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First Evidence of the Genus *Rhizoglyphus* (Acari: Acaridae) from Pakistan

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Abstract

Storage mites are important pests of all types of stored commodities. They are not only responsible for direct damage in form of weight reduction but also imply the indirect damage in form of germination loss of the grains, deterioration of the nutrients and quality of the stored grains and other stored products. Mites of the genus *Rhizoglyphus* are very important pests of stored grains, plant bulbs and tubers. One new species *Rhizoglyphus tritici* was found in abundance from wheat of different localities of Tehsil Toba Tek Singh. This is the first species of the genus *Rhizoglyphus* (Acaridae) recorded from Pakistan. The types were deposited in the Acarology Research Laboratory, University of Agriculture, Faisalabad.

Keywords: New record, *Rhizoglyphus*, wheat, Pakistan

Introduction

The population of the World including Pakistan is increasing with greater rate. To feed the increasing population, we have to increase the food supply. Minimizing the post harvest and storage losses is an important tool to meet the increasing demand of food. There are many factors which are responsible for these losses. Among the stored-product pests, mites are of immense significance causing quantitative as well as qualitative losses to food grains. The importance of storage mites is often underestimated due to their small size which makes it difficult to recognize their infestation (Palyvos and Emmanouel, 2006). The damage is often accredited to the larger insects which infest the stored commodities. Many commercial farmers are unaware of the damage and losses caused by the stored grain mites. The direct damage of mites to stored grains is through contamination and penetration into seeds/embryo, consumption of the grain germ (Zachvatkin, 1941) and to some extent the endosperm (Parkinson, 1990) which consequently decreases the vitality and germination capability of the seeds. The grain becomes useless for seed (Zdarkova, 1996) or brewing purposes and unacceptable to the millers (Solomon, 1946). The indirect damage is tanning of the grains with distinctive fusty smell due to secretion of certain lipids (White, 1995). Mites are responsible for spreading fungal spores in the stores (Lacey, 1988; Hubert et al., 2004). They also cause certain allergenic reactions including asthma, rhinitis and eczema particularly in the occupational environment (Marx et al., 1993; Chambers et al., 1999; Kondreddi et al., 2006; Yadav et al., 2006). Contaminated grains, dried fruits and vegetables become useless and harmful for human and animal consumption. These mites are important pests of stored food commodities and animal feed in areas with humid climates (Sanchez-Ramos and Castanera, 2003). In grain stores, the mites tend to remain in locations with high moisture such as the corners and the central area of stored rooms (Athanassiou et al., 2003). Under these suitable a-biotic conditions, their populations can increase to high numbers of individuals in dust of grain residues or in grain commodities (Athanassiou et al., 2003, 2005; Hubert et al., 2006), leading to a consistent reduction in food and feed quality (Solomon, 1946) and safety due to acariasis (Farley et al., 1989; Li et al., 2003).

Stored grain mites have been reported from grain stores from all over the world by workers *viz*., Mahmood (1992); Haines (1997); Kucerova and Horak (2004); Hubert et al. (2004, 2006); Collins (2006). From Pakistan the existence of mite pests in different godowns of different localities have been recorded (Ashfaq and Chaudhri, 1983, 1984, 1986; Ashfaq et al., 1985, 1986, 1999, 2000; Sher et al., 1991; Sarwar et al., 1998; Ashfaq and Sarwar, 1999, 2001; Ashfaq and Sher, 2002; Sarwar and Ashfaq, 2002, 2004).

Mites of family Acaridae are among the most important pests attacking agricultural and stored product systems. Within this family, mites of the genus *Rhizoglyphus* are economically important pests of plants with bulbs, corns, and tubers (Fan and Zhang, 2003, 2004) causing substantial damage to a variety of crops (garlic, onions, carrots) and ornamental plants in the field and greenhouses worldwide (Diaz et al., 2000; Fan and Zhang, 2003).

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Many species of the genus *Rhizoglyphus* have been reported world wide (Ho and Chen, 1987, 2000, 2001; Bu and Li, 1998; Diaz et al., 2000; Chen et al, 2002; Fan and Zhang, 2003, 2004; Rojas and Klimov, 2007; Darvishzadeh and Kamali, 2009). From Pakistan this genus is reported for the first time with one new species *Rhizoglyphus tritici* found in abundance, in stored wheat in some villages of Tehsil Toba Tek Singh, Punjab, Pakistan.

Materials and Methods

A comprehensive survey of Tehsil Toba Tek Singh was carried out to explore the mite pests from stored grains. Different stored grains were sampled for mite pests. For on spot collection, sieve method was used. The stored grains were shaken on the sieve held over a white paper. The mites received on the paper were sorted and stored in the small vials containing 70% alcohol. The samples were brought to the laboratory and processed through Berlese's funnel. Pest mites were sorted under a binocular microscope and permanent slides were prepared in Hoyer's medium. Diagrams were made with the help of grid by using a phase contrast microscope. The mounted specimens were identified with the help of available literature and keys of Diaz et al. (2000) and Fan and Zhang (2003, 2004). Measurements of different body parts were done with the help of ocular micrometer. All the measurements are given in micrometer.

Results and Discussion

Rhizoglyphus tritici n.sp.

ADULT FEMALE

Gnathosoma

Chelicera chelate 108, *cha* spine shape 7, *palpal elcp* 10, infracapitular Setae *m* 34 (Fig. 1d-f).

Dorsam

Idiosoma 549 long, 304 wide. Prodorsal shield 71 long and 75 wide, evenly punctulate, posterior margins slightly concave. Setae *vi* and *ve* located on prodorsal shield. Setae *vi* located on anterior margins of prodorsal shield while *ve* located on outer mid portion of shield. Setae *vi* thick, serrated and pionted, 82 long, distance between *vi-vi* 20. Setae *ve* minute and distance between *ve-ve* 66. Setae *sci* and *sce* located on a semi circular line. Setae *sci* obliviously long, 61 and serrated from mid to its outer margin, distance between *sci-sci* 61, *sce* prominently long, 176 and almost 2 times longer than *sci*, distance between *sci-sce* 25. Grandjean's organ 27 long and bifurcate (Figure 1e). Setae c_1 34 long and serrated, distance between c_1-c_1 61, c_2 47 serrated, c_p 149 and simple, c_3 34; d_1 37, distance between d_1-d_1 76, d_2 far from *gla*, d_2-*gla* 47, e_1 56 long, distance between e_1-e_1 81, e_2 59 long, f_2 51, h_1 47, h_2 49. All setae from mid of body to the posterior end are serrated and setae c_1, d_1 and e_1 almost in a straight line from anterior to posterior end (Fig. 1a).

Venter

All setae on ventral side are simple. Setae *1a* 37, *3a* 22, *3b* 25, *g* 22, *4a* 39. Anal opening with 6 pairs of long and strong setae, ps_1 135 long, ps_2 54, ps_3 25, ad_1 20, ad_2 22, ad_3 15, h_3 123**.** Setae ps_1 prominently long as compared to ps_2 and ps_3. Copulatory opening ring shaped. Spermatheca funnel shape, Spermathecal duct thin and long, slightly expanded near base of inner part of spermatheca. Base of inner part of spermatheca with a small triangular scleritised structure (Fig. 1b).

Legs

Leg I: 184 long, Femur I 54 long, *vf* whip-like 66 long, *PR* 22. Genu I 34, σ' 25, σ'' 29, *cG* 56 barbed, *mG* barbed 32. Tibia I 29 long, solenidium φ 59, *gT* whip-like 15, *hT* 17. Tarsus I 59 long, *ba* 15, ω_1 thin and long, slightly broadened 20, ε **7**, ω_2 7, ω_3 22, 1- 32, 2- 29, 3- 49.

Leg II: 196 long, Femur II 59, *vf* whip-like 64, *PR* 25 long. Genu II 34, σ' 44, *cG* 12, *mG* slender 25. Tibia II 27, φ 44, *gT* slender 12, *hT* 17. Tarsus II 61.

Leg III: 208 long, Femur III 49 long, Genu III 34, σ 7, *nG* 34, Tibia III 32, φ 76, *kT* 22. Tarsus III 74 long.

Leg IV: 257 long, Femur IV 54 long, *wF* 27. Genu IV 49 long, Tibia IV 42 long, φ 39, *kT* 15. Tarsus IV 88 long (Fig. 1c).

Type

Holotype adult female was collected from Grain Market Toba Tek Singh from Wheat (*Triticum aestivum*) grain on 15-04-2010, 5 female paratypes with the same collection data, all deposited in the Department of Agri. Entomology, University of Agriculture, Faisalabad.

Etymology

The species name is derived for the source of collection i.e., *Triticum aestivum*

Remarks

This new species comes closer to *Rhizoglyphus echinopus* (Fumouze & Robin), but can be separated from it due to following characters;

1. Supra coxal seta of leg I is smooth in *R. echinopus* while it is barbed in this new species.
2. Setae e_1 is shorter than setae h_1 in *R. echinopus* while in this new species setae e_1 is longer than setae h_1.
3. In this new species anal opening with 6 pairs of setae, out of which 2 are longer while in *R. echinopus* 3 pairs of setae are longer.

This new species can be compared with *R. Caladii* Manson and separated from it on the basis of following characters;

1. All dorsal setae smooth *R. Caladii* while all setae except *sce* and *cp* serrated in this new species

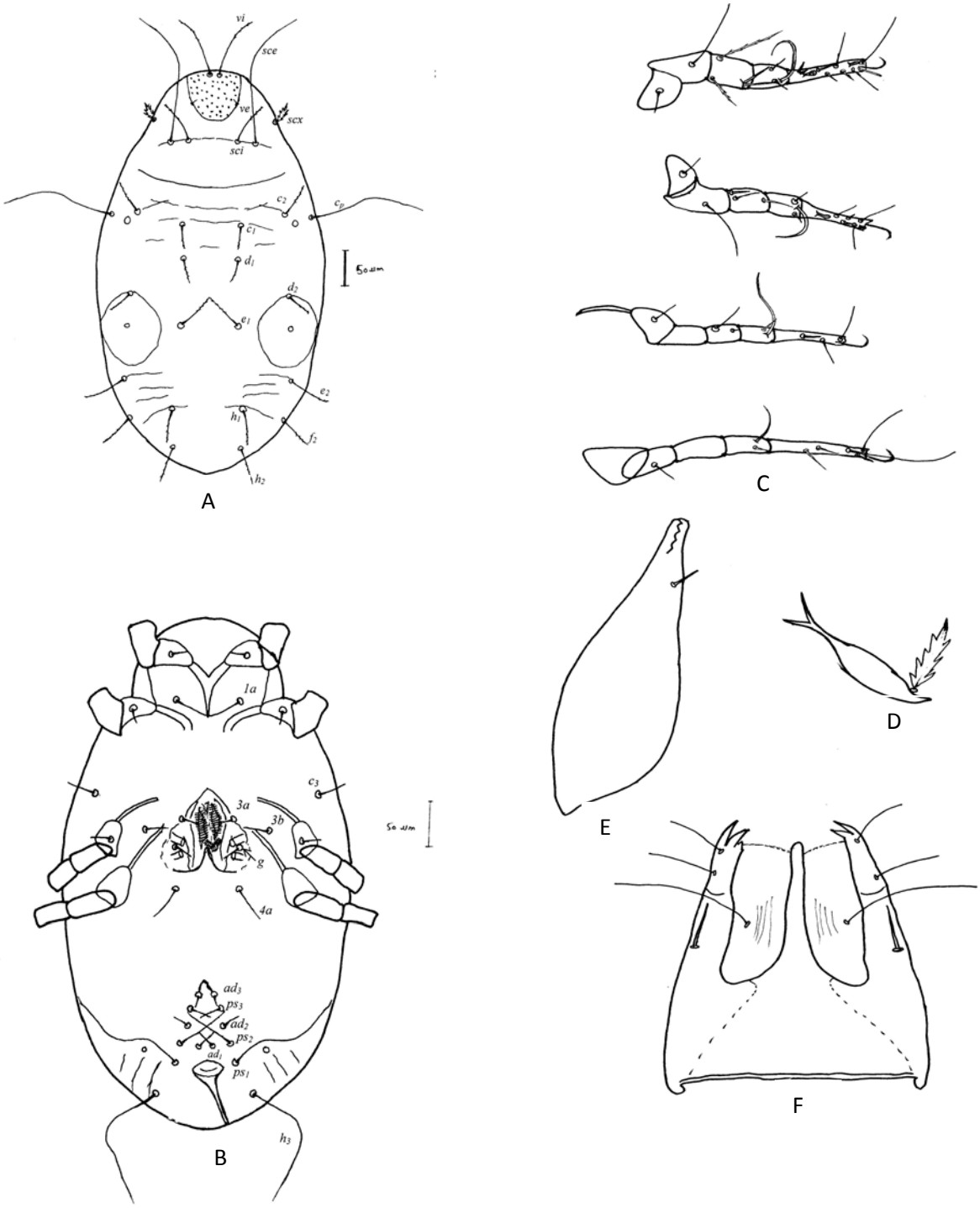

Fig. 1: ***Rhizoglyphus tritici*** **n.sp.**

A. Dorsal Side
B. Ventral Side
C. Legs I-IV
D. Grandjean's organ with supra Coxal Seta
E. Chelicera
F. Infracapitulum

2. All dorsal setae smooth *R. Caladii* while all setae except *sce* and *cp* serrated in this new species.
3. *scx* slender and pointed in *R. Caladii* while in this new species it in serrted and pointed.
4. Anal region has 3 pair setae in *R. Caladii* as compared to 6 pairs in this new specie.

Prodorsal shield in *R. Caladii* smooth and rectangular while in this new species it in dotted and semi triangular with concave posterior margin.

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