Notas Científicas

Occurrence of *Aceria tosichella* in Brazil

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Abstract – The objective of this work was to evaluate the occurrence of *Aceria tosichella* Keifer (Prostigmata: Eriophyidae), the wheat curl mite, in Rio Grande do Sul, Brazil. Samples to detect *A. tosichella* specimens were collected in wheat, corn, oat crops and potential host grasses in 46 localities, in October 2006, August and October 2007. Samples of wheat were also collected in experimental greenhouses at Embrapa Trigo, Passo Fundo, RS, Brazil. *A. tosichella* specimens were found in wheat samples from Passo Fundo, Palmeira das Missões, São Luís Gonzaga, and Santo Antônio das Missões, RS, Brazil. Symptoms due to *A. tosichella* infestations were observed only in greenhouse conditions. This is the first report of *A. tosichella* in Brazil and the second in South America.

Index terms: Eriophyoidea, South America, acari, cereal, quarantine, virus.

Ocorrência de *Aceria tosichella* no Brasil

Resumo – O objetivo deste trabalho foi avaliar a ocorrência de *Aceria tosichella* Keifer (Prostigmata: Eriophyidae), ácaro-do-enrolamento-do-trigo, no Rio Grande do Sul. Amostras para detectar espécimes de *A. tosichella* foram coletadas em lavouras de trigo, milho e aveia e em potenciais gramíneas hospedeiras em 46 localidades, em outubro de 2006 e em agosto e outubro de 2007. Amostras de trigo também foram coletadas em casas de vegetação na Embrapa Trigo, Passo Fundo, RS. Espécimes de *A. tosichella* foram encontradas em amostras de trigo de Passo Fundo, Palmeira das Missões, São Luís Gonzaga e Santo Antonio das Missões. Sintomas de infestação de *A. tosichella* foram observados somente em condições de casa de vegetação. Este é o primeiro registro de *A. tosichella* no Brasil e o segundo na América do Sul.

Termos para indexação: Eriophyoidea, América do Sul, ácaros, cereal, quarentena, vírus.

Aceria tosichella Keifer (Acari: Eriophyidae), commonly known as the wheat curl mite (WCM), was described from wheat (*Triticum aestivum* L.) leaves from Zemun-Beograd, Yugoslavia, in 1969. Damages due to *A. tosichella* infestation include discoloration, curling or rolling of leaves, abnormal development of leaves and plant stunting. The stunting occurs because infested leaves do not expand normally, remaining inside older leaves, and the plant stays arched (Jeppson et al., 1975; CAB International, 2002). Yield losses in wheat crops due to high WCM infestations can reach 30% (Harvey et al., 2002).

A. tosichella occurs mainly on wheat, but can also develop on sorghum (*Sorghum* sp.), barley (*Hordeum vulgare* L.), corn (*Zea mays* L.), oat (*Avena sativa* L.), rye (*Secale cereale* L.) and pearl millet (*Pennisetum* sp.) (Jeppson et al., 1975). *A. tosichella* also infest a large number of grasses of minor economic importance and weeds (Amrine Junior & de Lillo, 2003). WCM is widespread in the main wheat production areas around the world: North America and Europe (CAB International, 2002); Asia and Middle East (Meyer, 1981), and Oceania (Thomas et al., 2004). However, the main damage caused by *A. tosichella* is the transmission of *Wheat streak mosaic virus* (WSMV) and *High plain virus* (HPV) (Malik et al., 2003). WSMV is the etiological agent of one of the most important virus diseases in wheat crops, causing major yield losses in North America. It also occurs in Europe, the Middle East, Oceania and Asia (French & Stenger, 2003). Other diseases associated with *A. tosichella* are *Wheat spot mosaic virus* in wheat (Jeppson et al., 1975) and Kernel Red Streak Agent in corn (CAB International, 2002). Recently, WCM was confirmed as a vector of *Brome streak mosaic virus* (BrSMV) by Stephan et al. (2008). Until now, *A. tosichella* is the only known vector of WSMV, HPV and BrSMV.

In South America, the report of WCM and its associated virus is recent. WSMV was found for the first time in Argentine in 2002 (Truol et al., 2004). Two years later, its vector, *A. tosichella*, was also found in the continent in association with WSMV infected plants, in Argentine (Navia et al., 2006). The presence of HPV was confirmed in Argentine in 2007, in the Province of Buenos Aires, localities of Necochea, Balcarce, Colinas de las Galias y Azul, in mixed infections with WSMV (Truol & Sagadin, 2008). These reports have alerted to the threat the pathosystem WCM/WSMV & HPV represents to cereal crops in other countries in South America, especially Argentine's neighbor countries that present contiguous cereal production areas.

The objective of this work was to evaluate the occurrence of *A. tosichella* in Rio Grande do Sul, Brazil.

Surveys were conducted in 46 localities in the state of Rio Grande do Sul, Brazil, in October 2006, August 2007 and October 2007, covering 42 municipalities in the main wheat production areas of the state. The surveys conducted in October 2006 and August 2007 were coordinated by Embrapa, and the ones carried out in October 2007, by Embrapa together with Superintendência Federal de Agricultura no Estado do Rio Grande do Sul. In August and October, wheat plants varied from being at the end of stem extension to heading stages. Samples of wheat, oat and corn fields, as well as of the most common weeds, native or spontaneous grasses rounding cultivated or recently harvested areas were collected. A total of 34 grass species belonging to 15 genera, including cultivated grasses, were sampled. In addition to field areas, samples of wheat were also collected in greenhouse, under uncontrolled conditions, at Embrapa Trigo, Passo Fundo, RS, Brazil. Samples of wheat, oat and corn were composed of leaves randomly collected in a 100x5 m area along the border of the crop. Samples of other grasses were composed of three to ten plants randomly collected. For the extraction of the mites, samples were washed in a 5% detergent solution during 10 min. After that, the solution was submitted to a set of granulometric sieves of 0.25, 20, and 270 mesh size, in ascending order. The material retained by the 270-mesh sieve was placed in hermetic plastic vials containing 70% ethyl alcohol and appropriately labeled. Samples were examined under stereomicroscope (40x) at the Laboratory of Plant Quarantine at Embrapa Recursos Genéticos e Biotecnologia. The eriophyoid mites detected were mounted in permanent microscope preparations using Berlese modified medium, and the specimens were identified using a phase-contrast microscope. Eriophyoid mites identified as *Aceria* Keifer were compared with the description of *A. tosichella* (Keifer, 1969) (Figure 1). *A. tosichella* specimens collected

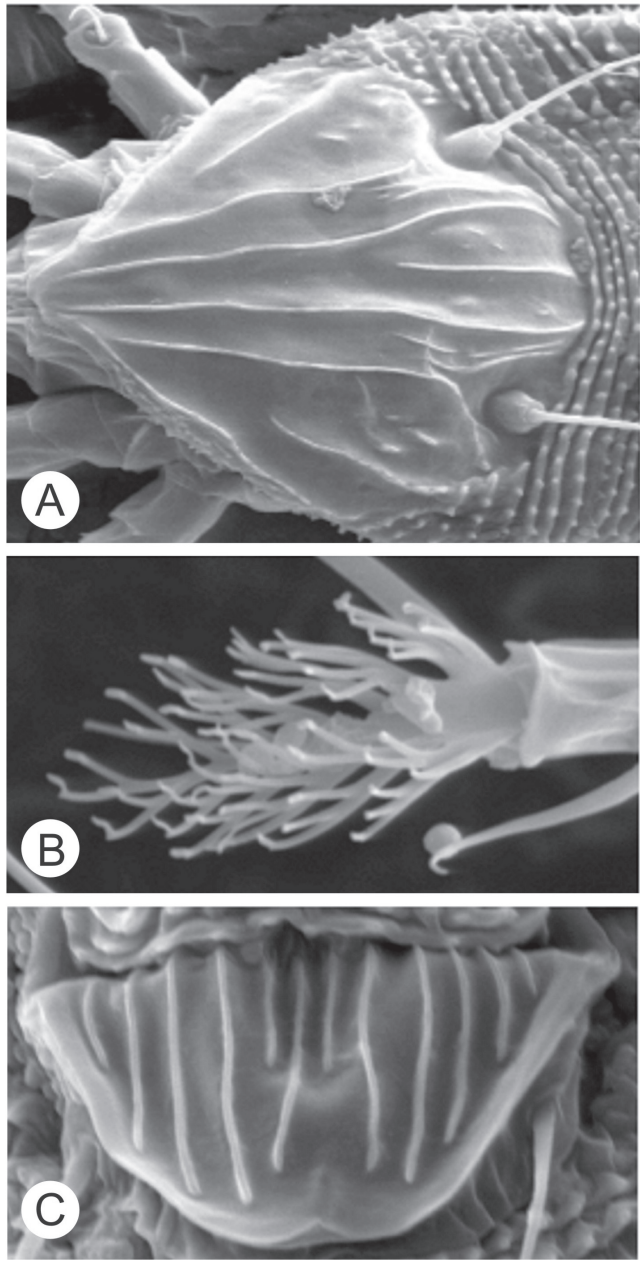

Figure 1. Scan micrographs of the wheat curl mite, *Aceria tosichella* Keifer, showing important taxonomic characters. A, prodorsal shield ornamentation; B, 8-rayed empodium in leg I; C, epigynium with 12 longitudinal ribs.

during this survey were deposited at the Reference Mite Collection, Laboratory of Plant Quarantine, Embrapa Recursos Genéticos e Biotecnologia, Brasília, Brazil.

A. tosichella was found in wheat samples in four municipalities of Rio Grande do Sul: Passo Fundo (28°13,74074'S; 52°24,17319'W), Palmeira das Missões (27°49,74099'S; 53°21,75295'W), São Luís Gonzaga (28°24,91330'S; 55°00,52120'W) and Santo Antonio das Missões (28°29,68439'S; 55°25,28303'W). This is the first report of *A. tosichella* in Brazil and the second one in South America.

Symptoms of WCM infestations were not observed in the field, only in greenhouse conditions. Wheat plants infested with high *A. tosichella* populations presented curling or rolling of leaves, and some young affected leaves remained with their extremities inside older leaves, forming a characteristic arch.

Results of the present study indicated that occurrence of *A. tosichella* in Rio Grande do Sul are restricted to northern and western regions. *A. tosichella* was not currently found in any other grass besides wheat in South America. The knowledge of *A. tosichella* alternative grass hosts is important and should be taken into consideration in the adoption of integrated management measures, because they can act as a "green bridge" to wheat infestations in the following growing season.

Although there is no information about the way *A. tosichella* arrived in Argentine, the dissemination of this mite to Rio Grande do Sul at its border with that country probably occurred by natural ways. The most important natural ways to eriophyid mites dissemination, in short and medium distances, are wind, animal vectors (phoresy), passive spread by rain and human activities. The way *A. tosichella* has been disseminated for long distances around the world is still unknown. Eriophyid mites are usually unable to disseminate along with seeds, only through host plants propagation material or fruits (Fan & Petitt, 1998; Bergh, 2001; Duffner et al., 2001; Bell et al., 2005).

Considering the possible natural pathway of *A. tosichella* into Brazil from Argentine, the action of this mite as a vector of WSMV and HPV, the severe WSMV epidemies and the HPV presence in Argentine (Truol & Sagadin, 2008; Truol et al., 2008), it is possible to assume that the introduction of WSMV and HPV in Brazil is imminent.

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