

TWO NEW SPECIES OF *TETRANYCHUS* (ACARI: TETRANYCHIDAE) INFESTING CORN IN INNER MONGOLIA, CHINA

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ABSTRACT - *Tetranychus huhhotensis* n. sp. and *T. zae* n. sp. are described and illustrated from corn leaves in Inner Mongolia. *Tetranychus huhhotensis* n. sp., assigned to Flechtmann and Knihinicki's Group 4 of *Tetranychus*, can be separated from its allied species by having the aedeagal knob with dorsal surface distinctly emarginate centrally. *Tetranychus zae* n. sp. is distinctive in Group 9 of this genus in that the aedeagal knob is minute, with anterior projection practically absent and posterior projection conspicuous, acute. Summer females of the two new species are pale greenish-yellow, while their diapausing females are pale-orange.

Key words - Acari, Prostigmata, Tetranychidae, *Tetranychus*, new species, China, corn.

INTRODUCTION

The genus *Tetranychus* Dufour in the subfamily Tetranychinae Berlese is characterized by having a single pair of paranal setae and by the empodia split into usually three pairs of ventrally directed hairs. The aedeagus bends dorsally. A total of about 140 species belonging to *Tetranychus* have been recorded world-wide (cf. Bolland *et al.*, 1998; Migeon and Dorkeld, 2007). However, there is little information on *Tetranychus* species from Inner Mongolia Autonomous Region. Corn, an important crop in Inner Mongolia, is known to be heavily infested by spider mites which have been referred to as "*T. truncatus* Ehara" (e. g., Pang *et al.*, 2004, 2005). Two new species of *Tetranychus* are described and illustrated here from corn in this region.

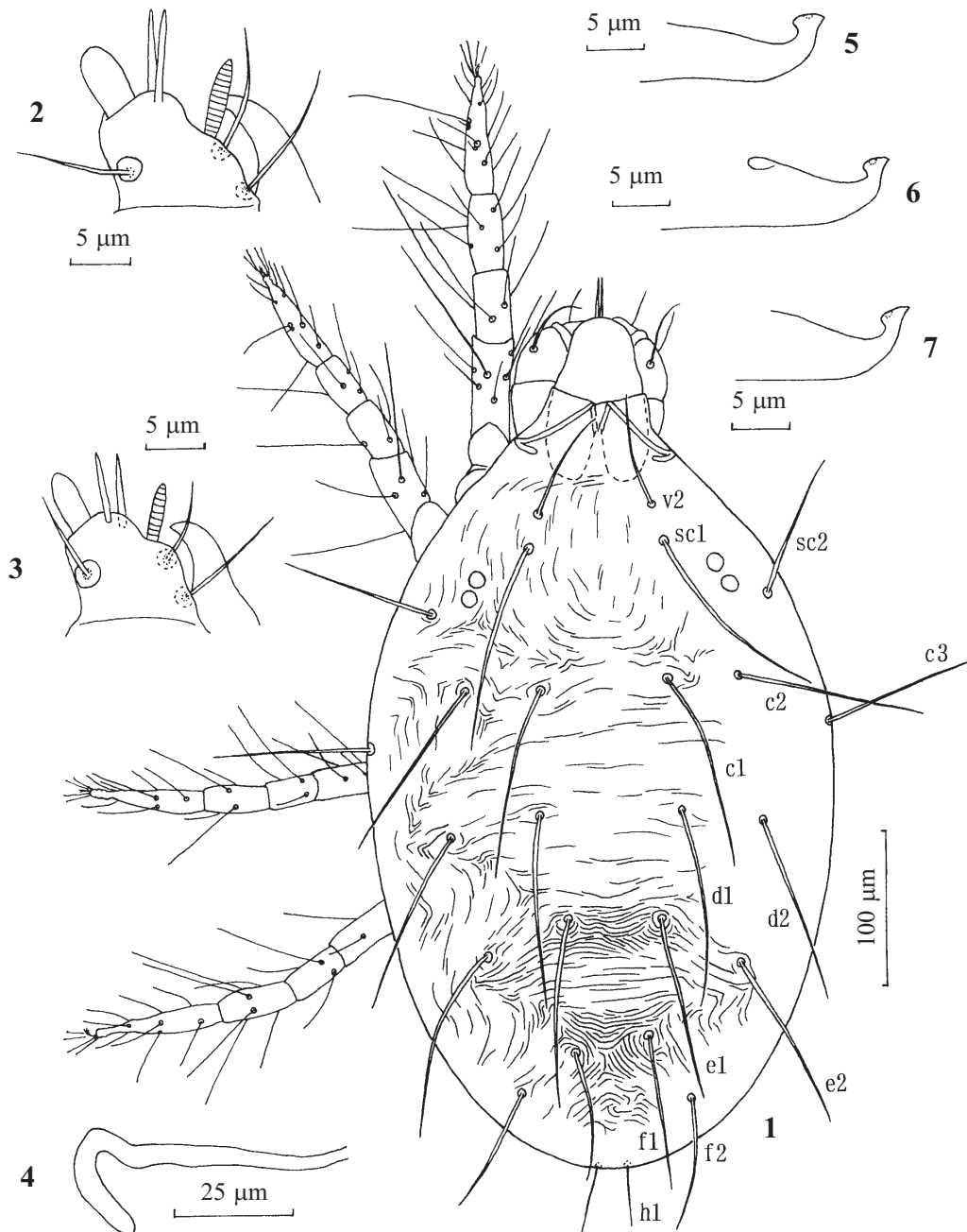
MATERIALS AND METHODS

The materials studied in this paper were found infesting corn, *Zea mays* L. (Poaceae) in Huhhot, Inner Mongolia. Collected mites were preserved in 70% ethyl alcohol and later mounted in Hoyer's medium on glass slides for examination. Mites were examined under an Olympus compound microscope using phase-contrast. Drawings were made using a camera lucida attached to the microscope.

Setal notations used in the description generally follow Lindquist's (1985) system. Measurements are given in micrometers. The mean is followed by the measurements of the holotype in parentheses. Holotypes and part of the paratypes are deposited in the collections of the Department of Entomology, Nanjing Agricultural University, Nanjing, China (NJAU); remaining paratypes are kept in the National Museum of Nature and Science, Tokyo, Japan (NSMT).

Tetranychus huhhotensis n. sp. (Figs. 1-11, 23)

FEMALE - Body pale greenish yellow, with dark lateral spots (Fig. 23A) (uniformly pale orange in diapausing female, Fig. 23B). Rostrum reaching distal part of femur I. Palpus (Fig. 2) with spinneret about twice as long as broad; solenidion more or less fusiform. Peritreme hooked distally (Fig. 4). Dorsal setae on idiosoma much longer than distances between consecutive setae. Opisthosomal striae transverse between members of setae e1 and longitudinal between members of fl1, thus not forming a diamond-shaped pattern between these setae (Fig. 1); dorsal striae on opisthosoma with lobes variable in shape: from acute-angled triangle to semicircular. Genital flap with transverse striae; area immediately anterior to flap with longitudinal striae.

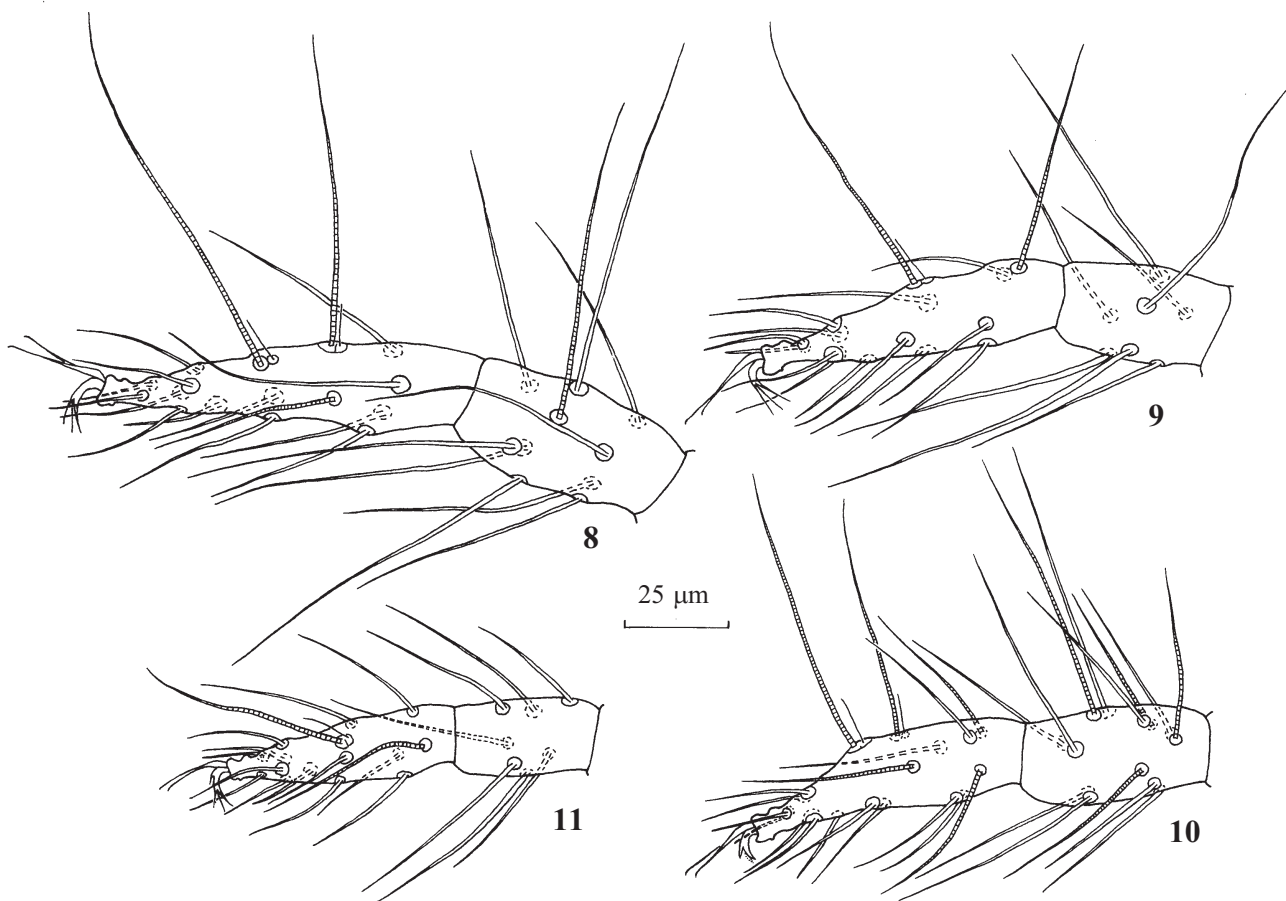


Figs. 1-7. *Tetranychus huhhotensis* n. sp. - 1. Dorsum (female), 2. Distal segment of palpus (female), 3. Distal segment of palpus (male), 4. Peritreme (female), 5-7. Aedeagi (5, holotype).

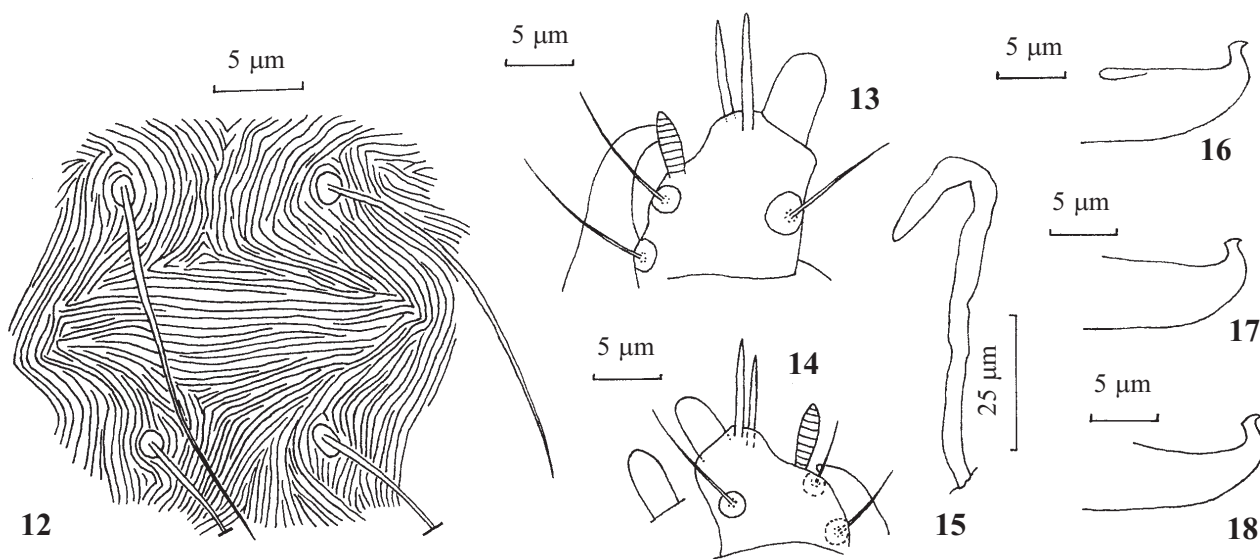
Numbers of setae and solenidia (in parentheses) on leg segments - coxae 2-2-1-1, trochanters 1-1-1-1, femora 10-6-4-4, genua 5-5-4-4, tibiae 9(1)-7-6-7, tarsi 13(1)+ 2 dupl.-13(1)+1 dupl.-9(1)-10(1). Tarsus I with 4 tactile setae proximal to proximal set of duplex setae, and 1 solenidium at level of proximal duplex setae (Fig. 8); tarsus II with 3 tactile setae and 1 solenidium proximal to duplex setae (Fig. 9). Empodia with 3 pairs of proximoventral hairs, without mediodorsal spur.

Measurements (n = 10) - Length of body (including rostrum) 593-727, 659; width of body 336-409, 379; lengths of setae (mean \pm SE): v2 82.6 ± 1.4 , sc1 142.2 ± 1.4 , sc2 101.8 ± 0.8 , c1 135.9 ± 1.6 , c2 127.9 ± 2.8 , c3 109.5 ± 1.6 , d1 132.3 ± 2.1 , d2 129.5 ± 1.0 , e1 125.2 ± 1.7 , e2 124.6 ± 1.4 , f1 109.9 ± 1.1 , f2 97.0 ± 1.0 , h1 47.1 ± 1.1 .

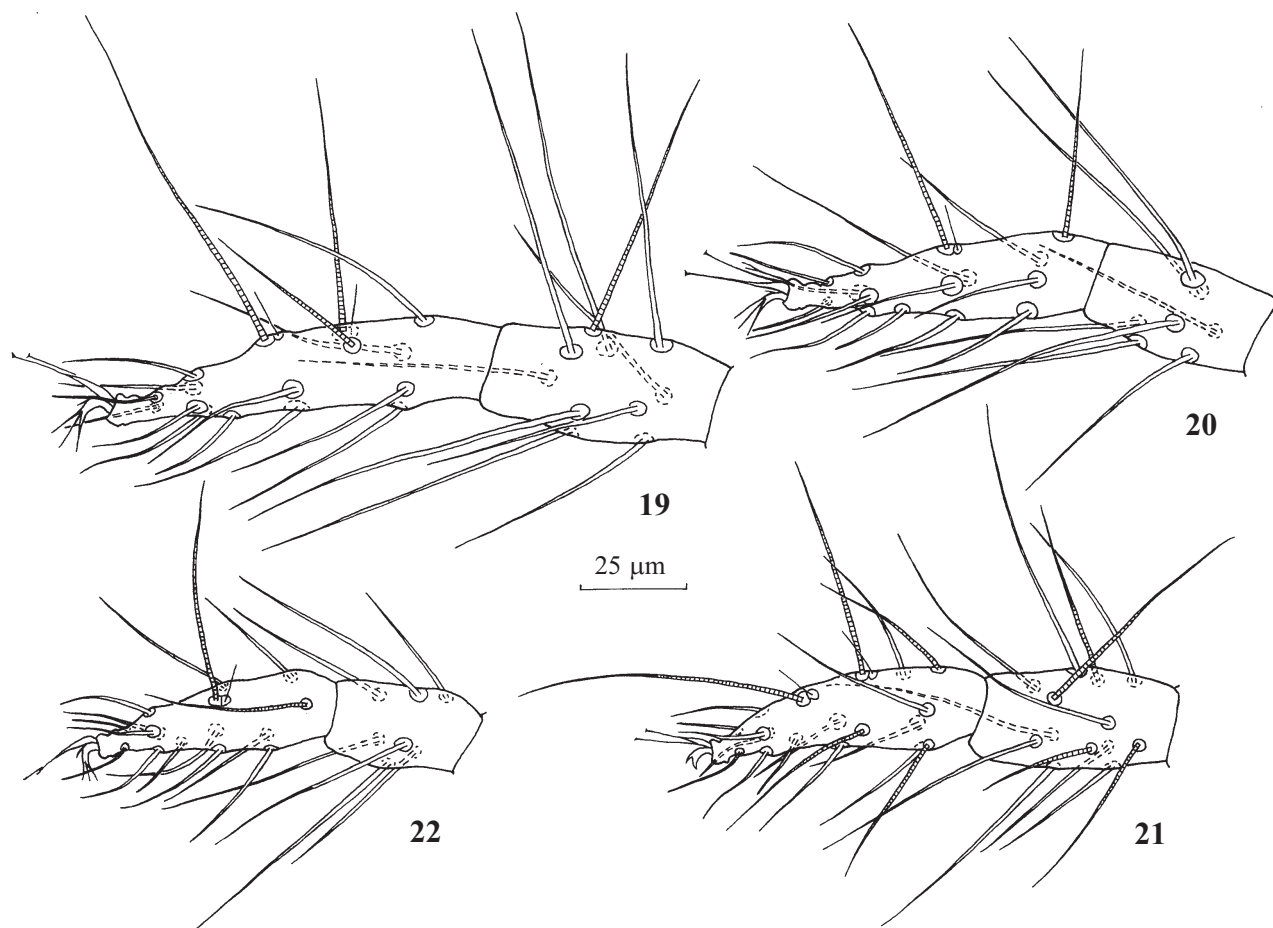
MALE - Color similar to summer female. Palpus (Fig. 3) with spinneret about 2.5 times as long as broad;



Figs. 8-11. *Tetranychus huhhotensis* n. sp. - 8. Tarsus and tibia I (female), 9. Tarsus and tibia II (female), 10. Tarsus and tibia I (holotype male), 11. Tarsus and tibia II (male).



Figs. 12-18. *Tetranychus zeae* n. sp. - 12. Part of dorsocentral opisthosoma (female), 13. Distal segment of palpus (female), 14. Distal segment of palpus (male), with other spinneret, 15. Peritreme (female), 16-18. Aedeagi (16. holotype).



Figs. 19-22. *Tetranychus zeae* n. sp. - 19. Tarsus and tibia I (female), 20. Tarsus and tibia II (female), 21. Tarsus and tibia I (male), 22. Tarsus and tibia II (male).

solenidion fusiform, similar in length to spinneret. Opisthosoma with transverse striae dorsocentrally. Aedeagus (Figs. 5-7) with shaft upturned distally to form a stout neck (stem); terminal knob ca. 2.6 long, approximately twice the narrowest width of neck, 1/4 to 1/3 as long as dorsal margin of shaft; dorsal surface of knob rounded, and emarginate centrally; axis of knob forming a slight angle with dorsal margin of shaft; anterior tip of knob roundish, the posterior tip acute.

Numbers of setae and solenidia (in parentheses) on leg segments - coxae 2-2-1-1, trochanters 1-1-1-1, femora 10-6-4-4, genua 5-5-4-4, tibiae 9(4)-7-6-7, tarsi 13(3)+2 dupl.-13(1)+1 dupl.-9(1)-10(1). Tarsus I with 4 tactile setae and 2 solenidia proximal to proximal set of duplex setae, and 1 solenidion at level of proximal duplex setae (Fig. 10); tarsus II with 3 tactile setae and 1 solenidion proximal to duplex setae (Fig. 11). Empodium I with conspicuous mediodorsal spur and pair of proximoventral spurs; empodium II with minute mediodorsal spur and 3 pairs of proximoventral hairs; empodia III and IV with 3 pairs of proximoventral hairs, without mediodorsal spur.

Measurements (n = 10) - Length of body (including rostrum) 399-456, 435 (456); width of body 190-227, 204 (not measured in holotype); lengths of setae (mean \pm SE): v2 62.1 ± 1.3 (68.0), sc1 109.5 ± 1.5 (113.0), sc2 74.4 ± 1.2 (75.5), c1 97.7 ± 1.1 (100.0), c2 94.3 ± 1.1 (96.0), c3 82.2 ± 0.8 (88.0), d1 97.5 ± 1.2 (100.0), d2 99.2 ± 1.3 (98.0), e1 89.9 ± 1.7 (89.5), e2 93.7 ± 1.0 (94.0), f1 68.0 ± 1.1 (70.5), f2 60.0 ± 0.9 (61.0), h1 24.1 ± 0.5 (24.0).

Type series - Holotype male (NJAU, tetra 2008-001-01): Tuheidate (40°43'N-111°23'E), Huhhot, Inner Mongolia, China, 26-VII-2007 (T. Gotoh leg.), on corn (*Zea mays* L., Poaceae). Paratypes: 7 males and 8 females (NJAU, tetra 2008-001-02-06), 7 males and 6 females (NSMT-Ac 12899-12903), data same as for holotype.

Remarks - *Tetranychus huhhotensis* n. sp. is assigned to Group 4 in this genus (Flechtmann and Knihinicki, 2002). The aedeagus of *T. huhhotensis* resembles those of the allied species, *T. neopolys* Tuttle, Baker and Abbatiello, *T. agropyronus* Wang, *T. polys* Pritchard and Baker, and *T. elsae* Manson (Tuttle *et al.*, 1976; Wang, 1981; Pritchard and Baker, 1955; Manson, 1967), but dif-



Fig. 23. *Tetranychus huhhotensis* n. sp., photographs (Top) - A. Summer female (left), B. Diapausing female (right).
 Fig. 24. *Tetranychus zeae* n. sp., photographs (Bottom) - A. Summer female (left), B. Diapausing female (right)

fers from the latter in having the dorsal surface of the terminal knob emarginate centrally.

The aedeagal knob of this new species is also distinctive from that of *T. neopolys* by having the anterior tip roundish, and from that of *T. agropyronus* by having the dorsal margin not angulate but rounded. Further, the new species is separable from *T. polys* and *T. elsae* in that male empodia I and II are provided with a conspicuous mediodorsal spur but absent in *T. polys* and *T. elsae*.

Etymology - This new species is named after Huhhot where it was collected.

***Tetranychus zeae* n. sp.**
 (Figs. 12-22, 24)

FEMALE - Body pale greenish-yellow, with dark spots laterally (Fig. 24A) (uniformly pale orange in diapausing female, Fig. 24B). Rostrum reaching distal part of femur I. Palpus (Fig. 13) with spinneret about twice as long as broad; solenidion fusiform. Peritreme hooked distally (Fig. 15). Dorsal idiosomal setae much longer than distances between consecutive setae. Opisthosomal striae longitudinal between members of setae e1

and between those of f1, forming a diamond-shaped pattern between these setae (Fig. 12); dorsal striae on opisthosoma with lobes roundish distally, about as long as broad, or semicircular. Genital flap with transverse striae; area immediately anterior to flap with longitudinal striae.

Numbers of setae and solenidia (in parentheses) on leg segments - coxae 2-2-1-1, trochanters 1-1-1-1, femora 10-6-4-4, genua 5-5-4-4, tibiae 9(1)-7-6-7, tarsi 13(1)+2 dupl.-13(1)+1 dupl.-9(1)-10(1). Tarsus I with 4 tactile setae proximal to proximal set of duplex setae, and 1 solenidion at level of proximal duplex setae (Fig. 19); tarsus II with 3 tactile setae and 1 solenidion proximal to duplex setae (Fig. 20). Empodia with minute mediodorsal spur and 3 pairs of proximoventral hairs.

Measurements (n = 10) - Length of body (including rostrum) 553-624, 591; width of body 336-375, 360; lengths of setae (mean \pm SE): v2 83.0 \pm 1.0, sc1 147.7 \pm 2.7, sc2 108.4 \pm 1.3, c1 135.0 \pm 1.2, c2 130.6 \pm 1.4, c3 117.2 \pm 1.3, d1 132.5 \pm 1.5, d2 132.4 \pm 1.4, e1 127.4 \pm 1.3, e2 125.7 \pm 1.4, f1 113.9 \pm 1.8, f2 101.5 \pm 1.1, h1 46.8 \pm 1.1.

MALE - Color similar to summer female. Palpus (Fig. 14) with spinneret about 2.5 times as long as broad;

solenidion fusiform. Opisthosoma with transverse striae on dorsocentral area. Aedeagus (Figs. 16-18) with shaft abruptly upturned distally to form a vertical narrow neck which has a minute terminal knob; knob ca. 1.5 long, 1/7 to 1/5 as long as the length of dorsal margin of shaft; anterior tip of knob blunt, inconspicuous, the posterior tip acutely protruding.

Numbers of setae and solenidia (in parentheses) on leg segments - coxae 2-2-1-1, trochanters 1-1-1-1, femora 10-6-4-4, genua 5-5-4-4, tibiae 9(4)-7-6-7, tarsi 13(3)+2 dupl.-13(1)+1 dupl.-9(1)-10(1). Tarsus I with 4 tactile setae and 2 solenidia proximal to proximal set of duplex setae, and 1 solenidion at level of proximal duplex setae (Fig. 21); tarsus II with 3 tactile setae and 1 solenidion proximal to duplex setae (Fig. 22). Empodium I with conspicuous mediodorsal spur and pair of proximoventral spurs; empodium II with small mediodorsal spur and 3 pairs of proximoventral hairs; empodia III and IV with minute mediodorsal spur and 3 pairs of proximoventral hairs.

Measurements (n = 10) - Length of body (including rostrum) 391-446, 426 (435); width of body 190-231, 209 (not measured in holotype); lengths of setae (mean ± SE): v2 57.7 ± 1.1 (59.0), sc1 101.6 ± 0.6 (100.0), sc2 75.2 ± 1.4 (72.0), c1 94.6 ± 1.5 (92.0), c2 89.2 ± 1.2 (87.5), c3 82.4 ± 1.0 (79.0), d1 92.7 ± 1.6 (92.0), d2 92.4 ± 1.2 (90.0), e1 85.9 ± 1.5 (82.0), e2 88.8 ± 1.9 (81.0), f1 64.5 ± 1.8 (57.0), f2 58.5 ± 1.1 (54.5), h1 21.8 ± 0.4 (22.0).

Type series - Holotype male (NJAU, tetra 2008-002-01): Tuzuoqitaosihao (40°40'N-110°57'E), Huhhot, Inner Mongolia, China, 26-VII-2007 (T. Gotoh leg.), on corn. Paratypes: 7 males and 9 females (NJAU, tetra 2008-002-02~08), 7 males and 9 females (NSMT-Ac 12904-12910), data same as for holotype.

Remarks - *Tetranychus zae* n. sp. resembles *T. lombardinii* Baker and Pritchard, *T. kaliphorae* Gutierrez and *T. sawzdargi* Mitrofanov in the shape of the aedeagus (Baker and Pritchard, 1960; Gutierrez, 1969; Meyer, 1974; Mitrofanov *et al.*, 1980). However, it differs with the greenish yellow color of the female body in contrast to the dark red female body of *T. lombardinii* (Meyer, 1996). This new species can also be distinguished from *T. kaliphorae* by having the terminal knob of the aedeagus minute, 1/7 to 1/5 as long as margin of shaft, as opposed to the larger knob, approximately one half the length of dorsal margin of shaft in *T. kaliphorae*. Further, the aedeagus of the new species differs from that of *T. sawzdargi* in having the terminal knob with posterior projection as opposed to the knob without posterior projection in *T. sawzdargi*.

Moreover, the aedeagus of *Tetranychus truncatus* Ehara is similar to that of *T. zae* n. sp. in having the terminal knob minute, 1.5 µm long. However, the dorsal margin of the knob of *T. truncatus* is slightly undulate (Ehara, 1956, 1999) whereas it is convex in *T. zae*. Fur-

thermore, the summer females are red in *T. truncatus* but pale greenish-yellow in *zae*.

In addition, the aedeagus of a *Tetranychus* species which was referred to as *T. similis* Wainstein by Mitrofanov *et al.* (1987) strikingly resembles that of *T. zae* n. sp., but markedly differs from the illustration of the aedeagus on the original description of *T. similis* (Wainstein, 1958).

Etymology - The new species is named after the generic name of the host plant, *Zea*.

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This was Dr. Shôzô Ehara's last paper with description of new species before he died on October 7, 2008. He had written that he desired to publish this paper in the last memorial issue of IJA from Indira Publishing House but did not know that he was going to die suddenly. He had stated that he had published his paper in the first volume of IJA and was glad to serve the Editorial Board for 34 years. He has two more papers in press, one on a new record of spider mite in Japan and the other on owned museum list of his holotypes and paratypes.
