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On Puccinia Parasitic on the Umbelliferæ of Japan.

BY

Tsutomé Miyaké, *Nogakushi.*

(With Plate III.)

INTRODUCTION.

In 1902, LINDROTH (1) in his admirable monograph made a critical study and a thorough revision of the species of Puccinia parasitic on the Umbelliferæ, which had been left in a chaotic state up to that time. He has split up many of the old species, such as *Puccinia bullata*, *P. Pimpinellæ*, etc. into numerous new species. He has divided them into five groups, by the character of the markings on the epispore and by the thickness of the wall of teleutospores. He has also laid great stress on the position and number of the germ-pores of the uredospores as well as the teleutospores as a distinguishing character of the related species. He has distinguished seventy nine species of Puccinia as growing on the Umbelliferæ from different parts of the world.

In P. and H. SYDOW'S Monographia Uredinearum, the species of Puccinia on the Umbelliferæ increased to the number of one hundred and twelve. Among them, only five species are attributed to our flora. They are *P. Cicutæ* Lasch, *P. Nanbuana* P. Henn., *P. Apii* Desm., *P. tokyensis* Syd., and *P. angelicicola* P. Henn. These are the result of study by DIETEL (2, 3), P. HENNINGS (1, 3, 4) and SYDOWS (1, 2) on the materials collected by SHIRAI, KUSANO, and NAMBU. *P. Angelicæ* of P. HENNINGS (2) on *Angelica hakonensis* and on *Angelica shikokiana* (as *A. inæqualis*) is now found to contain two new distinct species; and *P. bullata* of DIETEL (1) on *Peucedanum decursivum*, though at first also considered as that species by P. HENNINGS (1) with some doubt, was afterward elevated to a new species under the name of *P. Nanbuana* by the latter authority. Five of them are

mentioned by MATSUMURA (1) in his Index, and seven by SHIRAI (1) in his List.

In the present paper, I have been able to increase the number of species of Puccinia on the Japanese Umbelliferæ to eighteen, among which four species are apparently new. They are *P. Angelicæ-edulis*, *P. Miyabeana*, *P. Œnanthes*, and *P. ligusticicola*. If we add to these, *P. tokyensis*, *P. Nanbuana*, and *P. angelicicola*, seven species may be counted as peculiar to our country. *P. Saniculæ*, *P. Bupleuri-falcati*, *P. Chærophylli*, *P. Pimpinellæ*, *P. Angelicæ*, *P. bullata*, and *P. Bulbocastani* are widely distributed in Asia, Europe, and America; *P. Osmorrhizæ* in Asia and America; *P. leioderma* in Asia and Europe; and *P. Phellopteri* in Asia only.

The total number of specimens I have examined amounts to more than two hundred. They were collected from all parts of Japan, from Liukiu in the south to Hokkaidō in the north. The greater part of these materials are the specimens preserved in the Herbarium of Sapporo Agricultural College. They were kindly placed in my hand for study by Prof. MIYABE.

In the present paper, the monographs of LINDROTH (1) and SYDOWS (2) were freely consulted in the description of the stages not yet found in our country.

To Prof. Y. YABE I am indebted for the determination of some host-plants. I am also under obligation to Prof. G. YAMADA, Messrs. Y. TAKAHASHI, N. HIRATSUKA, S. KUSANO, T. NISHIDA, J. HANZAWA, T. YOSHINAGA, and E. TOKUBUCHI, for their kindness in sending me many valuable specimens. To these gentlemen I tender my thanks for their kindness.

In conclusion, I wish to express my heartiest thanks to Professor Dr. K. MIYABE, for his kind help and advice during the progress of my work in the botanical laboratory under his direction.

SPECIAL PART.

Group I: Reticulatæ Lindroth.

Eupuccinia Schœter.

1. Puccinia Chærophylli Purt., Brit. Plants III. No. 1553, (1821); Sacc., Syll. XVI., p. 281; Lindr., Umbell. Ured. S. 13; Syd., Monogr. Ured. I. p. 367.

Spermogonia, circularly clustered, of light yellowish color.

Æcidia, circularly or irregulary clustered along the nerves of the leaves and petioles. Æcidiospores, polygonal, globose, verrucose, orange yellow, 18–35 × 16–26μ.

Uredosori, hypophyllous; scattered, small, roundish, powdery, cinnamon-colored. Uredospores, globose, subglobose or elliptical, echinulate, pale brown, 20–30 × 18–25μ; germ-pores always 3, placed at the equatorial region.

Teleutosori, hypophyllous; scattered, small, roundish, powdery, blackish brown. Uredospores are frequently mixed in the sori. Teleutospores, ovate, oblong or elliptical, apex not thick, slightly constricted at the septum, rounded or rarely attenuated at the base, reticulated, yellowish brown or chestnut brown, 24–43 × 16–25μ; germ-pore of the upper cell at the apex, that of the lower at 2/3 from the septum; pedicels, hyaline, slender, as long as the spores.

HAB. On *Anthriscus sylvestris* Hoffm.

Honshu.—Prov. Ugo: Akita (H. & H. E. TOKUBUCHI. June 5, 1902), Yokote (H. E. TOKUBUCHI. May, 1904).

DISTRIB. Europe and Asia.

REMARKS. Our specimens have only two stages, uredostage and teleutostage. The character of these stages exactly coincides with that of *Puccinia Chærophylli* of Europe, and there is no doubt about their identity. It was recently proved by O. SEMADENI (2) by infection experiments, that Puccinia on Anthriscus is biologically different from that on Chærophyllum, although there is no apparent morphological differences between them.

2. Puccinia Osmorrhizæ (Peck) Cke. et Peck in XXIX. Rep. State Mus. New York, p. 73 (1878); Syd., Monogr. Ured. I. p. 397.

Syn.: *Æcidium Osmorrhizæ* Peck, 24. Rep. p. 92.

Puccinia Osmorrhizæ Lindr., Umbell. Ured. S. 17. (1902).

Spermogonia, circularly clustered, light yellow colored.

Æcidia, hypophyllous, or on the petioles and stems; cup-shaped, yellowish, with slightly torn edges; those on the leaves, small, roundish or oblong, clustered on small yellowish spots, and those on the petioles and stems in elongated clusters. Æcidiospores, polygonal, globose, orange yellow, 18–32 × 16–25μ.

Uredosori, hypophyllous; scattered, small, powdery, cinnamon-colored. Uredospores, subglobose, ovate or elliptical, echinulate, yellow or yellowish brown, 22–30 × 18–27μ; germ-pores 3 or rarely 2.

Teleutosori, hypophyllous; blackish, surrounded by the ruptured epidermis. Teleutospores, elliptical or oblong, apex not thickened, slightly constricted, base slightly attenuated, reticulated, chestnut-brown, 33–53 × 22–27μ; germ-pore of the upper cell at the apex, that of the lower at 2/3 from the septum; pedicels, hyaline, slender, deciduous.

HAB. On *Osmorrhiza japonica* Sieb. et Zucc.

Hokkaido.—Prov. Iburi: Mororan (H. & H. G. YAMADA. July 21, 1897), Usu (H. G. YAMADA. July 23, 1897).

DISTRIB. North America and Japan.

REMARKS. This species is very closely related to *P. Chærophylli*. According to LINDROTH (1) these two species are exactly alike in the character of their teleutospores and æcidiospores; but in the uredospores they show a marked difference. The uredospore of *P. Osmorrhizæ* is said to be slightly smaller in size than that of *P. Chærophylli*; and the wall of the spore decidedly thicker in the former than in the latter. Moreover, the number of the germ-pores is 2 in *P. Osmorrhizæ*, and 3 in *P. Chærophylli*. These differences, however, do not hold good in the Japanese specimens. A careful comparison does not reveal any difference in their size, in the thickness of their wall nor in the number of their germ-pores. In fact, our form may perhaps differ from the American type. But until

further study is prosecuted, we shall retain our form under the present species.

3. Puccinia Pimpinellæ (Str.) Mart., Fl. Mosq. ed. II. p. 226 (1817); Wint., Pilze, S. 212; Sacc., Syll. VII, p. 616; Plowr., Monog. Ured., p. 155; Schrœt., Pilze Schles., S. 321; Lindr., Umbell. Ured. S. 29; Syd., Monogr. Ured. I. p. 408.

Spermogonia, amphigenous, scattered among the æcidia, rounded, yellowish.

Æcidia, hypophyllous, or on the petioles; those on the leaf, forming irregular roundish clusters, or elongated ones along the nerves; on the petioles, forming elongated clusters; cup-shaped, with whitish torn edges. Æcidiospores, polygonal, globose-elliptical, finely verrucose, very light yellow, 18–24 × 22–30μ.

Uredosori, hypophyllous; scattered or loosely clustered; small, cinnamon-colored. Uredospores, globose, subglobose or elliptical, echinulate, pale brown, 18–26 × 22–32μ; germ-pores 3 or rarely 2 at equatorial region.

Teleutosori, amphigenous, or often on the petioles; powdery, small, scattered, blackish brown. Teleutospores, elliptical or ovate, rounded at both ends, not or slightly constricted, reticulated, chestnut-brown, 18–30 × 30–40μ; germ-pore of the upper cell at the apex, that of the lower 1/2–2/3 from the septum; pedicels, slender, hyaline, deciduous.

HAB. On *Pimpinella calycina* Maxim.

Hokkaidō.—Prov. Ishikari: Sapporo (III. E. TOKUBUCHI. Oct. 12, 1891), Makomanai (O. & I. T. NISHIDA. May 23, 1897) (III. K. MIYABE. Sept. 20, 1883); Prov. Hidaka: Shitomambetsu near Shōya (II. & III. E. TOKUBUCHI. Aug. 17, 1892); Samani (II. & III. E. TOKUBUCHI. Aug. 22, 1892.)

Honshu.—Prov. Shimotsuke: Nikkō (II. & III. Y. TAKAHASHI. July 26, 1895).

DISTRIB. Europe, Africa, and Asia.

REMARKS. *Puccinia Pimpinellæ*, *P. Chærophylli*, and *P. Osmorrhizæ* are very nearly related species. According to LINDROTH (1) they may be distinguished from each other by the morphological character of their

uredospores, that is, by their color and size, as well as by the number of their germ-pores. In our specimens, *P. Pimpinellæ* may be readily distinguished from the other two species by the color of its uredospores; but *P. Chærophylli* and *P. Osmorrhizæ*, as has already been remarked, can hardly be distinguished from each other, as their uredospores have similar color and size, as well as an equal number of germ-pores.

4. Puccinia tokyensis Syd., Monogr. Ured. I. p. 377 (1903).—(Plate III, fig. 1.)

Syn.: *Æcidium Cryptotæniæ* DIET. in Engl., Bot. Jahrb. Bd. 28 (1900) S. 288.

Uredo Cryptotæniæ SYD. in Mém. Herb. Boiss. No. 4. p. 4. (1900).

Puccinia Cryptotæniæ KUSANO in Tokyo Bot. Mag. Vol. 16. (1902) p. 205.

Spermogonia, amphigenous, scattered among the æcidia, rounded, yellowish.

Æcidia, hypophyllous, or on the petioles; clustered, cup-shaped, with whitish torn edges, on small irregular spots. Æcidiospores, polygonal, globose, finely verrucose, subhyaline, yellowish, 14–20μ in diameter, thin walled.

Uredosori, amphigenous, or on the petioles; small, scattered, on pale spots, long covered by epidermis, yellowish brown. Uredospores, globose, subglobose or oval, finely echinulate, light yellowish, 16–27 × 14–23μ; germ-pores 3 or rarely 2, with swollen hyaline papilla, equatorial; epispore usually 3–4μ thick.

Teleutosori, amphigenous, or on the petioles and stems, covered by epidermis, or surrounded by the ruptured remains; small, scattered, blackish brown; those on the petioles and stems elongated (2 or 3 mm.). Teleutospores, ovate or elliptical, apex rounded, not thickened, slightly constricted, base rounded, or slightly attenuated, inconspicuously reticulated, chestnut-brown, epispore very thin, 18–23 × 22–38μ; germ-pore of the upper cell at the apex, that of the lower 2/3 from the septum; pedicels, hyaline, very slender, deciduous, short, or as long as the spore or rarely very long (about 80μ).

HAB. On *Cryptotænia japonica* Hassk.

Hokkaidō.—Prov. Ishikari : Sapporo (II. G. YAMADA. July 13, 1900), Maruyama (II. & III. T. MIYAKE. Oct. 19, 1902), Makomanai (II. & III. J. HANZAWA. Sept. 29, 1901), Shiroishi (II. N. HIRATSUKA. July 29, 1894), (II. & III. N. HIRAT. Sept. 16, 1894) ; Prov. Iburi : Abuta (II. & III. K. MIYABE. Aug. 16, 1890), Chitose (II. & III. K. MIYABE. Sept. 2, 1896) (II. K. MIYABE and S. ARIMOTO. Aug. 4, 1902) ; Prov. Oshima : Kamaya (II. & III. K. MIYABE. July 13, 1890), Sasayama, Esashi, (II. & III. G. YAMADA. Aug. 3, 1902), Iōzan, Kaminokuni (II. & III. G. YAMADA. Aug. 21, 1902) ; Prov. Hidaka : Saru (II. & III. E. TOKUBUCHI. Aug. 13, (1892, Urakawa (II. & III. T. KAWAKAMI. Sept. 26, 1900).

Honshu.—Prov. Ugo : Maeda, Kita-Akita (III. E. TOKUBUCHI. Aug., 1902) ; Prov. Rikuchū : Kuroishino near Morioka (II. G. YAMADA. July 5, 1903) ; Prov. Rikuzen : Sendai (II. K. MIYABE. July 23, 1893) ; Prov. Iwaki : Sōma (II. S. KUSANO. Aug. 4, 1899) ; Prov. Shimotsuke : Nikkō (II. S. HORI. July 22, 1891), (II. Y. TAKAHASHI. July 26, 1895), (II. G. YAMADA and J. HANZAWA. Aug. 6, 1900) ; Prov. Musashi : Akabane (II. T. NISHIDA. July 29, 1900), (III. T. NISHIDA. Nov. 5, 1899), Nishigahara (O. & I. KAMIMURA. May 14, 1900), (III. T. NISHIDA. Nov. 6, 1899), Shimura (II. T. NISHIDA. Nov. 22, 1903), Mt. Takao (O. & I. KUSANO. May 8, 1899), (III. N. NAMBU. Nov. 1901) ; Prov. Izumo : Kitsuki (II. S. KUSANO. Aug. 1, 1901) ; Prov. Nagato : Hagi (II. S. KUSANO. Aug. 9, 1901) ; Prov. Iwami : Hamada (II. S. KUSANO. Aug. 6, 1901).

Shikoku.—Prov. Tosa : Sakawa (II. S. YOSHINAGA. Aug. 1901).

On *Cryptotænia canadensis* DC. (Introduced).

Hokkaido.—Prov. Ishikari : Sapporo, Botanic Garden of Sapporo Agricultural College (II. & III. J. HANZAWA. Sept., 1899), (II. & III. T. MIYAKE. Nov. 5, 1903).

DISTRIB. Japan.

REMARKS. Compared with *Puccinia Cryptotæniæ* of North America, our species differs in many important points. First of all, *P. tokyensis* belongs to the Auteupuccinia, while *P. Cryptotæniæ* to the Micropuccinia. Morphologically, the teleutospore of the latter species is smooth and apiculate at apex, while that of the former is reticulated, and has rounded apex.

In 1903, SYDOWS (2) described the teleutospore of this fungus, and considered *Æcidium Cryptotæniæ* Diet. and *Uredo Cryptotæniæ* Syd. as its stages. By infection experiments, I have been able to prove the correctness of SYDOWS' assertion. At the end of May, 1904, by infecting the sporidia obtained by sowing in water the teleutospores collected in the fall of the previous year, I obtained the æcidia on the leaves of *Cryptotænia japonica*. By sowing the æcidiospores thus produced on other healthy leaves of the same plant, I obtained the uredospores, from which I was able to produce at last the teleutospores.

During this infection experiment, I have observed that the teleutospores, which have acuminate apex while young, become gradually obtuse and rounded as they grow older.

5. Puccinia Cicutæ Lasch in Klotsch. Herb. viv. myc. no. 787 (1845); Sacc., Syll. VII., p. 647; Schrœt., Pilze Schles. S. 341; Lindr., Umbell. Ured. S. 53; Syd., Monogr. Ured. I. p. 372.

Spermogonia, scattered among the æcidia, rounded, hyaline.

Æcidia, along the leaf-nerves, sometimes on the petioles and stems, forming circular or oblong clusters, pustuliform, yellowish or flesh-colored. Æcidiospores, roundish, elliptical or oblong-elliptical, hyaline, very finely and closely verrucose, 17–26 × 10–20μ.

Uredosori, usually hypophyllous, or on the petioles; scattered, small, pustuliform, or elliptical, powdery, cinnamon-colored. Uredospores, subglobose, ovate, or yellowish, 18–28 × 14–22μ; germ-pores 3, equatorial; epispores equally thick (*ca.* 2μ).

Teleutosori, amphigenous, or hypophyllous, or on the petioles; blackish brown. Teleutospores, elliptical, oblong, or globose, apex thickened, rounded or rarely attenuated at both ends, slightly constricted, indistinctly verrucose, brown, 18–25 × 30–40μ; germ-pore of the upper cell at the apex, that of the lower at 1/2–3/4 from the septum; pedicels, short, hyaline, deciduous.

HAB. On *Cicuta virosa* L.

Hokkaidō.—Prov. Ishikari: Naebo near Sapporo (III. K. KIKUCHI.

Oct. 7, 1895), Maruyama (II. & III. R. SUZUKI. Oct. 22, 1904), Kotoni (II. & III. T. MIYAKE. Aug. 13, 1901); Prov. Shiribeshi: Zenibako (II. G. YAMADA. Aug. 12, 1896).

Honshu.—Prov. Rikuchū: Iioka near Morioka (III. G. YAMADA. Oct. 11, 1903).

DISTRIB. Europe, North America, and Asia (Siberia and Japan).

REMARKS. In regard to the marking of teleutospores, the opinions of European authors differ, one regarding it verrucose, others considering it smooth or reticulate. On this point, I am of the same view as LINDROTH and SYDOWS. The marking is indistinctly verrucose, but by prelonged treatment with potash the epispore swells up and becomes perfectly smooth.

Pucciniopsis Schrœter.

6. Puccinia Bulbocastani (Cum.) Fuck. Symb. p. 52 (1869); Lindr. Umbell. Ured. S. 46; Syd., Monogr. Ured. I. p. 363.

Spermogonia, scattered among æcidia, few in number, light yellowish.

Æcidia, on the leaves, petioles, and stems, clustered, often producing yellowish deformed swellings; cup-shaped, or short cylindrical, with yellowish irregularly torn edges. Æcidiospores, polygonal, globose, finely verrucose, yellowish, 15–21μ.

Teleutosori, usually amphigenous or hypophyllous, or on the petioles; small, rounded or oblong, scattered, long covered by the epidermis, black; those on the petioles elongated. Teleutospores, elliptical, oblong, apex rounded, not or very slightly thickened, slightly constricted, base attenuated or rounded, finely reticulate, chestnut-brown, 22–28 × 33–45μ; germ-pore of the upper cell at the apex, that of the lower near the base; pedicels, slender, deciduous.

HAB. On *Carum holopetalum* Maxim.

Hokkaidō.—Prov. Oshima: Fukuyama (III. K. MIYABE. July 14, 1890).

DISTRIB. Europe and Japan.

REMARKS. There are two species of Puccinia known to grow on Carum;—*P. Bulbocastani* and *P. microsphincta*. To the former our Japa-

nese plant corresponds closely in the morphological character of its teleutospore.

The marking of this teleutospore is reticulated as MAGNUS and LINDROTH (1) say, and is not finely punctate as WINTER (1) and DE TONI (1) regard it. The teleutosori are small, rounded or oblong, and long covered by epidermis. By these characteristics one can easily distinguish it from *P. Pimpinellæ* macroscopically.

Hemipuccinia Schrœter.

7. Puccinia angelicicola P. Henn. in Hedw. Bd. 32 (1903) S. (107); Syd., Monogr. Ured. I. p. 886.—(Plate III. fig. 2.)

Uredosori, usually epiphyllous, small, brown, on yellowish spots. Uredospores, subglobose, ovate-elliptical, apex not thick, echinulate, light brownish, 18–27 × 25–30μ; germ-pores 3 or 4.

Teleutosori, amphigenous or on the petioles; small, pustuliform, long covered by epidermis, at length powdery, blackish brown, intermixed with the uredospores. Teleutospores, globose, ovate or elliptical, apex not thickened, rounded, rarely shortly apiculate, base rounded or attenuated, not or slightly constricted, reticulated, chestnut-brown 18–27 × 24–38μ; germ-pore of the upper cell at the apex, that of the lower 1/2–5/6 from the septum; pedicels, hyaline, slender, deciduous, about 10μ long.

HAB. On *Angelica Miqueliana* Maxim.

Honshu.—Prov. Musashi: Mt. Takao (II. & III. N. NAMBU. Oct. 1902) (III. T. NISHIDA. Oct. 22, 1903).

DISTRIB. Japan.

REMARKS.—This species is nearly related to *P. tokyensis*, from which it can be distinguished by the conspicuous markings on the epispore of its teleutospore.

8. Puccinia Œnanthes (Diet.) T. MIYAKE. n. comb.—(Plate III. fig. 3).

Syn.: Uredo Œnanthes Diet. in Engl., Bot. Jahrb. Bd. 28 (1900) S. 290.

Uredosori, amphigenous, or on the petioles, scattered, small, long

covered by epidermis, little elavated, powdery, ochraceous. Uredospores, subglobose, ovate, or elliptical, apex not thickened, echinulate, light yellow, or subhyaline, 18–27 × 22–34μ; germ-pores indistinct 2 or 3; wall very thin.

Teleutosori, amphigenous, or on the petioles and stems, small, scattered, blackish brown, long covered by epidermis. Teleutospores, elliptical, oblong, apex not thickened, rounded, unconstricted or slightly constricted, base rounded or slightly attenuated, reticulated, light chestnut-brown, 20–27 × 30–40μ; germ-pore of the upper cell at the apex, that of the lower at 2/3 from the septum; pedicels, hyaline, slender, deciduous.

HAB. On *Œnanthes stolonifera* DC.

Hokkaidō.—Prov. Ishikari: Sapporo (III. N. HIRATSUKA. Oct. 13, 1895), (III. K. KIKUCHI. Oct. 20, 1895), Okatama (II. & III. T. MIYAKE. Oct. 5, 1902), Maruyama (II. & III. R. SUZUKI. Oct. 22, 1904).

Honshu.—Prov. Ugo: Mt. Funakawa, Peninsula Ozika (II. E. TOKUBUCHI. Sept. 3, 1902), Akita (II. E. TOKUBUCHI. July, 1902); Prov. Rikuchū: Morioka (II. G. YAMADA. July 12, 1903); Prov. Iwaki: Sōma (II. S. KUSANO. Aug. 10, 1899); Prov. Musashi: Tokyo (II. G. YAMADA. Aug. 29, 1900), Nishigahara (II. K. MIYABE. Aug. 2, 1897), (II. T. NISHIDA. Aug. 13, 1903); Prov. Sagami: Misaki (II. T. YOSHINAGA. Aug., 1904); Prov. Yamashiro: Kyoto (II. N. HIRATSUKA. June 13, 1895), (II. Y. TAKAHASHI. July 14, 1895).

Shikoku.—Prov. Tosa: Kotakazaka (II. T. YOSHINAGA. June, 1901), Ushinoe (II. T. YOSHINAGA. July, 1903).

Kiushu.—Prov. Hizen: Nagasaki (II. OLDHAM. 1862, *fide* LINDROTH); Prov. Higo: Demizu (II. K. YOSHINO. May 15, 1904).

On *Œnanthe stolonifera* DC. var. *japonica* Maxim.

Liukiu.—Isl. Okinawa: Shuri (II. N. HIRATSUKA. Jan. 6, 1899).

DISTRIB. Japan.

REMARKS. The uredospores of this species are very much like those of *P. Cicutæ* in general character, but somewhat larger. The teleutospores are thin walled, not thickened at the apex, and covered with rather inconspicuous markings as in the case of *P. tokyensis*, but not so roundish as the latter. At first, the uredostage of this fungus collected by KUSANO at Sōma,

Prov. Iwaki, was described by DIETEL (3) as a new species under the name of *Uredo Œnanthes*.

Group. II. **Bullatæ** Lindroth.

Eupuccinia Schrœter.

9. Puccinia Bupleuri-falcati (DC.) Wint., Pilze. S. 212. (1884); Lindr., Umbell. Ured. S. 131; Syd., Monogr. Ured. I. p. 364; E. Fischer, Ured. Schweiz. S. 123.

Spermogonia, amphigenous, scattered among æcidia, rounded, brownish yellow.

Æcidia. hypophyllous, uniformly scattered, yellow, cup-shaped, with whitish torn edges. Æcidiospores, globose, subglobose or polygonal, verrucose, yellow, 16–24μ in diameter.

Uredosori, amphigenous, scattered, small, roundish, cinnamon-colored. Uredospores, globose, subglobose or elliptical, echinulate, yellowish brown, 19–24 × 17–22μ; germ-pores 3 or 4, rarely 5.

Teleutosori, amphigenous or on the petioles and stems; on the leaf, scattered, small, roundish or elliptical, sometimes oblong, long covered by epidermis, brown; on the petioles and stems, confluent. Teleutospores, elliptical or oblong-elliptical, apex rounded, not or slightly thickened, slightly constricted, base rounded, smooth, chestnut-brown, 25–44 × 16–36μ; germ-pore of the upper cell at the apex, that of the lower near the base, with subhyaline papilla on the pores; pedicels, hyaline, slender, deciduous.

HAB. On *Bupleurum multinervis* DC. var. *minor* Ledeb.

Hokkaido.—Prov. Hidaka: Saru (H. & H. K. MIYABE. Aug. 18, 1884).

On *Bupleurum sachalinense* Fr. Schm.

Hokkaido.—Prov. Ishikari: Ishikari (H. & H. K. MIYABE. Aug. 21, 1885), (O. & I. K. MIYABE. May 31, 1897), (O. & I. T. KAWAKAMI. June, 1896), (O. & I. G. YAMADA. June, 1898); Prov. Shiribeshi: Shiribetsu (H. & H. G. YAMADA. July 28, 1897).

On *Bupleurum falcatum* L.

Honshu.—Prov. Sagami: Hakone (S. ŌKUBO. Oct. 10, 1890. *fide* KUSANO).

Formosa.—(TASHIRO. June, 1887. *fide.* KUSANO).

DISTRIB. Europe and Asia (Asia minor, India, China and Japan).

REMARKS. The forms on *B. multinervis* and *sachalinense* belong to the Type A of LINDROTH, the teleutospores being broad and short elliptical, and provided with a thicker and darker membrane. The form on *B. falcatum* may belong to the Type B of LINDROTH, but as I have not been able to examine the specimens myself, I can not here state with certainty.

At Izumizawa in the Province of Oshima, Hokkaido, Prof. MIYABE collected on July 13, 1890, on *Bupleurum sachalinense* an Æcidium which differs in many points from the ordinary form. The æcidia are gregarious on the under surface of the leaf, forming small irregularly roundish groups, 1-2 mm. or sometimes 3 mm. in diameter; and spermogonia are present both on the upper and lower surfaces of the discolored spots intermixing with the æcidia. The æcidiospores are globose or subglobose, thicker walled, verrucose, darker colored, and 22–25μ in diameter. This Æcidium may safely be considered as a new form-species, and we will designate it *Æcidium Bupleuri-sachalinensis.*

10. Puccinia Saniculæ Grev., Fl. Edin. p. 431 (1824); Wint., Pilze S. 213; Sacc., Syll. VII. p. 618; Plowr., Monogr. Ured. p. 160; Lindr., Umbell. Ured. S. 126; Syd., Monogr. Ured. I. p. 413; E. Fischer, Ured. Schweiz. S. 122.

Spermogonia, scattered among æcidia, yellowish to brownish.

Æcidia, hypophyllous, forming small roundish clusters on brown or purple spots, or elongated clusters along the nerves and petioles; cup-shaped, with whitish torn edges. Æcidiospores, subglobose or elliptical, polygonal, verrucose, hyaline, 18–26 × 15–22μ.

Uredosori, hypophyllous or amphigenous, small, roundish, on small scattered or clustered spots; light cinnamon-colored. Uredospores, globose, subglobose or elliptical, echinulate, apex not thickened, yellowish brown 25–38 × 18–27μ; epispore uniformly thick (5μ); germ-pores 2 or rarely 3, equatorial.

Teleutosori, amphigenous, small, scattered, blackish. Teleutospores,

elliptical, oblong or ovate, thin walled, apex rounded, not or very slightly thickened, slightly constricted, base rounded or slightly attenuated, smooth, chestnut-brown, 26–45 × 18–30μ; germ-pore of the upper cell at the apex, that of the lower 2/3–3/4 from the septum, with hyaline papilla; pedicels, hyaline, short, deciduous.

HAB. On *Sanicula europæa* L.

Hokkaido.—Prov. Oshima: Hakodate (H. & H. K. MIYABE. July 10, 1890).

DISTRIB. Europe and Asia (Himalaya and Japan).

REMARKS. The only specimen I have examined is one found by Prof. MIYABE at Hakodate, which has both uredospore and teleutospore stages. Their character corresponds exactly with that of the European form, and there is no doubt of their identity. Our species is distinctly different from the American species on Sanicula, *P. marylandica* Lindr. and *P. microica* Ell. From the former it is distinguished by the smooth wall of its teleutospores, and from the latter by not having a prominently pointed apex.

Brachypuccinia Schrœter.

11. Puccinia Angelicæ (Schm.) Fuck., Symb. myc., p. 52 (1869); Lindr., Umbell. Ured. S. 97; Syd., Monogr. Ured. I. p. 357; E. Fischer, Ured. Schweiz. S. 117.—(Plate III. fig. 5.)

Spermogonia, amphigenous, scattered in the primary uredosori, light colored.

Primary Uredosori, elongated along the nerves and petioles, at first dark yellow, gradually becoming brown, and at last blackish brown. *Secondary Uredosori*, hypophyllous or rarely amphigenous in small pale spots; scattered, small, brown, powdery. Uredospores, oval, elliptical or ovate-oblong, echinulate, apex thick (5–10μ), and base also slightly thickened (4μ); wall brown, contents orange yellow, 25–40 × 22–28μ; germ-pores 3 or rarely 4, equatorial, provided with hyaline projecting membrane.

Teleutosori, amphigenous, small, scattered, roundish, powdery, black. Teleutospores, elliptical or oblong, apex roundish or slightly attenuated, not thickened, slightly constricted at the septum, base rounded or slightly

attenuated, smooth, with granular spots in the epispore, chestnut-brown, with subhyaline projecting papilla at the apex, 30–50 × 16–24μ; germ-pore of the upper cell at the apex, that of the lower 2/3–3/4 from the septum; pedicels, short, hyaline, deciduous.

HAB. On *Angelica anomala* Lallem.

Hokkaido.—Prov. Ishikari : Kotoni (III. G. YAMADA. Sept. 25, 1898), Toyohira (J. MATSUMURA. Aug. 1, 1899. *fide* KUSANO), Yuni (III. G. YAMADA. Sept. 9, 1899); Prov. Iburi : Mororan (III. G. YAMADA. Aug. 3, 1900); Prov. Shiribeshi : Raidentōge (III. G. YAMADA. Oct. 6, 1901).

On *Angelica multisecta* Maxim.

Honshu.—Prov. Shimotsuke : Nikko (II. J. HANZAWA. Aug. 1900).

On *Angelica refracta* Fr. Schm.

Hokkaido.—Prov. Ishikari : Sapporo (O. & Pr. II. E. TOKUBUCHI. June 1, 1891), (II. & III. E. TOKUBUCHI. June 26, 1891), (III. K. MIYABE. Nov. 4, 1903).

Honshu.—Prov. Shimotsuke : Nikkō (II. & III. S. KUSANO. Aug. 24, & Sept. 1, 1904).

On *Angelica ursina* Maxim.

Hokkaido.—Prov. Ishikari : Kamikawa (II. & III. K. MIYABE. Aug. 11, 1891), Maruyama (III. K. MIYABE. Oct. 7, 1894); Prov. Iburi : Mororan (II. & III. G. YAMADA. Aug. 3, 1900).

Honshu.—Prov. Mutsu : Mt. Iwaki (II. & III. K. KIKUCHI. Aug. 3, 1896).

DISTRIB. Europe and Asia.

REMARKS. In the present species, according to LINDROTH, there are two stages, the primary and secondary in both uredo and teleutospores. These stages are easily recognizable in the uredospores in our specimens, but the primary stage of the teleutospores I have not yet been able to find.

12. Puccinia Angelicæ-edulis S. Miyake n. sp.—(Plate III. fig. 6.)

Syn. : *Puccinia Angelicæ* P. Henn., Engl. Bot. Jahrb. Bd. 31 (1901) S. 730.

Spermogonia, amphigenous; scattered in the primary uredosori, light yellow.

Primary Uredosori, elongated along the nerves and petioles, at first yellowish brown, gradually becoming brown and at last blackish brown. *Secondary Uredosori*, hypophyllous or rarely amphigenous, in small pale spots; scattered, small, brown, powdery. Uredospores, oval, elliptical or ovate-oblong, echinulate, apex thick (7–12μ); wall yellowish brown, 25–40×22–35μ; germ-pores 3 or rarely 4, equatorial, provided with a hyaline projecting membrane.

Teleutosori, hypophyllous or rarely amphigenous; small, scattered, roundish, powdery, black. Teleutospores, elliptical or oblong, both ends roundish or slightly attenuated, slightly constricted at the septum, smooth, with granular spots in the epispore, chestnut-brown, 30–55×19–25μ; germ-pore of the upper cell at the apex, that of the lower just below the septum, provided with a projecting membrane, lateral wall (2.7μ) thinner than the septum (3.8μ); pedicels, deciduous, hyaline, slender, short or rarely as long as the spores.

HAB. On *Angelica edulis* Miyabe.

Hokkaido.—Prov. Ishikari : Sapporo (O. & Pr. II. K. MIYABE. May, 1890), (III. K. MIYABE. Oct. 15, 1889), (O. & Pr. II. K. MIYABE. June 2, 1895), (II. & III. T. KAWAKAMI. Aug., 1895), (III. K. MIYABE. Sept. 15, 1889), (III. E. TOKUBUCHI. Oct., 1895), Mt. Moiwa (O., Pr. II., II. & III. K. MIYABE. July 29, 1891), (O. & Pr. II. G. YAMADA. June 7, 1889), (O. Pr. II. & II. G. YAMADA. July 13, 1900), (II. & III. K. MIYABE. & G. YAMADA. July 31, 1900), (II. & III. K. MIYABE. Aug. 31, 1899), Maruyama (O. & Pr. II. J. HANZAWA. May 8, 1901), Yamahana (O. & Pr. II. G. YAMADA. June 8, 1902), Ishiyama (III. E. TOKUBUCHI. & Y. TAKAHASHI. Oct. 5, 1895), Garugawa (O. & Pr. II. G. YAMADA. May 21, 1899), (II. & III. K. MIYABE., Y. TAKAHASHI, & E. TOKUBUCHI. Aug. 14, 1904); Prov. Shiribeshi : Zenibako (II. & III. K. MIYABE. Sept. 9, 1896), Otaru (II. & III. G. YAMADA. Aug., 1898), Takashima (III. K. MIYABE. Oct. 7, 1902), Shikuzushi (O. & Pr. II. K. MIYABE & G. YAMADA. June 3, 1901), Raiden (O. & Pr. II. G. YAMADA. June 29, 1897), (III. G. YAMADA. Oct. 5, 1901), Kudō (II. K. MIYABE. June 26, 1897), (III. T. KAWAKAMI. Oct. 27, 1900); Prov. Oshima : Chiisagosandō (II. & III. K MIYABE. July 22, 1890); Prov. Iburi : Mororan (II. & III. G. YAMADA. July 21, 1897), Mu-

kawa (III. K. JIMBŌ. Sept. 1891); Prov. Hidaka : Urakawa (II. J. HANZAWA. Aug. 13, 1902), Samani (II. & III. E. TOKUBUCHI. Aug. 8, 1892), Erimozaki (III. E. TOKUBUCHI. Aug. 18, 1892).

Honshu.—Prov. Ugo : Maeda (II. & III. E. TOKUBUCHI. Aug. 1902); Prov. Rikuchu : Goshomura (II. & III. Y. TAKAHASHI. Aug. 20, -903), Mt. Ganju (II. & III. G. YAMADA. Aug. 17, 1903).

On *Angelica Matsumuræ* Yabe.

Honshu.—Prov. Shimotsuke : Nikkō (II. & III. S. KUSANO. Aug. 29, 1904).

On *Angelica Miqueliana* Maxim.

Honshu.—Prov. Musashi : Mt. Takao (II. & III. N. NAMBU. Oct., 1902), (III. T. NISHIDA. Nov. 22, 1903).

On *Angelica polyclada* Franch.

Honshu.—Prov. Shinano : Unajiri, at the foot of Mt. Yatsugatake (II. & III. T. MIYAKE. Aug. 3, 1903).

On *Angelica polymorpha* Maxim.

Honshu.—Prov. Ugo : Matsumine (II. T. KAWAKAMI. July, 1894); Prov. Shimotsuke : Nikkō (III. T. NISHIDA. Oct. 28, 1900), (II. S. KUSANO. Aug. 27, 1904); Prov. Kōzuke : Mt. Myogi (III. S. KUSANO. Nov. 4, 1899); Prov. Musashi : Hachiōji (II. & III. K. MIYABE. Sept., 1899), Mt. Takao (III. T. NISHIDA. Nov. 22, 1903); Prov. Sagami : Misaki (II. K. TAMURA. Jan. 3, 1902); Prov. Ise : Mt. Kumano (II. & III. NAKANISHIKI. Aug., 1903).

On *Angelica shikokiana* Makino.

Honshu.—Prov. Yamato : Mt. Ōdaigahara (II. & III. T. YOSHINO. Aug. 1898).

Shikoku.—Prov. Iyo : Senzokuyama (II. & III. K. OKUDAIRA. July, 1903); Prov. Tosa : Ōmachi (II. T. YOSHINAGA. Aug., 1902), Koshichi (III. T. YOSHINO. Sept., 1901).

On *Angelica ursina* Maxim.

Hokkaido.—Prov. Ishikari : Sapporo (III. E. TOKUBUCHI. Sept. 4, 1894), (III. G. YAMADA. Sept. 29, 1888), (III. K. MIYABE. Oct. 7, 1894), (III. Y. TAKAHASHI. Oct. 8, 1894), Maruyama (III. G. YAMADA. Sept. 16, 1896), (III. G. YAMADA. Oct. 7, 1897), Ishikari (O. & Pr. II. K. MIYABE.

June 1, 1891); Prov. Shiribeshi : Zenibako (III. T. KAWAKAMI. Aug., 1895), Otaru (III. T. KAWAKAMI. Oct., 1898), Inahotoge (III. G. YAMADA. Oct. 7, 1901), Kudō (II. & III. K. MIYABE. July 26, 1890); Prov. Oshima : Hakodate (II. & III. K. MIYABE. July 10, 1890), Taniyoshi (II. & III. K. MIYABE. July 12, 1890), Kumaishi (II. & III. K. MIYABE. July 26, 1890), Sasayama, Esashi (II. & III. K. MIYABE. Aug. 4, 1890), (II. & III. G. YAMADA. Aug. 17, 1902); Prov. Iburi : Mororan (II. & III. G. YAMADA. July 21, 1897), Sandō between Abuta and Bembe (II. & III. G. YAMADA. July 24, 1897); Prov. Tokachi : Pekerepetsu (II. & III. Y. TAKAHASHI. Aug. 18, 1901); Prov. Kitami : Isl. Rishiri, Mt. Rishiri (O. & Pr. II. & III. T. KAWAKAMI. Aug. 11, 1899), Oshidomari (II. & III. T. KAWAKAMI. July 2, 1899).

Honshu.—Prov. Ugo : Mt. Gassan (II. G. YAMADA. Aug. 7, 1901), Sugisawa (II. & III. T. KAWAKAMI. July, 1894).

On *Angelica* sp.

Honshu.—Prov. Shimotsuke : Nikkō (II. & III. S. KUSANO. Aug. 24, 1904).

On *Cœlopleurum Gmelini* Ledeb.

Hokkaido.—Prov. Iburi : Mororan (O. & Pr. II. G. YAMADA. June 29, 1901); Prov. Hidaka : Shōya (II. & III. E. TOKUBUCHI. Aug. 17, 1892), Erimozaki (II. & III. E. TOKUBUCHI. Aug. 18, 1892).

DISTRIB. Japan.

REMARKS. There are four species of Puccinia parasitic on Angelica in our country, *i. e. P. angelicicola*, *P. Angelicæ*, *P. Angelicæ-edulis*, and *P. Miyabeana*. *P. angelicicola* may easily be distinguished from the other three by the reticulated markings on its teleutospores, and *P. Miyabeana* from the second and third species by the long pedicels of its teleutospores. *P. Angelicæ* and *P. Angelicæ-edulis* are very closely related species, but they can readily be distinguished from each other by the following character.

The teleutosori of *P. Angelicæ* are amphigenous, while those of *P. Angelicæ-edulis* are usually hypophyllous or if amphigenous, always scantily scattered along the midrib. The wall of the uredospores in *P. Angelicæ* is thickened at the apex (5–10μ) and also somewhat at the

base. In *P. Angelicæ*, the lateral membrane of the teleutospore has about equal thickness with the membrane of the septum, and the position of the germ-pore on the lower cell is lateral, 2/3–3/4 from the septum, and the papilla on the pore is slightly or not projecting. On the other hand, in *P. Angelicæ-edulis*, the lateral membrane of the teleutospore is thinner than the membrane of the septum, and the position of the germ-pore on the lower cell is just below the septum or sometimes at about the middle on irregularly shaped spores. The papilla on the pore is distinctly projecting.

In regard to the teleutostage, I have found only a stage which corresponds to the secondary stage of LINDROTH on *P. Angelicæ*.

13. Puccinia bullata (Pers.) Wint., Pilze S. 191 (1884); Sacc., Syll. VII, p. 634; Schrœt., Pilz. Schles., S. 335; Plowr., Monogr. Ured. p. 183; Lindr., Umbell. Ured. S. 103; Syd., Monogr. Ured. I. p. 403; E. Fischer, Ured. Schweiz. S. 119.

Spermogonia, yellowish or subhyaline, irregularly scattered in the primary uredosori.

Primary Uredosori, elongated along the nerves and petioles, sometimes to 3 cm. in length, yellowish brown. *Secondary Uredosori*, hypophyllous or sometimes amphigenous; scattered, small, punctiform, brown. Uredospores, subglobose ovate or elliptical, chinulate, apex more or less thickened, brownish yellow, 25–40 × 18–28μ; germ-pores 3 or rarely 4, with projecting hyaline membrane.

Teleutosori, amphigenous small, or on the petioles, elongated, commonly confluent, black. Teleutospores, elliptical or oblong-elliptical, apex rounded and more or less thickened, slightly constricted, base rounded or slightly attenuated, smooth, chestnut-brown, 28–50 × 18–32μ; germ-pore of the upper cell at the apex, that of the lower 2/3 from the septum or nearly at the base; pedicels, hyaline, slender, deciduous.

HAB. On *Peucedanum japonicum* Thunb.

Honshu.—Prov. Sagami: Misaki (H. G. YAMADA AND J. HANZAWA. Aug. 24, 1900), (H. S. KUSANO. Aug., 1903), Koaziro (H. T. YOSHINAGA. Aug., 1904).

On *Seseli Libanotis* Koch.

Honshu.—Prov. Ugo : Kamo, Peninsula Ozika (III. E. TOKUBUCHI. Sept. 2, 1902) ; Prov. Rikuchū : Foot of Mt. Ganju (II. & III. Y. TAKAHASHI. Aug. 23, 1897).

DISTRIB. Europe, North America and Asia.

REMARKS.—As the specimens on *Peucedanum japonicum*, which I have examined, have only the secondary uredosori, I can not determine with certainty whether they belong to *P. bullata* or not. But here I have followed the opinion of DIETEL, and have considered them as *P. bullata.*

P. bullata has been and seems to be still a large collective species, including many smooth spored forms. LINDROTH has already split it up into many small species based principally on slight morphological character.

Pucciniopsis Schrœter.

14. Puccinia leioderma Lindr., Umbell. Ured. S. 110 (1902).

Spermogonia, scattered among æcidia, rounded, yellowish or brownish colored.

Æcidia, hypophyllous, scattered or clustered in a small ring-form, in brown spots, cup-shaped, with whitish torn edges. Æcidiospores, polygonal, globose, subhyaline, very finely verrucose, 15–22μ.

Teleutosori, hypophyllous, on small brownish spots ; small, dark brown, powdery, long cavered by episdermis, 1/2 mm. in diam. Teleutospores, elliptical or ovate, apex rounded, not or slightly constricted, base usually rounded, smooth, chestnut-brown, 25–33 13–22μ ; germ-pore of the upper cell at the apex, or rarely near the septum, that of the lower just below the septum, with a projecting papilla ; pedicels, slender, short, hyaline, deciduous.

HAB. *Ægopodium alpestre* Ledeb.

Hokkaido.—Prov. Ishikari : Yamahama (O. & I. T. MIYAKE. June 2, 1904).

On *Ægopodium* (*Chamœle*) *tenera* (Miq.) Yabe.

Shikoku.—Prov. Iyo : Sannai (O. & I. K. OKUDAIRA. May 17, 1903).

DISTRIB. Asia (Turkestan, Siberia, and Japan.)

REMARKS.—In June, 1904, I found the spermogonia and young æcidia growing on *Ægopodium alpestre* at Yamahana near Sapporo. Although I have tried several times since to find the other stages of this fungus in the same locality, I thus far have failed. The specimens sent from YOSHINAGA are also in the æcidium stage. Both of them are quite similar to the æcidia of *P. leioderma*. Although I have not yet examined its teleutospores, I shall treat it here provisionally as *P. leioderma*.

Hemipuccinia Schrœter.

15. Puccinia Nanbuana P. Henn., in Hedw. Bd. 40 (1901) S. (26); Sacc., Syll. XVI. p. 283; Lindr., Umbell. Ured. S. 93; Syd., Monogr. Ured. I. p. 403.—(Plate III. fig. 4.)

Syn.: Puccinia bullata Diet., Engl., Bot. Jahr. Bd. 28 (1901) S. 284; P. Henn. in Engl. Bot. Jahrb. Bd. 32 (1903) S. 35.

Uredosori, hypophyllous; small, punctiform, long covered by epidermis, light brown. Uredospores, globose, subglobose, ovate or elliptical, echinulate, apex very thick (4–9μ), brown, 25–38 × 18–29μ; germ-pores 3 or rarely 2, with a thickened hyaline membrane (3–5μ).

Teleutosori, hypophyllous; blackish brown, small, scattered, powdery. Teleutospores, elliptical, ovate-ellitical or ovate-oblong, apex roundish, slightly thickened with subhyaline short papilla, slightly constricted, base rounded or slightly attenuated, smooth, chestnut-brown, 30–42 × 19–27μ; germ-pore of the upper cell at the apex, that of the lower just below the septum; pedicels, hyaline, or subhyaline, slender, persistent, length about 22μ (rarely 60μ).

HAB. On *Peucedanum decursivum* Maxim.

Honshu.—Prov. Rikuchū: Nambu (III. TSCHONOSKI. 1865), Gosho (II. & III. Y. TAKAHASHI. Aug. 20, 1897), Takizawa (II. & III. K. SAWADA. Sept. 20, 1903); Prov. Iwaki: Sōma (III. S. KUSANO. Aug. 5, 1899); Prov. Shimotsuke: Nikkō (II. & III. S. HORI. Aug. 26, 1890); Prov. Kozuke: Ōmama (II. & III. T. MIYAKE. Aug. 8, 1903); Prov. Shimōsa: Kōnodai (II. & III. N. NAMBU. June 4, 1899); Prov. Musashi: Tokyo (III. K. MIYABE. Sept., 1899), (III. S. KUSANO. Sept., 1899),

Komaba (II. & III. G. YAMADA. Aug. 21, 1900), Mt. Takao (III. S. KUSANO. Oct. 18, 1891), Hodogaya (II. & III. T. MIYAKE July 26, 1903); Prov. Izu: (III. S. KUSANO. Jan. 3, 1901).

Shikoku.—Prov. Tosa: Aki (II. & III. T. YOSHINAGA. Oct., 1903).

DISTRIB. Japan.

REMARKS.—All the specimens I have examined are referable to one form and correspond exactly with the description of *P. Nanbuana.*

16. Puccinia ligusticicola S. Miyake n. sp.

Teleutosori, hypophyllous, or on the petioles; scattered, rounded, small (1–2 mm. in diam.), little elevated, black. Uredospores are intermixed among the teleutospores. Uredospores, globose or elliptical, echinulate, apex thickened (usually 7μ), light brownish yellow, 25–36×22–28μ; germ-pores 3, with swollen hyaline papilla. Teleutospores, elliptical or oblong-elliptical, apex roundish, slightly constricted, base roundish or slightly attenuated, smooth, chestnut-brown, 32–54 × 23–34μ; germ-pore of the upper cell at the apex, that of the lower just below the septum, provided with a subhyaline membrane; pedicels, hyaline or subhyaline, short, deciduous.

HAB. On *Ligusticum scoticum* L.

Hokkaido.—Prov. Hidaka: Mitsuishi (III. T. KAWAKAMI. Oct. 5, 1900).

On *Ligusticum ibukiense* (Mak.) Yabe.

Honshu.—Prov. Ōmi: Mt. Ibuki (III. T. MAKINO. Nov. 4, 1893).

DISTRIB. Japan.

REMARKS. The present species resembles very closely *P. Nanbuana.* With the teleutospores only, it is almost impossible to find the difference between them; though we may find among many spores of this species some little longer and somewhat more constricted. But macroscopically we can easily distinguish them by the size of teleutosori, those of *P. Nanbuana* being twice to several times smaller in diameter. With *P. aphanicondra* Lindr. on *Ligusticum alatum* our species is also nearly related. They can readily be distinguished from each other by the position of the germ-pore on the lower cell of teleutospore; the pore in the species under

consideration being just below the septum, while that in *P. aphanicondra* at about middle.

17. Puccinia Miyabeana S. Miyake n. sp.—(Plate III. fig. 7.)

Syn.: Puccinia Angelicæ P. Henn. in Engl., Bot. Jahrb. Bd 31 (1901) S. 730.

Teleutosori, hypophyllous or rarely amphigenous; small, scattered, pustuliform, compact, surrounded by the ruptured epidermis, blackish brown. Uredospores are intermixed among the teleutospores. Uredospores, ovate-oblong or elliptical, apex thick (5–10μ) or frequently not thickened, echinulate, brownish yellow, 18–27 × 27–42μ; germ-pores 3 or 2, equatorial, with projecting hyaline membrane. Teleutospores, oblong, ovate-oblong or elliptical, smooth, apex roundish, not thickened, with a very short subhyaline papilla, more or less constricted at the septum, base rounded or slightly attenuated, chestnut-brown, with granular spots in the epispore, 40–53 × 26–30μ; germ-pore of the upper cell at the apex, that of the lower just below the septum; pedicels, subhyaline or hyaline, slender, very long (50–190μ), swollen at its upper portion.

HAB.—On *Angelica hakonensis* Maxim.

Honshu.—Prov. Sagami: Hakone (II. & III. Y. YABE. Oct. 18, 1899 & Oct., 1900?), Yumoto (II. & III. N. NAMBU. Oct. 30, 1900).

On *Ang. kiusiana* Maxim.

Honsku.—Prov. Sagami: Misaki (III. K. TAMURA. Jan. 3, 1902).

On *Ang. utilis* Makino.

Honshu.—Prov. Awa: Awa (III. T. NISHIDA Jan. 3, 1902); Prov. Sagami; Misaki (III. S. HORI. Jan. 23, 1891), (III. Y. YABE. Oct. 1899?), (III. T. YOSHINAGA. Aug., 1904); Prov. Izu: Shimoda (III. S. KUSANO. Jan. 1, 1904), Doi (III. S. KUSANO. Jan. 3, 1901).

DISTRIB. Japan.

REMARKS. This species can easily be distinguished from the related species by its compact, blackish teleutosori macroscopically, and by the very long pedicels of its teleutospores microscopically. The wall of the teleutospores is not so thick as in the case of *P. Angelicæ*, but is about equal in thickness to that of *P. Angelicæ-edulis*. In uredospores we can

find no distinction between this species and *P. Angelicæ-edulis*. P. HENNINGS (2) regarded a species of Puccinia parasitic on *Angelica hakonensis*, which had been collected by N. NAMBU at Hakone, as *P. Angelicæ* (Schm.) Fuck. The examination of the type specimen has proved beyond all doubts, that it is not identical with *P. Angelicæ*, but it belongs to the species under consideration. This well marked species is peculiarly parasitic on the littoral species of Angelica, such as *Angelica utilis* Makino and *A. kiusiana* Maxim.

Independent uredosori of the species have not yet been found.

18. Puccinia Phellopteri Syd., Monogr. Ured. I. p. 406 (1904).—(Plate III. fig. 8.)

Syn. : *Puccinia Apii* Diet., Engl., Bot. Jahrb. Bd. 27. (1900) S. 570.

Uredosori, amphigenous or on the petioles; small, scattered, powdery, brown; those on the petioles, elongated. Uredospores, subglobose, elliptical, strongly echinulate, wall uniformly thickened (7–9μ), yellowish brown, 27–38 × 22–30μ); germ-pores 3, with hyaline projecting membrane.

Teleutosori, amphigenous; blackish brown, long covered by epidermis. Teleutospores, elliptical, oblong, apex rounded, very slightly thickened, slightly constricted, base roundish or attenuated, smooth, chestnut-brown, 35–53 × 18–20μ; germ-pore of the upper cell at the apex or rarely at the lateral side, that of the lower 1/2–2/3 from the septum, provided with a subhyaline membrane; pedicels, hyaline, slender, deciduous.

HAB. On *Phellopterus littoralis* Fr. Schm.

Hokkaido.—Prov. Iburi: Mororan (III. G. YAMADA. Aug. 3, 1900), Okonshibe (II. & III. G. YAMADA. July 21, 1897), Abuta (II. & III. G. YAMADA. July 24, 1897).

Shikoku.—Prov. Iyo: Hiburijima (II. July 21, 1903); Prov. Tosa: Aki (II. T. YOSHINAGA. May, 1904).

On *Cnidium japonicum* Miq.

Honshu.—Prov. Awa: Awa (III. S. KUSANO. Dec. 30, 1897); Prov. Sagami: Misaki (II. S. KUSANO. Aug., 1903.)

DISTRIB. Japan and Corea.

REMARKS. Descriptions of this species by SYDOWS (2) based on

the Corean specimens correspond exactly with the character of the Japanese form on Phellopterus.

DIETEL (2) regarded a form on *Cnidium japonicum* collected by KUSANO as *P. Apii.* By the kindness of Mr. KUSANO I have been able to study both the uredospore and teleutospore stages of that fungus. Compared with *Puccinia Apii,* the uredospore is entirely different, the wall being very much thicker, although there is no apparent difference between them in the character of teleutospores.

The form on Phellopterus and that on Cnidium are here treated as belonging to the same species. The further study may prove them as two distinct species.

In a letter of Mr. KUSANO, it is communicated that the following differences are noticeable between these forms.

The uredospores on Phellopterus have thicker membrane and also a distinct boundary line between the epispore and inner membrane. Germ-pores of the uredospores on Cnidium are 4 (or 3), while those on Phellopterus are usually 3, and never 4.

My own observations, however, rather point to the contrary conclusion. Distinctive characters enumerated by Mr. KUSANO are not constant and fixed.

Table I., showing the distribution of the species of Puccinia on the Japanese Umbelliferæ in the world.

Species.	Japan.	Corea.	China.	Siberia.	India.	Europe.	North America.
Puccinia Chærophylli	—			—		—	
„ Osmorrhizæ	—						—
„ Pimpinellæ	—				—	—	
„ tokyensis	—						
„ Cicutæ	—			—		—	—
„ Bulbocastani	—					—	
„ angelicicola	—						
„ Œnanthes	—						
„ Bupleuri-falcati	—		—		—	—	
„ Saniculæ	—				—	—	
„ Angelicæ	—					—	
„ Angelicæ-edulis	—						
„ bullata	—					—	—
„ leioderma	—			—			
„ Nanbuana	—						
„ ligusticicola	—						
„ Miyabeana	—						
„ Phellopteri	—	—					

Table II., showing the distribution of the species of Puccinia on the Japanese-Umbelliferæ in Japan.

Species.	Sachalin.	Hokkaidō.	Northern Part of Honshu.	Middle Part of Honshu.	Southern Part of Honshu.	Shikoku.	Kiusiu.	Liukiu.	Formosa.
Puccinia Chærophylli			—						
„ Osmorrhizæ		—							
„ Pimpinellæ		—		—					
„ tokyensis		—	—	—	—	—			
„ Cicutæ		—	—						
„ Bulbocastani		—							
„ angelicicola				—					
„ Œnanthes		—	—	—		—	—	—	
„ Bupleuri-falcati		—		—					—
„ Saniculæ		—							
„ Angelicæ		—	—	—					
„ Angelicæ-edulis		—	—	—		—			
„ bullata			—	—					
„ leioderma		—				—			
„ Nanbuana			—	—		—			
„ ligusticicola		—		—					
„ Miyabeana				—					
„ Phellopteri		—		—		—			

Host Index.

Ægopodium alpestre	Puccinia	leioderma.	(p. 116.)
„ (Chamæle) tenera			
Angelica anomala	„	Angelicæ.	(p. 110.)
„ multisecta			
„ refracta			
„ ursina			
„ edulis	„	Angelicæ-edulis.	(p. 111.)
„ Matsumuræ			
„ Miqueliana			
„ polyclada			
„ polymorpha			
„ shikokiana			
„ ursina			
„ Miqueliana	„	Angelicicola	(p. 106.)
„ hakonensis	„	Miyabeana.	(p. 119.)
„ kiusiana			
„ utilis			
Anthriscus silvestris	„	Chærophylli	(p. 99.)
Bupleurum multinerve	„	Bupleuri-falcati.	(p. 108.)
„ falcatum			
„ sachalinense			
Carum holopetalum	„	Bulbocastani.	(p. 105.)
Cicuta virosa	„	Cicutæ.	(p. 104.)
Cnidium (Selinum) japonicum	„	Phellopteri,	(p. 120.)
Cœlopleurum Gmelini	„	Angelicæ-edulis.	(p. 111.)
Cryptotænia canadensis	„	tokyensis.	(p. 102.)
„ japonica			
Ligusticum ibukiense	„	ligusticicola.	(p. 118.)
„ scoticum			
Œnanthe stolonifera	„	Œnanthes.	(p. 106.)
Osmorrhiza japonica	„	Osmorrhizæ.	(p. 100.)

Peucedanum decursivum	Puccinia	Nanbuana.	(p. 117.)
,, japonicum	,,	bullata.	(p. 115.)
Phellopterus littoralis	,,	Phellopteri.	(p. 120.)
Pimpinella calicina	,,	Pimpinellæ.	(p. 101.)
Sanicula europæa	,,	Saniculæ.	(p. 109.)
Seseli Libanotis	,,	bullata.	(p. 115.)

A List of Literature referred to in this Paper.

De-Toni, J. B. (1). Sylloge Uredinearum, in Saccardo's Sylloge Fungorum. Vol. VII. 1888.

Dietel, P. (1). Uredinales, in Engler u. Prantl, Nat. Pflanzenfam. Th. I. ** S. 25.

„ (2). Uredineæ Japonicæ. I., in Engler's Bot. Jahrb. Bd. 27. S. 568. 1900.

„ (3). Uredineæ Japonicæ. II., in Engler's Bot. Jahrb. Bd. 28. S. 283. 1901.

„ (4). Bemerkungen über primäre Uredoformen, in Hedwigia. Bd. 40. S. (130). 1901.

Fischer, Ed. (1). Die Uredineen der Schweiz.—Beitrage zur Kryptogamenflora der Schweiz. 1904.

Hennings, P. (1). Fungi japonici. III. in Engl., Bot. Jahrb. Bd. 32. S. 35. 1902.

„ (2). Fungi japonici. IV. in Engl., Bot. Jahrb. Bd. 31. S. 730. 1901.

„ (3). Einige neue japanische Uredineen, in Hedwigia. Bd. 49. S. (26). 1901.

„ (4). Einige neue japanische Uredineen. IV. in Hedwigia. Bd. 51. S. (107). 1903.

Klebahn, H. (1). Die wirtswechselnden Rostpilze. 1904.

Kusano, S. (1). Notes on the Uredineæ found in the Prov. of Idzu during the Winter, in Tokyo Bot. Magazine, Vol. XVI. No. 187. p. 195.

„ (2). On the distribution of the Parasitic Fungi in Chiugoku, in Tokyo Bot. Magaz. Vol. XVI. No. 187, p. 201.

Lindroth, J. I. (1). Die Umbelliferen—Uredineen, in Acta Societatis pro Fauna et Flora Fennica. Vol. 22. No. 1. 1902.

Matsumura, J. (1). Index Plantarum Japonicarum. Vol. I. 1904.

Nambu, N. (1). On the parasitic Fungi collected in the Vicinity of Tokio, in Tokyo Bot. Magaz. Vol. XVIII. No. 203. p. 1. 1904.

Plowright, C. B. (1). A monograph of the British Uredineæ and Ustilagineæ. 1889.

Schræter, J. (1). Die Pilze Schlesiens, in Cohn's Kryptogamenflora von Schlesien. Bd. III. 1889.

Semadeni, F. O. (1). Kultur-versuche mit Umbelliferen bewohnenden Rostpilzen, in Centralbl. für Bakt. etc. II. Abt. Bd. X S. 522. 1903.

„ (2). Beiträge zur Kenntnis der Umbelliferen bewohnenden Puccinia. 1904.

Shirai, K. (1). A List of Japanese Fungi Hitherto known. 1905.

Sydow, H. et P. (1). Fungi Novi Japonici, in Mémoires de l'Herbier Boissier. No. 4. p. 4. 1900.

„ (2). Monographia Uredinearum. Vol. I. 1904.

Thümen, F. von (1). Beiträge zur Pilz-Flora Sibiriens. I. in Bulletin de la Société Impériale des Naturalistes de Moscou. 1877 p. 128.

„ (2). Beiträge zur Pilz-Flora Sibiriens. IV. ditto. 1880 p. 198.

Winter, G. (1). Die Pilze, I., in Rabenhorst's Kryptogamen Flora. Zweite Auflage. 1884.

Yabe, Y. (1). Revisio Umbelliferarum Japonicarum, in the Journal of the College of Science, Imperial University, Tokyo, Japan. Vol. XVI. 1902.

Yoshinaga, T. (1). On some Fungi from Tosa, in Tokyo Bot. Magaz. Vol. XV. No. 171. p. 94. 1901.

„ (2). On some Fungi from Tosa. II., in Tokyo Bot. Magaz. Vol. XVI. No. 179. p. 1. 1902.

„ (3). On some Parasitic Fungi from Tosa. III., in Tokyo Bot. Magaz. Vol. XVIII. No. 204. p. 27. 1904.

Yoshino, K. (1). A List of the Parasitic Fungi collected in the Province of Higo, in Tokyo Bot. Magaz. Vol. XIX. No. 220. p. 87. 1905.

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Fig. 1. Puccinia tokyensis Syd.
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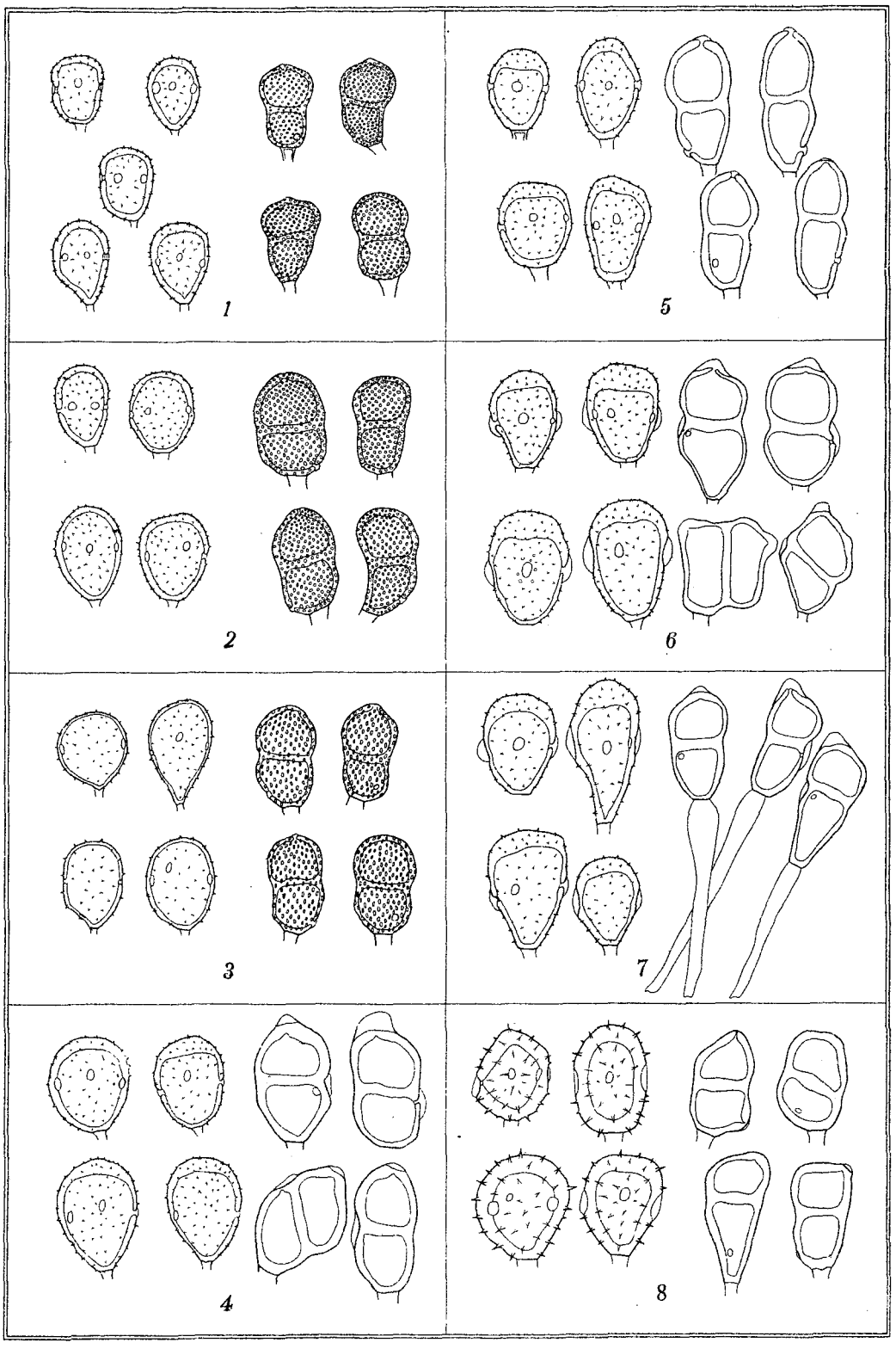
Fig. 3. „ Œnanthes (Diet.) n. comb.
Fig. 4. „ Nanbuana P. Henn.
Fig. 5. „ Angelicæ (Schm.) Fuck.
Fig. 6. „ Angelicæ-edulis n. sp.
Fig. 7. „ Miyabeana n. sp.
Fig. 8. „ Phellopteri Syd.



T. Miyake del.

Miyake—Umbelliferæ-Puccinia.

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