

Study on three species of wheat aphids (Homoptera: Aphididae) in Río Grande do Sul, Brazil

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SUMMARY

RUBÍN DE CEUS V, GASSEN D N, VALENTE V L, KALIS DE OLIVEIRA A. 1996. Study on three species of wheat aphids (Homoptera: Aphididae) in Río Grande do Sul - Brazil. Rev. per. Ent. 38.— During 1994, aphid samples were collected in wheat fields belonging to an experimental farming area in southern of Brazil, where *Schizaphis graminum* (Rondani), *Rhopalosiphum padi* (Linnaeus) and *Sitobion avenae* (Fabricius) are important wheat pests. In this paper, we report the most important morphological characteristics of such aphids, designed for use with specimens on microscope slides and provide a simple identification key useful to classify multispecific infestations, as a contribution to biological control programs.

Keywords: Aphids, taxonomy, wheat pests, Brazil.

RESUMEN

RUBÍN DE CELIS V, GASSEN D N, VALENTE V L, KALIS DE OLIVEIRA A. 1996. Estudio sobre tres especies de áfidos del trigo (Homoptera: Aphididae) en Río Grande do Sul. Rev. per. Ent. 38.— Durante 1994 se colectaron muestras de áfidos en campos de trigo de un área experimental del sur de Brasil. Las especies fueron *Schizaphis graminum* (Rondani), *Rhopalosiphum padi* (Linnaeus) y *Sitobion avenae* (Fabricius). Se informa aquí de las características morfológicas más importantes en especímenes preparados en láminas microscópicas y se da una clave útil para identificar infestaciones multispecíficas, como una contribución a programas de control biológico.

Palabras clave: Afidos, taxonomía, plagas del trigo, Brasil.

Introduction

Among the Graminae family there are many species of economic importance for man, but aphids are a very serious problem for these cultures, being considered as first magnitude pests for these plants all over the world.

Wheat aphids were introduced into Brazil probably from Asia and Europe and are considered to be pests producing a great damage. The economic losses promoted by aphids are the consequence of the activities of plant feeding, when results in arrested development, reduced photosynthesis ability and in virus transmission, leading to leaf deformation and consequent negative effect on the crops.

Insecticides provide some prevention against the action of aphids, but farmers need to carefully control the amount of product applied to avoid ecological damage. Alternatively, information about the biology of aphids can contribute to the establishment of effective biological control programs.

Some studies performed with Brazilian aphids are those by MOREIRA (1925), who described the aphid fauna of Brazil, and by COSTA *et al.* (1972), who listed species such as *Cavariella aegopodii*, *Amphorophora coinmellinensis* and many others. BERTELS (1973) presented a key identification for aphid species of Río Grande do Sul (Southern Brazil) but, as mentioned by COSTA *et al.* (1993), this key is of limited value because the species mentioned in the text do not correspond exactly to the original key from which it was translated (BIANCHARD, 1939) and that corresponds to an excellent revision of Argentinian aphids. *Schizaphis graminum*, *Rhopalosiphum padi* and *Sitobion avenae* are aphid species that attack wheat during the early growth stages by infesting the leaves and the stem.

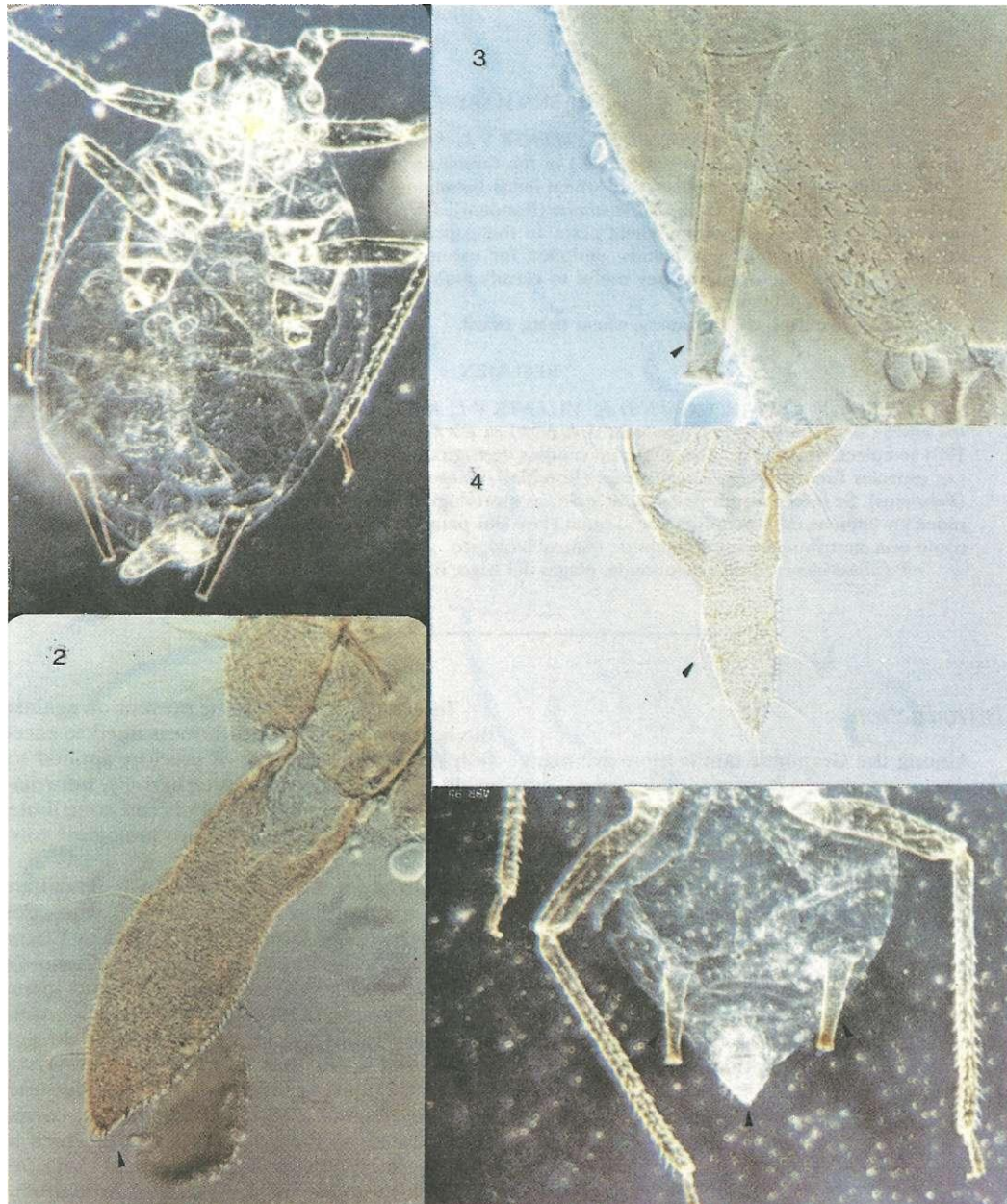
RONNA (1933), cited by GASSEN (1978), detected *Schizaphis graminum* in several graminiae in Río Grande do Sul state in Southern of Brazil,

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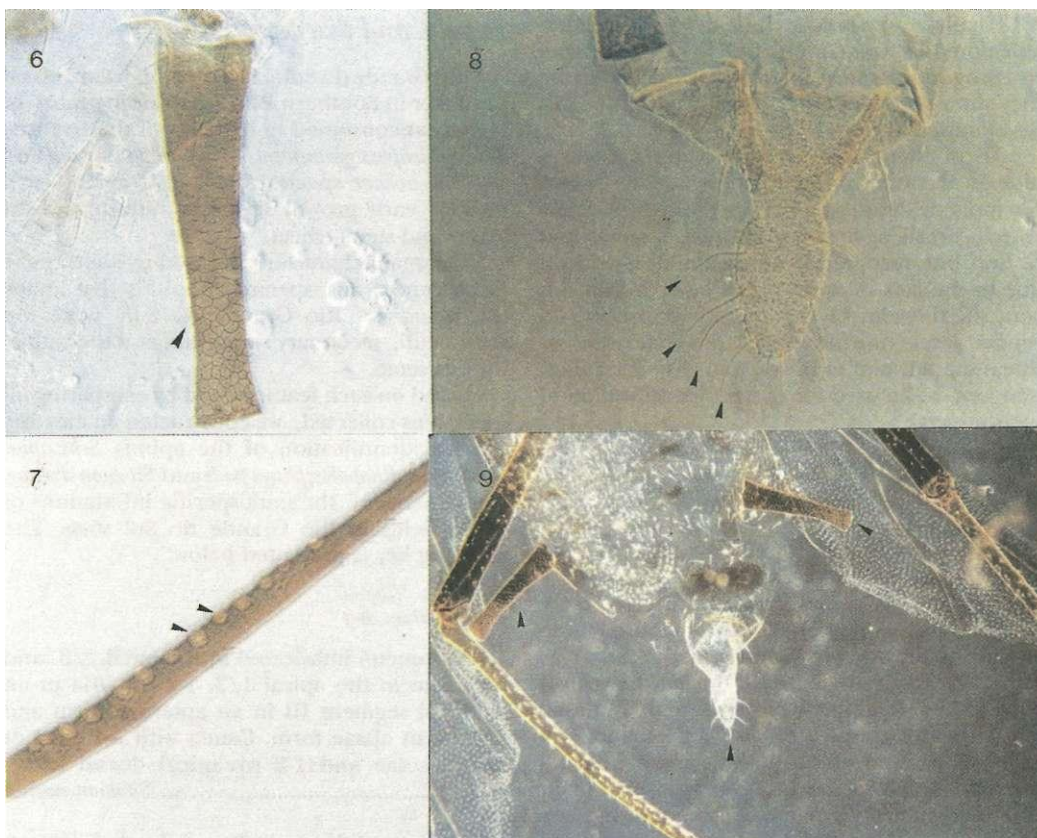
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FIGURES 1-2. Aspect of the *Schizaphis graminum*: 1, apterous form (phase contrast 6.3x with cylindrical siphunculi and cauda; 2, with two pairs of lateral setae (arrowheads) 40x.

FIGURES 3-5. Aspect of the most conspicuous characteristics of *Rhopalsiphum padi*: 3, Siphunculi 40x; 4, Cauda with two pairs of lateral setae (small arrowhead) preapical dorsal setae (40x) and 5, Cauda with siphunculi of an apterous form (phase contrast) 6,3x.



FIGURES 6-9. Aspect of the most conspicuous characteristics of *Sitobion avenae*: 6, Siphunculi 40x; 7, Secondary rhinaria on antennae segment III (arrowhead) 40x; 8, cauda with 3-4 pairs of lateral setae (arrowhead) 40x and 1-2 preapical dorsal (arrowheads) in the apterous form, and 9, Cauda with siphunculi of a wingless form (phase contrast) 6.3x.

in 1922. This species excretes a toxic secretion which rises a yellow spot at the insertion point causing a chlorotic and necrotic region on wheat leaves with its stylets. It is known as a green cereal aphid and shows parthenogenesis of the telytokia kind, being a viviparous form.

Sitobion avenae is considered to be the most harmful species to plants such as wheat, because it chooses ears and panicles as feeding sites promoting serious damage to plant integrity by its direct sucking habits.

Rhopahsiphum padi is one of the main pests of graminiae in Argentina, Brazil and Uruguay since the 1930 decade (COSTA and MÜLLER, 1982).

During the 1970 decade, aphids were the main phytosanitary problem for Brazilian wheat cultures, promoting damages estimated as 30% of the wheat production (GASSEN 1993). This event was preceded by the rapid expansion of *S. avenae*, introduced in Brazil in 1966. The same occurred with *S. graminum*, that quickly reached high level of abundance, definitely due to the

absence of parasitoid control in these parts of South America (ZUÑIGA, 1990). Such facts called attention to the need for the implantation of biological control programs.

Among the predators of aphids useful for such programs, coccinellids are the most common and intensively studied. This group of organisms is biologically well known, but its significance for the control of aphid populations is poorly understood. Nevertheless, the effectiveness of coccinellids as aphid predators could be improved by the selection of coccinellid races that are not so restricted by the temperature conditions as the aphids already present. On the other hand, varieties of plants characteristics that would permit a more efficient aphid capture by the coccinellids could be selected (FRAZER, 1988).

Alternatively, certain Neuroptera, can act as aphid predators, depending heavily on the local fine ecological conditions that make the success of the control very difficult (NEW, 1988).

Finally, Chrysopidae have also a considerable potential for manipulation in biological control programs, against aphids (NEW, 1988) because they show high longevity, high fecundity and fast developmental rates.

All of them are currently being used in a biological control program implanted by Centro Nacional de Pesquisa de Trigo, EMBRAPA, Passo Fundo, Brazil, against *S. graminum*, *S. avenae* and *R. padi*, but recognition of the aphids is difficult due to the lack of appropriate keys. Within this context, the aim of the present paper was to report some morphological characteristics of wheat aphids and to provide an easy identification key, to be used for correct identification of such insects.

Material and methods

Sixty samples of ten apterous and ten alate forms of three species of aphids (*S. graminum*, *S. avenae* and *R. padi*) were analyzed. They were collected from wheat BR-35 leaves at Passo Fundo city, Rio Grande do Sul (Brazil), (28°15'S; 52°24'W) Southern of Brazil, during the year of 1994. These samples were collected by direct methods and transferred to 70% ethanol. All ecological observations of the sample were recorded, as well as the locality, date, host plant and the collector's name. For mounting, the samples were dehydrated, macerated and cleared as follow:

1. Tubes containing samples were placed in a water bath until alcohol started to boil and kept there for three additional minutes, for easy removal of the fat content of each specimen.

2. The samples were then placed in another tube containing 10% KOH and maintained in a water bath at 100°C for four minutes remove the stomach content of the aphid. When this material was fully extruded, aphids were macerated.

3. The samples were then transferred to a Chloral phenol solution in roughly equal proportions for clearing and cleaning.

4. Each individual was mounted on previously washed in a solution of alcohol and ether (3:1) using a Berlesse fluid according to the technique of Hille Ris Lambers (1950).

5. The sudes were sealed with nail polish and all the morphological features commonly used for taxonomic identification were analyzed. The material studied is stored at the Invertebrates Cytogenetics Laboratory, Department of Genetics, Universidade Federal do Rio Grande do Sul.

6. The specimens were observed and photomicrographs of their most prominent morphological characteristics were taken using a Zeiss Standard 25 photomicroscope.

Results and discussion

Rio Grande do Sul state is an important wheat producer in Southern Brazil, providing most of the wheat consumed in this part of the country. The *Schizaphis graminum*, *Rhopalosiphum padi* and *Sitobion avenae* species attack this cereal crop during early growth stages by infesting wheat leaves and stem wheat.

The main characteristics used to identify the three genera and species of aphids that attack the wheat in Rio Grande do Sul were the siphunculi, secondary rhinarium and the cauda, with its setae.

Based on such features, and by comparing all specimens collected, we constructed an easy key for the identification of the aphids *Schizaphis graminum*, *Rhopalosiphum padi* and *Sitobion avenae*, components of the multispecific infestations of wheat fields in Rio Grande do Sul state. The resulting key is presented below.

Identification key

1. Siphunculi imbricated in the basal 2/3 and reticulate in the apical 1/3. 1-2 rhinaria in an antennal segment III in an apterous form and 5-12 in an alatae form. Cauda with 3-4 pairs of lateral setae and 1-2 preapical dorsal setae. (Fig.1).....*Sitobion avenae*
- V. Imbricate siphunculi all over the surface.....2
2. Swollen siphunculi, with a distal rebord. Terminal process of the VI antennal segment 4-5 times the length of its base. Cauda with 2-3 pairs of lateral setae and 1 preapical dorsal setae. (Fig. 2).....*Rhopalosiphum padi*
- 2'. Siphunculi approximately cylindrical in shape without a distal rebord and apically dark. Cauda with two pairs of lateral setae (Fig 3).....*Schizaphis graminum*

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