



HOKKAIDO UNIVERSITY

Title	SOME REMARKS ON THE TAXONOMY OF THE FUNGUS HYPOCHNUS SASAKII SHIRAI
Author(s)	Matsumoto, Takashi
Citation	札幌博物学会会報, 13(3), 115-120
Issue Date	1934-06-20
Doc URL	https://hdl.handle.net/2115/64123
Type	journal article
File Information	Vol.13No.3_005.pdf



SOME REMARKS ON THE TAXONOMY OF THE FUNGUS *HYPOCHNUS SASAKII* SHIRAI*

BY

TAKASHI MATSUMOTO

(松 本 巍)

(With 2 text-figures)

As has already been stated by ENDO⁽⁶⁾ as well as by the present author⁽⁴⁾, some species designated as *Rhizoctonia Solani* KÜHN in Philippines and India are quite identical with the fungi which are generally referred to as *Hypochnus Sasakii* SHIRAI. Nevertheless, obviously much still remains to be done regarding the taxonomic relationship of these two species. In the present paper I am unable to discuss fully about the matter on account of a limited number of pages, but will permit myself only to make a brief review of the taxonomy of the fungi under consideration.

In my previous papers it has been confirmed that our fungi can be distinctly separated from the causal fungus of "Pockenkrankheit" of potato tuber in cultural characters, hyphal fusion, and temperature relation. The latter fungus was isolated from the superficial sclerotial mass of potato black speck (or black scurf) fungus collected by the author in Dahlem-Berlin.

The first question naturally arises whether or not this potato organism, i. e. No. 19 according to our numeration, can be unmistakably referred to the type species *Rhizoctonia Solani* described by KÜHN⁽¹²⁾, inasmuch as the binomial *Rhizoctonia Solani* has been used for all the fungi morphologically more or less resembling the KÜHN's potato pathogen. According to DUGGAR⁽⁵⁾ who conferred with Prof. KÜHN, the nomenclator of *Rhizoctonia Solani*, regarding this disease in the winter of 1899-1900, it was noted that when KÜHN first described the disease of potato in Germany he laid emphasis upon a scab ("Schorf oder Grind," later termed "Pockenkrankheit") of potato which is now widely distributed throughout the world. In view of the fact, therefore, it seems likely that our potato organism may be identical with the species described by KÜHN. In this connection, it is also to note that our potato organism is very closely related to the culture designated as P₄ in my previous paper⁽¹³⁾ published while I was in St. Louis, U. S. A., the latter being isolated from sclerotia of black speck of potato tuber secured on the market of St. Louis, 1918.

* From the Phytopathological Laboratory, Taihoku Imperial University, Formosa, Japan.

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

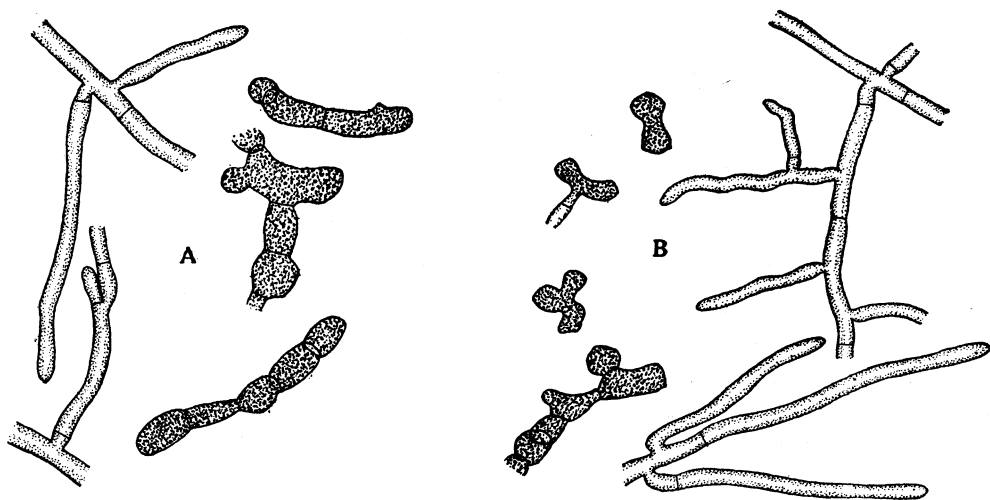


Fig. 1. A, *Rhizoctonia Solani*, hyphae and sclerotial cells; B, our fungus, hyphae and sclerotial cells. (Reduced to $\frac{2}{3}$ from camera lucida drawings, Apoch. Zeiss. 7×40 .)

The vegetative characters of the fungus *Hypochnus Sasakii* are almost similar to those of *Rhizoctonias* in many respects. The mycelium of the former is characterized by a constriction where branching occurs, and a septum near the constriction, becoming deeply colored and branching approximately at right angles to the main hypha when mature, while in the younger stage it is colorless and inclined in the direction of growth (fig. 1). The sclerotia are generally more or less flattened, irregular, brown, and fairly homogeneous and paraplectenchymatous in structure, composing of the cells concolorous with the surface.

Although many similarities exist in the vegetative stage, the fungus *Hypochnus Sasakii* is distinctly different from *Rhizoctonia Solani* in some morphological and physiological characters, so far as a comparison is made between our rice strain (No. 1) and the potato *Rhizoctonia* (No. 19). For convenience, some of the more contrasting features as usually found are shown in the following table:

Hypochnus Sasakii	Rhizoctonia Solani
A. Morphological characters (fig. 1)	A. Morphological characters
1. <i>Hyphae</i> :	1. <i>Hyphae</i> :
5-11 μ , mostly 6-8 μ .	7-13 μ , mostly 8-12 μ .
2. <i>Sclerotial cells</i> (near the periphery):	2. <i>Sclerotial cells</i> (do.):
7-18 $\times$ 22-37 μ .	15-26 $\times$ 26-50 μ .

B. Physiological characters

1. *On phenol red-Czapek's agar:*

Most of the strains exhibit "Peach red" or "Scarlet" in 7 days, showing increased alkalinity.

2. *On bromcresol purple-Duggar's agar:*

After 8 days all the cultures become "Mustard yellow" on account of the shifting to acid side.

3. *On aniline blue-Czapek's agar:*

A moderately strong growth in all the cultures.

4. *On tannic acid-potato agar:*

More or less tolerant to the acid.

5. *Fusion of hyphae:*

Fusion takes place between any strains of *Hypochnus Sasakii*.

6. *Temperature relation:*

These are rapid-growing fungi, giving most luxuriant growth in 2 days at 28-31° C.

B. Physiological characters

1. *On phenol red-Czapek's agar:*

This culture becomes "Bitter-sweet orange", thus showing less alkaline than the former.

2. *On bromcresol purple-Duggar's agar:*

This culture becomes "Antimony yellow", thus showing slightly less acid than the former.

3. *On aniline blue-Czapek's agar:*

This fungus is very sensitive to the dye.

4. *On tannic acid-Czapek's agar:*

Very sensitive to the acid.

5. *Fusion of hyphae:*

No fusion takes place in cross tests with any of the former.

6. *Temperature relation:*

This is a slow-growing fungus, showing no marked difference in growth even after 2 days at temperatures 22-31° C. The optimum is lower than that of the former.

In addition to these facts, it is also to note that direct attack of leaves by *Rhizoctonia Solani* is rather infrequent with the exception of such plants as lettuce, cabbage, etc., whereas in our case leaves are more frequently attacked by the fungus.

A comparison of the two species in the perfect stage also reveals some differences, provided *Corticium vagum* B. & C. described by BURT⁽⁴⁾ is the



Fig. 2. *Corticium vagum* (upper), $\times 800$. a, from specimen on potato; c, from specimen on earth; d, from specimen on wood. (Reproduced from BURT⁽⁴⁾) Our fungus (lower), $\times 500$. (S. HIRANE del.)

perfect stage of *Rhizoctonia Solani*. For instance, the number of basidiospores of *Corticium vagum* varies from 4 to 6, though in the illustration of ROLFS (reproduced by Güssow⁽⁹⁾) the basidia are 2 to 4 sterigmated, whereas in our case the basidiospores vary from 2 to 4 on each basidium, and are slightly shorter but broader than the former (fig. 2). The characteristic features as described by several investigators are shown in the following table:

<i>Corticium vagum</i>	<i>Hypochnus Sasakii</i>		
	SAWADA ⁽¹⁸⁾	IKATA & HITOMI ⁽¹⁰⁾	The author ⁽¹⁴⁾
Basidia :			
10-20 × 7.5-11 μ	10-15 × 7-9 μ	5.6-12 × 5-8 μ	10-16 × 8-9 μ
Sterigma :			
6-16 μ, 4-6 sterigmated	4.5-7 × 2-3 μ, 2-4 sterigmated	2.5-8.4 × 0.8-2.8 μ	5-8 × 2.2-2.7 μ, 2-4 sterigmated
Basidiospores :			
8-14 × 4-6 μ	8-11 × 5-6.5 μ	6.5-8.4 × 4.8-8.4 μ	6-10 × 4-7 μ

It is also to note that while I was working with *Rhizoctonia Solani* in St. Louis I found that a strain, i. e. B₃*, originated from *Corticium* stage on lima beans grew better at lower temperatures (ca. 24°C.). This temperature relation is apparently different from that of our fungi and rather referable to that of our No. 19 strain (*Rhizoctonia Solani*).

Although the morphological differences between these two fungi in the perfect stage are not sufficient enough to warrant a classification of our fungus as a distinct species, in judging from the vegetative characters of our fungus this can not be included in the species *Corticium vagum*, and should be separated from the latter as a distinct species rather than as a biologic form.

In this connection it may be necessary to make a brief review regarding the species *Hypochnus Solani* (*Corticium Solani*), since this binomial has been used for *Rhizoctonia Solani* by several investigators, particularly by European workers^{7, 11)}. The species concerned was first described by PRILLIEUX and DELACROIX in 1891, about two decades after *Corticium vagum* had been reported, as a causal fungus on potato stem, although no connection was suspected with *Rhizoctonia Solani*, already known to occur in Europe. The diagnosis of the fungus was so imperfectly described, that a comparison could hardly be made satisfactorily except that the basidiospores appear to agree more closely with those of ours, as far as can be judged from the measurement of the spores⁽¹⁷⁾.

* This material was examined by Dr. BURT and determined to be identical with *Corticium vagum*. (cf. the paper⁽¹⁸⁾.)

As a matter of fact, however, it is to note that the species *Corticium Solani* (*Hypochnus Solani*) described by BROOKS⁽²⁾ has basidiospores measuring $8-14 \times 4-6 \mu$ which perfectly agrees with that of the BURT's *Corticium vagum*. More recently, in regard to the nomenclature of the perfect form of the potato Rhizoctonia BRAUN⁽¹⁾ notices that it is not yet quite certain whether the fungus should be regarded as a *Hypochnus* or a *Corticium*, or whether the specific name should be *vagum* or *Solani*. However that may be, in view of the opinions given by many investigators up to the present time, it seems likely that *Hypochnus Solani* is considered to be identical with *Corticium vagum*.

Then the next attention is directed to the question whether or not there are any other species bearing a closer resemblance to the present fungus. In view of the literature available at present it would seem that our fungus is very closely related to *Corticium Stevensii* BURT^(4, 19) (or *Corticium koleroga* (COOKE) v. HÖHN. according to WOLF and BACH⁽²⁰⁾), a causal fungus of hypochnose of pomaceous plants, Citrus, crotons, roses, etc. The fungus *Corticium Stevensii* is characterized by having roundish or oblong sclerotia usually 3 or 4 mm in diameter and chestnut brown in color, composed of compactly woven masses of swollen irregular hyphae which are homogeneous throughout the tissues, dirty pinkish buff, membranaceous fructifications with spores measuring $10.5-11.6 \times 4.7-5.8 \mu$ (STEVENS & HALL⁽¹⁹⁾) or $8-11 \times 3-4 \mu$ (BURT⁽⁴⁾), and mycelial rhizomorphic structures extending lengthwise of the twigs and petioles. From the descriptions it would seem that this fungus somewhat differs from ours in having characteristic rhizomorphic structures, in producing sclerotia mostly on twigs, and in host relation. However, both are very closely related to each other in Rhizoctonia-like hyphal nature, sclerotial structure, fructification, mode of penetration, and in relation to temperature and humidity. As regards the matter studies are still in progress, so that further observations will be published later. In conclusion I may say that it would be better to name our fungus *Corticium Sasakii*⁽¹⁶⁾ instead of *Hypochnus Sasakii* until further alteration is needed.

Bibliography

- (1) BRAUN H.: Der Wurzeltöter der Kartoffel *Rhizoctonia Solani* K. Monogr. zum Pflanzenschutz 5, 136 pp. 1930. (cf. R.A.M. 9: 739. 1930)
- (2) BROOKS, E. T.: Plant diseases. pp. 263-265. 1928.
- (3) BURT, E. A.: The Thelephoraceae of North America. I. Ann. Mo. Bot. Garden 1: 185-228. 1914.
- (4) ———.: The Thelephoraceae of North America. XV. *Corticium*. Ibid. 13: 295-298. 1926.

- (5) DUGGAR, B. M.: *Rhizoctonia Crocorum* (PERS.) DC. and R. Solani Kühn (*Corticium vagum* B. & C.) with notes on other species. *Ibid.* 2 : 403-458. 1915.
- (6) ENDO, S.: On the Sclerotium disease of rice plants in the Philippines. (Article in Japanese) *Jour. Plant Protect.* 14 : 283-288. 1927. Also in *Nōgyō-kenkyū* 14 : 1-3. 1930.
- (7) ERIKSSON, J.: Die Pilzkrankheiten der landwirtschaftlichen Kulturgewächse. I Teil. pp. 148-150. 1927.
- (8) FORSTENEICHNER, F.: Die Jugendkrankheiten der Baumwolle in der Türkei. *Phytopath. Zeitschr.* 3 : 367-417. 1931.
- (9) GÜSSOW, H. T.: Beitrag zur Kenntnis des Kartoffel-Grindes. *Corticium vagum* B. et C. var. Solani BURT. *Zeitschr. f. Pflanzenkr.* 16 : 135-137. Taf. VIII. 1906.
- (10) IKATA, S. and HITOMI, T.: On the mode of primary infection through sclerotia and field observations on the basidiospore formation in *Hypochnus Sasakii* Shirai of rice plant. (Article in Japanese) *Jour. Pl. Prot.* 17 : 17-28. 1930.
- (11) KOTILA, J. E.: A study of the biology of a new spore-forming *Rhizoctonia*, *Corticium praticola*. *Phytopath.* 19 : 1059-1099. 1929. (cf. Historical pp. 1060-1062)
- (12) KÜHN, J.: Krankheiten der Kulturgewächse, ihre Ursachen und ihre Verhütung. pp. 222-228. 1858.
- (13) MATSUMOTO, T.: Studies in the physiology of the fungi. XII. Physiological specialization in *Rhizoctonia Solani* KÜHN. *Ann. Mo. Bot. Garden* 8 : 63-96. 1921.
- (14) MATSUMOTO, T., YAMAMOTO, W., and HIRANE, S.: Physiology and parasitism of the fungi generally referred to as *Hypochnus Sasakii* Shirai. I. Differentiation of the strains by means of hyphal fusion and culture in differential media. *Jour. Soc. Trop. Agr.* 4 : 370-388. 1932.
- (15) ———.: Physiology and parasitism of the fungi generally referred to as *Hypochnus Sasakii* Shirai. II. Temperature and humidity relations. *Ibid.* 5 : 332-345. 1933.
- (16) Review of Applied Mycology 7 : 54. 1928.
- (17) SACCARDO, P. A.: *Syll. Fung.* 11 : 130. 1895.
- (18) SAWADA, K.: On the "Shirakinubyō" of camphor. (Article in Japanese) *Taiwan Agr. Exp. Station Special Bull.* No. 4. 80 pp. 1912.
- (19) STEVENS, F. L. and HALL, J. G.: Hypochnose of pomaceous fruits. *Ann. Mycol.* 7 : 49-59, 1909.
- (20) WOLF, F. A. and BACH, W. J.: The thread blight disease caused by *Corticium koleroga* (Cooke) Höhn., on Citrus and pomaceous plants. *Phytopath.* 17 : 689-709, 1927.