

Comparison between the Soybean Pod Gall Midge, *Asphondylia* sp. and Its Exotic Relative, *Asphondylia ervi* Rübsaamen (Diptera : Cecidomyiidae)

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Introduction

The soybean pod gall midge, *Asphondylia* sp²⁾, is one of the serious pests of soybean, particularly in southwestern Japan. In summer and autumn, the larvae of the gall midge inhabit the pods of cultivated soybean as well as those of wild leguminous plants^{4,5)}. However, some aspects of the life history and host range of the gall midge still remain unclear, in particular with regard to the host plants of the overwintering generation. Recent studies^{5,11,12,16)} indicated the possibility that this species might have alternative winter hosts other than Leguminosae. In addition, this gall midge is morphologically quite similar to other *Asphondylia* species which inhabit a wide range of wild plant species^{10,11)}. These matters have made the species identification quite difficult.

E. P. Felt (New York State Entomologist) received some specimens of the soybean pod gall midge from Kanzawa²⁾ and suggested its relation to *Asphondylia ervi* Rübsaamen⁷⁾ which is associated with *Vicia hirsuta* (Leguminosae) in Germany. In contrast, Yuasa & Kumazawa⁹⁾ doubted his suggestion as they noted some differences between the 2 species through the examinations of the original description of *A. ervi*⁷⁾. However, they could not get any corroboration in support of the differences because the adult of *A. ervi* was not fully described and the immature stages were not given in the original description⁷⁾. Thus, the soybean pod gall midge has been left unnamed since its discovery in 1918²⁾.

Fortunately, in 1974 the present author had an opportunity to examine the types of *A. ervi* kept in the collection of the National Museum of Natural History in Stuttgart, West Germany. In this paper, the author briefly describes the female and pupa of *A. ervi* and the mature larva and pupa of the soybean pod gall midge to show some clear diagnostic differences between the 2 species.

Materials and Methods

The author visited the National Museum of Natural History in Stuttgart, West Germany in September 1974 and examined 1 pupa and 1 female of *A. ervi* which have been kept in the spirit collection of the Museum (vial no. 4037a, with a label indicating the types of Rübsaamen). The specimens were transferred into a droplet of glycerine on a slide glass and were observed under a compound microscope. After examination, the specimens were returned into the vial.

Larval and pupal specimens of the soybean pod gall midge were collected in 1981–1982 from soybean fields in Kagoshima City. They were mounted on microscope slides by the xylene-balsam method.

Asphondylia ervi Rübsaamen (Fig. 1)

Asphondylia ervi Rübsaamen, 1895. *Ent. Nachr.* **21**: 260.

Asphondylia ervi Rübsaamen: Möhn³⁾.

Adult (♀): Eye bridge 7 to 8 facets long medially; fronto-clypeal setae 18, mesepimeral setae 78 in number; palpus consisting of 1 basal and 2 distal segments, second distal segment about 2.5 times as long as first. See also Rübsaamen⁷⁾ for further details.

Mature larva: See Möhn³⁾ in which the mature larva was fully described (Fig. 1A).

Pupa: Apical spine of antennal horn long, strongly sclerotized, finely denticulate on inner margin (Fig. 1B); anterior (upper) frontal spine strongly sclerotized, incised distally by a V-shaped emargination, forming a pair of triangular lobes (Fig. 1C); posterior (lower) frontal spine rather weakly sclerotized, consisting of 3 small lobes which are connected basally (Fig. 1D); a pair of posterior (lower) facial papillae with short setae; apical papillae with relatively long setae (Fig. 1E).

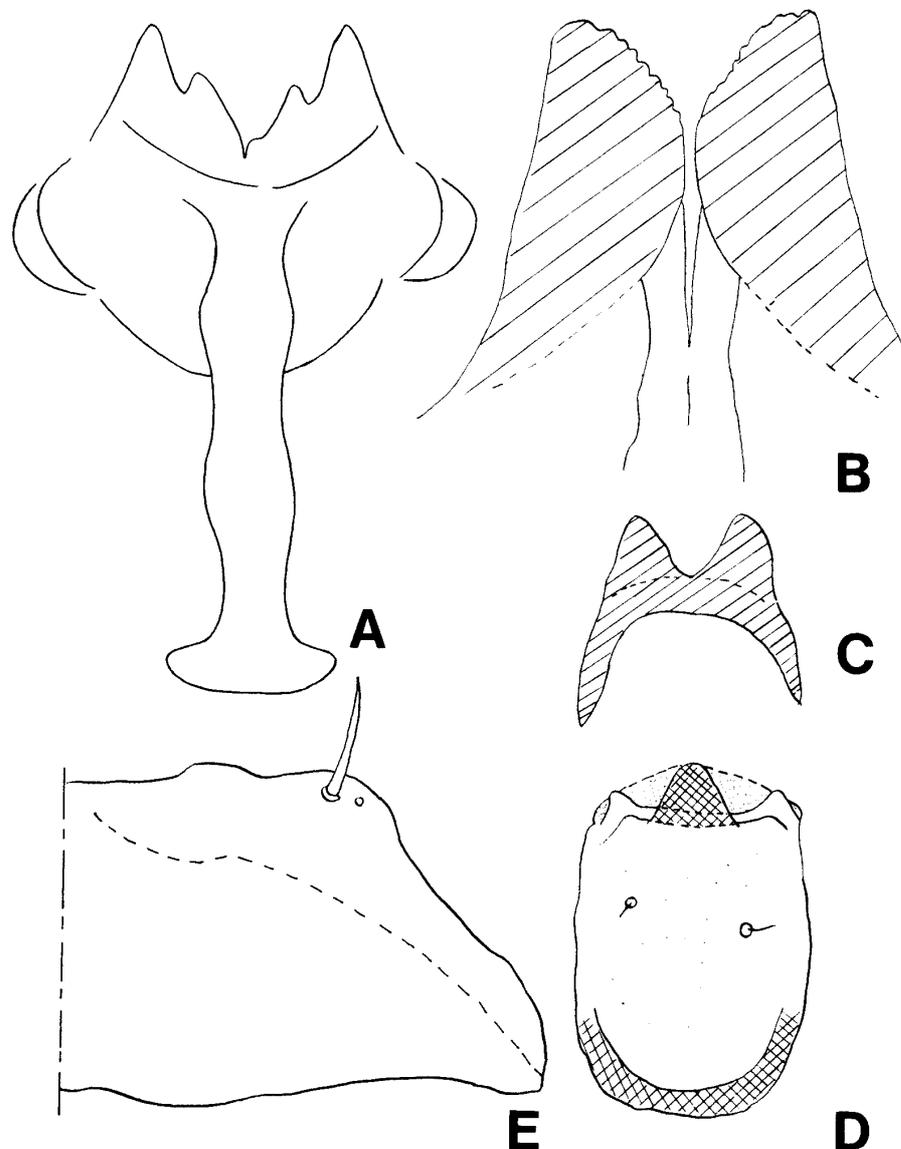


Fig. 1. *Asphondylia ervi*. A: Sternal spatula of mature larva (Möhn³⁾); B: Apical spine of pupa; C: Anterior frontal spine of pupa; D: Posterior frontal spine of pupa; E: Seta arising from apical papillae.

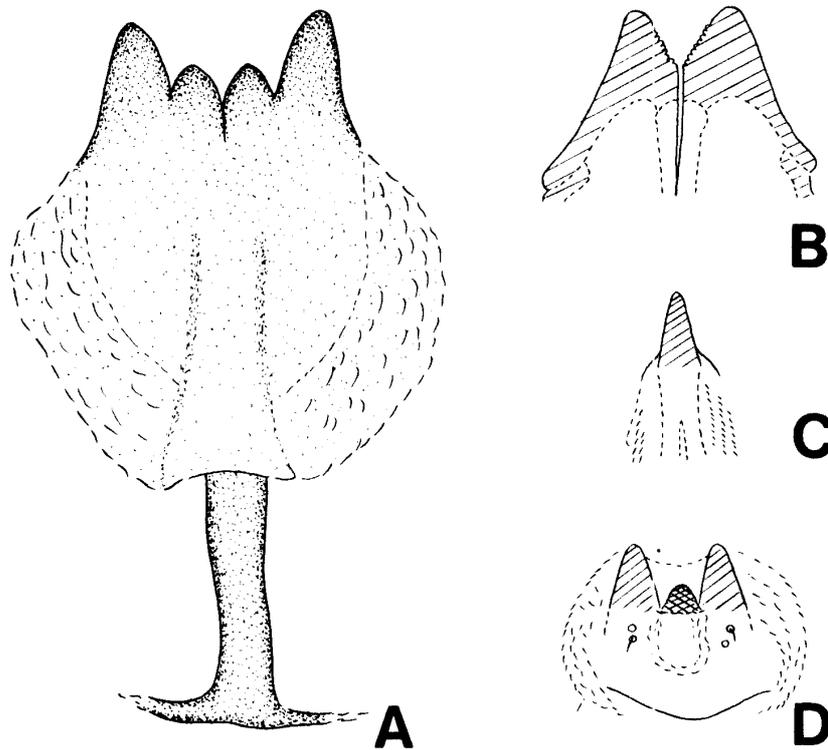


Fig. 2. *Asphondylia* sp. (The soybean pod gall midge).

A: Sternal spatula of larva; B: Apical spine of pupa; C: Anterior frontal spine of pupa; D: Posterior frontal spine of pupa.

Asphondylia sp. (Fig. 2)

Asphondylia sp. Kanzawa, 1918. *Jour. Plant Prot.* 5: 283.

Asphondylia sp. Kanzawa: Yukawa¹⁰⁾.

English name: Soybean pod gall midge

Japanese name: "Daizu-saya-tamabae"

Adult: See Yukawa¹⁰⁾.

Mature larva: Second antennal segment short, conical; 2 ventral and 2 lateral cervical papillae each with a seta. Number and position of spiracles normal; 4 of 6 dorsal papillae each with a seta; 3 pleural papillae present on each side, each with a seta; 2 dorsal papillae of eighth abdominal segment each with a seta; 2 of 6 terminal papillae somewhat cone-shaped, remaining 4 with short setae. Sternal spatula strongly sclerotized, 225 to 270 μm , 2.6 to 2.8 times as long as maximum width, distally with 4 lobes which are usually pointed apically (Fig. 2A); outer lobes longer than inner lobes; width between tips of 2 outer lobes 60 to 85 μm ; sternal and inner pleural papillae each with a seta on all thoracic segments; 3 inner and 2 outer lateral papillae each with a seta on all thoracic segments; 2 anterior ventral papillae and 2 posterior ventral papillae each with a seta; 2 ventral papillae of eighth abdominal segment each with a seta; anal papillae without setae.

Pupa: Apical spine of antennal horn long, strongly sclerotized, finely denticulate on inner margin (Fig. 2B); anterior (upper) frontal spine simple, strongly sclerotized, pointed apically (Fig. 2C); posterior (lower) frontal spine consisting of 3 pointed lobes, of which outer 2 are a little longer than central one (Fig. 2D); a pair of posterior (lower) facial papillae with short setae (Fig.

2D); apical papillae with relatively long setae.

Discussion

About 250 nominal species of the genus *Asphondylia* have been described in the world¹⁴. They are morphologically quite similar, and species identifications are therefore based almost entirely on host data¹. In this sense, it seems to be reasonable that Felt should have suggested the similarity between the soybean pod gall midge and the European species, *A. ervi*, since both the species have been known to inhabit leguminous plants. However, Yuasa & Kumazawa⁹, adopting a wise policy, refrained from applying the name *ervi* on to the soybean pod gall midge in Japan.

As have been noted for other *Asphondylia* species¹⁰, there are no clear diagnostic differences between the 2 species in the adult and larval morphology. The number of eye bridge ommatidia shows a little difference; 7 to 8 in *A. ervi* and 8 to 11 in the soybean pod gall midge¹⁰, but the difference is not clear enough to separate the 2 species. The numbers of fronto-clypeal and mesepimeral setae are of no use at the moment as they are based on a single female specimen of *A. ervi*.

However, remarkable differences in the pupal characters apparently indicate that the 2 species are not identical. The anterior frontal spine is simple and pointed apically (Fig. 2C), and the posterior frontal spines consisting of longer lobes (Fig. 2D) in the soybean pod gall midge. In contrast, *A. ervi* has the anterior frontal spine which is distally incised by a V-shaped emargination (Fig. 1C) and the posterior frontal spine consisting of 3 small lobes (Fig. 1D).

The incised anterior frontal spine is also noted for the mulberry black midge, *Asphondylia morivorella* (Naito) in Japan⁸, but a large majority of the Japanese *Asphondylia* species have the anterior frontal spine which is simply pointed apically^{10,13,15}. Therefore, the soybean pod gall midge cannot be distinguished from these species only by the pupal characteristics. Thus, further information concerning the life history and host range is expected for the species identification of the soybean pod gall midge.

Summary

The female and pupa of *Asphondylia ervi* and the mature larva and pupa of the soybean pod gall midge, *Asphondylia* sp. are briefly described. The soybean pod gall midge is one of serious pests of soybean, particularly in southwestern Japan. This species has been considered to be related to *A. ervi* which inhabits a leguminous plant, *Vicia hirsuta* in Germany. However, comparison of pupal characteristics indicates that the two species are not identical.

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