Amended NPAG Report
***Steneotarsonemus spinki* Smiley: Rice panicle mite**
Acari/ Tarsonemidae
Date submitted to the PPQ Permit Unit: March 26, 2004
NPAG Chair Amendment Approval Date: January 3, 2008

Initiating Event, Notifier and Affiliation, Notification date: On February 9, 2004, Paul Courneya forwarded to NPAG the notification that *Steneotarsonemus spinki*, rice panicle mite, was identified in rice growing in a greenhouse at the Ohio State University (OSU). Specimens of the mite were mailed to the ARS Systematic Entomology Lab by Dr. Hans Klompen (OSU) and identified as *S. spinki* by Dr. Ronald Ochoa (SEL). The mite was detected and collected by Dr. Luis Cañas (OSU) sometime in November 2004 while trying to determine the cause of sterility in rice plants grown for experimental purposes (Wang 2004). The rice was grown from seed imported from China, Singapore and the Philippines under a permit issued by PPQ to Dr. Guo-Liang Wang (Directory of the Wang Laboratory for Plant Disease Resistance and Functional Genomics at OSU) in accordance with 7 CFR § 319.55 and probably passed through an inspection station in Maryland (Wang 2004).

Data sheet: Robert (Bob) Schall (PPQ-PDC) provided a datasheet on 10 March 2004.

Current PPQ Policy: The genus, *Steneotarsonemus*, is listed as reportable/actionable in the PIN 309 database, but the species *S. spinki* is not currently listed in PIN 309 or on the APHIS Regulated Plant Pest List (Query conducted 2 March 2004).

Pest Situation Overview:

Biology: *Steneotarsonemus spinki* is one of the smallest tarsonemid mites (Chow et al. 1980), and it has a high reproductive potential (Xu et al. 2001). Adult females measure approximately 272 µm long by 109 µm wide, while adult males measure approximately 217 µm long by 120 µm wide (Ramos and Rodríguez 2001). Eggs, nymphs and adults are translucent (Ramos and Rodríguez 2001), which in combination with their extremely small size may make detection of low population levels near impossible. Virgin females are parthenogenetic and capable of mating with their male offspring (Xu et al. 2001). A single unmated female on a mite-free rice plant could develop into 79 mites in only 17 days when the temperature is between 24.1 and 35.3°C (Xu et al. 2001). Mated females are highly fecund and can produce up to 78 eggs during their life, which can vary from 5-32 days depending on conditions (Chen et al. 1979, Xu et al. 2001). *Steneotarsonemus spinki* survives the winter in China on rice stubble and ratoons, tillers that emerge from previously harvested plants (Lo and Ho 1980). *Steneotarsonemus madecassus* Gutierrez is the only known synonym of *S. spinki* (Tseng 1978).
Prevalence and global distribution: *Steneotarsonemus spinki* was originally described from specimens found on a planthopper, *Sogata orizicola* Muir, that was collected in Louisiana in 1960 (Smiley 1967). The initiating event described above is the first detection of *S. spinki* in the United States since 1960 (Ramos and Rodríguez 2001). *Steneotarsonemus spinki* is most likely Asian in origin (Ochoa 2004a), but it has been detected on rice in China, the Philippines and Taiwan (Smiley et al. 1993), India and Kenya (Rao and Das 1977), Cuba (Ramos and Rodríguez 2001), the Dominican Republic (Ramos et al. 2001), Japan (Shikata et al. 1984), Korea (Schall 2004), and recently in Haiti and Columbia (Ochoa 2004b).
Potential pathways and spread: *Steneotarsonemus spinki* could be introduced into new areas on propagative rice, as the mite is thought to be transmitted from seed to seedling (Rao et al. 2000). Ochoa (2004a) believes that transport of *S. spinki* on infested rice seed is a distinct possibility, as larvae of tarsonemid mites can typically survive 1-2 weeks of low humidity. Transport on rice feeding insects may play an important role in natural dispersal, as *S. spinki* was originally described from a specimen found on a planthopper (Smiley 1967). Mites identified as *Steneotarsonemus* sp. have been intercepted 26 times at US ports of entry (PIN309 2004). These mites however

were probably not *S. spinki* because they were intercepted on pineapple, *Ananas comosus*, and coconut, *Cocos nucifera* (Schall 2004).

Host Range: *Oryza sativa* and *Schoenoplectus articulatus* (Chen et al. 1979, Ho and Lo 1979, Rao and Prakash 2002).

Potential economic and environmental impacts, trade implications: *Steneotarsonemus spinki* is a major pest of rice in China, the Philippines and Taiwan (Smiley et al. 1993). When population levels are low, *S. spinki* is typically found feeding on internal surfaces of leaf sheaths, but when populations are high, the mite can be found on all plant parts, including the kernel (Chow et al. 1980, Ramos and Rodríguez 2001). Symptoms, such as necrotic bands and spots, develop on rice grains and leaf sheaths when populations are large, and populations greater than 450 mites per cm^2 have been recorded (Ramos and Rodríguez 2001). In addition to reducing the value of the rice by scarring the kernel, *S. spinki* can reduce yield by transmitting the fungus, *Acrocylindrium oryzae* Sawada, and the mycoplasma-like organism, *Spiroplasma citri* Saglio et al., which both cause rice sterility (CABI, last modified March 2000 and 2001, respectively, Chow et al. 1980, Ochoa 2004b). Ramos and Rodríguez (2001) estimated that the combined activities of *S. spinki* feeding and disease transmission lowered rice yield in Cuba by 30-60%. *Steneotarsonemus spinki* should not be a major problem of rice grown in the continental US because economic damage has not been reported from any temperate rice growing regions of the world where *S. spinki* has been detected (Schall 2004), and the mite is believed to be unable to overwinter in temperate rice growing regions (Ochoa 2004a). *Steneotarsonemus spinki* could however be a problem in rice grown in Puerto Rico (Schall 2004).

NPAG Teleconference(s): None.

Current response and activities, technology/knowledge gaps and needs: No regulatory actions have been taken in response to the detection of *S. spinki* in an Ohio State University greenhouse (Harrison 2004). Natural, chemical and cultural methods have been used to control *S. spinki*. Natural enemies include predatory mites, such as *Amblyseius taiwanicus* Ehara, and an unidentified protozoan (Lo and Ho 1980, Lo et al. 1979). Efficacies of these biological control agents have not yet been evaluated. In contrast, efficacies of chemical controls have been assessed. Lo et al. (1981) reported that parathion and dicofol reduced *S. spinki* populations by 97-99.9%, and they recommended the use of dicofol because it was less toxic to mammals and beneficial arthropods than parathion. Ghosh et al. (1998) reported that 0.04% dimethoate 30EC reduced *S. spinki* populations by 88.49% when applied during the active tillering stage. Jiang et al. (1994) reported that isoprocarb, dichlorvos and thiophanate were effective controls against *S. spinki* that reduced the browning of rice leaf sheaths and increased yield by 24.27%. Finally, destruction of rice stubble and ratoons, along with fallowing fields for two weeks after harvest of the first crop are recommended cultural controls for *S. spinki* (Ho and Lo 1979).

NPAG Recommended Policy: PPQ recommends no change in PPQ policy regarding *Steneotarsonemus spinki*.

Recommendations: This was a regulatory incident because 7 CFR § 319.55 is designed to prevent the introduction of rice pests into the US. This report will be referred to PPQ-PHP-Permits on March 26, 2004 by Stacy Scott.

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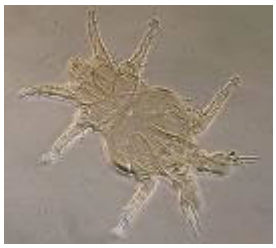
Author Name(s): Keith E. Colpetzer – March 18, 2004
Final edits by Stacy Scott - March 26, 2004

Amendment



Initiating Event and Pest Identification: Dr. Richard Dunkle (USDA-PPQ) notified the NPAG on July 13, 2007 of a new rice pest in Texas. On July 12, 2007 Dr. Robert Miller, Pathologist from RiceTec Inc., Alvin, Texas, presented a mite specimen from one of RiceTec's greenhouses to Eric McDonald, Identifier, Houston PIS. Tentative identification of the mite(s) specimen(s) was the rice panicle mite *Steneotarsonemus spinki*. Confirmation was determined on July 13, 2007 by Dr. Ron Ochoa, Systematic Entomology Laboratory, as the rice panicle mite *Steneotarsonemus spinki*. On August 7, 2007, APHIS positively identified *S. spinki* in Lajas, Puerto Rico on property owned by the same company (RiceTec) as the Texas outbreak as well as fields belonging to the University of Puerto Rico. On August 21, 2007, APHIS positively identified S. spinki in Rayne, Acadia Parish, Louisiana, at an experimental research station. *Steneotarsonemus spinki* was most recently detected in a greenhouse in Arkansas. Emergency Action Notifications (EANs) were issued for the Texas, Puerto Rico, and Louisiana outbreaks.

Current PPQ Policy: *Steneotarsonemus spinki* is listed as reportable/actionable in the Pest ID Database (queried July 31, 2007) (AQAS, 2007).

Pest Situation Overview:
Exotic status: *Steneotarsonemus spinki* is new to the United States and Puerto Rico. *Steneotarsonemus spinki* was detected in 1960 in Louisiana and in 2004 in Ohio (see original NPAG report).

Biology: Also see original NPAG report. Under laboratory conditions, *S. spinki* completes its life cycle from eggs to adults at 20, 24, and 30ºC in 11, 7, and 3 days, respectively (Navia *et al.*, 2006). *Steneotarsonemus spinki* can only complete its life cycle at temperatures above approximately 16ºC; only embryo development was observed at temperatures below 16ºC (Navia *et al.*, 2006). *Steneotarsonemus spinki* causes direct damage as well as indirect damage. Examples of indirect damage include toxin injection during feeding or dissemination of phytopathogens, especially fungi (Navia *et al.*, 2006). Pathogens known to be associated with the infestation of *S. spinki* are: *Sarocladium oryzae*, *Pyricularia* spp., *Rhynchosporium* spp., *Rhizoctonia* spp., *Spiroplasma citri*, *Fusarium graminearum*, *F. moniliforme*, *Curvularia lunata*, *Alternaria padwickii*, and *Burkholderia glumae* (Navia *et al.*, 2006). *Sarocladium oryzae, Pyricularia* spp., *Rhynchosporium* spp., *Rhizoctonia* spp. *Fusarium graminearum, F. moniliforme*, and *Curvularia lunata* are present in the United States (SBML, 2007).

Prevalence and global distribution: In addition to the original NPAG report, *Steneotarsonemus spinki* has also been reported in Belize, Costa Rica, Guatemala, Haiti, Honduras, Nicaragua, Panama, Philippines, Sri Lanka, Thailand (EPICA, 2007; GPDD, 2007; Navia *et al.*, 2006) and most recently in the United States (Texas, Louisiana, and Arkansas), Mexico (NAPPO, 2007), and Puerto Rico (DA-2007-28, 2007).

Host Range: In addition to the original NPAG report, the host range also includes *Oryza latifolia* (Navia *et al.*, 2006) and *Cynodon dactylon* (Ochoa, 2007b). *Cyperus iria* (PPQ-WR, 2007; CRRI, 2006), *Echinochloa colona*, and *Digitaria* spp. (Ochoa, 2007b) are recorded as hosts. However, Ron Ochoa (ARS-SEL) suspects these are "accidental" hosts (i.e., not a reproductive host) (Ochoa, 2007a). Ron Ochoa also believes the ability for *S. spinki* to adapt to other *Oryza* spp. is "very high" (Ochoa, 2007a). There are seven *Oryza* spp. listed in the PLANTS database: *Oryza barthii*, *O. glaberrima*, *O. latifolia*, *O. longistaminata*, *O. punctata*, *O. rufipogon*, and *O. sativa*

(USDA-NRCS, 2007). *Oryza rufipogon* and *Oryza sativa* are in the United States (USDA-NRCS, 2007). *Oryza latifolia* and *O. sativa* are in Puerto Rico (USDA-NRCS, 2007). *Oryza longistaminata*, *O. punctata*, and *O. rufipogon* are Federal Noxious weeds (FNWP, 2007).

Potential pathways and spread: Also see the original NPAG report. Puerto Rico is a winter nursery for rice seeds coming from Texas, Arkansas, and other growing states (Wiscovitch, 2007). If the seeds are infested in Puerto Rico, *S. spinki* can easily be introduced to states with *Oryza sativa* (see Figure 1). An additional two interceptions of *Steneotarsonemus* sp. have been reported in Pest ID (queried July 31, 2007) since the original NPAG report; one on *Colocasia* sp. (taro/elephant ears) from Costa Rica, and one on *Carex* sp. (sedge) from the Netherlands (AQAS, 2007). *Steneotarsonemus spinki* can be transported by wind (short or long distances), birds, insects, crop debris present in water flows, and without the use of dispersal agents when plant density is high as well as mechanical (farm equipment) and human dispersal (Navia *et al.*, 2006). In Texas, Ron Ochoa observed *S. spinki* floating in the water and "swimming" to find females and observed females purposely falling from the plant into the water to find males (Ochoa, 2007a). In addition, Ron Ochoa found large concentrations of the mite near the water doors (that allow the flood waters to rise and recede, similar to flood gates) (Ochoa, 2007a). Various biological control measures include utilizing the predatory mites *Amblyseius taiwanicus, Lasioseius parberlesei*, *Aceodromus asternalis*, *Asca pineta*, *Hypoaspis* sp., *Lasioseius* sp. *Proctolaelaps bickleyi*, *Galendromimus alveolaris*, *Galendromus longipilus*, *Galendromus* sp., *Neoseiulus parabensis*, *N. baraki*, *N. paspalivorus*, *Proprioseiopsis asetus*, and *Typholodromus* sp., and aracnopathogens *Hirsutella nodulosa* and *Enthomophtora* sp. (Navia *et al.*, 2006). Research projects in Cuba and Costa Rica are in the process of developing rice varieties resistant to infestations of *S. spinki* (Navia *et al.*, 2006). Chemical control is only recommended as a last resort in an emergency situation and include Triazophos, Bromopropilato, Dicofol, Diafentiuron, Edifenphos, Abamectin, Biomite, Endodsulfan, and Benomyl 5 PM plus TMTD (Thiran) (Navia *et al.*, 2006). Australia has had some success controlling grain mites with phosphine (PH_3) fumigation and could possibly be an alternative treatment for rice seed (Beard, 2007). Important cultural methods of control include eliminating debris and plant species that can act as a source of infestation, cleaning machinery and farm equipment between fields, using seeds of controlled quality and origin, decreasing water height, and decreasing plant density, among others (Navia *et al.*, 2006).

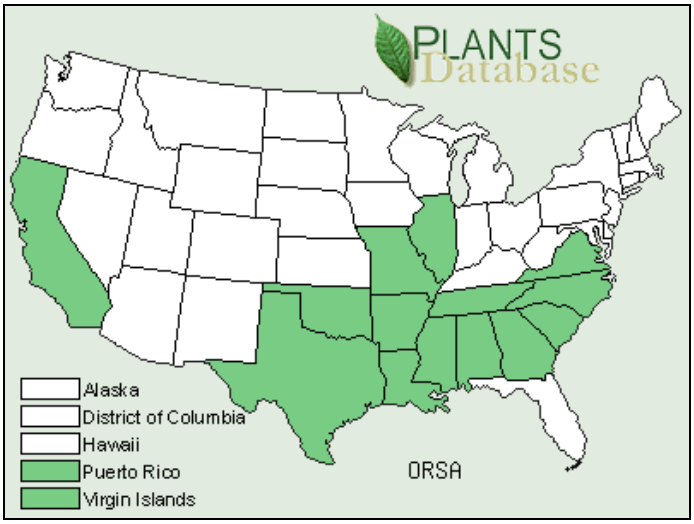


Figure 1: Distribution of *Oryza sativa* in the United States and its territories (USDA-NRCS, 2007).

Potential economic impacts: See original NPAG Report. *Steneotarsonemus spinki* is considered a serious rice pest in China, the Philippines, and Taiwan, where it has caused substantial crop losses. Yield losses can range from 30 to 90 percent (DA-2007-28, 2007). Puerto Rico is a winter nursery for rice seeds coming from Texas, Arkansas, and other growing states (Wiscovitch, 2007). Therefore, there is a great chance that infested seed imported from Puerto Rico will establish in rice growing states (see Figure 1), causing significant economic impacts.

Potential environmental impacts: See original NPAG Report.

Trade implications: According to Stuart Kuehn (SPHD-TX), there have been no indications of import restrictions from other countries or trading partners regarding *S. spinki* (Kuehn, 2007).

NPAG teleconferences: None held.

Current response and activities: In Texas, APHIS has issued an Emergency Action Notification (EAN) to stop movement of all rice seed, rice plants and plant parts, and farm equipment from the RiceTec facility (DA-2007-25, 2007). The action was classified as a regulatory incident, and emergency actions are in place on positive greenhouses, positive trial fields, and positive production fields (Kuehn, 2007). APHIS also issued an EAN for Puerto Rico to stop movement of all rice seed, rice plants and plant parts, and farm equipment from the affected field (DA-2007-28, 2007). The surveys in Texas are completed and are not expected to continue, either in RiceTec fields or the surrounding areas. The EAN in Louisiana was issued to stop movement of all rice seed, rice plants, and plant parts and farm equipment from the affected greenhouses and fields (DA-2007-35, 2007). In October 2007, the *S. spinki* Technical Working Group produced a list of treatment recommendations, including options for disinfesting greenhouse facilities, grain, seed, and rice fields (TWG, 2007). On November 2, 2007 PPQ released a SPRO letter regarding the eradication strategy for *S. spinki*, based on the pest mitigation and treatment measures recommended by the TWG (DA-2007-55, 2007). According to the letter, APHIS will "pursue eradication within PRM infested greenhouses as we continue to assess the pest distribution in the adjacent areas" (DA-2007-55, 2007). The infested rice fields will be monitored until the end of the 2007 harvest season and, beginning in Spring 2008, APHIS and state cooperators plan to implement a national *S. spinki* survey in rice producing states as well as in rice research facilities (DA-2007-55, 2007). Based on the survey results, APHIS and cooperators will then make a final determination on the type of program to be implemented in 2008 for *S. spinki* (DA-2007-55, 2007).

Need for new technology or knowledge: According to Ron Ochoa, Colombia states *S. spinki* is not a problem for them. Ron would like to see someone do a site visit to assess the situation in Colombia and also see some scientific papers published by the Colombians. Ron Ochoa would also like to confirm whether or not *S. spinki* is a vector for various phytoplasmas. If so, this would be the first mite scientifically proven to be associated with a pathogen. He says China may be the first to do this since they have more experience with *S. spinki* (Ochoa, 2007a).

NPAG Recommended PPQ Policy: The NPAG recommends no change in PPQ policy regarding *Steneotarsonemus spinki*, retain as reportable/actionable.

Recommendations:

1. The NPAG recommends no change in PPQ policy regarding *Steneotarsonemus spinki*, retain as reportable/actionable because APHIS is pursuing eradication of this pest. **Action Leader: Joe Cavey, NIS.**

2. The NPAG recommends following the recommendations outlined by the *Steneotarsonemus spinki* Technical Working Group: pursue eradication through the harvest season, survey in Spring 2008, and determine the program for 2008 based on survey results. **Action Leader: Brian Kopper, PPQ-ER.**

3. The NPAG recommends that PPQ investigate the potential of using biological control against *Steneotarsonemus spinki*. **Action Leader: Ken Bloem, PPQ-CPHST.**

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Chair's Amendment Approval: /s/ Brian M. Spears
Signature Date: January 3, 2007

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