

Coleosporium pini - densiorae(新種)によるアカマツの葉さび病

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著者名	陳野,好之 金子,繁
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短 報

A Needle Rust of Japanese Red Pine Caused by a New
*Microcyclic Coleosporium**

Yoshiyuki ZINNO** & Shigeru KANEKO**

I. Introduction

In June 1963, a needle rust caused by a microcyclic *Coleosporium* species was found on Japanese red pine (*Pinus densiflora* S. et Z.) about 30 years old planted at the Gifu Prefectural Forest Experiment Station (Yamada-machi, Takayama City, Gifu Prefecture) by Mr. Y. MORIMOTO. The senior author made field surveys of the disease in 1963 and 1964. However, the disease has not been found since then. The exact species name of the causal fungus that had been tentatively identified as *Coleosporium pinicola* (ARTH.) JACKSON, remained unclear.

Most pine needle-rusts are caused by the aecial stage of macrocyclic heteroecious *Coleosporium* species. Microcyclic needle-rusts have only telia or telia and spermogonia on pine needles during their life cycles. In Japan, a needle rust caused by *C. pini-pumilae* AZBUKINA, a microcyclic rust, has been known to occur on Japanese stone pine (*P. pumila* REGEL) (N. HIRATSUKA and Y. HIRATSUKA, 1958; KANEKO, 1981), but no microcyclic rust fungi have been known on two-needle pines except for this rust under discussion. This paper describes the symptoms and signs of the disease, and the taxonomy of the causal fungus is discussed.

II. Symptoms and Signs of the Disease

The first symptom appears in the middle of October on the current-year needles as reddish-brown small spots with yellowish areas on the margins. In June of the following year, the reddish-brown spots increase in size and become dark. In severe cases, an entire needle becomes brown (Fig. 2 A); premature defoliation results. Yellow-orange, glossy telia develop in the lesions of the needles (Fig. 2 B). They protrude in rows, and are 0.5~1 mm or more long when confluent, 0.2~0.4 mm broad, and 0.2~0.5 mm high.

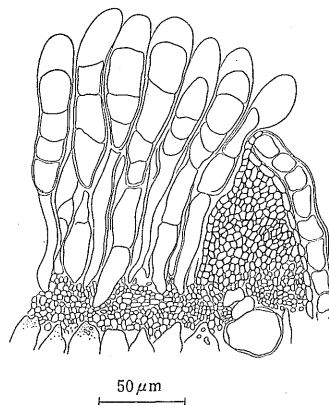
III. Morphology of the Fungus

The teliospores (probasidia) (Figs. 2 C and 2 D) are subepidermal in origin, erumpent, one-celled, and catenulate in chains of three to ten spores

(Fig. 1); the chains are laterally crowded but scarcely adherent. The teliospores develop into four-celled internal basidia (metabasidia) mostly with a sterile cell at the base (Fig. 2 D) without dormancy. The basidia frequently are septate longitudinally or obliquely, and often are observed to be cruciate in form. The one-celled teliospores are obovate, clavate, or cylindrical, and 60~85×20~35 μ m in size, excluding the gelatinous apical layer; the four-celled internal basidia are shorter than the one-celled teliospores and 47.5~70×22~35 (37.5) μ m in size (av. 58.5×27.5 μ m); the basal sterile cells are 7~38 μ m long; the wall is hyaline and 1.5~2 μ m thick. The gelatinous apical layer is 12~18 μ m thick. The basidiospores (Fig. 2 E) are produced at the tip of long sterigmata, broadly ellipsoidal, and 25~27.5×13.5~17.5 μ m in size. The cytoplasm of the basidia and basidiospores is orange-yellow. No spermogonia were found in the lesions.

IV. Taxonomic Discussion and Description of the Fungus

Four microcyclic *Coleosporium* species have been known throughout the world; of those, only *C. pinicola* in North America attacks two-needle pines. The type specimen of *C. pinicola* on *P. virginiana* MILL. had been collected in Washington, D. C. by

Fig. 1. Part of a telium of *C. pini-densiflorae** 陳野好之・金子 繁: *Coleosporium pini-densiflorae* (新種) によるアカマツの葉さび病

** Tohoku Branch, For. & For. Prod. Res. Inst., Morioka 020-01 林業試験場東北支場

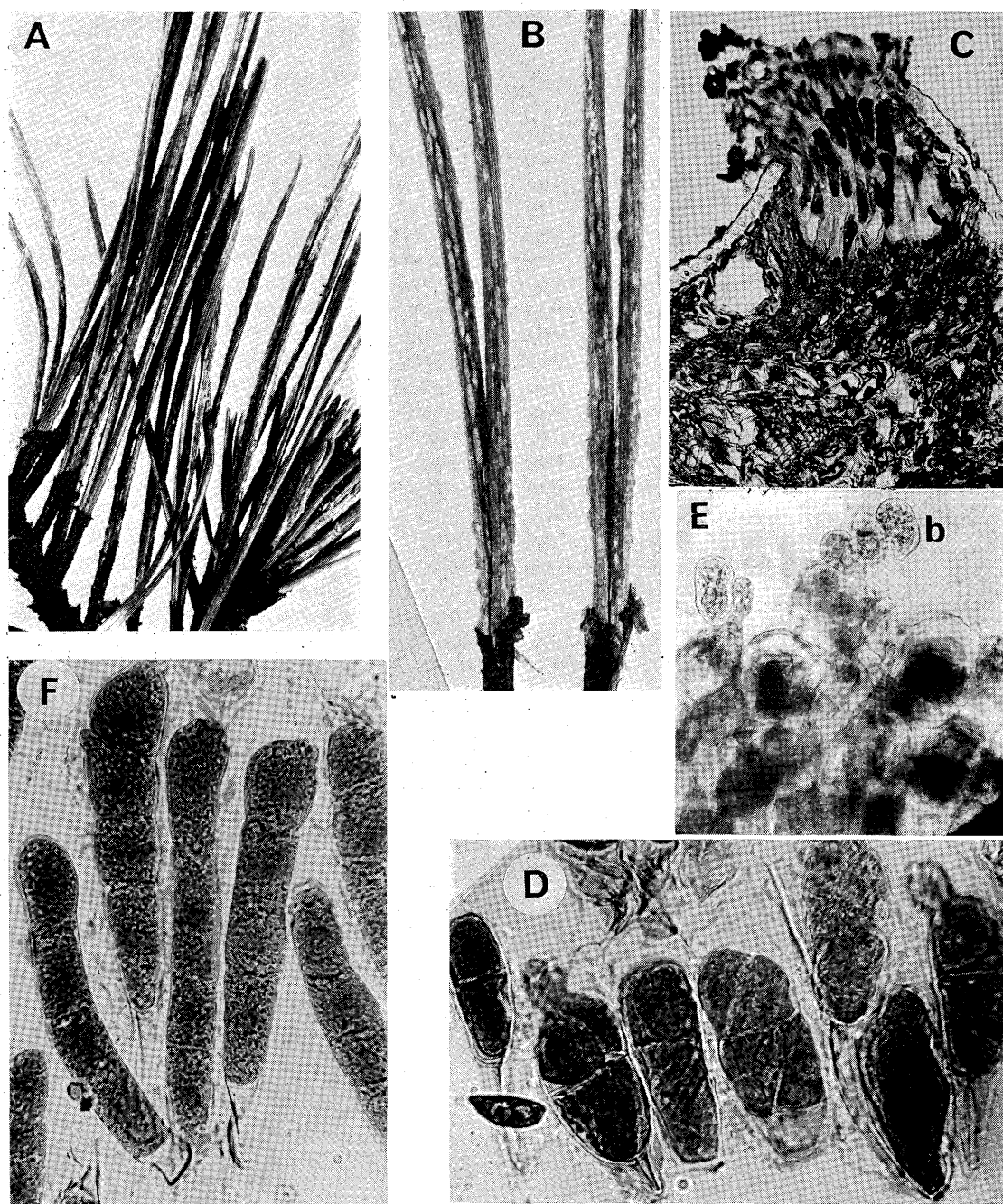


Fig. 2. A needle rust of *P. densiflora* caused by *C. pini-densiflorae* (A~E) and basidia of *C. pinicola* (F)

A: Affected needles

B: Telia on needles

C: Vertical section of telium (x130)

D: One-celled teliospore and 4-celled basidia (x530)

E: Basidiospores (b) (x350)

F: Four-celled basidia of *C. pinicola* from U.S.A. (PUR 2005) on *P. virginiana*

B. T. GALLOWAY. N. HIRATSUKA and Y. HIRATSUKA (1958) had recorded *C. pinicola* on *P. pumila* found in Hokkaido. The fungus, however, was re-identified later as *C. pini-pumilae* by HIRATSUKA (1970).

We examined seven North American specimens of *C. pinicola* on either *P. virginiana* or *P. banksiana* LAMB. from the ARTHUR Herbarium, U. S. A. (PUR 1342, 2005, 2008, and 43821), the National Mycological Herbarium, Canada (ex DAOM 76290 and 144452), and the Herbarium of Northern Forestry Research Centre, Canada (ex CFB 3620). In these is included the GALLOWAY collection (PUR 1342) of 1891 from the type locality. These observations indicated that the subject fungus on *P. densiflora* is clearly distinct morphologically from the North American specimens of *C. pinicola*. Although the four-celled internal basidia of *C. pinicola* provide mostly a basal sterile-cell like the subject fungus, the one-celled teliospores and internal basidia of *C. pinicola* were significantly more slender than those of the subject fungus. In *C. pinicola*, the one-celled teliospores were $55\sim160$ (200) $\times$ $12.5\sim25$ (30) μm in size; the four-celled basidia were $57.5\sim123\times15\sim27.5$ (30) μm in size (range of averages of each specimen $80\sim92\times20.5\sim23.5$ μm), and the basal sterile-cells were $12\sim45$ μm long. Furthermore, longitudinally septate basidia occurred very rarely (Fig. 2 F).

Three microcyclic *Coleosporium* species on five-needle pines have morphological characteristics (KANEKO, 1981) distinct from the subject fungus as well as having differences in host relationships. Therefore, we consider the microcyclic *Coleosporium* on *P. densiflora* to be a new species.

Microcyclic *Coleosporium* species follow "TRANZSCHER's law" in that they produce their telia on the aecial host of the parental macrocyclic heteroecious species (CUMMINS, 1959). Almost all macrocyclic *Coleosporium* species found in Japan are different from those in North America (KANEKO, 1981). Therefore, it is reasonable that microcyclic species derived from macrocyclic ones in Japan are different from those in North America. It is suspected that the subject rust is the microcyclic derivative of *C. phellodendri* KOM. that produces its aecia on *P. densiflora* and *P. thunbergii* and frequently has longitudinally septate basidia. The *Coleosporium* species is described below as a new species.

***Coleosporium pini-densiflorae* ZINNO et KANEKO, sp. nov. (Figs. 1, 2)**

Teliis amphigenis, primo subepidermalibus, erumpentibus, 0.5–1 mm longis vel plus quam confluentibus, 0.2–0.4 mm latis, 0.2–0.5 mm altis, flavido-aurantiacis; teliosporis in catenulas e 3–10 sporis dispositis, unicellularibus, obovatis, clavatis vel cylindraceis, $60\sim85\times20\sim35$ μm , basidiis 3-septatis, $47.5\sim70\times22\sim35$ (37.5) μm (plerumque 58.5×27.5 μm), frequenter septis longitudinalibus plerumque cellulae basali sterili $7\sim38$ μm longae, pariete hyalino, $1.5\sim2$ μm crasso instructis; acro-stromate gelatinoso, $12\sim18$ μm crasso; basidiosporis late ellipsoideis, $25\sim27.5\times13.5\sim17.5$ μm .

Holotype: on *Pinus densiflora* SIEB. et ZUCC. (Akamatsu). Gifu Prefectural Forest Experiment Station, Yamada-machi, Takayama City, Gifu Prefecture Japan, June 10, 1963, Y. MORIMOTO, in Herbarium, Forestry and Forest Products Research Institute, Tsukuba (TFM: FPH 2740).

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