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NOTE

The New Geographical Distribution of Rust Fungi from Taiwan

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ABSTRACT: In the field studies undertaken in central and southern Taiwan during 2003 to 2007, over 250 rust specimens were collected. Among these specimens, *Nyssopsora thwaitesii* on *Schefflera arboricola* (Araliaceae), *Goplana dioscoreae* on *Dioscorea* sp. (Dioscoreaceae), *Puccinia fusispora* on *Urtica thunbergiana* (Urticaceae), *P. paullula* on *Raphidophora* sp. (Araceae) and *Pucciniastrum potentillae* on *Fragaria hayatai* (Rosaceae) were found as new geographic distribution records.

KEY WORDS: Taiwan, Rust, Araliaceae, Dioscoreaceae, Urticaceae, Araceae, Rosaceae.

INTRODUCTION

In Taiwan, 335 species of rust, represent 226 species in 41 teleomorphic genera, and 109 anamorphic species have been recorded (Chung et al., 2006; Hiratsuka and Chen, 1991). These figures are far greater in terms of species number per unit area than those calculated for Japan (Hiratsuka et al., 1992), one of the most intensively studied geographic regions for the rust fungi. Taiwan lies in the subtropical region with high climatic, geographical and topographical diversity, and these physical diversities have created a multitude of habitats for herbaceous and arborescent plants that have been recorded in Taiwan (Kuo, 1999; Yang et al., 1999; Liu et al., 2000; Yang et al., 2000; Yang et al., 2001; Yang and Liu, 2002). This indicates that more intensive explorations than what had been done in the past would find new taxa or new host distribution records in Taiwan.

MATERIALS AND METHODS

Specimens collection and observation

There are more than 250 rust specimens were collected from 2003 to 2007. The specimens were used for light microscopic (LM), stereomicroscopic (SM) and scanning electron microscopic (SEM) observations. The morphological characteristics in teliospores or urediniospores were observed and examined. Spores for LM following rehydration were mounted in lactophenol and examined. For SEM, spores obtained from dry specimens were dusted on double-sided adhesive tape on specimen holders, and the coated with platinum-palladium with a Jeol JSM-7401F operating at 10 KV.

TAXONOMIC TREATMENTS

Nyssopsora thwaitesii (Berk. & Broome) Syd., Annls. Mycol. 19: 170. 1921. Fig. 1

Nyssopsora schefflerae Ramachar, Bagyan., Subbal. & Hosag. 1987
Triphragmium thwaitesii Berk. & Broome, 1875

Telia amphigenous, scattered or slightly clustered, rarely fused into large sori, naked, erumpent, dark black; teliospores borne singly on pedicels, triquetrous, 3-celled with a basal, brown or dark brown, 32.3-38.9 × 29.0-37.2 μm, wall bearing conspicuous appendiculate, 8.9-13.1 μm thickness, with three branched and two small branch on top of each branch.

Specimens examined: on *Schefflera arboricola* (Hayata) Kanehira, Huisum Forest Station, Nantou Co., Nov. 25, 2005 and May 12, 2007, Chung and Huang (CHUR-0020 and CHUR-0045).

Notes: In Taiwan, two *Nyssopsora* species, *N. cedrelae* (Hori) Tranz. on *Toona sinensis* and *N. formosana* (Sawada) Lutjeharms on *Koelreuteria bipinnata*, *K. formosana*, and *K. henryi*, are recorded. *Nyssopsora thwaitesii* is newly recorded in Taiwan. Recently, the fungus has a synonym, *N. schefflerae*, was reported on *Schefflera stellata* (Gaertn.) Harms. in India (Bagyanarayana et al., 1987).

Distribution: Taiwan, China, Sri Lanka, Philippines, Indonesia, India and Russia.

Goplana dioscoreae Cummins, Bull. Torrey Bot. Club 87: 35. 1960. Fig. 2

Goplana dioscoreae (Berk. & Br.) Cummins, 1935
Aecidium dioscoreae Berk. & Broome, 1875
Uredo dioscoreae Petch, 1912
Uredo dioscoreae-alatae Raciborski, 1900
Uredo dioscoreae-pyrifoliae Yen, 1970

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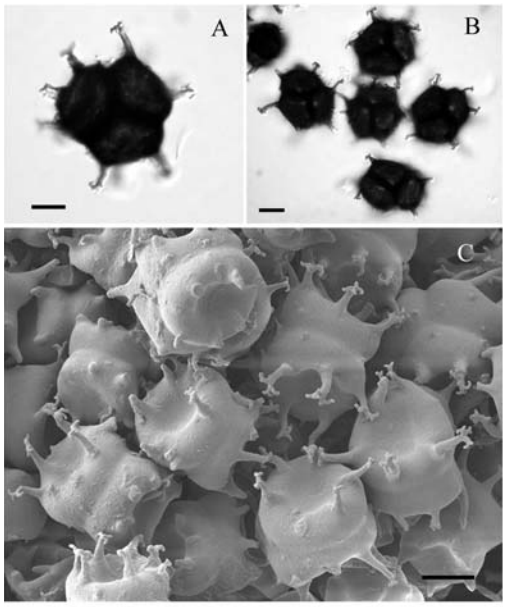


Fig. 1. *Nyssopsora thwaitesii*. A-B: Teliospores and appendiculate (LM). C: Surface structure of teliospores (SEM). Bars (A-C) = 10 µm.

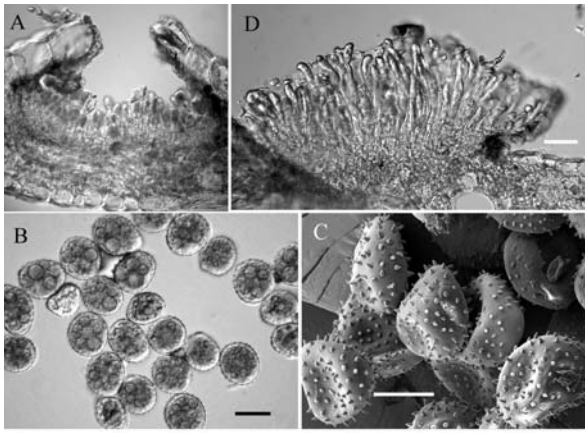


Fig. 2. *Goplana dioscoreae*. A: Cross section of a uredium (SM). B: Urediniospores (LM). C: Surface structure of urediniospores (SEM), bar = 10 µm. D: Cross section of a telium (LM). Bars (A-D)=20 µm.

Uredinia amphigenous, on petioles, and caulicolous, scattered or clustered, epidermal, naked, erumpent, orange, brown or brownish; urediniospore globose, subglobose, obovoid, ellipsoid or angular, 18.3-28.3 × 16.2-23.9 µm, hyaline to yellow or chestnut-brown, the wall echinulate, 1.0-1.5 µm, pores obscure. Telia mostly hypophyllous, circular clustered, subepidermal, erumpent as gelatinous cushions; teliospores in a single layer, length more than 30.8 µm, and width 5.7-10.4 µm, wall thin, pale or colorless, sessile, embedded in a gelatinous matrix.

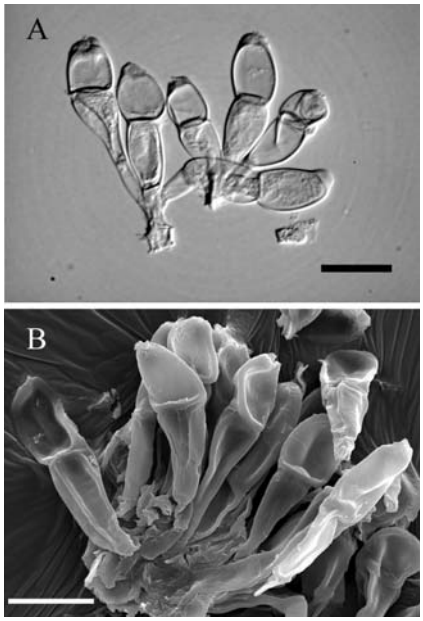


Fig. 3. *Puccinia fusispora*. A: Telioapores (LM). B: Surface structure of teliospores (SEM). Bars (A-B) = 20 µm.

Specimens examined: on *Dioscorea* sp., Neipu, Pingtung Co., April 20, 2007, June 18, 2007 and Oct. 2, 2007, Chung (CHUR-0051, CHUR-0070, CHUR-0078).

Notes: This fungus has been reported on *Dioscorea alata* L., *D. bulbifera* L., *D. esculenta* (Lour.) Burkill, *D. transversa* R. Br., and *Dioscorea* sp. in Australia, Asia and Pacific islands (Cummins, 1941; Ono, 1982; Ono, 1982; Ono and Hennen, 1983).

Distribution: Taiwan, Australia, Philippines, Papua New Guinea, Malaysia, New Caledonia, Micronesia Federated States, Indonesia, Sir Lanka, Singapore and Branei Darussalam.

Puccinia fusispora P. Sydow et H. Sydow, Arten. Ann. Mycol. 1: 15-23. 1904. Fig. 3

Puccinia urticae Jaczewski, 1898

Telia hypophyllous, scattered or slightly clustered, rarely fused into large sori, naked, erumpent, solid, brown or brownish; teliospores cylindrical or fusiform, apex obtuse or pointed, thickened, 1.5-5.4 µm, constricted at the septum, base narrowed, smooth, light yellowish brown, 30.0-50.8 × 9.3-16.6 µm, the wall thin; pedicels colorless or light brown, persistent.

Specimen examined: on *Urtica thunbergiana* Sieb. & Zucc, Shanping Forest Park, Kaoshiung Co., Jan. 8, 2005, Chung and Ono (CHUR-0004).

Note: This fungus is newly recorded in Taiwan. The spermogonia of this fungus is unknown, and the aceia and uredinia absent.

Distribution: Taiwan, Japan, China, Uganda, Kenya, USSR, Pakistan.

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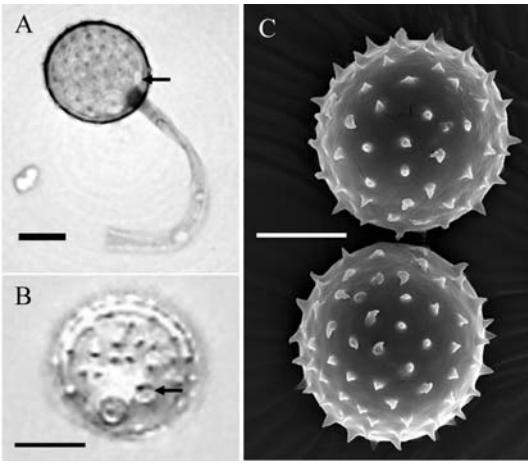


Fig. 4. *Puccinia paululla*. A-B: Urediniospores and germ pores position (indicated by arrows) (LM). C: Surface structure of urediniospores (SEM). Bars (A-C) = 10 µm.

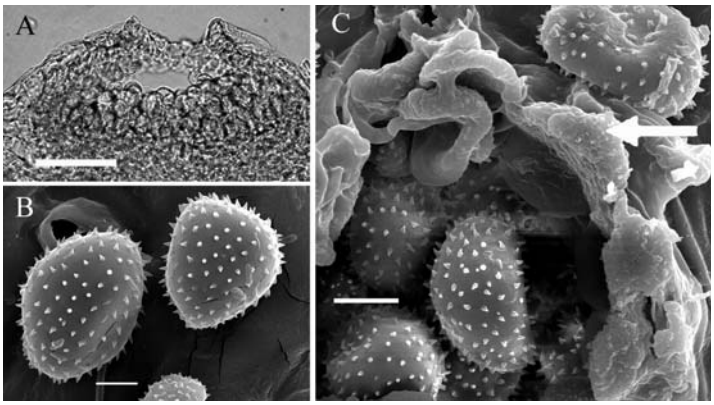


Fig. 5. *Pucciniastrum potentillae*. A: Cross section of uredinium (LM). B: Surface structure of urediniospores (SEM). C: Ostiolar cells (indicated by arrows) (SEM). Bar A = 50 µm, Bar B = 5 µm, Bar C = 10 µm.

Puccinia paullula H. Sydow et P. Sydow, Philipp. J. Sci., C, Bot. 8: 195. 1913. Fig. 4

Uredinia hypophyllous, scattered or slightly clustered, rarely fused into large sori, naked, erumpent, brown; urediniospores globose or subglobose, 22.9-32.2 × 21.8-30.9 µm, the wall echinulate, brown, 1.3-2.4 µm, 2 basal pores.

Specimen examined: on *Raphidophora* sp., Huisum Forest Station, Nantou Co., Dec. 15, 2003, Chung and Kakishima (CHUR-0001).

Note: Two formae speciales, *P. paullula* f. sp. *amorphopalli* Shaw on *Amorphophallus* and *P. paullula* f. sp. *monsterae* Shaw on three other hosts: *Monstera* spp., *Epipremnum pinnatum* (L.) Engl., and *Typonodorum lindleyanum* Schott, have been reported in *P. paullula* in Australia (Shaw, 1991).

Distribution: Taiwan, Australia, Papua New Guinea, Malaysia, Philippines, UK.

Pucciniastrum potentillae Körn., in Jaczewski, Komarov & Tranzschel, *Fungi Rossiae Exsicc.*, fasc. 7 (nos 301-350): no. 327 (1900) [1899]. Fig. 5

Uredinia hypophyllous, scattered or frequently crowded in small groups, subepidermal, light yellow or yellow; peridia hemispherical, dehiscent from a centeral pore; peridial cells minute, polygonal, walls thin, smooth, colorless; ostiolar cells rounded at the apex, somewhat minutely echinulate, urediniospores globose, subglobose, obovate or ellipsoid, 14.7-21.0 × 12.1-16.2 µm, the wall finely echinulate, pallid, thin, 0.9-1.3 µm thick.

Specimen examined: on *Fragaria hayatai* Makino, Shanping Forest Park, Kaoshiung Co., Jan. 8, 2005, Chung and Ono (CHUR-0006).

Note: Eleven species of *Pucciniastrum* were recorded in Taiwan. *Pucciniastrum potentillae* of spermogonia and aecia is unknown. This fungus is reported in New Guinea, North America, East Indies, China, Korea and Japan (Hiratsuka et al., 1992). The host of this fungus is Rosaceae (Hiratsuka et al., 1992).

Distribution: Taiwan, Russia, Canada, Papua New Guinea, North America, East India, China, Korea.

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臺灣銹菌之新紀錄種

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摘要：自 2003 到 2007 年於臺灣中南部進行田間調查，蒐集超過 250 個銹菌標本。其中寄生於五加科鵝掌藤之 *Nyssopsora thwaitesii*、山羊百科薯蕷屬之 *Goplana dioscoreae*、蕁麻科咬人貓之 *Puccinia fusispora*、天南科黃金葛屬之 *P. paullula* 及薔薇科臺灣草莓之 *Pucciniastrum potentillae*，被鑑定為地理新紀錄種。

關鍵詞：銹菌、五加科、山羊百科、蕁麻科、天南科、薔薇科。

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