SHORT COMMUNICATION

First resurgence of *Rhopalomia navasi*, gall midge (Dip: Cecidomyiidae) on *Artemisia herba alba* in Algeria

S. Tahar Chaouche, N. Salemkour

Scientific and Technical Research Centre for Arid Areas (CRSTRA), Biskra, Algeria

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Abstract

In the course of investigations at steppes in Algeria, Galls on *Artemisia herba alba* were recorded accidentally for the first time in 2015 at the region of Saida and Sidi Bel Abbes in the Northwest of the country. The associated host plants and midge-induced galls were collected and kept in glass boxes until the emergence of adult midges for the determination of specie.The identification of *Rhopalomia navasi* (Tavares,1904) was done by the Dr Marcela Skuhravá. Tavares is the first who signaled the presence of this specie in Algeria and described it with other gall midges species. Without access to Tavares's either large collection of galls and adults or lost of most Algerian samples. This collection is the first resurgence of *Rhopalomia navasi* in Algeria ; we aim to present it through its data.

Keywords: *Artemisia herba alba*, Cecidomyiidae, gall midges, *Rhopalomia navasi*, Algeria

La première résurgence de Rhopalomia navasi, mouche à galle (Dip:Cecidomyiidae) sur Artemisia herba alba en Algérie

Résumé

Au cours des enquêtes menées dans les steppes Algériennes, des galles sur Artemisia herba alba ont été enregistrées au hasard et pour la première fois en 2015 à Saida et Sidi Bel Abbes situées dans le Nord-ouest du pays. La plante hôte associé aux galles a été collectée et préservée dans des boîtes en verre jusqu'à l'apparition de moucherons adultes pour la détermination de l'espèce. L'identification de Rhopalomia navasi (Tavares, 1904) a été réalisée par le Dr Marcela Skuhravá. En Algérie, Tavares est le premier spécialiste qui a signalé la présence de cette espèce et il la décrit avec dautres espèces de moucherons gallicoles. Sans accès à la collection de Tavares, lun des plus larges collections de galles et adultes de Cecidomyiidae et/ou avec la perte de la plupart des échantillons algériens ; cette collection représente la première résurgence de Rhopalomia navasi en Algérie, nous voulons la présenter à travers ses données.

Mots-clés: *Artemisia herba alba, Cecidomyiidae, moucherons gallicoles, Rhopalomia navasi, Algérie*

Corresponding author

Soua Tahar Chaouch
E-mail: souadhouda@gmail.com

Introduction

Belonging to the Asteraceae family, *Artemisia herba -alba* Asso., is a perennial chamephyte, growing in large tufts (Fig.1. A), with several woody stems, very leafy and with tomentose young branches. The leaves are hairy, silvery, small, and deeply bi-pennated, with linear strips (Fig.1. B). The flowers (Fig.1. C) are all hermaphrodite, packed together in very small capitula, sessile and in bunch. The outside bracts of the involucre are orbicular, hairy and shorter than the inside bracts, which are green on the back, very scarious and glandulous. The fruits are achenes (Quezel & Santa, 1962; 1963). The vegetative growth of the *Artemisia herba-alba* takes place in the autumn; the flowering starts from September to December and basically develops at the end of the summer. It grows on steppe of north Africa (Algeria..) in different bioclimatic stages which range from upper semi-arid to the lower Saharian prevailing on salt soils and poorly drained areas (Wengler et al., 1994). It is host to specialized herbivous insects including gall-forming midges.

Cecidomyiid are among the most common and spesiose of the gall-forming insects.They are an ancient group found world-wide. (Gagné, 1989)

Cecidomyiidae are a large family of Diptera. The family contains 6,203 known species and 736 genera. The largest subfamily, the Cecidomyiinae, best known as herbivores and plant gall makers .It includes some of the most destructive pests of grains, fruits and vegetables and also many fungivores and predators of plant-feeding arthropods such as aphids.

This subfamily comprises the largest gall-making group among arthropods. Its great diversity and all published generic and specific names of Cecidomyiidae, recent and fossil, are listed in a Catalog of the Cecidomyiidae (Diptera) of the World. (Gagné and Jaschhof., 2014)

Until now the Algerian data on gall midges (Diptera: Cecidomyiidae) known betwen 1850-1971 were encountered in some papers of foreign researchers. The first 2 authors, keiffer and Tavares, conducted the main faunistic survey on gall midge species associated with different plants including field crops, trees, and wild vegetation like Artemisia.

The level of gall midge species knowledge in Algeria is not satisfactory enough in comparison with the knowledge of some adjacent European countries such as France (668sp) and Italy (508), but it is much higher in comparison with the knowledge of this family in adjacent North-African countries, such asTunisia and Moroccoo .

At present time and based on this data, we believe that a big effort is necessary to put together all data on gall midge species occurring in Algeria and ask for help from the experts for identification and the conservation of these native species because the majority of the samples signaled is lost. This article aimed to present the first simple of gall midge specie found randomly in Algeria on *Artemisia herba alba*.

Material and Methods

With a great ecological importance, *Artemisia herba alba* has à vegetative growth in autumn (large leaves) and then at the end of winter to spring (small leaves). (Mohsen H, 2008)

It is found in Algeria from the semi arid climatic stage to the Saharian stage (between 400 and 90 mm of annual precipitations). The collections of galls were conducted during the investigation including two provinces of Northwest Algeria steppe on the 15th and 17th april 2015. (Table 1)

One part of the collected plants with galls was prepared as a herbarium collection for determination of host plant species. Another part was put into emergence cages to obtain adults. Some galls were dissected to obtain the immature stages. Low level of knowledge was the reason why we decided to ask help for species identification through the larvae and pupae stages which are present inside the galls in absence of the emergence of adults. Some of these specimens, together with larvae, pupae and exuviae were sent to the Dr Marcela Skuhravá for identification and the rest were in the collection of the author.

Results and Discussion

Taxonomy of the gall midges

Subfamily: Cecidomyiinae

By tradition, for description of new species, adults are needed and this requires knowledge of specific pupation modes. Depending on species, Cecidomyiinae pupate either on a plant or in the soil. Species within most genera share pupation mode (e.g. *Asphondylia*, *Trigonomyia Kolesik* and *Rhopalomyia Rübsaamen*) in the gall. (Kolesik P, 2014)

Tribe: Rhopalomyiini

This tribe is made up of one large cosmopolitan genus of 293 species and a smaller Palearctic genus. Nearly

Table 1: Geographical coordinates of sample location, and elevation.

Location (Province)	Latitude -Altitude	Elevation (m)
Mesbah (Sidi Bel Abbes)	Lt : 34°20'57.590'' Lg : 0° 04'22.037''	1058
Sfid (Saida)	Lt : 34°28'43.564'' Lg : 0°00'32.099''	1094

all *Rhopalomyia* occur on Asteraceae and *Psectrosema* is restricted to *Tamarix* (Tamaricaceae).

Material examined

Rhopalomia navasi (Tavares,1904)

It is a typical Mediterranean specie which also associated in northern Africa with *Artemisia herba-alba*. The identification based on the immature stages offer sometimes useful taxonomic characters for distinguishing among species (Hawkins et al. 1986, Gagne & Waring 1990).

Gall

The development of gall is a complex phenomenon that involves subtle alterations initiated at critical points of time during plant differentiation. Galls are situated on stem sides of *Artemisia herba alba* (Asteraceae) with 8–10mm in diameter, composed of woolen fibers and several chambers occur inside one gall (Fig.2: a).

Figure1: View of Artemisia herba-alba Asso. Species. (A) Tuft; (B) Leave; (C) Flower.

They are induced by the activity of the first instar larvae. Determination of galls is based on Houard (1908-1909) and Buhr (1964-1965) ; Skuhravá M. and Skuhravý V. (2004) and the nomenclature of gall midge species is based on Skuhravá (1986,1989) ; Skuhravá M. and Skuhravý V. (2004). Galls are also hypothesized to provide protection from predators (Hufbauer R.A., 2004). The galls found support a rich community of Hymenoptera parasitoids.

Larvae

A solitary, yellow larvae,occurs inside a separate chamber where it develops, pupates and produces densely white pubescent galls on the stems of A*rtemisia herba alba*. (Fig.2: b,c)

Pupae

Pupae is the third stadium in gall midge development (Fig.2: d,e). The pupa is reddish-brown in color. The galls containing pupae usually remain on plants during the whole winter. Mature pupae shortly before the emergence of adult become black. (Fig.2: e)

The adult gall midge emerges from the pupal exuvia after it causes the sutura on the dorsal surface of the thorax to crack lengthwise. Adults after emergence remain for a short period stationary while their bodies harden. After several hours the adults are ready to fly. In spring the pupae start to cut their way out of the galls. Pupae perform characteristic movements with their abdomen and use their antennal horns, upper frontal horns and lower frontal horns to cut an opening in the wall of the gall. (Fig.2:f, g)

Distribution: Euro-Asian and Mediterranean, known to occur in Spain, Romania, Morocco, Algeria, Tunisia, Libya, Egypt, Syria and Iran.

The negative effect of developing galls and intensive attacks of *Rhopalomia navasi* on *Artemisia herba-alba* plants can limited the propagation and the area occupied by white wormwood. The reduction in abundance of Artemisia herba-alba on the steppes in the last decades years is obvious but cannot be attri-

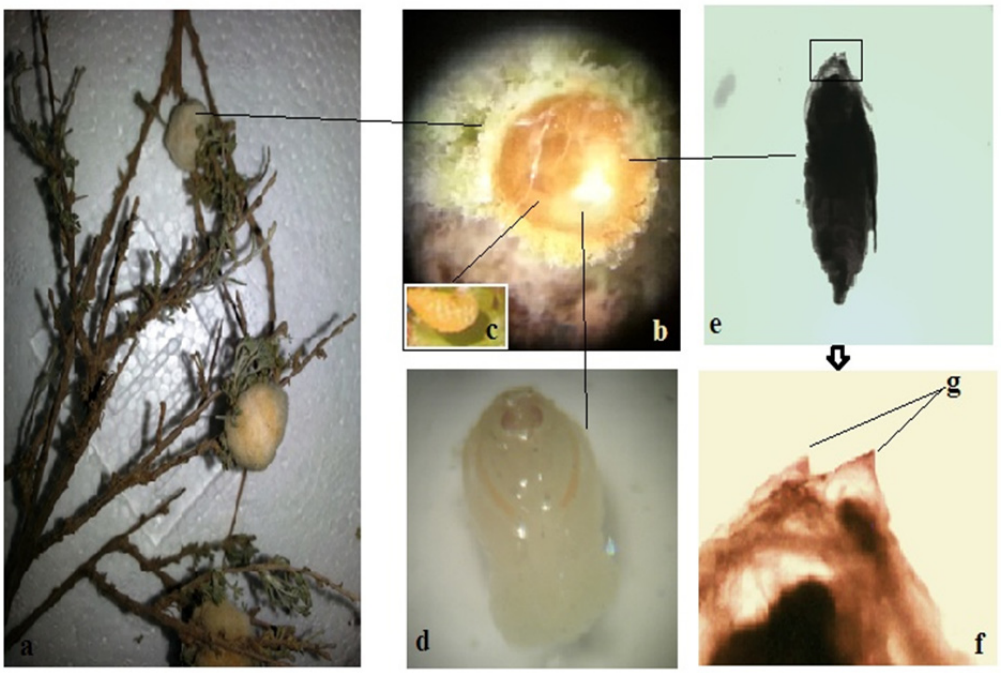

Figure 2: a. Galls on Artemisia herba alba; b, c. gall opened and larva; d, e. stages of pupae found on galls from which midges emerged ; f. pupal head, lateral ; g. antennal horns, exuviae, head.

buted only to phytophagous insect like gall midges, but also to human activity particular ingazing sheep and agricultural activities.

Conclusions

The species richness of gall midge species in a country is influenced by several factors, including geographic position, climatic factors, size of the country, floral composition, and anthropic factors, and also by the intensity of investigations and the ability and experience of researchers. (Skuhrava and Skuhravy, 2009).

In Algeria about 92 gall midge species have been found in various part of the country according to the data in the literature,with an area of 2,376,400 km^2 ,varying natural conditions and no systematic investigation known of the gall midge fauna has been carried out so far, it is obvious that the fauna of gall midges of Algeria is far from complete.Thus, it can be expected that with further research in different parts of the country, the recorded Algerian gall midge fauna will be considerably increased.

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Reference

Gagné, R. J.and J. H. Hatchett. 1989. Larval instars of Hessian fly (Diptera: Cecidomyiidae). Ann. Entomol. Soc. Am. 82: 73-79.

Gagne, R.J. & Waring G.L. (1990). The Asphondylia (Cecidomyiidae: Diptera) of creosote bush (Larrea tridentata), North America Proceedings of the Entomological Society of Washington, 92, 649–671.

Gagné, R.J. and M. Jaschhof. 2014. A Catalog of the Cecidomyiidae (Diptera) of the World. 3rd Edition.Washington, USA, 493p.

Haouari M. and Ferchichi A .2008. Study of genetic polymorphism of *Artemisia herba-alba* from Tunisia using ISSR markers. African Journal of Biotechnology Vol. 7 (1), pp. 044-050

Hawkins B.A., Goeden R.D. & Gagne R.J. 1986. Ecology and taxonomy of the Asphondylia spp. (Diptera: Cecidomyiidae) forming galls on Atriplex spp. (Chenopodiaceae) in southern California. Entomography, 4, 55–107

Hufbauer R.A. 2004. Observations of sagebrush gall morphology and emergence of Rhopalomyia pomum (Diptera: Cecidomyiidae) and its parasitoids.Western North American Naturalist 64(3), pp : 324-330.

Kolesik P.2014. A review of gall midges (Diptera: Cecidomyiidae: Cecidomyiinae) of Australia and Papua New Guinea: Morphology, biology, classification and key to adults. Austral Entomology, pp.01-022. DOI: 10.1111/aen.12100

Quezel, P. & Santa, S. (1962; 1963). New flora of Algeria and meridional desertic regions (in French). Vol. I & Vol. II, CNRS: Paris, France, 1170p.

Skuhravá M. and Skuhravý V. 2004. Gall midges (Cecidomyiidae, Diptera) of Mallorca (Balearic Islands, Spain). Boln. Asoc. Esp. Ent., 28 (1-2): 105-119.

Skuhravá M. and Skuhravý V. 1997. Gall midges (Diptera, Cecidomyiidae) of Greece. Entomologica, Bari, 31: 13-75.

Skuhravá M. and Skuhravý. V. 2009. Gall midges (Diptera: Cecidomyiidae) of Calabria, southern Italy. Acta Societatis Zoologicae Bohemicae 73:65-76

Skuhravá M., Blasco-Zumeta J.and Skuhravý. V. 1993. Gall midges(Diptera, Cecidomyiidae) of Aragon(Spain).A review species found in period 1891-1990 with new records for the Monegros region. ZAPATERI Revta.aragon.ent ; pp : 27-39

Wengler L. and Vernet J.L.1992. Vegetation, sedimentary deposits and climats during the Late Pleistocene and Holocene in eastern Morocco.Palaeogeogr.Palaeoclimatol.Palaeoecol., 94 :141-167.