

# Three species of rust fungi (Uredinales) from Okinawa, Japan\*

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Three species of rust fungi were reported based on the specimens collected in the islands of the Yaeyama group and Okinawa, Japan. *Puccinia tarennicola* on *Tarenna gracilipes* and *Uredo daphniphylli* on *Daphniphyllum teijsmannii* were described as new species. *Villebrunea frutescens* was added to the host plants of *Uredo pipturi*.

Key Words—rust fungus; taxonomy; *Puccinia tarennicola*; Uredinales; *Uredo daphniphylli*; *Uredo pipturi*.

Many species of rust fungi were collected during the survey of parasitic fungi on trees in the islands of the Yaeyama group (Ishigaki, Iriomote, Yonaguni, Taketomi), Miyako and Okinawa, Japan from 1988 to 1990 (Kobayashi et al., 1990; Kobayashi and Kawabe, 1991, 1992; Kobayashi et al., 1991). Among them, three specimens of rust fungi on *Tarenna gracilipes* (Hayata) Ohwi, *Daphniphyllum teijsmannii* Zoll. and *Villebrunea frutescens* (Thunb.) Blume were examined because there had been no record of rust fungus on these trees. After careful examination of these specimens, we concluded that two rust fungi on *T. gracilipes* and *D. teijsmannii* were new species and the rust fungus on *V. frutescens* was *Uredo pipturi* (H. Sydow) Hiratsuka, f. We here describe their morphology, host plants and geographical distribution.

## 1. *Puccinia tarennicola* Kakishima et Kobayashi, sp. nov.

Fig. 1

Teliis hypophyllis, atro-brunneis, subepidermicis, erumpentibus, pulverulentis; teliosporis bicellularibus, ellipsoideis vel obovoideis, 35.0–43.5 × 22.5–28.0 μm, membrana brunnea, 2.0–3.0 μm crassa, echinulata, poris germinationis intermediis in quaque cellula; pedicello hyalino vel flavido, 6–40 μm longo, persistenti, hygroscopico, basi inflato; urediniosporis inter telia mixtis, subglobosis vel obovoideis, 28.5–30.5 × 24.5–28.0 μm, membrana flavida vel brunneola, echinulata, poris germinationis obscuris.

Telia hypophyllous, dark brown, subepidermal in origin, erumpent, pulverulent; teliospores two-celled, ellipsoid to obovoid, 35.0–43.5 × 22.5–28.5 μm, walls brown, 2.0–3.0 μm thick, echinulate, germ pores located at the middle part of each cell; pedicels hyaline to pale yellow,

low, 6–40 μm long, persistent, hygroscopic, inflated at the base; urediniospores intermixed within the telia, subglobose to obovoid, 28.5–30.0 × 24.5–28.0 μm, walls pale yellow to pale brown, echinulate, germ pores obscure.

Holotype: II, III on *Tarenna gracilipes* (Hayata) Ohwi (= *T. gyokushinkwa* Ohwi) (Rubiaceae), Ginowan-shi, Okinawa Isl., Okinawa Pref., Japan, 6 Feb. 1990, T. Kobayashi, TSH-R1378.

The telial stage of a rust fungus on *T. gracilipes*, in which urediniospores were intermixed, was collected in Okinawa Isl. (Fig. 1A) (Kobayashi et al., 1991). Morphology of the telia and teliospores suggested that this rust fungus belonged to *Puccinia* (Fig. 1BCDF). As the result of morphological comparison with *Puccinia* species parasitic on plant species in Rubiaceae, this rust fungus was described as a new species. This is the first record of a rust fungus on *Tarenna* species.

The teliospore surface of *P. tarennicola* is echinulate (Fig. 1F). This morphological characteristic is similar to teliospores of *P. perasperata* Hennen et Cummins on *Bouvardia bouvardioides* (Seem.) Standl. reported from Mexico (Hennen and Cummins, 1973; Gallegos and Cummins, 1981) and *P. pentadis* P. Hennings on *Pentadis* sp. reported from Africa (Sydow and Sydow, 1904). However, *P. tarennicola* is different from these two species in size of teliospores. Additionally, pedicels of *P. tarennicola* are hygroscopic and inflated basally (Fig. 1BF) but those of the other two species are not.

## 2. *Uredo daphniphylli* Kakishima et Kobayashi, sp. nov.

Fig. 2

Urediniis hypophyllis, brunneis, subepidermicis, erumpentibus, pulverulentis; peridio hemisphaerico; urediniosporis obovoideis, 24.0–40.0 × 16.0–25.5 μm, membrana flavida vel brunneola, 1.5–2.0 μm crassa, echinulata, poris germinationis obscuris.

Uredinia hypophyllous, brown, subepidermal in ori-

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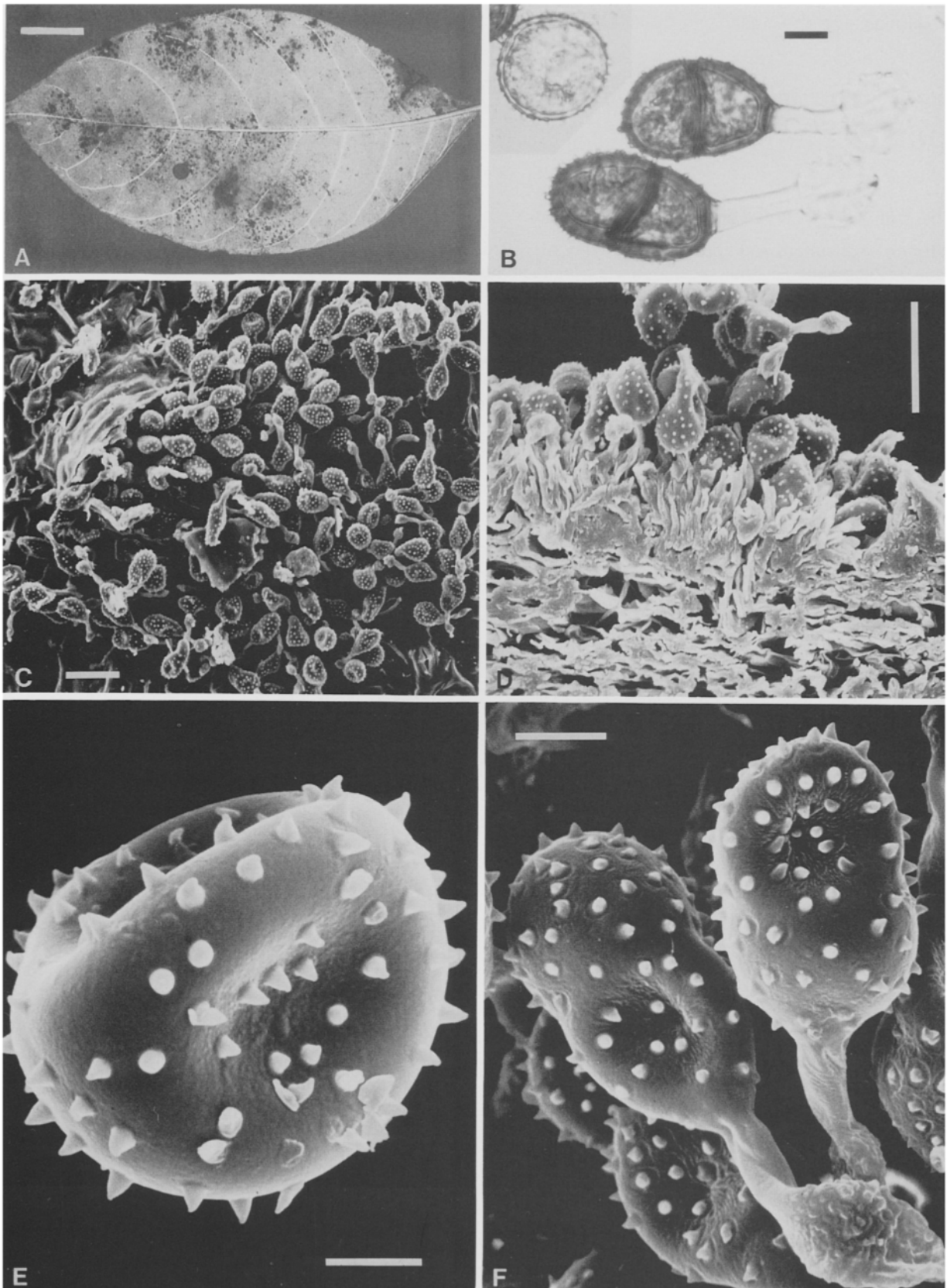


Fig. 1. *Puccinia tarennicola*. A. Telia on the lower leaf surface of *Tarena gracilipes*. B. Teliospores with basally inflated pedicels and a uredinospore. C. A telium observed by SEM. D. Vertical section of a telium observed by SEM. E. A uredinospore observed by SEM. F. Teliospores observed by SEM. (Scale bars: A=1 cm; B, F=10  $\mu$ m; C, D=50  $\mu$ m; E=5  $\mu$ m.)

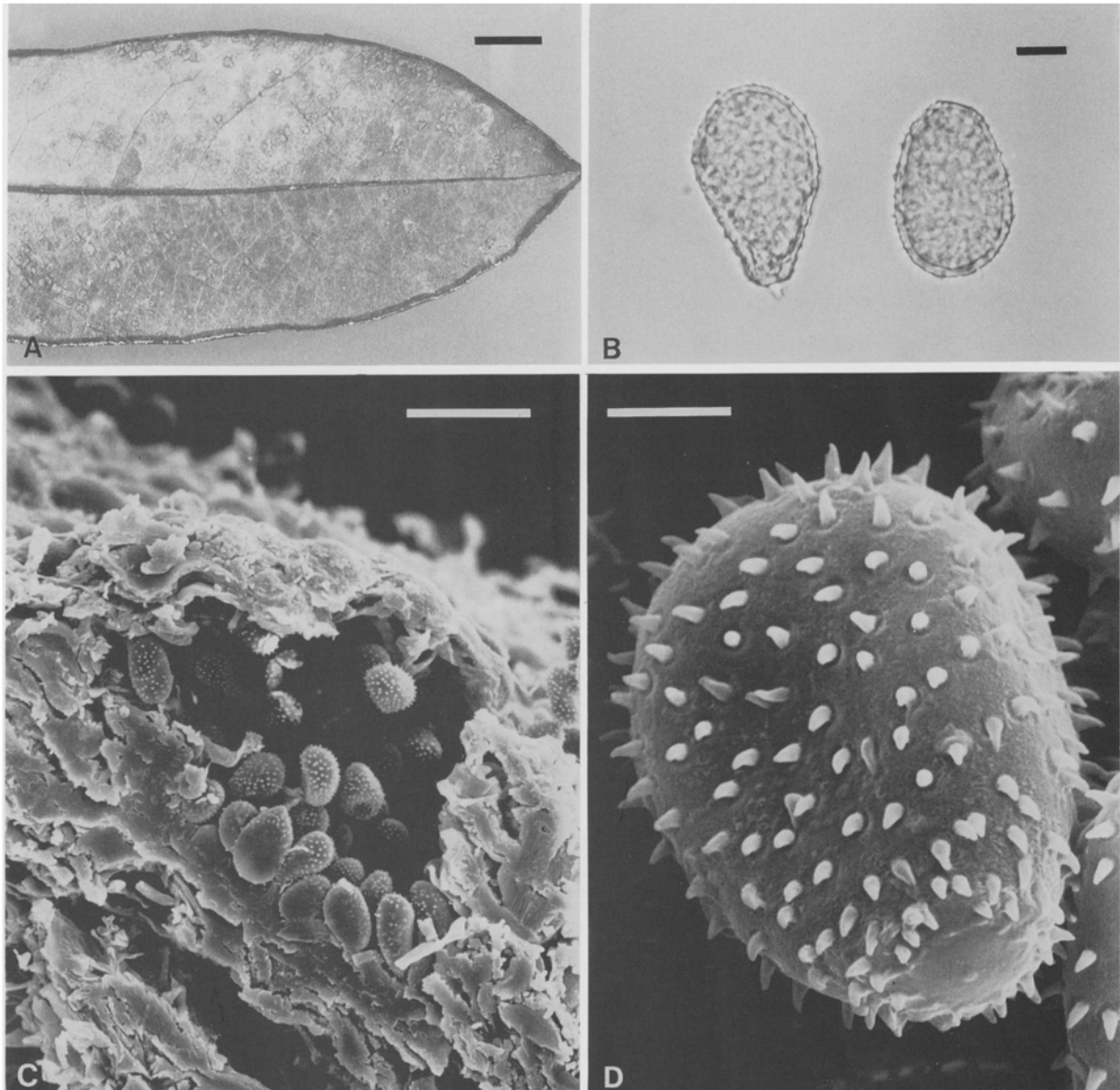


Fig. 2. *Uredo daphniphylli*. A. Uredinia on the lower leaf surface of *Daphniphyllum teijsmannii*. B. Urediniospores. C. Vertical section of a uredinium with peridium observed by SEM. D. A urediniospore observed by SEM. (Scale bars: A = 1 cm; B = 10  $\mu$ m; C = 50  $\mu$ m; D = 5  $\mu$ m.)

gin, erumpent, pulverulent, peridiate, peridia hemispherical; urediniospores obovoid, 24.0–40.0  $\times$  16.0–25.5  $\mu$ m, walls pale yellow to pale brown, 1.5–2.0  $\mu$ m thick, echinulate, germ pores obscure.

Holotype: II on *Daphniphyllum teijsmannii* Zoll. (Euphorbiaceae), Shirahama, Taketomi-machi, Iriomote Isl., Yaeyama Isls., Okinawa Pref., Japan, 8 Dec. 1988, T. Kobayashi and M. Onuki, TSH-R1380.

Other specimen examined: II on *D. teijsmannii*, Experimental Forest of Univ. of Ryukyus, Kunigami-mura, Kunigami-gun, Okinawa Isl., Okinawa Pref., Japan, 10 Feb. 1990, T. Kobayashi, TSH-R1381.

The uredinial stage of a rust fungus on *D. teijsmannii* was collected in Iriomote and Okinawa (Fig. 2A)

(Kobayashi et al., 1990). Morphological comparison with the uredinial stages of rust fungi parasitic on plant species in Euphorbiaceae showed that this rust fungus was a new species of *Uredo*.

*Uredo daphniphylli* is similar to *Phakopsora malloti* Cummins (= *Pucciniastrum malloti* Hiratsuka, f.) on *Mallostus* species reported from Taiwan, China and Japan (Okinawa, Kyushu) in morphology of uredinia (Cummins, 1950; Hiratsuka, 1936, 1960; Hiratsuka et al., 1985; Hiratsuka et al., 1992; Hiratsuka and Chen, 1991; Tai, 1979). However, urediniospore size of *U. daphniphylli* is larger than that of *P. malloti*.

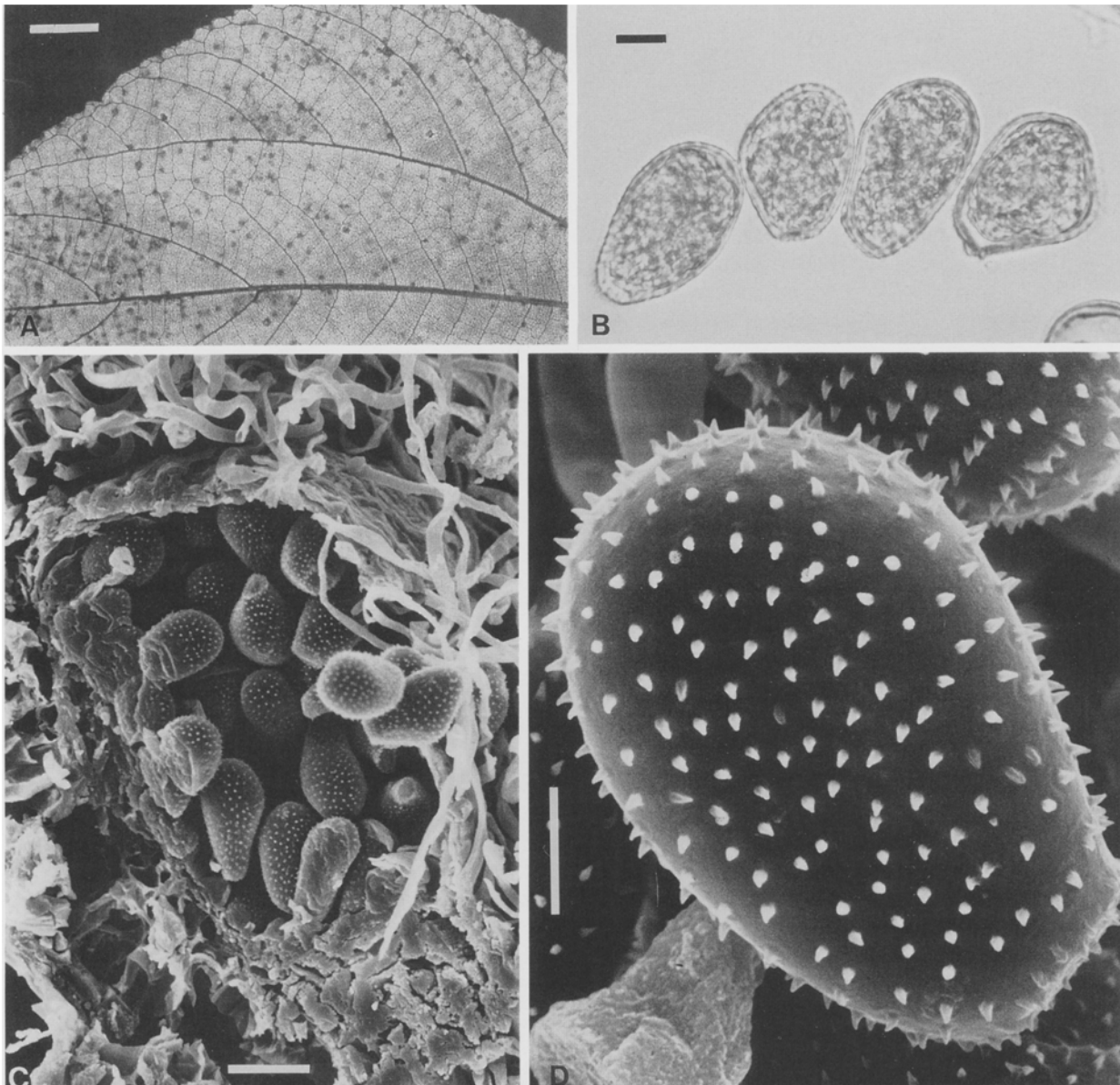


Fig. 3. *Uredo pipturi*. A. Uredinia on the lower leaf surface of *Villebrunea frutescens*. B. Urediniospores. C. Vertical section of a peridiate uredinium observed by SEM. D. A urediniospore observed by SEM. (Scale bars: A=1 cm; B=10  $\mu\text{m}$ ; C=20  $\mu\text{m}$ ; D=5  $\mu\text{m}$ .)

3. *Uredo pipturi* (H. Sydow) Hiratsuka, f. Fig. 3  
 Uredinia hypophyllous, minute, brown, subepidermal in origin, erumpent, pulverulent, peridiate, peridia hemispherical; urediniospores broadly ellipsoid, 26.5–40.0  $\times$  19.5–27.5  $\mu\text{m}$ , walls pale yellow to pale brown, 1.5–2.5  $\mu\text{m}$  thick, echinulate, germ pores obscure.

Specimen examined: II on *Villebrunea frutescens* (Thunb.) Blume (Urticaceae), Nagura, Ishigaki-shi, Ishigaki Isl., Yaeyama Isls., Okinawa Pref., Japan, 26 Nov. 1988, T. Kobayashi, TSH-R1379.

The uredinal stage of a rust fungus on *V. frutescens* was collected in Ishigaki Isl. (Kobayashi et al., 1990). By morphological comparison with the uredinal stages of rust fungi parasitic on plant species in Urticaceae, this

rust fungus was identified as *U. pipturi*.

*Uredo pipturi* was first described as *Pucciniastrum pipturi* H. Sydow (Sydow and Petrak, 1931) and transferred to *Uredo* because a telial stage was not found in any specimens of *P. pipturi* (Hiratsuka, 1957). This species was reported on *Pipturus arborescens* C. B. Clarke and *P. repandus* Wedd. and distributed in the Philippines and Japan (Ishigaki Isl., Iriomote Isl.) (Arthur and Cummins, 1936; Hiratsuka, 1936, 1958, 1960; Hiratsuka et al., 1985; Hiratsuka et al., 1992).

*Uredo pipturi* is similar to the uredinal stage of *Pucciniastrum boehmeriae* P. et H. Sydow on *Boehmeria* species, which is widely distributed in Asia, in morphology of uredinia. However, the urediniospore size of *U. pipturi* is

larger than that of *P. boehmeriae* (Hiratsuka, 1936).

All specimens examined were deposited in the Mycological Herbarium of the Institute of Agriculture and Forestry, University of Tsukuba (TSH).

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