

گونه‌های جنس *Planococcus Ferris* در ایران
(Homoptera: Coccoidea: Pseudococcidae)
و بررسی مجدد گونه *Planococcus vovae* (Nasonov)

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چکیده

در بررسی گونه‌های متعلق به شپشک‌های آردآلود (Pseudococcidae) موجود در موزه‌ی حشرات هایک میرزایانس موسسه‌ی تحقیقات آفات و بیماریهای گیاهی، تاکنون سه گونه متعلق به جنس *Planococcus Ferris* تشخیص داده شده است. این گونه‌ها شامل *P. citri* (Risso)، *P. ficus* (Signoret) و *P. vovae* (Nasonov) میباشند.

بررسی و مقایسه‌ی نمونه‌های جمع‌آوری شده‌ی گونه *P. vovae* از ایران نشان داد که نمونه‌های این گونه دارای خصوصیات متفاوتی از نمونه‌های این گونه در سایر موزه‌های دنیا می‌باشند. در منابع موجود، یکی از خصوصیات کلیدی مهم در جداسازی *P. vovae* از سایر گونه‌های *Planococcus* عدم وجود multilocular disc pores در کناره‌های جانبی شکم است. در حالیکه نمونه‌های جمع‌آوری شده از جنوب اروپا و ناحیه‌ی مدیترانه نشان می‌دهد که تعداد multilocular disc pores در کناره‌های جانبی شکم ۱-۲ عدد است و در نمونه‌هایی که از استان فارس جمع‌آوری شده به بالاترین تعداد می‌رسد. با توجه به تغییرات موجود در نمونه‌های جمع‌آوری شده از مناطق مختلف جهان، می‌بایست بررسی مجددی در کلید شناسایی جنس *Planococcus* انجام شود. گونه‌ی *P. vovae* در ایران روی درختان خانواده Cupressaceae خسارت وارد می‌کند.

در این مقاله توصیف و نحوه تفکیک گونه‌های جنس *Planococcus* در ایران، بحث و بررسی مجدد گونه *P. vovae* همراه با تصویر و کلید شناسایی ارائه شده است.

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Mealybug species of the genus *Planococcus* Ferris in Iran (Homoptera: Coccoidea: Pseudococcidae) with a discussion of *Planococcus vovae* (Nasonov)

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Key words: *Planococcus citri* (Risso), *Planococcus ficus* (Signoret), *Planococcus vovae* (Nasonov), Pseudococcidae, Mealybugs, Cupressaceae, damage, key to species.

ABSTRACT

Three species of the mealybug genus *Planococcus* Ferris are discussed from Iran. These are *P. citri* (Risso), *P. ficus* (Signoret) and *P. vovae* (Nasonov). Some characters of *P. vovae*, as represented in the species in Iran, differ from those in most specimens found elsewhere and are discussed as well. The species causes damage to species of Cupressaceae in Iran. A key to species of *Planococcus* in Iran is provided to further aid identification.

INTRODUCTION

Mealybugs feed by sucking plant sap and are often cryptic in their habits. They are sometimes the cause of serious outbreaks if accidentally introduced to other countries in the absence of their natural enemies. The increased movement of plant material and produce from one country to another in the latter half of the present century has emphasised the need for vigilance in the detection of mealybugs at plant quarantine

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inspection. As listed by Ben-Dov (1994), about 40 species of the mealybug genus *Planococcus* have been described, mostly are tropical and subtropical in distribution, but some species occur in temperate regions. Many species are fairly local but others have been transported to other countries on plant materials. The purpose of this study has been to identify the species of *Planococcus* present in Iran as a basis in case further species are introduced.

In recent years, *Planococcus vovae* (Nasonov) has become a serious pest in Iran causing damage to *Cupressus* spp., especially to the leaves. *P. vovae* has been discussed in great detail by Cox (1989) and the description and the key to species in this work aid easy recognition of the species in many parts of the world. However specimens collected from Iran, and especially from Fars Province in the south, does not wholly agree with this description. Some specimens collected in parts of the Mediterranean area are similar to specimens from Iran, and *P. vovae* appears to be much more variable in its characters.

Planococcus is one of several genera now assigned to the tribe Planococcini erected by Ezzat & McConnell (1956). Cox & Ben-Dov (1986) discussed the species in this tribe occurring in the Mediterranean Basin, and Cox (1989) defined the genus *Planococcus* in detail and presented a key to relevant genera. Kozar *et al.* (1996) have listed three species of *Planococcus* from Iran and the following discussion of these, is based on material actually studied. The terminology follows that of Cox (1989). Only important references are cited and for the complete synonymy to each species see Ben-Dov (1994).

Planococcus citri (Risso)

Dorthisia citri Risso, 1813: 416.

Planococcus citri (Risso); Ferris 1950: 165; Ezzat & McConnell, 1956: 65. Cox, 1989: 16.

This species is probably one of the most widespread and polyphagous of mealybugs and is a serious pest of citrus in many areas. The description of the species by Cox (1989) is based on earlier rearing experiments by Cox (1981, 1983) who studied the variation of populations under different environmental conditions to determine the limits of morphological variation within the species. The species is very close to *P. minor*

(Maskell) from which it differs in usually possessing more ventral tubular ducts on the head and next to the 8th pair of cerarii. In *P. citri*, these ducts normally number at least 14, and in *P. minor* there are usually fewer, although identification is often difficult and reference should be given to Cox (1989). *P. citri* is very common on citrus, a host plant not normally preferred by *P. minor*, *P. citri* also differs from *P. ficus* (Signoret) in always possessing conical cerarian setae on the head and thorax whereas in *P. ficus* these setae are usually longer and more slender. In Iran, *P. citri* occurs in many localities and on various plants. The following record on *Vitis* sp. is based on a single specimen. Although the host plant is unusual for *P. citri* (Cox & Ben-Dov, 1986), the specimen has 22 oral collar tubular ducts on the head as well as next to the 8th pair of cerarii, and all the other characters of *P. citri*. Specimens from the following localities and plants have been examined.

Firouz Abad, on *Fraxinus* sp., 28.X.1997 (M. Moghaddam).

Khorasan, Mashhad, on *Vitis* sp., 22.iv.1955 (Kamali).

Khuzestan, on *Citrus* sp., 13.i.1989 (G. A. Asadeh).

Shiraz, on *Citrus* sp., 20.viii. 1998 (Gharaii).

Tehran, on *Citrus* sp.

Intercepted in Bombay, India, from Iran, on *Citrus* sp., 26.xi.1968.

Planococcus ficus (Signoret)

Dactylopius ficus Signoret, 1875: 315.

Planococcus ficus (Signoret), Ezzat & McConnell, 1956: 79; Cox & Ben-Dov, 1986: 483; Cox & Wetton, 1988: 570; Cox, 1989: 25.

This species is common in Iran, occurring mainly on *Vitis* spp. and *Ficus* spp., host plants not normally infested by *P. citri* in the Middle East area (Cox & Ben-Dov, 1986). *P. ficus* usually has less than 4 oral collar tubular ducts on the venter of the head and thorax, it sometimes possesses translucent pores on the hind femora and these are never present in *P. citri*. Furthermore, while all the cerarian setae of *P. citri* are conical, those on the head and thorax of *P. ficus* are usually slender and more flagellate. Moreover, although many of the parasitoids are common to both species, some parasitoids of *P. ficus* have not been recorded from *P. citri* (Noyes & Hayat, 1994).

P. ficus is common in the Mediterranean area, the Middle East, the Irano-Turanian area and in Pakistan. The species is also present in South Africa, Argentina and Brazil. Although it was reported from southeastern USA by Ezzat & McConnell (1956). This species has been accidentally introduced into California recently where it is causing extensive damage to grapevines (R. J. Gill, personal communication). Rosciglioni & Gugerli (1989) confirmed that *P. ficus* transmits leafroll disease and an associated clostervirus from grapevine into grapevine in Italy. Specimens of *P. ficus* have been studied from the following localities in Iran:

Fars, Shiraz, on *Vitis* sp., 31.v.1998 (M. Moghaddam).

Kashan, on *Ficus carica*, 12.X.1982 (A. Naeem).

Khorasan, Mashad, on *Vitis* sp., 22.iv.1994 (Kámali); Nishabur, on *Vitis* sp.

Khuzestan, on *Vitis vinifera*, 22.v.1990 (G. A. Asadeh); on *Ficus* sp., 22.X.1990 (G. A. Asadeh); Dezphul, on *Vitis* sp., 22.iv.1994 (G. A. Asadeh).

Tehran, on *Ficus* sp., under glass, 1.iv.1978; on *Platanus orientalis*, 27.ix.1998; Evin, on *Cucurbita* sp., in laboratory.

Planococcus vovae (Nasonov)

(Fig. 1)

Pseudococcus (Dactylopius) vovae Nasonov, 1908: Lectotype, Poland, Skolimov, on *Juniperus* sp., designated by Danzig, 1980: 168.

Pseudococcus inamabilis Hambleton, 1935: 112. Syntypes, Brazil, on *Cupressus glauca*.

Pseudococcus junipericola Borchsenius, 1949: 116. Syntypes, Tajikistan; on *Juniperus* sp., synonymised by Danzig, 1986: 18.

Allococcus inamabilis (Hambleton), Ezzat & McConnell, 1956: 15.

Planococcus vovae (Nasonov), Danzig, 1980: 168; Cox & Ben-Dov, 1986: 485; Cox & Wetton, 1988: 561; Cox, 1989: 72.

The illustrations and descriptions in Cox & Ben-Dov (1986) and Cox (1989) have proved adequate to identify most specimens of this species. *P. vovae* is distributed throughout much of Europe as far north as St Petersburg in Russia. It is common in the Mediterranean area and south-west Asia to Turkey and Iran, and it has been introduced into South America where it is present in Argentina and Brazil. Almost always it infests genera of the plant family Cupressaceae when it often damages the trees, causing

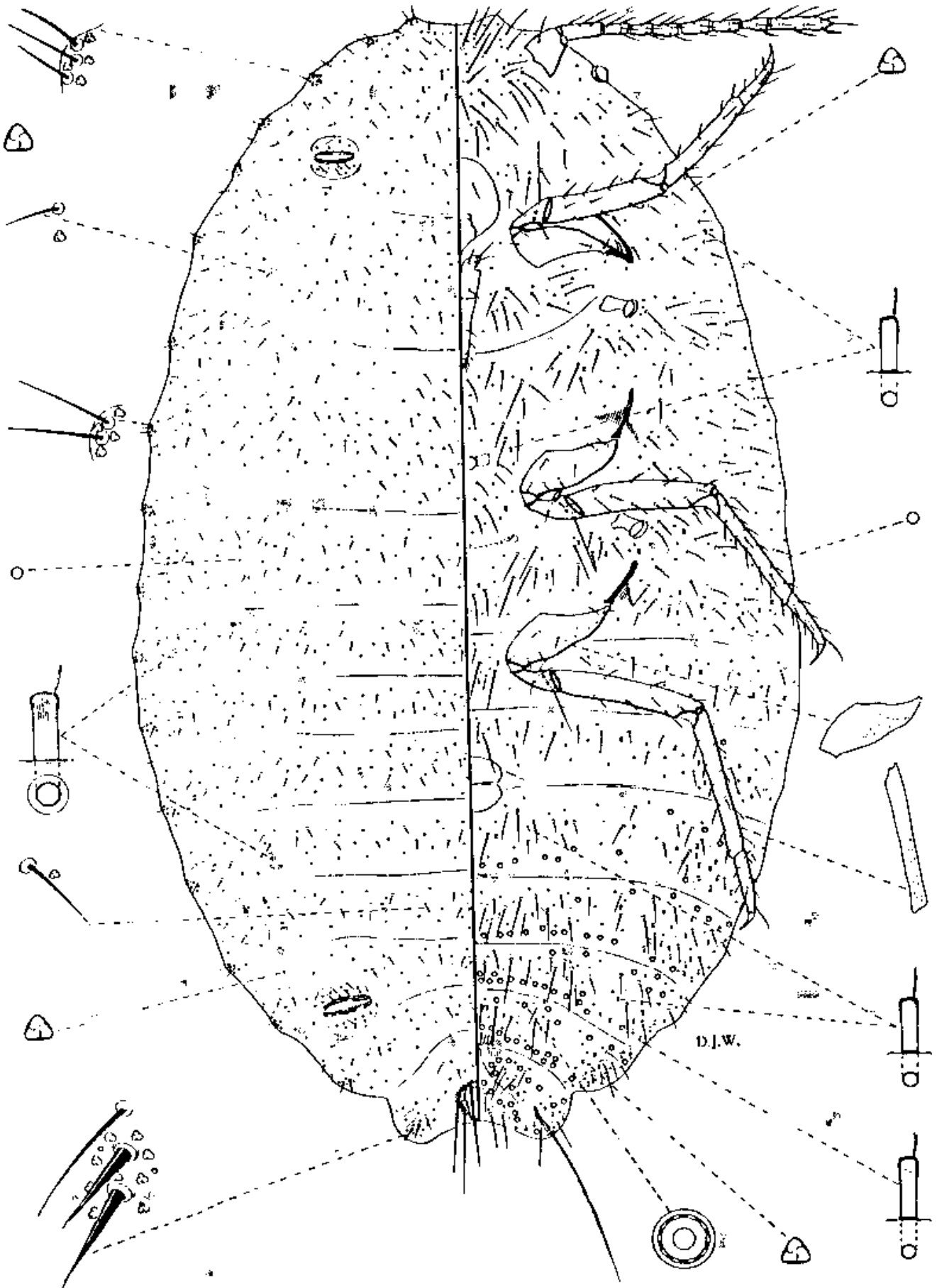


Fig. 1. *Planococcus voyae* (Nasonov). Specimen from Fars Province, Iran.

die-back of the twigs. Francadi & Covassi (1992) have discussed how feeding activity of the mealybug leads to drying of the twigs, the development of sooty moulds and eventual weakening of the tree. On another aspect, Cox & Ben-Dov (1986) have stressed that shelter trees, usually Cupressaceae, are often used to protect commercial fruit trees. Although the mealybug fauna of the Cupressaceae and fruit trees is quite different, nevertheless, the parasitoid range may be similar, and insecticide spraying of fruit trees often results in dense populations of *P. vovae* developing on *Cupressus* trees causing severe damage.

P. vovae possesses variable numbers of what Cox & Ben-Dov (1986) termed as modified dorsal tubular ducts, each similar to an oral rim tubular duct. The range numbers from 13-110 in the dorsum of the abdomen in specimens from Europe, the Middle East and as far south as Iran, with the higher numbers occurring in Central Europe. These variable characters were discussed by Marotta (1990) when recording the species from Italy.

Cox & Ben-Dov (1986) and Cox (1989) have indicated that one of the most important key characters separating *P. vovae* from many other species of *Planococcus* is the absence of ventral multilocular disc pores on the lateral abdominal margins. In her key to species, Cox (1989) separates species with only 1 or 2 of these pores per segment from species completely without marginal multilocular disc pores. *P. vovae* is normally described with multilocular disc pores confined to the medial areas of the abdomen and always lacking these pores on the lateral margins. Some specimens, mostly from southern Europe and the Mediterranean area, possess a few multilocular disc pores on the abdominal margins. Many of these specimens are from the same batches as specimens collected at the same time without marginal multilocular pores. The number of marginal pores ranges from only 1 or 2 to many. They reach their highest numbers in specimens from Fars Province in the south of Iran. Roberts & Tranfaglia (1982) have already illustrated the species (as *Allococcus inamabilis*) with a few marginal multilocular disc pores from specimens collected in Puglia, Italy, on *Cupressus macrocarpa*. The species is illustrated here from specimens collected in Fars Province, Iran, to show the high numbers of these pores. Specimens have been studied from the following localities in Iran:

East Azérbaijan Province, Marand, on *Cupressus* sp., 1999 (Lotfalizadeh).

Fiروز Abad, on *Cupressus* sp., 28.X.1997 (M. Moghaddam).

Kerman Province, Kerman, 1995 (M. Moghaddam).

Ramsar, on *Thuja* sp., 13. viii. 1973.

Shiraz, 11.vi.1998 (Lotfalizadeh).

Tehran, on *Cupressus* sp., 1.ii.1993 (M. Moghaddam); on *C. sempervirens*, 15.x.1994 (M.J. Maniee).

The following material has also been examined in addition to that from Iran. Specimens listed with an asterisk* possess multilocular disc pores on the abdominal margins whilst those lacking these pores are listed with a ° sign. Both symbols are used in records of specimens with and without these pores.

England, Surrey, on* *Cupressus sempervirens*, Norfolk, on ° *Juniperus communis*.

Corsica, Ajaccio, on* *Cupressus* sp.

Crete, Samaria Gorge, on* *Cupressus* sp.

Cyprus, on *° *Cupressus* sp.; Nicosia, on*° *C. macrocarpus*.

Germany, Berchtesgaden, on° *Juniperus nana*.

Italy, Cervo, on* *Juniperus* sp.

Poland, Zabornia, near Rabka, on° *J. communis*; Pieniny Mts on ° *Juniperus* sp. Oman, Salaleh Palace, on* *Cupressus* sp.

Turkey, Antalya, on*° *Thuja occidentalis*; * *C. sempervirens* var. *horizontalis*, * *C. goveniana*, ° *C. virginiana*; Erzin, on* *Cupressus* sp.; Istanbul, on* *Laurus nobilis*.

Çanakçıoğlu (1977) also listed *Juniperus excelsa* and *Libocedrus decurrens*. He mentioned that the record on *Laurus nobilis* may have been due to a misidentification and this record was also noted by Williams (1984) when discussing *P. vovae* for the first time from England.

Planococcus vovae is closely related to *P. taigae* Danzig, described by Danzig (1986) from Russia, southern Sakhalin, on *Juniperus sibirica*, the Primorya Region, on *J. rigida*, and as far west as northern Karelia on *J. communis*, *P. taigae* differs in possessing more than 200 dorsal ducts, with up to 24 ducts across each segment, and has ventral ducts on the head. Furthermore, *Crisicoccus matesovae* (Danzig), described from Kazakhstan on *Juniperus sabina*, is very similar to *P. taigae* and was originally described in *Planococcus* but differs from *P. vovae* and *P. taigae* in lacking a few cerarii on the thorax. There is a possibility that *P. vovae*, *P. taigae* and *C. matesovae* may prove to be a

single variable species (Cox, 1989).

Rondani (1874) described *Coccus gossipifera* Rondani as living on twigs of junipers in Italy. Lindinger (1921) synonymised the name *Pseudococcus vovai* (an unnecessary emendation of *P. vovae*) subjectively with *Coccus gossypifer*, another unnecessary emendation, and transferred the species to *Pseudococcus* Westwood as *P. gossypifer*. The gender altered by Lindinger is appropriate but the correct combination should have been *P. gossipifer*. The epithet *gossipifer* is a Latin adjectival name, which can be translated as cotton-bearing. Lindinger (1913) also recorded *P. gossypifer* on *Juniperus phoenica* from Scardona and Sebenica, Dalmatia (now Croatia). Kawecki (1948) accepted Lindinger's synonymy and recorded *P. gossypifer* from the Kielcie District and Beskidy, Poland.

The species described by Nasonov under the name *Pseudococcus (Dactylopius) vovae* and the subsequent combination as *Planococcus vovae* have become established by usage. Although Lindinger's synonymy may be correct, it would be better, under Article 23.9.2 of the International Code of Zoological Nomenclature, Fourth Edition, 1999, in effect from 1 January 2000, and under Article 23.9.1.2, to regard the taxon *Coccus gossipifer* Rondani, 1874, as a *nomen oblitum*, and the later taxon *Pseudococcus (Dactylopius) vovae*, as described by Nasonov, 1908, as a *nomen prodectum*.

The following key is presented to identify the three species of *Planococcus* in Iran. Many characters overlap, However, depending on different environmental conditions, and the work by Cox (1989) should be consulted for a more detailed key to the whole genus.

Key to species of *Planococcus* in Iran

- 1 Multilocular disc pores absent from margins of abdomen
..... *vovae* (Nasonov)
- Multilocular disc pores present on margins of abdomen even if only 1 or 2 pores occur on each segment 2
- 2 Modified dorsal tubular ducts numerous and conspicuous, numbering 13-110, occurring in marginal and medial areas, at least on abdomen. All cerarii anterior to anal lobe pair or penultimate pair with thin flagellate setae resembling dorsal setae but usually slightly wider..... *vovae* (Nasonov)

- Modified dorsal tubular ducts, if present, occurring singly adjacent to cerarii except for only 1 or 2 in medial areas of abdomen. Either all cerarii with distinct conical setae or some on anterior end of body long and slender, often flagellate at tips 3
- 3 Venter of head and thorax with 0-4 oral collar tubular ducts only.
Translucent pores sometimes present on hind femora. Cerarii on head and thorax often long and slender. Medial posterior area on venter of abdominal segment VII usually with a single row of multilocular disc pores. Longest dorsal setae on abdominal segments VI and VII 25-50 μ m long *ficus* (Signoret)
- Venter of head and thorax mainly with oral collar tubular ducts, usually numbering 0-30 on head and next to eighth pair of cerarii. Translucent pores never present on hind femora. All cerarii with conical setae. Longest dorsal setae on abdominal segments VI and VII 15-33 μ m long *citri* (Risso)

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