Three new *Pygmeophorus* Kramer (Acari: Pygmeophoridae) species from Turkey

Kunchithapatham RAMARAJU*  Nilgün MADANLAR**

**Summary**

This paper deals with three new species of *Pygmeophorus* mites on mushrooms in Turkey. They are as namely as: *P. turkiensis* n. sp., *P. madanlarae* n. sp. and *P. urlaensis* n. sp. which are described with adequate figures.

**Key words:** *Pygmeophorus* spp., new species, mushroom

**Anahtar sözcükler:** *Pygmeophorus* spp., yeni türler, kültür mantarı

**Introduction**

Numbers of modern mushroom growing farms are increasing in Turkey year by year. Mushroom production was 2467.6 tons in the areas of 183655 m² in 1994 (Bora et al., 1996). This crop is attacked by a wide range of mites, flies and nematodes. In the course of the study of Önder et al. (1995) regarding the mushroom pests in Izmir province of Turkey, some harmful and beneficial mite species were determined. From these harmful mites, four species of the genus *Pygmeophorus* Kramer (Acari: Pygmeophoridae) have been encountered. They are *P. sellnicki* Krczal, *P. turkiensis* n.sp., *P. madanlarae* n.sp. and *P. urlaensis* n. sp.

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There are few reports of mites belong to this genus on mushrooms in England and USA (Hussey et al., 1969; Smiley, 1978). The species of Pygmeophorus cause a severe loss to the mushroom industry even though these mites do not feed on mushrooms, they pierce mushroom caps and cause discoloration. The mite infestation may also produce brown patches on the external surface of the caps and cause allergic irritations in humans. Smiley (1978) presents an overview of Pygmeophorus species collected from North and South America with the identification key for females of the Western Hemisphere. He also provides keys and redescriptions to aid in the proper identification of Pygmeophorus spp. described from the Western Hemisphere (Mahunka, 1973; 1974; 1975; Rack, 1975). According to Smiley (1978) the pygmeophorids in mushroom houses apparently feed on weed moulds that develop on improperly prepared compost. The presence of pygmeophorid mites in mushroom houses may be an indication of improperly prepared compost which are favourable for the development of weed moulds.

Earlier reports suggest that P. sellnickki breeds only on a species of fungus in the genus Trichoderma (Hussey et al., 1969) and P. murphy (Smiley, 1978) has been found to feed on Iodophanus sarcobius (Baub.). The other pygmeophorid mites reported in mushroom houses are P. athiasae, P. flechtmanni, P. kneeboni (Wicht, 1970), P. mesembrinae (Canestrini, 1881) and P. quadratus (Krczal, 1959). Even though, only two reports are available on pygmeophorid mites in Turkey (Toros ve Çobanoğlu, 1985; Önder et al., 1995), not much work has been done on the mites associated with mushrooms. P. sellnickki and P. allmanni Krczal were determined in the province of Ankara by Toros ve Çobanoğlu (1985).

Material and Methods

Specimens were collected from mushroom growing houses in İzmir province during 1993-1994. In order to obtain the mites, compost, casing soil and mushroom samples were taken. Whenever the mites were found, they were collected, cleared and mounted in Hoyer’s medium for study.

The type slide and the paratype slides are deposited in Ege University, Faculty of Agriculture, Plant Protection Department, İzmir, Turkey.
All measurements given in the descriptions are in micrometers. The terminology of Rack (1975) was used to describe idiosomal characters.

**Results**

*Pygmephorus turkiensis* n.sp.

(Figures 1-3)

**Description**

**Female**

Pale, white coloured mite elongate oval body; idiosoma poorly sclerotized 270 µm long, 135 µm wide; dorsum divided into propodosomal and hysterosomal shields, 81 µm and 189 µm long, respectively, without integumental punctations and markings.

**Propodosoma dorsum**: Propodosomal plate small subrectangular, not heavily sclerotized with a heavy transverse apodeme limiting the hind margin; posterior portion of propodosomal dorsum arcuate, overlapping with first hysterosomal segment; peritreme large, drop shaped more contiguously placed, with three pairs of spiculate dorsal setae; posterior pseudostigmatals or setae pi 54 µm long; anterior pseudostigmatals or setae pml long, about 27 µm; distance between pml and pi greater than that between pml and pr (stigmatales).

**Propodosoma venter**: Anterior ventral plate with six pairs (1a, 1b, 1c, 2a, 2b and 2c) of small, thin, nude simple subequal setae, 14 µm long. Setae 1a, 1c and 2a almost on the same line.

**Hysterosoma dorsum**: Setae of first four segments spiculate; setae laterals I (pc₁) longest subequal to pi; dorsals I (pc₁) longer (38 µm) than other dorsals; dorsals II (pd₁), III (pe₁) and IV (pf₁) almost subequal about 40 µm; dorsolateral setae pe₂ about 1/4 as long as pe₁; and pf₂ slightly longer than pf₁. Only two pairs of simple caudal setae arising ventrally; the inner pair (ph₁) smaller than the outer (ph₂).

**Hysterosoma venter**: All posterior ventral plate setae thin, nude, flagellate; with six pairs (3a, 3b, 3c, 4a, 4b and 4c) of setae 10-16 µm long; setae 4b 1/3 longer than 4a and 4c.

**Gnathosoma**: Oval, length 30; width 27 µm with two pairs of widely separated gnathosomal dorsals, internals arising anterior to the
externals. Palp with a pair of ventral setae and a small clavate solenidion.

**Legs:** Leg I 95, leg II 95, leg III 102 and leg IV 135 μm long; coxal setal formula: 3-3-3-2. Legs I distally with a strong curved claw. Setation on femur, genu and tibiotarsus of leg I including eupathidia: 3+1 r odlike seta with spatulate tip-4-17+5 solenidia; leg II, femur, genu, tibia and tarsus: 3-3-4+1 solenidion -6+1 solenidion; leg III, 2-2-4+1 solenidion -6; leg IV, 3-1-4-6.

Dimensions of important body characters of new *Pygmerophorus* spp. are shown in Table 1.

Table 1. Dimension of important body characters of new *Pygmerophorus* spp. (in micrometers)

<table>
<thead>
<tr>
<th>Characters</th>
<th><em>Pygmerophorus turkiensis</em></th>
<th><em>Pygmerophorus madaenlarae</em></th>
<th><em>Pygmerophorus urlaensis</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Idiosoma length</td>
<td>270</td>
<td>245</td>
<td>297</td>
</tr>
<tr>
<td>Idiosoma width</td>
<td>135</td>
<td>135</td>
<td>165</td>
</tr>
<tr>
<td>Propodosoma length</td>
<td>81</td>
<td>68</td>
<td>80</td>
</tr>
<tr>
<td>Propodosoma width</td>
<td>189</td>
<td>178</td>
<td>223</td>
</tr>
<tr>
<td>Setae p1</td>
<td>54</td>
<td>43</td>
<td>59</td>
</tr>
<tr>
<td>Setae pe₂</td>
<td>54</td>
<td>43</td>
<td>59</td>
</tr>
<tr>
<td>Setae pe₁</td>
<td>38</td>
<td>27</td>
<td>38</td>
</tr>
<tr>
<td>Setae pd₁</td>
<td>36</td>
<td>27</td>
<td>38</td>
</tr>
<tr>
<td>Setae pe₁</td>
<td>40</td>
<td>27</td>
<td>38</td>
</tr>
<tr>
<td>Setae pf₁</td>
<td>38</td>
<td>28</td>
<td>40</td>
</tr>
<tr>
<td>Setae pf₂</td>
<td>48</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>Setae pe₂</td>
<td>11</td>
<td>17</td>
<td>27</td>
</tr>
<tr>
<td>Numbers of solenidia on tibio-tarsus I</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Number of solenidium on tarsus II</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Types:** The holotype female marked on slide, Turkey, İzmir (Torbali), 6.IV.1993 ex. Mushroom compost; Coll. Nilgün Madaenlar (No. 13A). Six paratype slides with adult female and collection data same as holotype.

**Diagnosis**

The adult females of this new species differs *Pygmerophorus americanus* Banks by having small simple dorsolateral setae (pe₂) on the third tergite. In addition, pe₂ about 1/4 as long as pe₁ and pf₂ slightly larger than pf₁. It is also distinguished from *P. smithi* Smiley by the presence of pf₂ setae; with only two pairs of caudals and the form and arrangement of solenidia and claw on tibio-tarsus I. The dorsal propodosomal setae of *P. turkiensis* n.sp. are spiculate in contrast to spiculate and simple in *P. kneeboni* Wicht (Smiley, 1978).
**Pygmephorus madanlarae** n. sp.

(Figures 4-6)

**Description**

**Female**

Pale, white coloured mite, body elongate oval; idiosoma poorly sclerotized 245 μm long, 135 μm wide; dorsum divided into propodosomal and hysterosomal shields, 68 and 178 μm long, respectively.

**Propodosoma dorsum:** Propodosomal shield subrectangular, longer than wide with one pair of spiculate setae (pl) and one pair of simple setae (pml); anterior pair about one-third length of the posterior pair. Pseudostigmatic organ globelike and without spicules; peritremes large drop shaped distinctly separated; a thick line of transverse apodeme separate the propodosomal shield from hysterosoma; posterior portion of propodosomal shield overlapping with anterior portion of hysterosomal shield.

**Propodosoma venter:** Anterior ventral plate with four pairs of elongate flagellate setae. Setae 1b and 2a are absent. Setae 1a and 2b almost subequal 54 μm long and longer than 1c and 2c 27 μm long.

**Hysterosoma dorsum:** Hysterosoma with lightly spiculate setae. First tergite largest; with a pair of lateral (pc₉) and medial setae (pc₁). Setae pc₂ longer than other hysterosomal setae but subequal to pl. Second tergite with a pair of simple lateral (pd₁). Third tergite with a pair of simple lateral (pe₂) and medial (pe₁) spiculate setae. Setae pe₂ about 2/3 length of pe₁. Fourth tergite with a pair of simple lateral (pf₂) and medial spiculate (pf₁) setae. Setae pf₂ about 2/3 length of pf₁. Setae pf₂ and pf₁ widely separated than pc₁ and pe₂. Three pairs of caudal setae are present; ph₃ longer than ph₁ and ph₂.

**Hysterosoma venter:** All ventral setae are thin, nude, long and flagellate; setae 4b longer than others.

**Gnathosoma:** Lenght 27, width 24 μm; dorsum with two pairs of setae; ventrally solenidion 1 prominent.

**Legs:** Leg I 108, leg II 94, leg III 92 and leg IV 121 μm long. Coxal setal formula: 2-2-3-2. Leg I long stout distally with a strong claw setation on femur, genu and tibio-tarsus of leg I including eupathidia: 2+1 rodlike setae ~4-16+2 solenidia; leg II, femur, genu, tibia and
tarsus: 3-2-4+1 solenidion -6+1 solenidion; leg III, 2-2-4+1 solenidion -6; leg IV, 2-1-4-6.

**Type:** The holotype female marked on the slide, Turkey, İzmir (Bornova: Belkahve), 5.X.1993 ex. Mushroom compost, Nilgün Madanlar (No.12). This species is named for Dr.N. Madanlar, collector of this species.

**Diagnosis**

This new species *Pygmephorus madanlarae* n.sp. resembles *P. (P.) bennetti* (Cross and Moser, 1971) and *P. (P.) karafiati* (Krczal, 1959) in all general characters but can be differentiated by the absence of solenidion 3 and 4 on tibio-tarsus I. It is also distinguished from *P. (P.) brachycerus* (Cross and Moser, 1971) by the from and arrangement of dorsal setae and the number of solenidia on tibio-tarsus I. *P. madanlarae* n.sp. also differs from *P. (P.) ceratophyi* (Krczal, 1959) by the absence of 5 or 6 spiniform setae each on legs III and IV and from *P. urlaensis* n.sp. by the shape of tibio-tarsus I.

*Pygmephorus urlaensis* n.sp.

(Figures 7-9)

**Description**

**Female**

Body length 297, width 165; oval, pale in colour, integument well sclerotized in the apodemes, dorsum divided into propodosomal and hysterosomal shields, 80 and 223 μm long, respectively.

**Propodosoma dorsum:** Propodosomal shield subrectangular; longer than wide, with two pairs of setae; anterior pair short and simple, posterior pair longer (59 μm); a thick line of transverse apodeme separates the propodosomal shield from hysterosoma. Peritremes drop shaped; pseudostigmatic organ narrowly ellipsoidal.

**Propodosoma venter:** Apodeme I, short and strong flanked with a strongly sclerotized coxal plate. Apodeme II longer than apodeme I; anterior ventral plate with four pairs of long thin simple setae 32 μm in length.

**Hysterosoma dorsum:** Hysterosoma with stout spiculate setae. First tergite largest with a pair of medial pc₁ and lateral pc₂ spiculate setae 38 and 59 μm long. Second tergite with a single pair of spiculate
setae (pd₁). Third tergite with a medial (pe₁) and lateral spiculate (pe₂) setae; pe₁ and pe₂ almost subequal; fourth tergite with a medial (pf₁) and lateral (pf₂) spiculate setae; pf₂ about 1/2 the length of pf₁.

**Hysterosoma venter:** Coxae III and IV with six pairs of strong simple setae; setae 4b longer than others; these pairs of caudals thin, bristle like arising ventrally ph₁ and ph₂ contiguous, ph₃ widely separated from ph₂.

**Gnathosoma:** Gnathosoma oval, wider than long; dorsally with two pairs of simple setae.

**Legs:** Coxal setal formula: 2-2-3-2. Leg I stout with a long claw: setation femur, genu and tibio-tarsus of leg I including eupathidia: 3+1 rod like seta -4-15+2 solenidia; leg II, femur, genu, tibia and tarsus: 3-2-4+1 solenidion -5+1 solenidion; leg III, 2-2-4+1 solenidion -5; leg IV, 2-1-4-5. All claws uncinate and normal.

**Types:** The holotype female marked on the slide, Turkey, İzmir (Uzla), 1.X.1993, ex. Mushroom compost. Coll. Niğün Madanal (No. 12A). Five paratype slides with adult females and collection data same as holotype.

This species is named for the type-locality Uzla, Turkey.

**Diagnosis**

This species closely related to many other *Pygmephorus* species, but it can be differentiated by the presence of three caudal setae; a strong claw arising distally from the elongate projection of tibio-tarsus I and the form/shape of tibio-tarsus I.

**Acknowledgement**

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**Özet**

Türkiyeden üç yeni *Pygmephorus* Kramer (Acari: Pygmephoridae) türü

Bu çalışmada, İzmir'de 1993-1994 yılları arasında kültür mantarlarında bulunan zararlıların saptanması sırasında rastlanan *Pygmephorus* cinsine bağlı üç yeni türün (P. turkiensis n. sp., P. madanalae n. sp. ve P. urlaensis n. sp.) orijinal tanıtımı yapılmıştır.
References


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Figures 1 - 3. *Pygmeophorus turkiensis* n. sp. female,
1. Dorsal view,  2. Ventral view,  3. Legs I-IV.
Figures 4 - 6. *Pygmeophorus madanlarae* n. sp. female,
Figures 7-9. *Pygmeophorus urlaensis* n. sp. female.