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The Aquatic Hyphomycete *Geniculospora inflata* from Labrador

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extracts imply a lack of chemotaxonomic significance, at least at the generic level, for these constituents in the investigated species.

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## THE AQUATIC HYPHOMYCETE GENICULOSPORA INFLATA FROM LABRADOR<sup>1</sup>

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During a survey of the parasites of black-fly and mosquito larvae in the vicinity of the spray zone of Churchill Falls (Labrador), the author also collected saprophytic fungi. One collection (L21; June 6, 1971) consisted of a submerged, decaying twig from a pool (1.2 m × 1.2 m × 0.3 m deep; 6 C) on the margin of a swiftly flowing stream just outside of the spray zone. The twig was covered with mycelial tufts and aleuriospores of *Geniculospora inflata* (Ingold) Nilsson ex Marvanová & Nilsson (1971).

<sup>1</sup> Studies in Biology from Memorial University of Newfoundland, No. 284.

This species was originally described as *Articulospora inflata* by Ingold (1944). His material was on submerged, decaying oak and sycamore leaves collected from a stream near Leeds, England. Nilsson (1964) transferred *A. inflata* to a new genus *Geniculospora* which contains aquatic Hyphomycetes with hyaline, septate, tetra-radiate aleurio-spores—the third and fourth arms of which arise successively at the same level on the bent axis of the spore. Members of *Geniculospora* are also characterized by the production in the spore primordium of a septum which then separates spore arm #1 (the basal arm attached to the aleuriophore) and spore arm #2. Spore arm #1 is separated from the aleuriophore by a single septum rather than by a specialized cell (separation cell).

Because it is essential to know the method and sequence of production of the spore arms, the identification of members of some genera, e.g., *Geniculospora* and *Articulospora*, with hyaline, tetra-radiate aleurio-spores is extremely difficult unless developmental stages occur in field material or unless developmental studies are carried out with cultured material. Unfortunately, some isolates either require certain conditions for the induction of sporulation (Ingold, 1942; Iqbal, 1971) or will not form spores in culture (Conway, 1970).

Within the genus *Geniculospora*, *G. grandis* Greathead ex Nolan (see below), is distinctive because of its wide spore arms and its tendency to form constrictions at intervals along the spore arms; whereas, *G. inflata* and *G. intermedia* (Petersen) Nilsson ex Marvanová & Nilsson (1971) appear to be very similar, if not identical (TABLE I).

The Labrador material (L21) possessed the characteristic tetra-radiate spores (FIG. 1) with an inflation at the apical end of spore arm #1 (FIG. 2). As originally reported by Ingold (1944), a septum occurred at the base of spore arm #2 (FIG. 2, arrow). The constriction at the base of the third and fourth spore arms (Ingold, 1944) was found only at the base of the third arm in the Labrador material and was most obvious in immature spores. Many of the spores did not have fully developed fourth arms. The lengths of the aleuriophore were greater than those previously reported for *G. inflata* but close to those given for *G. intermedia* [= *Tricladium intermedium* Petersen (1962); TABLE I]. One aspect of spore development in *G. inflata*, which was evident in the Labrador material and which has not been mentioned in the literature, was the formation of a swollen region in the hyphal tip at the time of the initiation of aleuriophore development. The swelling (FIG. 3, arrow) persists during spore development and marks the base of the aleuriophore. This swelling was found only when spores

TABLE I  
COMPARISON OF SPORE AND RELATED CHARACTERS FOR  
GENICULOSPORA INTERMEDIA AND *G. INFLATA*

	<i>G. intermedia</i> (Petersen, 1962)	<i>G. inflata</i>	
		(Ingold, 1944)	L21
Spore arm length			
# 1	} 150–200 $\mu$	50–70 $\mu$	(38–)48–84 $\mu$
# 2		50–120 $\mu$	72–144 (–151) $\mu$
# 3, # 4		50–120 $\mu$	77–152 (–182) $\mu$
Spore arm width	3.8–4.2 $\mu$	3–4 $\mu$	3.2–3.6 $\mu$
Inflation width	—	—	4.8–7.2 $\mu$
Number of septa			
arm # 1	up to 2 <sup>a</sup>	up to 2	up to 2
arm # 2 <sup>b</sup>	up to 3 <sup>a</sup>	up to 2	up to 4
arm # 3	1 <sup>a</sup>	up to 2	up to 3
arm # 4	1 <sup>a</sup>	up to 2	none <sup>c</sup>
Location of constriction	base of arm # 3 and # 4	base of arm # 3 and # 4	base of arm # 3 <sup>c</sup>
Aleuriophore			
length	50–100 $\mu$	40–50 $\mu$	76–100 $\mu$
width	4.0–4.2 $\mu$	3–4 $\mu$	3.2–3.6 $\mu$
Mycelium (width)	—	—	2.4–4.8 $\mu$

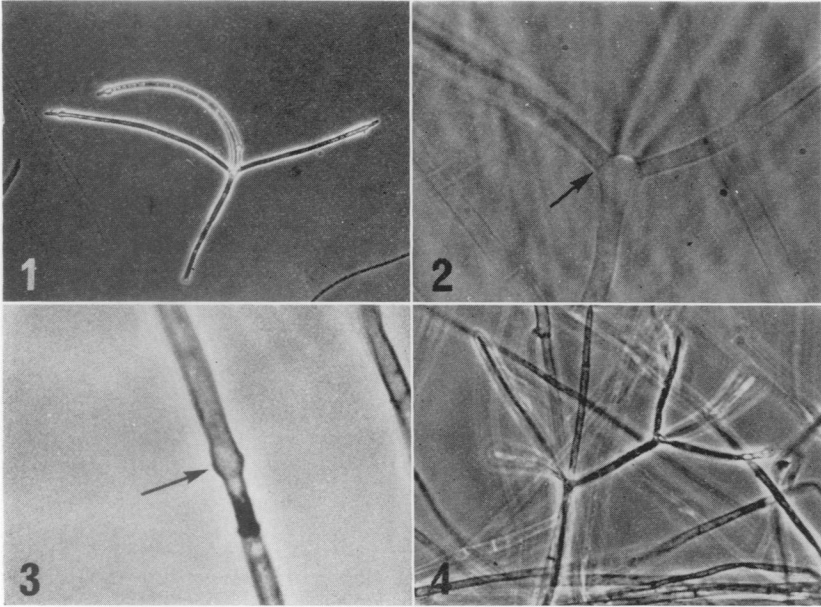
<sup>a</sup> Based on text figures.

<sup>b</sup> Including one at base.

<sup>c</sup> See text comment on spore arm # 4.

were formed at the tips of the main hyphal axis. The Labrador material (L21) has been deposited in Herb. NFLD.

Iqbal (1971) has questioned the need for the genus *Gemiculospora* on the basis of the production by *Tricladium giganteum* Iqbal of spores with lateral arms (#3 and #4) which arise successively at either different levels or at the same level. However, he includes only the spore form with lateral arms at the same level in his diagnosis. It is difficult to determine on the basis of the drawings presented (Iqbal, 1971: Fig. 3 A–L) if there is a consistent pattern of spore development in the material. For example, a cross-wall which would separate spore arms #1 and #2 is indicated in the spore primordium (Fig. 3 A) but not in some more fully developed spores (Fig. 3 B, C, E). Variant spore forms are not unknown in the aquatic Hyphomycetes. Ingold (1942) has noted that, in culture, *Tricladium splendens* Ingold may commonly form spores with a main axis and only one of the two lateral arms and, in one instance, form a spore with no lateral arms. Ingold (1944; Fig. 3 E) has figured a spore of *Articulospora inflata* with an additional lateral arm at a different level than the point of divergence of the other arms. The Labrador material (L21) possessed one variant spore form in which a lateral spore arm functioned as a spore primordium



FIGS. 1-4. *Geniculospora inflata*. 1. Tetra-radiate aleuriospore,  $\times 200$ . 2. Inflation at apical end of spore arm #1. Arrow indicates septum at base of spore arm #2,  $\times 800$ . 3. Swelling (arrow) at base of the aleuriophore,  $\times 960$ . 4. Variant spore,  $\times 300$ .

(FIG. 4). These instances indicate our lack of information on the effects of environmental factors on spore development and variability.

The generic name *Geniculospora* has recently been validated with *G. inflata* designated as the type species (Marvanová and Nilsson, 1971). However, type material is not available for either *A. inflata* (personal communication from Prof. C. T. Ingold; November 4, 1971) or *T. intermedium*. The slides of *T. intermedium* deposited by Dr. R. H. Petersen at the New York Botanical Garden are severely desiccated and no longer usable (personal observation; November 25, 1971). Also, neither Greathead (1961) nor Nilsson (1964) designated a type for *G. grandis*. The author proposes that: (1) *G. intermedia* be reduced to synonymy with *G. inflata*; (2) in the absence of type material, the original illustrations and text descriptions of *A. inflata* (Ingold, 1944) function as the holotype for *G. inflata*; and (3) in the absence of a designated type, the text descriptions, illustrations and plates for *A. grandis* (Greathead, 1961), which is now transferred to the genus *Geniculospora*, function as the holotype of *G. grandis*.

GENICULOSPORA Nilsson ex Marvanová & Nilsson, Trans. Brit. Mycol. Soc. 57: 532. 1971.

≡ [*Geniculospora* Nilsson, Symb. Bot. Upsal. 18(2): 95. 1964; not validly published (type not indicated)].

TYPUS: *Geniculospora inflata* (Ingold) Nilsson ex Marvanová & Nilsson.

GENICULOSPORA INFLATA (Ingold) Nilsson ex Marvanová & Nilsson, Trans. Brit. Mycol. Soc. 57: 532. 1971.

≡ *Articulospora inflata* Ingold, Trans. Brit. Mycol. Soc. 27: 38. 1944.

≡ [*Geniculospora inflata* (Ingold) Nilsson, Symb. Bot. Upsal. 18(2): 96. 1964; not validly published (generic name not validly published)].

HOLOTYPUS: On decaying oak leaves, Meanwood Valley, near Leeds, England, specimen illustrated by Ingold (1944: Fig. 1).

≡ *Geniculospora intermedia* (Petersen) Nilsson ex Marvanová & Nilsson, Trans. Brit. Mycol. Soc. 57: 532. 1971.

≡ *Tricladium intermedium* Petersen, Mycologia 54: 135. 1962.

≡ [*Geniculospora intermedia* (Petersen) Nilsson, Symb. Bot. Upsal. 18(2): 96. 1964; not validly published (generic name not validly published)].

***Geniculospora grandis* Greathead ex Nolan, sp. nov.**

≡ [*Articulospora grandis* Greathead, J. S. African Bot. 27: 218. 1961; not validly published (type not designated)].

≡ [*Geniculospora grandis* (Greathead) Nilsson, Symb. Bot. Upsal. 18(2): 95. 1964; not validly published (generic name not validly published and type not designated)].

HOLOTYPUS: On leaves of *Celtis africana* Burmf. from Paradise Kloof, Eastern Cape Province of South Africa, specimen illustrated by Greathead (1961: Fig. 10 and Pl. 29, C, D).

The distribution of *G. inflata* in continental North America appears to be limited to the eastern portion. Conway (1970) found *G. inflata* in four out of five streams studied in New York State. Petersen (1962) found *A. inflata* in New York State and *T. intermedium* in New Jersey and South Carolina in a study covering New York, New Jersey, Pennsylvania, Connecticut, North Carolina, South Carolina, Tennessee and

Georgia. Crane (1968) found *G. intermedia* in Maine in a study covering Maine, Virginia, West Virginia, Maryland, Delaware, Pennsylvania, Massachusetts, Connecticut, Vermont and New Hampshire. Ranzoni (1953), Baxter (1960, 1964), Scott and Umphlett (1963) and Ingold (1960) did not include the above taxa in their lists covering California, Wyoming, Oregon, Virginia and Canada (Quebec), respectively.

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