STENEOTARSONEMUS FURCATUS DE LEON (PROSTIGMATA: TARSONEMIDAE) INFESTING RICE CROPS IN BRAZIL

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ABSTRACT - *Steneotarsonemus furcatus* De Leon is reported for the first time infesting rice crops in the State of Mato Grosso do Sul, Brazil. Symptoms observed on the rice infested plants are spots in leaves, stems, sheaths and grains, and sterile panicles with completely empty grains. Phytopathogenic fungi, *Bipolaris oryzae* (Breda de Haan) and *Pyricularia oryzae* Cavara, were detected in infested plants. The source of *S. furcatus* rice infestation as well as the potential of the mite to spread to other areas of the country and become a major pest of this crop are discussed.

Keywords - Acari, Tarsonemidae, phytophagous mite, phytopathogenic fungi, *Oryza sativa* L., Brazil.

INTRODUCTION

Steneotarsonemus furcatus De Leon 1956 (Prostigmata: Tarsonemidae) was described from *Paspalum* sp. (Poaceae) from Coral Gables, Florida, USA. In 1958, it was found on *Maranta* sp. (Marantaceae) grown in a greenhouse in California, USA. Plants infested with the mite showed leaf distortion and appeared to be stunted (Beer, 1958). In 1981, colonies of *S. furcatus* were found under the leaf sheaths of *Maranta* sp. in Apopka, Florida causing considerable damage to the plants as well as to *Calathea* sp. (Marantaceae), rendering many of the plants unmarketable and necessitating the use of chemical pesticides to control its populations (Denmark and Nickerson, 1981). Since then, *S. furcatus* has been found infesting coconut in Costa Rica, Cuba, El Salvador, Puerto Rico and Venezuela (Howard *et al.*, 1990; Ochoa *et al.*, 1991; Smiley *et al.*, 1993) and in Malaysia (Sathiamma, 1995). In 1998, the mite was found on coconut fruit in the State of Pernambuco, Brazil (Gondim Jr. and Oliveira, 2001). Navia *et al.* (2005) observed that the species is widely distributed in Brazil. It has been collected on coconut fruit in the States of Alagoas, Minas Gerais, Rio de Janeiro and Sergipe. Recently, Torre *et al.* (2005) listed 14 Gramineae host plants of *S. furcatus* in Cuba belonging to *Brachiaria*, *Digitaria*, *Echinochloa*, *Eleusine*, *Oryza*, *Panicum*, *Paspalum*, *Rottboelia* and *Sorghum*. In January 2006, *S. furcatus* was intercepted in USA from propogative elephant ear bulbs (*Colocasia esculenta* L.) arriving from Costa Rica (Ochoa, personal communication).

Steneotarsonemus furcatus colonies develop on the meristematic zone of the fruit, which is covered by the perianth (Ochoa *et al.*, 1991, 1994; Navia *et al.*, 2005). It causes longitudinal necrotic areas on the fruit of infested coconuts (Ochoa *et al.*, 1994; Navia *et al.*, 2005).

Until now, *Schizotetranychus oryzae* Rossi de Simons (Prostigmata: Tetranychidae) was the only mite reported infesting rice in Brazil. This tetranychid spider mite develops on the inner surface of rice leaves, causing long whitish spots along midribs and has only been observed in the southern region of the country (Rossi de Simons, 1966; Flechtmann, 1985).

MATERIALS AND METHODS

During the 2004-2005 growing season, there was a 30 to 50% decrease in the rice production (77 ha, cv. Primavera) in Fazenda Jatobá, in the State of Mato Grosso do Sul, Brazil. The cause of the loss was unknown and it could not be attributed to any of the pests usually associated with rice in the country. Almost all of the rice plants in the infested area showed spots on the leaves, stems, sheaths and grains and sterile panicles with grains without seeds (Fig. 1). Samples of whole rice plants from the infested area were taken for three consecutive weeks and sent to the Laboratory of Plant Quarantine, Embrapa Recursos Genéticos e Biotecnologia, Brasilia, Brazil for analyses to determine the causal agent.

A mycological analysis was conducted using the following methods: 1) Incubation of the leaves and stems

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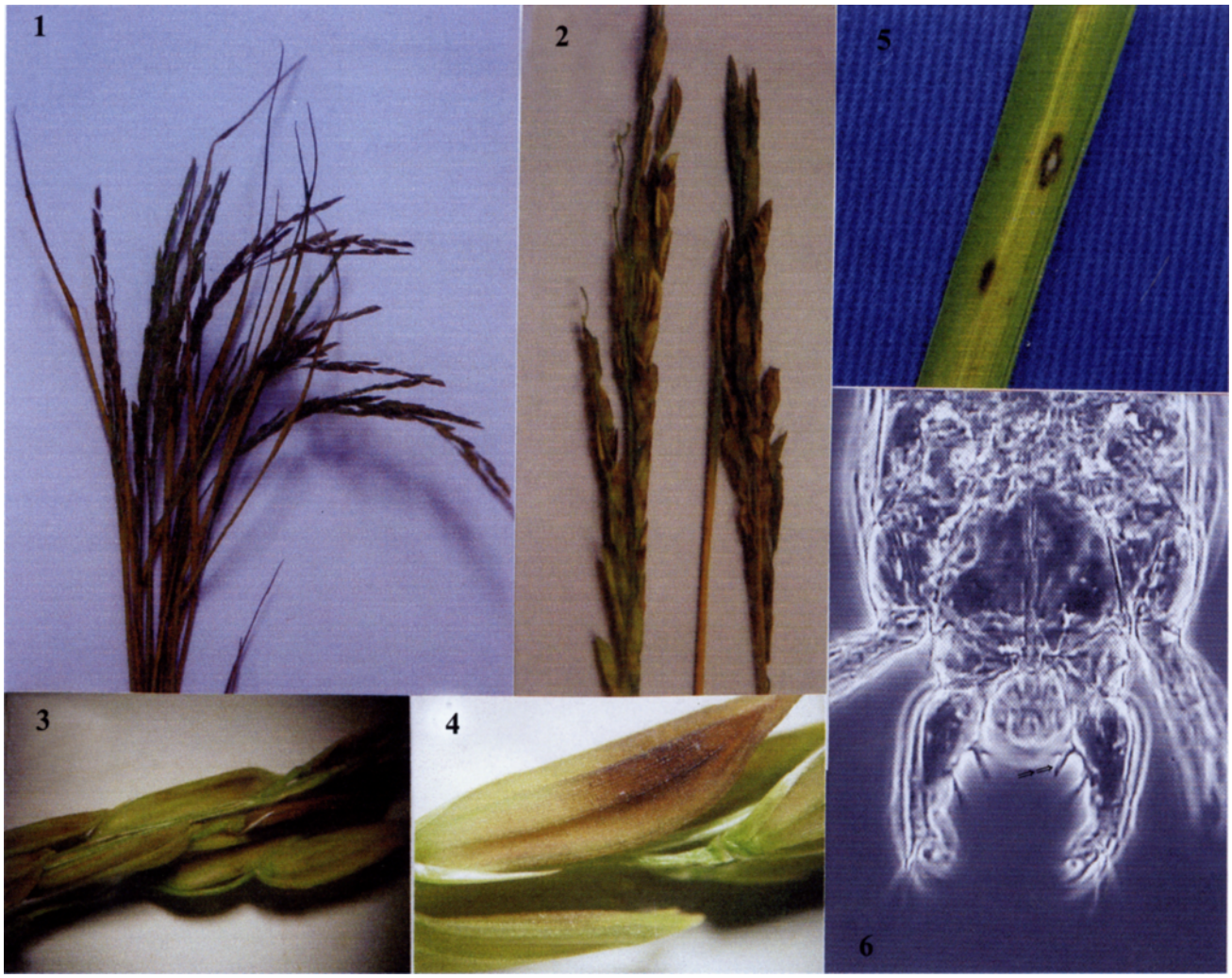

Figs. 1-5. Rice plants infested by *Steneotarsonemus furcatus* De Leon in State of Mato Grosso do Sul, Brazil - 1. a rice plant, 2. sterile panicle with spotted and empty grains, 3. empty grains under stereomicroscope, 4. detail aspect of spotted grain under stereomicroscope, 5. oval-shaped lesion on a rice leaf caused by *Cochliobolus miyabeanus* infection, 6. male of *S. furcatus* showing leg IV with bifurcate V'F seta (see arrow).

in a humidity chamber for three days followed by examination under light microscope for observation of fungal structures; 2) Isolation of vegetation fragments in Potato-Dextrose-Agar (PDA), previously disinfected with 0.2% sodium hypochloride for 2 minutes and washed twice in sterilized distilled water. The fragments were incubated under continuous fluorescent light at 25-28 °C for 7-8 days. The fungi were identified using morphological characteristics under the light microscope.

RESULTS AND DISCUSSION

A large number of tarsonemid mites were detected when plants were examined using a stereoscope microscope (40x). Most of the mites were on panicles but also on leaves, sheaths and stems of the plants (Figs. 1-5). The mites were preserved on microscope slides in Berlese modified medium and identified using a phase contrast microscope. The only phytophagous species found in the samples was identified as *Steneotarsonemus furcatus* De Leon, 1956 (Fig. 6). The main morphological characters used to distinguish *S. furcatus* from other *Steneotarsonemus* species were: atrium of main tracheal trunk conspicuously encapsulated, extremely enlarged and ovoid on males and females, and V'F seta on leg IVof the male bifurcate (Fig. 6) (Smiley *et al.*, 1993).

The presence of two main diseases of rice were detected: the brown spot, caused by *Cochliobolus miyabeanus* (Ito & Kuribayashi) Drechs. ex Dastur (anamorph: *Bipolaris oryzae* (Breda de Haan) Shoemaker), and the blast, *Pyricularia grisea* Sacc. = *P. oryzae* Cavara, (teleomorph: *Magnaporthe grisea* (Hebert) Barr). These fungi occur in all regions where rice is commercially grown such as Africa, Asia, Central and South

America, Europe and Oceania, and occurs in all rice-growing areas in the United States (Lee, 1994; Greer *et al.*, 1997). Typical symptoms of brown spot on leaves are oval-shaped lesions of about 1 cm in length which are evenly distributed (Fig. 5).

Steneotarsonemus furcatus has been collected on rice in China (Ochoa, personal communication), in Cuba (Torre *et al.*, 2005) and in Colombia (ICA, 2005). This is the first record of *S. furcatus* infesting rice in Brazil.

Another species of *Steneotarsonemus, S. spinki* Smiley, is a noxious rice pest that is known to occur in several Asian countries since the 1930's (Smiley *et al.*, 1993; Cho *et al.*, 1999; Xu *et al.*, 2001; Jagadiswari and Prakash, 2003). It has been disseminated to Central and South America (Colombia) in the last decade (Ramos and Rodriguez, 1998; Mendonça *et al.*, 2004), and is of quarantine concern to Brazil (Brasil, 1999).

Symptoms observed in rice infested with *S. furcatus* in Brazil are similar to those caused by *S. spinki* particularly because both cause panicle sterility and spotted grains (Fig. 4). This similarity emphasizes the importance of properly identifying the species of tarsonemid mites infesting the rice plants to avoid an erroneous diagnosis of the problem. Curiously, in Colombia and Cuba, *S. furcatus* infestations were observed together with *S. spinki* in rice crops (ICA, 2005; Torre *et al.*, 2005).

In Asian and Caribbean countries, infestations of *S. spinki* are associated with an increase in fungal infections by *Sarocladium oryzae* (Sawada), that causes sheath rot which, together with *S. spinki*, cause panicle sterility, resulting in drastic losses in crop production. The fungus is considered to be an opportunist that causes problems to rice when it is associated with *S. spinki* (Chow *et al.*, 1980; Ramos and Rodriguez, 2003). Evidence suggests that *S. spinki* may carry and disseminate the fungus. Microscopic studies showed the presence of conidia adhering to gnathosomal and cuticular surfaces of *S. spinki* mites; there were no conidia in the digestive tract of the mites, indicating they did not feed on fungus (Chow *et al.*, 1980). Lo and Hor (1977) and Hsieh *et al.*, (1977) also described damage caused by the association of *S. spinki* and the fungus *S. oryzae*. In addition to *S. oryzae*, other species of fungi in the genera *Pyricularia*, *Rhynchosporium* and *Rhizoctonia* are reported with *S. spinki* in Cuba (Almaguel *et al.*, 2003). A similar association may occur between *S. furcatus* infestations and *B. oryzae* and *P. oryzae* infections in rice in Brazil; however, experimental studies need to be conducted to evaluate this hypothesis.

Currently, *S. furcatus* is known to infest a relatively small rice growing area in Brazil. All of the crop residue in the infested area was destroyed in an effort to eliminate the source of infestation. However, due to the proximity of this area to one of the main rice areas of the country (about 200 km), in the State of Mato Grosso do Sul (IBGE, 2004), it is possible that it has already spread to other areas and could become a major pest. Therefore, it is important to monitor the areas neighboring the known infestation to detect any new infestations in Brazil.

The origin of the *S. furcatus* population infesting rice in the State of Mato Grosso do Sul, Brazil is unknown. It is possible that populations of *S. furcatus* occurring on coconut shifted to rice as an alternative host. Coconut is widely distributed in Brazil with the main production areas concentrated in the northeastern region; however, small production areas and isolated plants occur throughout the country. Another possible explanation for this mite species dramatic appearance on rice in Brazil may be that it was recently introduced into the country from a rice population, independent of the population that occurs on coconut. Further studies are needed to compare specimens of *S. furcatus* collected on rice versus those collected on coconut to determine the degree of genetic variability that exists between different populations.

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