Alvarez et al., 2006; Kergoat et al., 2007). The present report, with three hosts belonging to Astragalus and Onobrychis confirms that it is an oligophagous insect.

Vicia sp., of the family Fabaceae, is introduced as a host plant for Spermophagus calystegiae for the first time. Seeds of this genus are usually the Bruchus species’ diet (Delobel and Sadeghi, 2014). The plant species Calystegia sepium (L.), Calystegia soldanella (L.), Convolvulus sepium (L.), and Convolvulus soldanella (L.), of the family Convolvulaceae are known as host plants for the species (Borowiec, 1991; Anton, 1998). This new host which belongs to a different family indicates that the insect is to be considered polyphagous.

In the literature, host plants for Spermophagus caricus were not mentioned. In this study Convolvulus leiocalyxinaus Boiss. is introduced as a host for this monophagous insect for the first time.

Spermophagus decellei was previously reported only from Iran (Borowiec, 1987, 1991; Anton, 1998), and before the present study its host plants were unknown. We reared adults of this species from Convolvulus fruticosus seeds and this plant is reported as its host plant for the first time.

Convolvulus fruticosus is reported as a new host plant for Spermophagus canus. The new species, Spermophagus shamszadehi, that was recently described, was reared from seeds of this host (Delobel and Sadeghi, 2013). The known regions for the distribution of Spermophagus canus are central Asia, Kazakhstan, China, Tadzhikistan, Pakistan and Iran (Borowiec, 1987, 1991 and Anton, 1998).

Two new hosts of the families Apiaceae and Fabaceae are reported for Caryedon mesra in this study. This insect was previously reported only from Palestine (Johnson et al., 2004; Lobl & Smetana, 2010.) and its only known host was Ferula communis L. of the family Apiaceae (Johnson et al., 2004). The hosts of the genus Caryedon are in three subfamilies, Mimosoideae, Caesalpinioideae, and Papilionoideae of the family Leguminosae (Silvain et al., 1998). The fact that it feeds in seeds belonging to two different families indicates that it is a polyphagous insect.

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