Rhizopogon pannosus – Rhizopogon pumilionus?

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Received 23. 3. 2000

Key words: *Rhizopogon pumilionus*, *R. pannosus*. – Spore data, taxonomy. – Mycobiota of Austria.

Abstract: The holotypes of *Rhizopogon pannosus* and *R. pumilionus* have been compared with seven recent collections. This led to the conclusion, that *R. pumilionus* is not conspecific neither with *R. pannosus* nor with *R. roseolus*. Thus, all recent collections studied in this context belong to *R. pumilionus*.

Zusammenfassung: Die Holotypen von *Rhizopogon pannosus* und *R. pumilionus* wurden mit rezenten Aufsammlungen verglichen. Das führte zu dem Ergebnis, daß *R. pumilionus* weder *mit R. pannosus* noch mit *R. roseolus* konspezifisch ist. Alle in diesem Zusammenhang untersuchten rezenten Aufsammlungen gehören daher zu *R. pumilionus*.

When we compiled our article on *Rhizopogon pannosus* ZELLER & DODGE (MOSER & al. 1999) we relied on the monographs of SMITH & ZELLER (1966) and particularly MARTÍN (1996) for determination. In both monographs our records from Zireiner Lake keyed out to *R. pannosus* without problems and seemed to coincide sufficiently with the descriptions. After publication of our paper BRESINSKY (pers. comm.) drew our attention to two publications in Zeitschrift für Mykologie (BRESINSKY & STEGLICH 1989, BRESINSKY 1996). In these papers *R. pumilionus* ADE ex BATAILLE was described, found in very similar subalpine habitats in Tyrol and southern Bavaria respectively. Both collections had truncate spores too and were made under *Pinus mugo* TURRA. They are certainly conspecific with our fungus from Zireiner Lake. This stressed on the problem of the correct name. If *R. pannosus* and *R. pumilionus* would be conspecific, the name *R. pannosus* ZELLER & DODGE (1918) would have priority over *R. pumilionus* ADE 1909, as this name was validated only by BATAILLE (1923). The problem became more complicated by the fact, that MARTÍN, when revising the type of *R. pumilionus* synonymized it with *R. vulgaris* (VITT.) M. LANGE var. *intermedius* SVRČEK on the scheda in the herbarium in Munich or *R. roseolus* (CORDA) TH. M. FRIES respectively in her monograph, a species for which she does not indicate truncate spores. This may possibly have been influenced by the remark of SOEHNER in the herbarium M, who referred it to *R. rubescens* TUL. & C. TUL. And a further complication arises from the fact that the collection now designated as type of *R. pannosus* seems not to correspond to the original description. SMITH & ZELLER (1966) wrote:

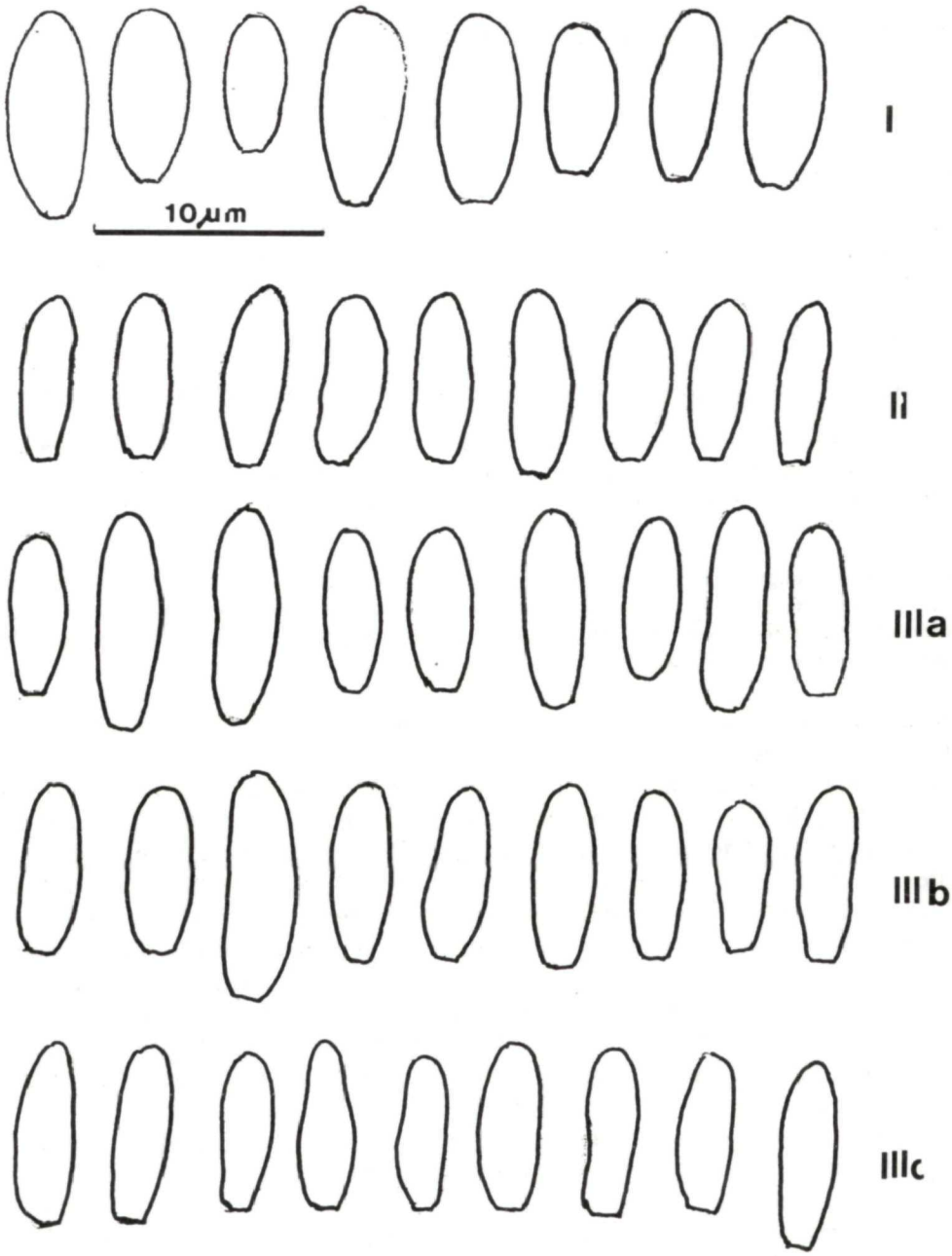

Fig. 1. Spores of *Rhizopogon* species. I Holotype of *R. pannosus*. II Holotype of *R. pumilionus*. III a-c Recent collections of *R. pumilionus* (further explanation see head of Table 1).

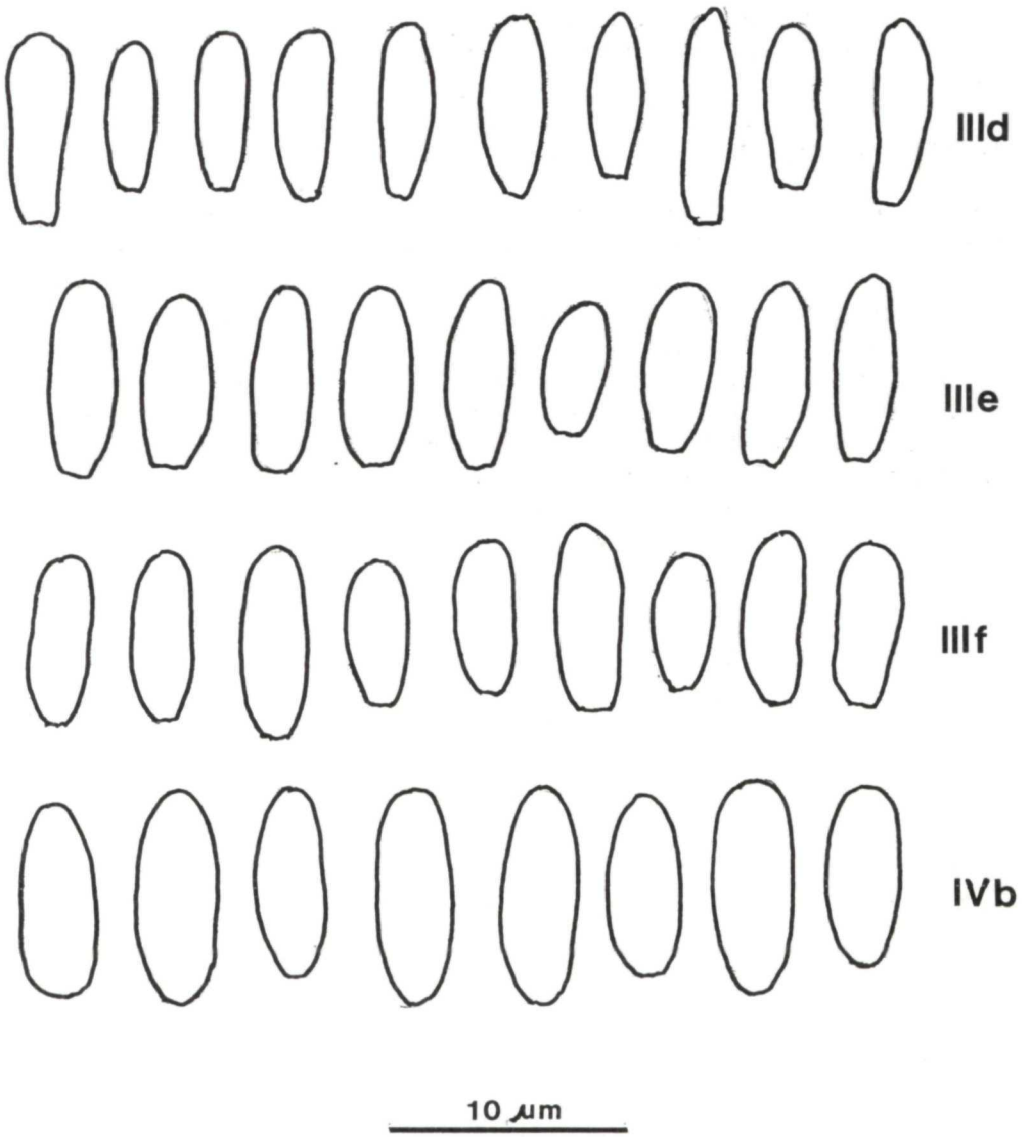

Fig. 2. Spores of *Rhizopogon* species. III d-f Recent collections of *R. pumilionus*. IV b *Rhizopogon roseolus* (further explanation see head of Table 1).

„... the peridium varies from a dingy cinnamon-buff to reddish tan in places, but nowhere does one find colors as given in the type description. The difference is so great and so obvious, that one can only conclude that somewhere in previous handling of the specimens, collections became mixed. ... The spore width is given as up to 5 µm and the color as cream color in mass. It is clear to me that two species are involved. ... but

unless the question in regard to the material described in the original account can be cleared up the name may have to be dropped".

This made necessary a thorough reexamination of the types and comparisons with all our records.

1. The holotype of *Rhizopogon pumilionus*

This collection comes from Schrofenpass, Allgäu, growing under *Pinus montana* MILL. (= *P. mugo*) and *Rhododendron ferrugineum* L. in 1680 m s. m. altitude. ADE (1909) describes his fungus as globose, reaching the size of a hazelnut with appearance and colours reminding of strawberries („feinwarzig-gekörnelt, ... gelblich-zinnoberrot, fast erdbeerfarbig"). He found his collection in a depth of 25 to 50 cm (!).

The collection consists of two halves of two different small basidiomata. One of these seems immature and has only few spores. The other half is mature: spores 6.1-8.6 x 2.2-3.5 µm, mean 7.3 ± 0.6 x 2.9 ± 0.3 µm, Q = 2.1-3, mean 2.5, V=16.8-46.2 µm^3, mean 32.4 µm^3 (n = 36), slender, cylindric to subfusoid with distinctly truncate base, sometimes with somewhat irregular surface, basidia 13-17 x 4.4-5 µm, 4-spored, cystidia are rare and almost all collapsed.

2. The holotype of *Rhizopogon pannosus*

What at present is designated as holotype of this species comes according to the scheda from Mariposa Co., California, grown on trampled roadway, leg. W. A. SITCHELL, June 1916, det. ZELLER & DODGE. This agrees with the original description. But as SMITH & ZELLER (1966) indicated (see above) the content may have become mixed up.

This collection consists of somewhat more than a half carpophore with 25 mm diameter: surface Cinnamon (RIDGWAY 1912: R) to Ochraceous Tawny (R) in places. Gleba rather pale, Light Buff, Cream Buff to Chamois (R); spores 6.7-9.7 x 3.1-3.9 µm, mean 7.9 ± 0.7 x 3.4 ± 0.2 µm, Q = 2-2.75, mean 2.35, V = 35-69 µm^3, mean 48 ± 8.8 µm^3, cylindric-ellipsoidic, with truncate base; basidia 17-25 x 5-6.5 µm, 4-spored, cystidia fusoid to clavate, 25-65 x 4-7 µm, generally scarce, only close to the peridium more frequent and badly reviving. The spores are distinctly wider and more ellipsoidic than those of *R. pumilionus* and are significantly more voluminous.

3. Comparison of *R. pumilionus* with *R. roseolus* (= *R. vulgaris* var. *intermedius*)

SVRČEK (1958) places this variety in the same book once under *R. roseolus*, once under *R. vulgaris*.

When MARTÍN (1996) placed *R. pumilionus* in synonymy with *R. roseolus*, we have the impression that she overlooked the truncate spores of the former. The spores of the latter have blunt ends, are not truncate or in some collections may show a rather indistinct trace of a truncation. Moreover, the spores of *R. roseolus* are distinctly wider than those of *R. pumilionus* and more voluminous (see table 1). So we are sure, that they are not conspecific.

Table 1. Comparison of spore data of *Rhizopogon* collections. I Holotype of *Rhizopogon pannosus*. II Holotype of *Rhizopogon pumilionus*. III recent collections of *R. pumilionus*: a-e all collected under *Pinus mugo*; a IB 98/14, Zireiner Lake, Tyrol; b IB 97/799 Halsl trail to Ampferstein, Tyrol; c Leutasch, Tyrol, leg. W. STEGLICH; d Schachen, Bavaria; e WU 19788, Rax, Lower Austria; f and g collected under *Pinus nigra*; f WU 6023, Mollram, Neunkirchen, Lower Austria; g WU 10583, Mollram, Neunkirchen, Lower Austria. IV some collections of *Rhizopogon roseolus* (these collections were named *R. vulgaris* var. *intermedius* in the Staatsherbarium München by M. P. MARTÍN, later in her monograph she placed them under *R. roseolus*). a leg. A. EINHELLINGER, Ascholdinger Au, Landkreis Wolfratshausen, 2. 8. 1970; b leg. J. STANGL, Augsburg, Haunstetter Wald, 27. 9. 1979; c leg. NIESSL, Millstätter See, Kärnten.

Coll. No.	Spores µm	Mean (n = 36)	Q (l: w)	Volume µm^3
I	6.6-9.7 x 3.1-3.9	7.8 ± 0.7 x 3.4 ± 0.2	2.0-2.7 mean 2.3 ± 0.2	32-69 mean 47.1 ± 8.9
II	6.1-8.6 x 2.2-3.5	7.2 ± 6 x 2.8 ± 0.3	2.1-3.2 mean 2.6 ± 0.2	17-45 mean 31 ± 7.5
III a	6.2-10 x 2.4-3.4	8.1 ± 0.9 x 2.8 ± 0.2	2.0-3.5 mean 2.9 ± 0.4	22-47 mean 33.5 ± 7
III b	6.5-10.3 x 2.4-3.3	7.7 ± 0.7 x 2.7 ± 0.2	2.4-3.4 mean 2.8 ± 0.2	24-58 mean 31.5 ± 5.7
III c	5.5-8.3 x 2.4-3.0	7.4 ± 0.6 x 2.7 ± 0.1	1.9-3.2 mean 2.7 ± 0.3	28.5-36 mean 28.5 ± 3.3
III d	6.4-9.7 x 2.3-3.1	7.7 ± 0.7 x 2.6 ± 0.2	2.3-3.8 mean 2.9 ± 0.3	19-39 mean 28 ± 4.2
III e	6.2-9 x 2.7-3.4	7.7 ± 0.6 x 2.9 ± 0.2	2.1-3.2 mean 2.6 ± 0.2	28-45 mean 35 ± 4.5
III f	6.0-8.9 x 2.7-3.1	7.3 ± 0.6 x 2.9 ± 0.1	2.1-3.2 mean 2.5 ± 0.2	23.5-40 mean 31.9 ± 4.5
III g	6.2-9.1 x 2.7-3.4	7.6 ± 0.6 x 3.0 ± 0.1	2.1-2.9 mean 2.5 ± 0.2	27-40 mean 37.4 ± 6
IV a	6.2-9.3 x 2.9-3.6	7.7 ± 0.7 x 3.2 ± 0.2	2-2.8 mean 2.4 ± 0.2	31-62 mean 41.5 ± 7.5
IV b	7.2-9.7 x 2.8-3.6	8.2 ± 0.6 x 3.2 ± 0.2	2.2-2.9 mean 2.6 ± 0.2	33-60 mean 43.8 ± 7.6
IV c	7.2-9.3 x 2.9-3.5	8.1 ± 0.5 x 3.2 ± 0.2	2.2-3.1 mean 2.5 ± 0.2	36-58 mean 44.3 ± 6

4. Recent collections of *Rhizopogon pumilionus* (see Table 1)

We have studied in detail seven recent collections of *R. pumilionus*. Five of these were collected in the vicinity of *Pinus mugo* on calcareous soils under subalpine conditions. This agrees well with the habitat of ADE's collection. Only two come from lower elevation growing with *Pinus nigra* ARNOLD. They all agree with the description we have given under the name *R. pannosus* (MOSER & al. 1999). This means they are larger than the fruitbodies described by ADE and differ also somewhat in colour. These discrepancies may be explained by the unusually depth in which ADE collected his fungus (25-50 cm!) while normally fruiting of *Rhizopogon* occurs close to the surface of soil. The spores however agree in all collections. One characteristic of the spores is, that in each collection exists a number of spores with a somewhat irregular surface.

The surface colours in these exsiccati vary from Cinnamon (R) to Ochraceus Tawny (R) to Tawny (R). The gleba colour in all these collections is olivaceous, in dry

condition darker, brownish, but constantly with an olivaceous tinge, Isabella Color (R) to Buffy Brown (R), MU (MUNSELL 1975) 10YR 6/10, 5/8, 2.5Y 6/4 to 6/8.

5. Comparison of *Rhizopogon pumilionus* and *R. pannosus* and conclusion

Characters in common are the typically verrucose surface of the basidiomata with rhizomorphs only at the base, the squamules consisting of clusters of converging, erect hyphae, the colors of the peridium varying from salmon orange to cinnamon or orange-reddish and the truncate spores.

The main difference can be found in spore width and volume (Table 1), and in the colour of the gleba being olivaceous in *R. pumilionus* and buffy to ochraceous in *R. pannosus*.

We are convinced that *R. pumilionus* is not conspecific with the type of *R. pannosus*, apart from the fact, that the later name seems doubtful. Further, *R. pumilionus* is not conspecific with *R. roseolus*. All collections from subalpine habitats with *Pinus mugo* studied and the two collections made by W. KLOFAC under *Pinus nigra* must be named *Rhizopogon pumilionus*.

We want to thank Prof. Dr A. BRESINSKY for his comments and loan of exsiccata, the keepers of the herbaria WU, M and NY for the kind loan of type collections and other specimens.

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