

I think PDA medium was formulated  
by Thaxter. There is mention of Thaxter (1888)  
in Limson et al book (1988)

## A NEW FORM GENUS OF THE MONILIACEAE

DONALD P. LIMBER<sup>1</sup>

(WITH 2 FIGURES)

A fungus which, when examined under a hand lens, appeared to belong to the form genus *Verticillium* was found on the dead roots of a plant of *Yucca Treculeana* that was of Cuban origin. More detailed study quickly showed the fungus to be distinct. The conidia-bearing branches had a zigzag appearance under low magnification. Under higher magnification they were seen to be similar in form to the rachis of a wheat spike. In this respect the fungus somewhat resembles *Polythrincium Trifolii* Schmidt & Kunze as described by Wolf.<sup>2</sup> Lacking a perfect stage, its bright yellowish conidiophores and mycelium place it in the form family Moniliaceae and the verticillate habit of the conidiophores assigns it to the tribe Verticilliae. A search of the literature for a verticillate, moniliaceous fungus, bearing conidia on the peculiar zigzag conidiophores described, was unrewarded until our attention was called by Miss Vera K. Charles to a fungus described by Ferraris<sup>3</sup> under the binomial *Sporotrichum flavicans* Fries var. *spicatum* Ferraris. This fungus differs from the one under discussion in that it is described and illustrated with conidiophores bearing only a single whorl of branches. We have been unable to secure a specimen of Ferraris' fungus. It was possible, however,

<sup>1</sup> Grateful acknowledgment is made to Miss Edith K. Cash of the Division of Mycology and Disease Survey, Bureau of Plant Industry, U. S. Department of Agriculture, who contributed the Latin diagnoses; to Miss Vera K. Charles of the same division for assistance in the search of literature; to Dr. Charles Thom of the Division of Soil Microbiology, B. P. I., for the fungus described under the name *T. album*; and to Mr. John A. Stevenson of the Division of Mycology and Disease Survey, B. P. I., for constructive criticism and assistance throughout the work reported.

<sup>2</sup> Wolf, Frederick A. Morphology of *Polythrincium* causing sooty blotch of clover. *Mycologia* 27: 58-73. illus. 1935.

<sup>3</sup> Ferraris, T. *Ann. Myc.* 10: 295. illus. 1912. Also in: *Flora Italica Cryptogama Fasc.* 10: 671-672. illus. 1913.

Nov. 28  
25

LIMBER: NEW FORM GENUS OF MONILIACEAE

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to grow our fungus on the underside of a cork which was placed in the mouth of a flask of picric acid, thus duplicating the substratum on which *S. flavicans* var. *spicatum* was first found. Under these conditions our fungus did not revert to the simpler type of branching described by Ferraris. It seems best, therefore, to describe the fungus isolated from *Yucca* root as a distinct species.

Though Ferraris described his fungus as a variety of *S. flavicans* it seems clear that he recognized that *S. flavicans* var. *spicatum* bore conidiophores of a form differing from those of the form genus *Sporotrichum* Link. He states, "Curious for the origin of the conidia and the formation of the conidiferous spike. The first conidium is formed at the apex. Below this is formed another branch which bears another conidium somewhat higher up. Thus the first becomes lateral, then there is another branch which extends in an opposite direction, and so always runs alternately, forming a symmetrical ramification in the highly regular ensemble. The axis of the spike is accordingly tortuous as if bent zigzag, and is sometimes quite long."<sup>4</sup>

After the *Yucca* fungus had been under study for about three years, it was our good fortune to receive, through the kindness of Dr. Charles Thom, a similar fungus showing differences of only specific value. On the basis of these fungi and *Sporotrichum flavicans* Fries var. *spicatum* Ferraris, the latter of which quite evidently is more closely related to the first two in form than to the genus *Sporotrichum* and should be transferred to the *Verticillium*, we propose the new form genus as described below:

*Tritirachium*<sup>5</sup> gen. nov.

Mycelium hyaline or dilutely colored, branched, septate, sinuous, slender; conidiophores long, erect or recumbent, septate, vertically branched (irregular branching may occur on unfavorable substratum), sometimes biverticillate or triverticillately branched, apical branches slightly subulate at the base and tapering to the rachis-like or zigzag conidia-bearing portion; conidia acropleurous, globose to ovate, hyaline or dilutely colored, often conglutinate.

<sup>4</sup> Translation from the Italian by Mr. C. R. Sage, specialist in the translation of foreign languages.

<sup>5</sup> The name is based on the resemblance in form of the conidiophore tips to the rachis of *Triticum*.

Mycelium hyalino vel pallide flavido, ramoso flexuoso, parce septato; conidiophoris longis, erectis vel procumbentibus, septatis, verticillatim ramosis, vel bis vel ter verticillatim ramosis; ramis apicalibus subulatis, alternate in forme rachidis vel "zigzag" ordinatis; conidis acropleurous globosis vel ovatis, hyalinis vel pallide flavis saepe conglutinatiss.

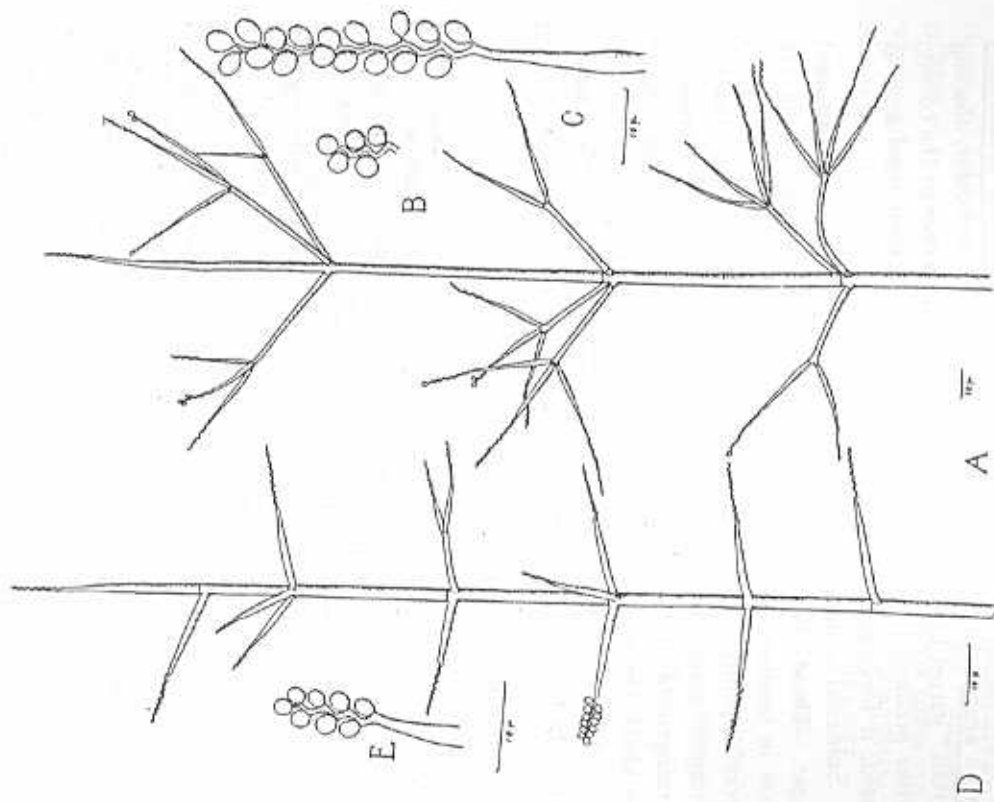


FIG. 1. A-C, *Tritirachium dependens*; D, E, *T. album*.

The members of this form genus are readily distinguished from other members of the Moniliaceae by the zigzag form of the fertile portion of the conidiophore (FIG. 2, A, B).

*Tritirachium dependens* n. sp. nov.

Mycelium pale-yellowish to brownish-yellow, branched septate; conidiophores long, stiffly upright, septate,  $2.5-4.8 \mu \times 600-900 \mu$ ,<sup>7</sup> verticillately branched; 5-10 whorls of branches, mostly 5; branches in primary whorl 2 or 3, mostly 3, primary branches usually branch giving a secondary verticil of 2-4 branches; secondary branches occasionally branch giving a tertiary verticil; conidiophores and branches cylindrical except the terminal branches, these slightly swollen near the base and tapering to the first conidia, from the first conidia to the tip zigzag (FIG. 1, A); a definite spiral can sometimes be detected in young conidiophore tips bearing three or four spores; conidia acropleurogenous, globose to slightly ovate, pale-yellow, smooth,  $2.1-3.3 \mu \times 2.8-3.6 \mu$ , soon cut off, but under favorable conditions spores cohere and may form a club-like mass covering the conidiophore branch or may, on falling away, collect in the axil of the verticil.

Mycelio pallide flavido, ramoso, septato; conidiophoris longis, rigide erectis, septatis, verticillatim ramosis,  $2.5-4.8 \mu$  in diam.,  $600-900 \mu$  longis, verticillis primariarum ramorum 5-10, fere 5, praeditis; ramis primariis plerumque verticillum secundarium ramulorum 2-4, et ramulis secundariis interdum verticillum tertiarium gerentibus; conidiophoris et ramis cylindricis, ramulis spicalibus ad basim subulatis; alternate in forma rachidis vel spiraltier ordinatis; conidiis acropleurogenous, globosis vel aliquanto ovalis, pallide flavis,  $2.1-3.3 \mu \times 2.8-3.6 \mu$ , mox abscissis, saepe circum conidiophorum vel in axe verticilli conglutinatis.

Hab. in radicibus *Yuccae Treculanae*, in Cuba, cum *Penicillio consociatus*.

Type and dried culture deposited in the Mycological Collections of the Bureau of Plant Industry. This specimen is also designated as the type for the genus *Tritirachium*.

## CULTURAL CHARACTERS

The conidia germinate slowly in agar media. Six to seven days elapse before a single spore colony becomes visible to the unaided eye. Growth on such common media as potato dextrose, corn meal, or lima bean agar is restricted, and in some cultures it is definitely of the starvation type with the aerial growth scant and closely appressed to the surface of the agar. On Thaxter's potato

<sup>6</sup> The name refers to the dependence of this fungus on other fungi for accessory growth substances.

<sup>7</sup> The conidiophore measurements and details are those of the original interception of *Yucca*. On culture media longer conidiophores are found and more complex branching.

dextrose agar a needle streak spreads laterally only 4-5 mm. (FIG. 2, C, tube labeled control at right). On corn meal agar a needle streak attains a width of 2-3 mm. The color of the aerial growth is "vinaceous fawn" to "avellaneous."<sup>8</sup> Thaxter's potato dextrose agar, used as the substratum, takes on a red color, shading from "garnet brown" to maroon beneath the center of the colony, after prolonged growth of the fungus; when corn meal agar is used, it becomes slightly pink.

Subaerial conidia may be found in cultures grown on corn meal agar. These may occur sparsely, in which case the conidia are few in number on the zigzag branch (1-3) and normal in size; or abundantly. In this case the conidia-bearing portion of the branches resembles a raceme (FIG. 1, C) due to the less crowded arrangement of the conidia and the fact that they are here borne on short sterigma or stalks measuring about  $1 \mu$  long; the conidia are larger, measuring up to  $2.3-4 \mu \times 3.2-4.5 \mu$  and are more ovate in shape than the aerial conidia.

*Tritirachium album* sp. nov.

Mycelium hyaline, tortuous, septate, sparingly branched, branches usually near septa,  $1-2 \mu$  in diameter, conidiophores erect, or recumbent with age, branched, branches usually in whorls of 2-4, occasionally biverticillate with 2-3 branches in secondary verticil, fertile branches short, forming a  $70^{\circ}-90^{\circ}$  angle with the conidiophore, sterile portion cylindrical to subulate, fertile region zigzag; conidia hyaline, globose or ovate,  $1.6-2.5 \mu \times 1.7-3.2 \mu$  (based on 60 measurements).

Mycelio hyalino, tortuoso, septato, parce ramoso, ramis plerumque prope septum,  $1-2 \mu$  in diam., conidiophoris rectis vel in maturitate recumbentibus, 2-4 verticilliter ramosis, ramis fertilibus brevibus, parte sterili cylindrica usque subulata, parte fertili "zigzag"; conidiis hyalinis, globosis vel ovalis,  $1.6-2.5 \mu \times 1.7-3.2 \mu$

Dried culture deposited in the Mycological Collections of the Bureau of Plant Industry.

<sup>8</sup> Color readings in quotation marks are based on Ridgway, Ridgway, R. Color standards and color nomenclature. 43 pp. Washington, D. C. illus. 1912.

CULTURAL CHARACTERS

Mycelial mat pure white, forming a low dome or hemisphere, densely matted, covering substrate if moisture conditions remain favorable, surface cottony, margin regular. On Czapek's agar the conidiophores are quite uniformly verticillate (FIG. 1, D) with numerous whorls of short and, usually, simple branches. The color of the substrate on this medium is "orange." On Thaxter's potato dextrose agar vegetative growth is encouraged at the expense of spore production and less regularity is found in the verticillate character of the conidiophores. Fifty per cent of the whorls may be represented by solitary branches. On this medium the color of the substrate is "orange."

This species was received in pure culture from Dr. Charles Thom as acknowledged above. It was separated by Dr. Thom from a colony of *Penicillium intricatum* Thom and was thought to be a contaminant. Dr. Thom received the material from Oscar W. Richards of the Spencer Lens Co., Buffalo, N. Y., who informed the writer that the collection "was taken from a book" in the basement of the Marine Biological Laboratory, Woods Hole, Mass., in 1937. A brief description of this habitat is given by Richards and Hawley.<sup>9</sup> But the reader is cautioned that, as *T. album* was probably a contaminant of the *Penicillium* culture, it may have entered the culture at a later date and be of quite different origin. It is perhaps noteworthy that both this species and *Trichirachium dependens* were found associated with species of *Penicillium*.

SPOROTRICHUM FLAVICANS FRIES VAR. SPICATUM FERRARIS

This fungus is described and illustrated by T. Ferraris as having verticillately branched conidiophores, and zigzag conidiophore tips. As noted above, it resembles *T. dependens* so closely as to suggest identity. As *S. flavicans* var. *spicatum* is not available for study, we are forced to accept the difference in their conidiophore branching, that is, a single whorl of branches, some of which may be forked, for *S. flavicans* var. *spicatum*; whereas *T. dependens* shows many whorls with secondary and tertiary division of the

<sup>9</sup> Richards, Oscar W., & Hawley, K. J. Mold elimination in marine laboratories. Jour. Chem. Educ. 16: 6-10. 1936.

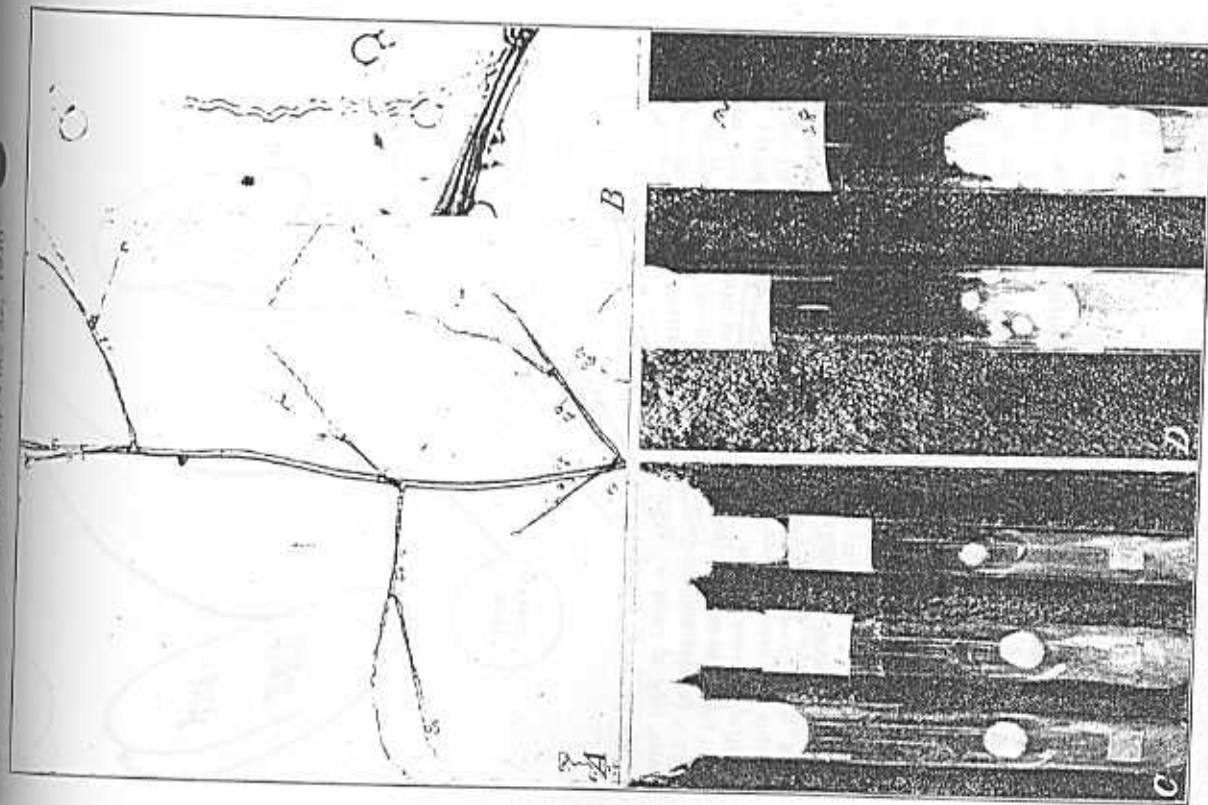


FIG. 2. A-C, *Trichirachium dependens*; D, *T. album*.



branches, as a specific difference. We would assign *Sporotrichum flavicans* Fries var. *spicatum* Ferraris to the new form genus *Tritirachium*.

*Tritirachium spicatum* (Ferraris) comb. nov.

*Sporotrichum flavicans* Fries var. *spicatum* Ferraris.

BUREAU ENTOMOLOGY AND PLANT QUARANTINE,  
WASHINGTON, D. C.

#### EXPLANATION OF FIGURES

Fig. 1, A-C. *Tritirachium dependens*: A, conidiophore; B, conidia on conidiophore; C, subaerial conidia; D-E, *Tritirachium album*: D, conidiophore; E, conidia attached.

Fig. 2, A-C. *Tritirachium dependens*: A, portion of conidiophore with branches; B, conidiophore tip under higher magnification; C, tube labeled "control" shows normal restricted growth on Thaxter's potato dextrose agar; the tubes at the left received additions of growth accessory nature and show a decided response; D, *Tritirachium album*; tube at left on synthetic media, tube at right on Thaxter's potato dextrose agar. Photomicrographs by Marcel L. F. Foubert.

## DEVELOPMENT OF GASTERELLA LUTOPHILA

LEVA B. WALKER<sup>1</sup>

(WITH 45 FIGURES)

*Gasterella lutophila* was described by S. M. Zeller and Walker<sup>2</sup> from an initial collection of the fungus that had developed upon the surface of saturated woodland loess soil in a greenhouse, during very hot weather. At the suggestion of Dr. Zeller the source of the soil was traced and, as indicated in a note appended to the published paper, abundant additional materials were secured after the paper was in the hands of the publisher. Since then many soil collections from the same region have been obtained during various seasons, and in all cases (except one collection) *Gasterella* appeared in just three weeks after the soil had been saturated, covered and placed under growing conditions. Soil from this region, on one occasion, was stored dry during the entire summer in a third floor room where the temperatures were near or above 100° F. throughout an especially hot, dry summer. Upon saturation in the fall *Gasterella* appeared as usual. These later cultures have furnished quantities of materials for study. Soils from other regions that have been tested by the writer have never developed the fungus.<sup>3</sup>

In spite of the fact that *Gasterella* seems to be so abundantly present in these loess soils the writer or seemingly no one else has been able to find the fungus in its natural habitat. Whether it is epi- or hypogeous in nature is uncertain. Attempts to determine experimentally this point yielded inconclusive evidence. Where

<sup>1</sup> Contribution No. 116 from the Department of Botany, University of Nebraska.

<sup>2</sup> Zeller, S. M., and Leva B. Walker. *Gasterella*, a new uniloculate Gasteromycete. *Mycologia* 27: 573-579, 13 figs. 1935.

<sup>3</sup> Mr. John B. Routien of Mich. Agr. College writes me he has secured *Gasterella* from several locations in Michigan. A slide sent me agrees perfectly with the original materials studied. His cultures were made during the summer.

