HOKKAIDO UNIVERSITY

Title	ON SOME NEW SPECIES OF PHRAGMIDIUM
Author(s)	Hiratsuka, Naohide
Citation	札幌博物学会会報, 13(3), 134-138
Issue Date	1934-06-20
Doc URL	https://hdl.handle.net/2115/64120
Type	journal article
File Information	Vol.13No.3_008.pdf

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ON SOME NEW SPECIES OF PHRAGMIDIUM

BY

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(平　塚　直　秀)

1. ***Phragmidium Itoanum*** HIRATSUKA, f. nov. spec.

Aecidiis amphigenis, plerumque hypophyllis vel petiolicolis, sparsis vel aggregatis, minutis, rotundatis, ellipsoideis vel irregularibus, 0.3–1.5 mm diam., praecipue ad petiolos et nervos foliorum evolutis et tunc elongatis, usque 6 mm longis, pulvinatis, aurantiacis; paraphysibus clavatis, 45–62 × 10–16 μ; aecidiosporis globosis, subglobosis, ellipsoideis vel ovatis, 20–31 × 18–21 μ; episporio 1.8–2.5 μ crasso, densiuscule verruculoso.

Soris teleutosporiferis amphigenis vel caulicolis, sparsis vel solitariis, rotundatis vel oblongis, 0.3–1.2 mm diam., vel elongatis 1–6 mm vel ultra longis, pulvinatis, mox nudis, epidermide rupta cinctis, atris; teleutosporis cylindraceis, 1–4-septatis (plerumque 2–3), 45–87 × 18–27 μ, ad septa non constrictis, apice et basi rotundatis olivaceo- vel cloveo-brunneis, levibus; episporio 2.5–3.5 μ crasso, quaque cellula poris germinationis 2–3; pedicello persistenti, hyalino, 60–145 μ longo.

Hab. In foliis caulibusque *Potentillae Matsumurae* in Hokkaidô (Ishikari, Iburi), Honshû (Shinano) et Kuriles in Japonia.

Aecidia amphigenous, mostly hypophyllous, petiolicolous or often on stems, scattered or gregarious, minute, round, oblong or irregular in shape, 0.3–1.5 mm across, often elongated on the nerves or petioles, up to 6 mm long, at first covered by the epidermis, then naked, pulvinate, ruptured epidermis conspicuous, orange in colour; paraphyses not abundant nor consicuous, surrounding each sorus, clavate, erect, 45–62 μ long, 10–16 μ wide, walls uniformly thin, 1 μ or less, smooth, colourless; aecidiospores globose, subglobose, ellipsoidal or ovate, 20–31 × 18–21 μ; epispore moderately thin, 1.8–2.5 μ thick, minutely verrucose; contents orange-yellow in colour.

Teleutosori amphigenous or on petioles, peduncles, stems, even on bracts, scattered or solitary, small, round or oblong, 0.3–1.2 mm across, or elongated up to 1–6 mm long, pulvinate, finally powdery, ruptured epidermis conspicuous, black; teleutospores cylindrical, 1–4-septate (generally 2 or 3), 45–87 × 18–27 μ; rounded at both ends, not constricted at the septa; epispore olive-brown to clove-brown in colour, smooth, moderately thick, 2.5–3.5 μ thick, thickened at the apex (up to 10 μ), 2 or 3 germ pores in each cell; pedicels persistent, 60–145 μ long, colourless, somewhat rugose especially in the lower part, non-hygroscopic.

Hab. On *Potentilla Matsumurae* WOLF. (*Miyama-kinbai*).

Hokkaidô:—Prov. Iburi: Mt. Makkari-nupuri (Aug. 8, 1907, S. ITO). Prov. Ishikari: Mt. Hokkai-dake (Sept. 11, 1926, HIRATSUKA, f.); Kumonotaira (Daisetsu-zan) (Aug. 19, 1925, K. MIYABE & HIRA-

[Trans. Sapporo Nat. Hist. Soc., Vol. XIII, Pt. 3, 1934]

TSUKA, f.; Sept. 11, 1926, HIRATSUKA, f.); Mt. Hakuun-dake (Aug. 5, 1925, HIRATSUKA, f.); Hokkaisawa (Daisetsu-zan) (Aug. 14, 1927, S. ITO, HIRATSUKA, f. & S. IWADARE, *type*!); Mt. Tomuraushi (Aug. 1927, H. KATAOKA).

Kuriles:—Shikotan: Shakotan (Aug. 22, 1927, M. TATEWAKI).

Honshû:—Prov. Shinano: Mt. Yatsugatake (July 21, 1930, HIRATSUKA, f.); Mt. Tsubakura (July 29 & Aug. 2, 1930, HIRATSUKA, f.); Mt. Komagatake (Kiso) (Aug. 10 & 11, 1931; Aug. 23, 1932, HIRATSUKA, f.).

This is an alpine species; it has been found only in the alpine regions in Japan up to the present.

The present fungus closely resembles the American species, *Phragmidium biloculare* DIET. et HOLW. on *Potentilla gelida* C. A. MEY., in its life-cycle and the host relation as well as in some morphological characters. This fungus is, however, distinguishable from the American species by the septation of the teleutospores and the teleutospore-walls. The teleutospores of the Japanese fungus are generally 2 or 3-septate and their epispore is entirely smooth, while those of the American fungus are mostly 1-septate (very rarely 3-septate) and their epispore is closely verrucose especially at the apex.

Moreover, this species can easily be distinguished from the related species, *Phragmidium Potentillae* (PERS.) KARST. by the smaller number of teleutospore-cells as well as by its life-history, lacking the uredo-generation.

The first reference to this species was made by M. KASAI[1] under the name *Phragmidium Potentillae* (PERS.) KARST. basing upon a collection on *Potentilla Matsumurae* WOLF. (KASAI erroneously recorded it as *Potentilla gelida* C. A. MEY.) which was made by Prof. ITO on Mt. Makkari-nupuri in the province of Iburi in August 1907. I have had the privilege of examining Dr. ITO's collection preserved in the Herbarium of the Botanical Institute, Faculty of Agriculture, Hokkaido Imperial University, and found that it is really this fungus.

This species is dedicated to Prof. ITO in honor of the twenty-fifth anniversary of his appointment to a post in the Botanical Institute of the Hokkaido Imperial University.

2. ***Phragmidium brevipedicellatum*** HIRATSUKA, f. nov. spec.

Syn. *Phragmidium Potentillae* (not KARSTEN nor WINTER) (DIETEL in Engl. Bot. Jahrb. XXXVII, p. 104, 1905, p.p.; Ann. Myc. VI, p. 227, 1908; HENNINGS in Engl. Bot. Jahrb. XXXII, p. 36, 1902; KASAI in Trans. Sapporo Nat. Hist. Soc. III, p. 29, 1910, p.p.; NAMBU in Bot. Mag. Tokyo, XXIII, p. (309), fig. 3, 1909; YOSHINAGA in Bot. Mag. Tokyo, XV, p. (96), 1901; YOSHINAGA & HIRATSUKA, f. in Bot. Mag. Tokyo, XLIV, p. 649, 1930).

Aecidiis amphigenis, plerumque hypophyllis vel petiolicolis, sparsis vel aggregatis, minutis, rotundatis vel ellipsoideis, 0.4–1 mm diam., mox nudis, pulverulentis, aurantiacis, aparaphysatis; aecidiosporis globosis, subglobosis, ob-

(1) Trans. Sapporo Nat. Hist. Soc. III, p. 29, 1910.

ovatis vel ellipsoideis, 17.5–30 × 15–25 μ; episporio 1.2–2 μ crasso, densiuscule verruculoso.

Soris uredosporiferis plerumque hypophyllis, petiolicolis vel caulicolis, sparsis vel laxe aggregatis, minutis, rotundatis vel oblongis, 0.2–1 mm diam., rarius elongatis usque 1 cm longis, mox nudis, pulvinatis, aurantiacis; paraphysibus numerosis, clavatis vel plus minus capitatis, 35–75 × 9–18 μ, levibus, hyalinis; uredosporis globosis, subglobosis vel obovatis, 15–25 × 15–22.5 μ; episporio minutissime echinulato, 1.2–1.8 μ crasso, pallide flavidio vel subhyalino.

Soris teleutosporiferis hypophyllis vel petiolicolis, sparsis vel aggregatis, minutis, rotundatis vel oblongis, 0.3–1 mm diam., pulvinatis, mox nudis, atris; teleutosporis cylindraceis, 1–5-septatis (plerumque 3–4), 42–93 × 21–30 μ, levibus olivaceo-brunneis; episporio 2–3 μ crasso, quaque cellula poris germinationis 2–3; pedicello persistenti, 18–70 μ longo, hyalino vel superne leniter colorato.

Hab. In foliis caulibusque *Potentillae Kleinianae* in Honshû (Inaba, Hôki, Iwami), Shikoku (Iyo, Tosa), Kiushû (Higo, Bungo) in Japonia.

Aecidia amphigenous, mostly hypophyllous or petiolicolous, scattered or gregarious, small, round or ellipsoidal, 0.4–1 mm across, soon naked, pulvinate, orange chrome in colour; paraphyses wanting; aecidiospores globose, subglobose, obovate or ellipsoidal, 17.5–30 × 15–25 μ; epispore rather thin, 1.2–2 μ thick, nearly colourless, densely verrucose; contents orange-yellow in colour.

Uredosori mostly hypophyllous or on petioles, peduncles or stems, scattered or loosely grouped, minute, round or oblong, 0.2–1 mm across, elongated on petioles, peduncles or stems, up to 1 cm long, soon naked, pulvinate, finally pulverulent, orange to cadmium orange in colour; paraphyses numerous, clavate or more or less capitate, erect or somewhat incurved, 35–75 × 9–18 μ, walls smooth, colourless, uniformly thin, 1 μ or less; uredospores globose, subglobose or obovate, 15–25 × 15–22.5 μ; epispore minutely echinulate, thin, 1.2–1.8 μ thick, pale yellow or nearly colourless; contents orange-yellow in colour.

Teleutosori hypophyllous, or rarely on petioles, scattered or gregarious, minute, round or oblong, 0.3–1 mm across, pulvinate, early naked, black; teleutospores cylindrical, 1–5-septate (generally 3 or 4), 42–93 × 21–30 μ, rounded at both ends, not constricted at the septa; epispore rather thick, 2–3 μ, smooth, olive-brown in colour, germ pores 2 or 3 in each cell; pedicels persistent, non-hygroscopic, 18–70 μ long, hyaline and slightly coloured toward the upper part.

Hab. On *Potentilla Kleiniana* WIGHT et ARN. (*O-hebi-ichigo*).

Honshû:—Prov. Inaba: Tottori (May 31 & June 5, 1933; Nov. 27, 1930, HIRATSUKA, f. *type*!); Omokage-mura (June 8, 1933; Oct. 24, 1929, HIRATSUKA, f.); Ubeno-mura (May 18, 1930, HIRATSUKA, f.). Prov. Hôki: Daisen-mura (Nov. 11, 1929, HIRATSUKA, f.); Tokoroko-mura (Nov. 11, 1929, HIRATSUKA, f.). Prov. Iwami: Yoshida-mura (May 22, 1921, T. NAITÔ).

Shikoku:—Prov. Iyo: Ebara-mura (May 22, 1899, M. OKUDAIRA). Prov. Tosa: Kamoda-mura (May, 1903, T. YOSHINAGA); Asakura-mura (Nov., 1907, T. YOSHINAGA); Nyûgauchi, Higashigawa-mura (May, 1904, T. YOSHINAGA).

Kiushû:—Prov. Higo: Idzumi-mura (Jan. 3, 1907, K. YOSHINO; April 18, 1910, K. MURAKAMI); Jinnai-mura (May 11, 1907, K. YOSHINO). Prov. Bungo: Takeda-machi (June 21, 1905, K. YOSHINO).

The first record of this fungus was made by P. HENNINGS[1] in 1902

(1) Engl. Bot. Jahrb. XXXII, p. 36, 1902.

under the name *Phragmidium Potentillae* (PERS.) KARST. based upon a specimen which was collected by T. YOSHINAGA (T. INOUYE) at Sakawa-machi, the province of Tosa (Shikoku). Since then, this fungus was reported by DIETEL, KASAI, YOSHINAGA and the writer under the same name from Honshû and Shikoku.

Although the present fungus is closely related to *Phragmidium Potentillae* (PERS.) KARST., it is well distinguished from the latter species by its much shorter pedicels of the teleutospores, measuring 18–70 μ, instead of 60–240 μ in length.

This species is indigenous to Japan, and is commonly found in the southern districts of our country; viz. in southern Honshû, Shikoku and Kiushû. The specific name of this species was suggested by the very short pedicels of the teleutospores.

3. ***Phragmidium arisanense*** HIRATSUKA, f. et HASHIOKA, nov. spec.

Soris uredosporiferis hypophyllis, sparsis vel aggregatis, minutis, rotundatis, 0.2–0.8 mm diam., mox nudis, pulverulentis, aurantiacis; paraphysibus numerosis, cylindraceis vel clavatis, 50–80 μ longis, 12–20 μ latis; uredosporis globosis, subglobosis, obovatis vel ellipsoideis, 17–25 × 16.5–22 μ; episporio 1.5–2 μ crasso, echinulato.

Soris teleutosporiferis hypophyllis, sparsis vel hinc inde aggregatis, mox nudis, pulverulentis, atris; teleutosporis cylindraceis, 4–7-septatis (plerumque 5 vel 4), 60–114 × 25.5–39 μ; apice rotundatis, epapillatis, ad septa non constrictis, verrucis minutis dense obsitis, castaneo-brunneis; episporio 3–4.5 μ crasso, quaque cellula poris germinationis 3 instructa; pedicello persistenti, hyalino, superne leniter flavidulo, 30–90 μ longo, basi incrassato, hygroscopiceo.

Hab. In foliis *Rubi rarissimi* in Formosa, Japonia.

Uredosori hypophyllous, scattered or in small groups, round, minute, 0.2–0.8 mm across, early naked, somewhat pulverulent, orange-yellow in colour; paraphyses numerous, cylindrical or clavate, 50–80 μ long, 12–20 μ wide, somewhat incurved, walls smooth, thin, colourless; uredospores globose, subglobose, obovate or ellipsoidal, 17–25 × 16.5–22 μ; epispore 1.5–2 μ thick, coarsely echinulate, colourless; contents orange-yellow in colour.

Teleutosori hypophyllous, scattered or gregarious, minute, round, 0.2–0.4 mm across, early naked, pulverulent, black; teleutospores cylindrical, 4–7-septate (generally 5 or 4), 60–114 × 25.5–39 μ, apical papilla wanting, rounded at both ends, not constricted at the septa; epispore verrucose with hyaline or subhyaline warts, 2.5–4 μ thick, chestnut-brown in colour, 3 germ pores in each cell; pedicels persistent, hyaline, smooth, 30–90 μ long, up to 20 μ at broadest diameter, hygroscopic.

Hab. On *Rubus rarissimus* HAYATA (*Arisan-miyama-urajiro-ichigo*).

Formosa:—Prov. Tainan: Mt. Arisan (July 12, 1933 & Nov. 6, 1932, Y. HASHIOKA, *type* !).

In the general character of the teleutostage, the present fungus resembles *Phragmidium Nambuanum* DIET., from which it differs, however, in the septation of teleutospores and the length of their pedicels.

This species is known only from the above two collections by Mr. Yoshio HASHIOKA in Mt. Arisan, Formosa. The specific name of this fungus is derived from the locality where it was discovered.

4. ***Phragmidium Rubi-Oldhami*** TOGASHI et MAKI, nov. spec.

Soris uredosporiferis hypophyllis, sparsis vel aggregatis, minutis, rotundatis, 0.1–0.4 mm diam., flavidis; paraphysibus numerosis, clavatis, 35–70 × 10–18 μ; uredosporis globosis, subglobosis, ovatis vel ellipsoideis, densiuscule breviterque echinulatis vel echinulato-verruculosis, 14–24 × 12–20 μ; episporio 1.5–2 μ crasso, hyalino.

Soris teleutosporiferis hypophyllis, sparsis vel aggregatis, medioribus, rotundatis, 0.2–1.5 mm diam., subinde confluentibus, pulverulentis, atris; teleutosporis plerumque cylindraceis vel fusoideo-cylindraceis, 1–7-septatis, plerumque 4–6-septatis, ad septa non constrictis, apice papilla hyalina, subhyalina vel dilutiore (1–12.5 μ) longa auctis, verrucis numerosis minutis obsitis, castaneo-brunneis, 32.5–107.5 × 24–32.5 μ; episporio 2–4 μ crasso, quaque cellula poris germinationis 2–3 instructa; pedicello persistenti, 42–144 μ longo, superne 6–12 μ crasso, deorsam (10–20 μ) incrassato, hygroscopiceo.

Hab. In foliis *Rubi Oldhami* in Honshû (Rikuchû), Japonia.

Uredosori hypophyllous, scattered or gregarious, round, small, 0.1–0.4 mm across, early naked, somewhat pulverulent, yellow in colour; paraphyses numerous, clavate, 35–70 × 10–18 μ, incurved, walls thin, 1 μ or less, occasionally slightly thickened at apex, smooth; uredospores globose, subglobose, ovate or ellipsoidal, 14–24 × 12–20 μ; epispore 1.5–2 μ thick, densely and strongly echinulate, colourless; contents yellow in colour.

Teleutosori hypophyllous, scattered or grouped, round, minute, 0.2–1.5 mm across, sometimes confluent, early naked, powdery, black; teleutospores mostly cylindrical or fusoid-cylindrical, 1–7-septate (generally 4 to 6), 32.5–107.5 × 24–32.5 μ, not constricted at the septa, rounded at both ends, apical papilla 1–12.5 μ long, hyaline or subhyaline; epispore 2–4 μ thick, densely verrucose with hyaline or subhyaline tubercles, 2 or 3 germ pores in each cell, chestnut-brown in colour; pedicels persistent, 42–144 μ long, 6–12 μ wide at the upper part, wider at the base (10–20 μ), somewhat rugose at the lower part, hygroscopic.

Hab. On *Rubus Oldhami* MIQ. (*Rubus pungens* CAMB. var. *Oldhami* MAXIM.) (*Sanagi-ichigo*). *Honshû*:—Prov. Rikuchû: Morioka (Nov. 7 & 14, 1931, Y. MAKI, *type* !).

The present fungus seems to be closely related to the European species, *Phragmidium Rubi-saxatilis* LIRO. But it is distinctly distinguished from the latter species by the smaller number of septa, shorter papilla and longer pedicels of the teleutospores.

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