ほっぷの新病原菌
ペロノプラズモパラ ヒユーミユリーに就て

宮部金吾
高橋良直

A NEW DISEASE OF THE HOP-VINE CAUSED BY PERONOPLASMOPARA HUMULI N. SP.

By

Kingo Miyabe, SD., *Rigakuhakushi.*
Professor of Botany in the Sapporo Agricultural College.

and

Yoshinao Takahashi, *Nogakushi.*
Botanist to the Hokkaido Agricultural Experiment Station, Sapporo.

It was in the early summer of 1905 that our attention was first drawn to a diseased appearance of the leaves of the cultivated hop-vines in the experimental plat of the Hokkaido Agricultural Experiment Station in Sapporo. An examination showed at once that it was due to a kind of downy mildew, having a close affinity to that of cucumber. Our interest was naturally aroused leading us to inquire into the extent of the damage done in other hop fields about Sapporo, and also into its occurrence on the wild hop, which is not uncommon in this vicinity as well as in other districts in northern Japan.

In the hop-field belonging to the Sapporo Brewery Company a careful search was made on June 15th this year, and we found the mildew to have already begun to spread to an alarming extent throughout the field. A portion of the field adjoining the place where the hop-vines were collected and burnt the previous autumn was very badly attacked. The lower leaves of the vine were at that time most infected, but the disease had already spread to some of the upper leaves. Judging from the extent to which the fungus had spread in the field, we may safely infer, that the disease had existed there for many years without drawing attention,

Messrs. **S. Fujita** and **J. Kasahara** of the Company struck with the seriousness of the case at once took active measures to combat the disease. By thoroughly spraying with the Bordeaux mixture and by systematic picking of the affected leaves, they were able to prevent the spread of the disease for the rest of the year.

The fungus in question seems to be peculiar to Japan, as there are no records of the occurrence of the downy mildew on the hop-vines either in Europe or America, for such a destructive parasite on such an important crop is scarcely likely to have passed unnoticed there.

In August of 1905, Mr. **J. Hanzawa,** an assistant professor of botany in the Sapporo Agricultural College, found on the wild hop-vine, *Humulus Lupulus* L. var. *cordifolius* Maxim. the same fungus at Zenibako about 12 miles from Sapporo. At about the same time, Prof. **G. Yamada** of the Morioka Agricultural and Dendrological High School also collected the same parasite on the same host in the vicinity of Morioka in Northern Honshū. These facts prove beyond doubt, that the mildew fungus is indigenous to this country growing on the wild hop-vine, and has recently found a more congenial host in the cultivated hop-vines introduced from America and Europe.

The diseased leaves show at first small yellowish spots limited by the veinlets and scattered irregularly over their surface. Finally these spots become confluent often forming large irregular brownish or dark brown patches. On the undersurface of the leaf at the discolored portion is formed à thick downy growth, which is whitish at first but later turns to dark gray. The leaves having large affected spots along their margin or midrib show occasionally conspicuous bullations in the adjoining green portion of the blade.

From two to five conidiophores spring out of a stoma. Their length is variable, ranging from 200 to 460 μ, sometimes attaining even 600 μ. They are slightly swollen at the base; and their average diameter at about the middle is 6–7 μ. The first branching takes place at about 2/3 or 3/4 from the base. The branch system is 5–6 times dichotomous and rather spreading; and its ultimate branches are either straight or slightly curved inwards or occasionally outwards, tapering to a blunt point.

Conidia are broad elliptical or obovate, 22–26 μ long and 15–18 μ broad, of a light smoky color, and with a lighter colored or colorless blunt apical papilla (1.5–2 μ in height and 4 μ in breadth). The thickened septum of the conidium often remains as a short papilla at its base, but generally it dissolves away when it is mounted in water. The germination takes place in about three or four hours. The contents break up into about eight zoospores, which escape through an open-

ing formed at the apical papilla. The zoospores are kidney-shaped with two cilia attached to its lateral side.

The oospores are formed in abundance in the mesophyll of the discolored spots. They are spherical, smooth, 28–34 μ in diameter, and light brownish in color. The wall of the oogonium is persistent and loosely surrounding the oospore. The diameter of the oogonium is about 40 μ.

This fungus with its dichotomously branched conidiophores and with its conidia germinating by zoospores shares the characters of two genera *Peronospora* and *Plasmopara*, and may form an intermediate genus together with the downy mildew fungi of cucumber and *Celtis*. In 1901, **Berlese**[1] created a new subgenus, *Peronoplasmopara*, in the genus *Plasmopara* and placed under it *Peronospora cubensis* Berk. et Curt. and *Peronospora Celtidis* Waite. **Rostowzew**[2] reported in 1903 a detailed account of his study on different species of the Peronosporaceae, but especially on *Peronospora cubensis* B. et C., on which he founded a new genus *Pseudoperonospora*, apparently without knowing the above mentioned work of **Berlese.**

In 1904, **Clinton**[3] made a critical study of the cucumber mildew and came to a similar conclusion in regard to the recognition of its generic position. But regarding **Berlese's** subgenus, *Peronoplasmopara*, because of priority of publication, and also because it was given definite descriptive characters, as deserving preference over **Rostowzew's** rather indefinite *Pseudoperonospora*, **Clinton** elevated *Peronoplasmopara* to generic rank and included under it two species,—*Peronoplasmopara cubensis* (B. et C.) Clint., and *Peronoplasmopara Celtidis* (Waite) Clint.

In the present paper, we have adapted **Clinton's** view and named our fungus *Peronoplasmopara Humuli* Myb. et Tak., thus adding another species to this interesting genus.

In this connection, it may be interesting to know, that *Peronosplasmopara Celtidis* is also found in Japan on *Celtis sinensis*. It was collected by Mr. **K. Yoshino** in the Province of Echigo in 1903. The specimen was sent to one of us for determination, and it was proved to correspond exactly with the descriptions and figures of *Peronospora Celtidis* Waite.[4]

An apparently rare species *Peronospora cannabina* Otth parasitic on the leaves

---

1. **Berlese, A. N.** *Plasmopara cubensis* (B. et C.). Riv. Pat. Veg. Vol. 9. p. 123-6. 1901.
2. **Rostowzew, S. J.,** Beiträge zur Kenntnis der Peronosporeen. Flora. Bd. 92. p. 405-430. 1903.
3. **Clinton, G. P.,** Downy mildew, or Blight, *Peronoplasmopara cubensis* (B. & C.) Clint., of Musk Melons and Cucumbers. Report of the Conn. Agric. Exp. Stat. for the Year 1904. p. 329-362. 1905.
4. **Waite, M. B.,** Description of Two New Species of Peronospora. Journ. of Mycology. Vol. VII. p. 105-109. Pl. XVIII. 1892.

of *Cannabis sativa*, was also recently found in this country by Mr. **T. Goto** in the Province of Shimotsuke. The fungus was first found in Switzerland, and described by **Otth**[1] in 1868, and later by **Massalongo**[2] in Italy. Unfortunately, the original papers of these authors are not accessible here, and we cannot tell whether the germination of its conidia was determined or not. At any rate, we hope we shall be able to settle the question duing the next season, and thereby may possibly be able to add another species to the genus under consideration.

Let us here enumerate the species of *Peronoplasmopara* in Japan, giving its hosts and distribution.

1. Peronoplasmopara cubensis (B. et C.) Clint.

Syn. *Peronospora cubensis* B. et C.
Plasmopara cubensis Humph.
Pseudoperonospora cubensis Rostow.

Hosts and Distrib. On *Cucumis sativus* L.

Hokkaidō. Prov. Ishikari: **K. Miyabe,** 1890, 1891; **E. Tokubuchi,** 1894; **G. Kurosawa,** 1895; **T. Miyagi,** 1905. Prov. Kitami: **K. Miyabe,** 1894. Prov. Teshio: **K. Miyabe,** 1894.

Honshū. Prov. Musashi: **Y. Tanaka, K. Tamari,** 1888; **S. Hori,** 1895; **K. Shirai,** 1896; **K. Miyabe,** 1897; **N. Nambu,** 1899; **T. Nishida, G. Yamada,** 1900. Prov. Rikuchū: **G. Yamada,** 1904. Prov. Uzen: **G. Yamada,** 1901. Prov. Echigo: **K. Yoshino,** 1903. Prov. Mino: **E. Tokubuchi,** 1898. Prov. Ise: **E. Tokubuchi,** 1898.

Kyushū. Prov. Higo: **K. Yoshino,** 1905.

On *Cucumis Melo* L.

Honshū. Prov. Musashi: **K. Tamari,** 1888; **N. Nambu,** 1897; **S. Hori,** 1900. Prov. Kōzuke; **K. Tamari,** 1888.

Kyushū. Prov. Higo: **K. Yoshino,** 1905.

On *Cucumis Melo* L. var. *Conomon* Mak.

Honshū. Prov. Musashi: **T. Nishida,** 1900.

On *Cucurbita Pepo* L.

Honshū. Prov. Musashi: **Y. Tanaka,** 1888; **S. Hori,** 1901.

On *Cucurbita maxima* Duch.

Honshū. Prov. Musashi: **N. Nambu,** 1899.

---

1. **Otth,** Mitteil. d. Naturf. Gesell. in Bern. 1868. p. 63.—Hedwigia. Bd, 35, Repertorium. p, XXII. 1896.
2. **Massalongo, C.,** La Peronospora della Canapa. Agricoltore Ferrarese. 1898. c. tab.—Saccardo, Sylloge Fung. Vol. XIV. p. 460.

2. Peronoplasmopara Celtidis (Waite) Clint.

Syn. *Peronospora Celtidis* Waite.
Plasmopara Celtidis Berl.

Hosts and Distrib. On *Celtis sinensis* Pers.

Honshū. Prov. Echigo: Fukudo-mura, **K. Yoshino,** Oct. 10, 1903.

3. Peronoplasmopara Humuli Myb. et Tak. n. sp.

Spots, small, irregular, limited by nerves, scattered or confluent forming large irregular patches, at first yellowish, then brownish Conidiophores 2-5 from a stoma, 200-460 μ long, 6-7 μ wide, 5-6 times dichotomous, rather spreading; the first branch at about 2/3 to 3/4 from the base; the ultimate branches straight, slightly arcuate or sometimes deflexed, tapering to a blunt point. Conidia, broad elliptical or obovate, 22-26 μ × 15-18 μ, of light smoky color, with blunt apical papilla, and germinating by zoospores. Oospores, spherical, smooth, 25-40 μ in diameter, and light brownish.

Hosts and Distrib. On the leaves of *Humulus Lupulus* L. (cult).

Hokkaidō. Prov. Ishikari: at the experimental fields of the Hokkaidō Agricultural Experiment Station, Sapporo, **Y. Takahashi,** July, 3, 1905; **K. Miyabe,** July 29, 1905. Hop-fields belonging to the Sapporo Brewery Company, Sapporo, **K. Miyabe,** June 15, 1906.

On *Humulus Lupulus* L. var, *cordifolius* Maxim. (wild).

Hokkaidō. Prov. Shiribeshi, at Zenibako. **J. Hanzawa,** Aug. 1905.

Honshū. Prov. Rikuchū, at Morioka, **G. Yamada,** July 1905.

Dec. 20, 1906.

摘　　要

歐米に於てはホップ (*Humulus Lupulus* L.) を侵害する菌類少なからざれども未だ之れに寄生する露菌 (Peronosporaceae) あるを聞かず。然るに昨年來北海道農事試驗場 (札幌) のホップ園は一種の露菌に害せられ、又大日本麥酒會社札幌支場のホップ園に於ても本年之れが發生を認め其害少々にあらざりき。猶農學士**半澤洵**氏は昨年八月後志國錢函に於て、又之れと殆んと同時に農學士**山田玄太郎**

氏は陸中國盛岡附近に於て、何れも此菌の野生ホップ即ちカラハナサウ (*H. Lupulus* T. var. *cordifolius* Maxim.) に寄生せるものを採集せられたり。之れによりて之れを觀れば、本菌は從來野生ホップに寄生して生存せる本邦固有の露菌にして、偶々舶來種ホップの栽植せらるゝに及び之れに傳播せしものなるや疑なし。余等は此菌を一新種と認定し、*Peronoplasmopara Humuli* と命名したり。

本病の發生期は六月初旬にして、黄色の病斑は被害葉の上面に現はれ、始めは其形小にし葉脈を以て限られ箇々孤立するも、後には互に癒合して褐色の大病斑となる。又病斑部の下面には軟毛狀の叢を生じ、其色始め白色なるも後には暗灰色に變ず。

擔子梗は二乃至五本づゝ葉の下面の氣孔より簇生して上記の如き軟毛狀の叢を爲し、五乃至六回二股狀に分岐す。分生胞子は廣楕圓又は倒卵形にして、淡黑色を呈し其上端に乳房狀突起あり。分生胞子を水に投ずれば三、四時間にして發芽す。即ち其内容は分裂して八箇内外の游走子となり、胞子の上端に生ぜる孔より脫出す。游走子は腎臟形にして、其凹側に二本の纖毛を具ふ。本菌は又卵胞子を有す。卵胞子は葉の被害部の葉肉中に生じ、球形にして平滑なる面を有し、微かに褐色を帶ぶ。造卵器の膜は緩かに卵胞子を圍繞し永存す。

Peronoplasmopara 屬の特徴は、其擔子梗二股狀に分岐し (*Peronospora* に於けるが如く)、而して其分生胞子は游走子を生ずる (*Plasmopara* に於けるが如し) に在り。此 *Peronoplasmopara* 屬たるや、往年 **A. N. Berlese** 氏がキウリの露菌とエノキの露菌 (*Peronospora Celtidis* Waite) を收容せんが爲めに *Plasmopara* の亞屬として設定したるものにして、近年 **G. P. Clinton** 氏は其位置を引上けて獨立の一屬と爲し、キウリの露菌を *Peronoplasmopara cubensis* (B. et C.) Clint. と改稱せり之れより先 **S. J. Rostowzew** 氏もキウリの露菌を以て一箇の獨立屬と爲し、*Pseudoperonospora* てふ新屬を設けたるも、氏は其特徴

を截然說示せざりき。蓋し氏は Berlese 氏の亞屬あるを知らざりしものゝに似たり。故に余等も Clinton 氏の說に同意して *Peronoplasmopara* を採り、*Pseudoperonospora* を以て之れが異名と爲す。

Peronoplasmopara Celtidis (Waite) Clint. も亦本邦に產す。即ち吉野毅一氏は數年前に越後に於て之れを採集せられたり。

之れを要するに現今 *Peronoplasmopara* に屬するもの三種あり、何れも本邦に存在す。即ち、

1. *Peronoplasmopara cubensis* (B. et C.) Clint.

異名 { *Peronospora cubensis* B. et C.
Plasmopara cubensis (B. et C.) Humph.
Pseudoperonospora cubensis (B. et C.) Rostow.

キウリの外、水瓜、南瓜等に寄生す。本邦各地に普通。

2. *Peronoplasmopara Celtidis* (Waite) Clint.

異名 { *Peronospora Celtidis* Waite.
Plasmopara Celtidis (Waite) Berl.

エノキに寄生す。採集地—越後(吉野毅一氏、明治三十六年)。

3. *Peronoplasmopara Humuli* Myb. et Tak. nov. sp.

舶來種ホップ及び野生ホップ(カラハナサウ)に寄生す。

採集地—札幌(但し舶來種ホップに寄生せるもの)、後志國錢函(但しカラハナサウに寄生せるもの、半澤洵氏、明治三十八年)陸中國盛岡(仝上、山田玄太郎氏仝上)。

本病害は『ボルドー』合劑の撒布によりて豫防するを得べし。大日本麥酒會社の札幌に於けるホップ園にては、本年其被害を認むるや直に全園に之れが撒布を行ひ好成蹟を得たり。

(明治三十九年十二月二十日)