Two new coprophilous species of Saccobolus

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Saccobolus reticulatus O. Aas sp. n. on dung of sheep and deer, and *S. tuberculatus* O. Aas sp. n. on dung of sheep, are described from Norway.

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Searching for coprophilous Discomycetes (Ascomycetes, Pezizales) in Solund, a group of islands at the mouth of Sognefjord, South Norway, I came across an interesting species of *Saccobolus*. It was found on two different islands. Owing to its network-like ornamented ascospores, it is called *S. reticulatus*. The other species described as new in this work, *S. tuberculatus*, is so far regarded as an alpine species; it has characteristically warted spores.

Saccobolus reticulatus O. Aas n. sp.
Figs. 1–3

Apothecia ± gregaria, sessilia, subglobosa vel pulvinata, usque ad 240 μm diam., extus dilute rosea. Discus convexus. Excipulum inter texturam globulosam et texturam angularem. Margo non manifestus. Asci maturi hymenio valde protrudentes. Sporarum fasciculi, secundum typum II (auctorem van Brummelen), 44–49.5 × 16–19 μm, appendicibus gelatinosis unilateralibus in ambabus extremitatibus. Ascosporae ellipsoideae vel inaequilaterae, juvenales hyalinae, maturae plumbeo-nigrae vel violaceo-plumbeae, 17.5–19 × 8.5–9.5 μm. Ornamentum profunde retiforme.

Holotypus, Aas 91 b, vide infra.

Apothecia more or less gregarious, sessile, subglobular to pulvinate, up to 240 μm in diameter, with light rose colour. Disc convex, dotted with the strongly protruding tips of the ripe asci. Margin not differentiated. Excipulum more or less intermediate between textura globulosa and textura angularis.

Asci eight-spored, truncate at the apex, gradually tapering at the base, 110–130 × 26–40 μm, strongly protruding above the level of the hymenium at maturity. The ascus wall becomes deep blue in Melzer's reagent.

Spore-clusters 44–49.5 × 16–19 μm, arranged according to pattern II in van Brummelen's classification, with two rows of three and one row of two spores, and a single longitudinal plane of symmetry. The spore clusters have two isolated, more or less ellipsoid gelatinous excrescences, one at each end of the cluster.

Ascospores ellipsoid, or more often unequal-sided with the one side more convex than the other, narrowing towards the ends, at first hyaline, then greyish-black to violet-grey, the colour persisting into maturity, 17.5–19 × 8.5–9.5 μm. Spore sculpture consisting of deep furrows that form a characteristic and rather regular network. The spores appear slightly warty owing to the deep furrows. The thickness of the pigmentation is variable, therefore some parts are lighter than others.

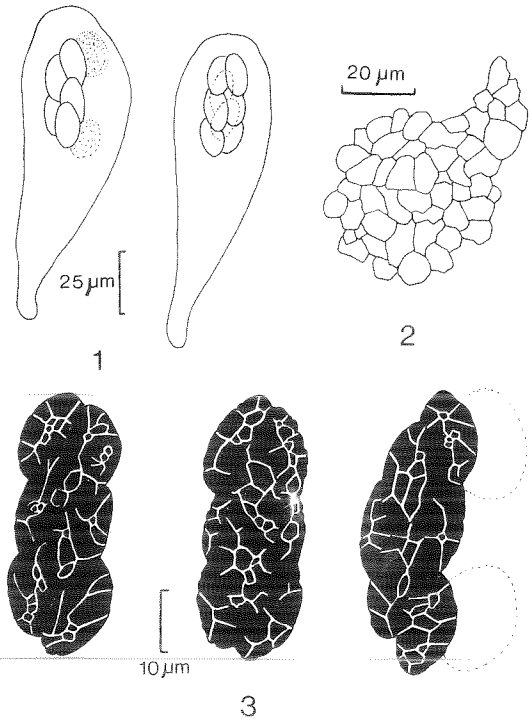
Paraphyses are simple or branched, colourless, septate, 1.5–2 μm in diameter, only slightly enlarged at apex.

On dung of sheep and deer (*Cervus elaphus*).

Material examined

Norway: Sogn & Fjordane: Solund: Hjønnevåg 30.9.1975 O. Aas leg. No. 91 b (BG), on dung of deer. Holotypus. – Sengskjæret 1.10.1975 O. Aas & H. Hjønnevåg leg. No. 88 c (BG), on dung of sheep.

The network-like deeply furrowed spore-ornamentation of this species seems to be different from other known *Saccobolus* species. It is therefore difficult to find any convincing relationship to other species in the genus. Immature spores are colourless, and maturing spores seem to lack the characteristic violet or



Figs. 1–3. *Saccobolus reticulatus*. Fig. 1. Asci and ascospores, the spore cluster in the left ascus with two isolated gelatinous excrescences. Fig. 2. Part of the outer excipulum seen from the surface, from the lower part of the apothecium. Fig. 3. Spore clusters, on the right with two gelatinous excrescences. (Figs. 1–2. from the type, no. 91 b. Fig. 3. from no. 88 c).

purplish epispore pigmentation of the genus. The colour of the pigmentation is at first light brownish, with only poorly developed ornamentation; when mature, the pigmentation is dark greyish, occasionally with a slight tinge of violet.

S. glaber (Pers. ex Pers.) Lamb. may have a somewhat network-like ascospore ornamentation. In this case, however, irregular secondary fissures appearing after drying or swelling of the spores make the ornamentation (van Brummelen 1967, p. 174). This species belongs to quite another section of *Saccobolus* and differs from *S. reticulatus* in the pigmentation of the apothecia and paraphyses and in the packing of its ascospores.

To a certain extent the spore ornamentation of *S. reticulatus* may resemble that of *S. quadrisporus* Mass. & Salm., but the latter has only four ascospores in each ascus. *S. portoricensis* Seaver has a spore oranamentation consisting of a network of crevices (van Brummelen 1967, p. 179), but spore form, spore packing, and the pigmentation of the apothecia are different from that of *S. reticulatus*.

The description of *S. reticulatus* is based upon living material. Both collections are from islands in the furthest western part of South Norway.

Saccobolus tuberculatus O. Aas n. sp. Figs. 4–6

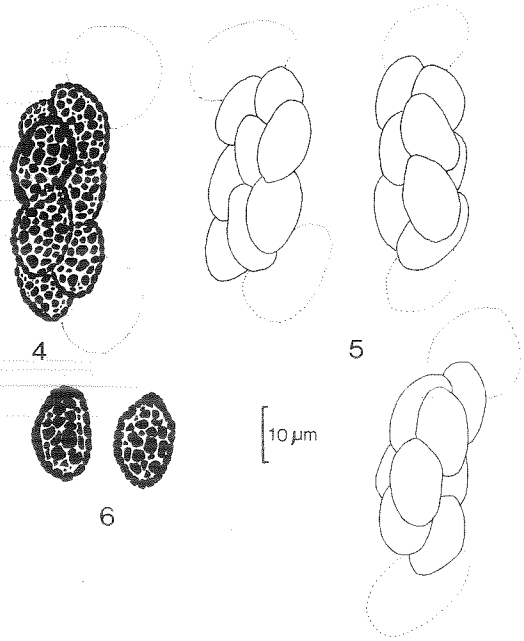
Apothecia solitaria vel gregaria, cylindrica, 200–400 µm diam., primum albida deinde erubescentia, extus hyphis hyalinis, septatis, simplicibus vel fasciculatis obtecta. Discus planus vel convexus. Margo non manifestus. Excipulum textura intricata constructum. Asci maturi hymenio valde protrudentes. Sporarum fasciculi 39–43 × 15–18 µm, secundum typum II (auctorem van Brummelen), appendicibus gelatinosis unilateralibus in ambabus extremitatibus. Ascosporae ellipsoideae vel fusiformi-ellipsoideae, valde inaequilaterae, juvenales hyalinae, maturae violaceae, ultimo obscure spadiceae, 15–18 × 9–10 µm, sparse verrucis crassis instructae.

Holotypus, Aas 111 a, vide infra.

Apothecia solitary or gregarious in small groups, cylindrical, when over-ripe sometimes cupulate on a stout base, 200–400 µm in diameter, up to 250 µm high, whitish, later with a shade of rose. Disc flat or convex, dotted with the dark, far protruding tips of ripe asci. No differentiated margin. Outer surface more or less covered with colourless, septate, thin-walled hyphae, most of them connected with the substrate. In addition to these hyphae of varying length, the base of the apothecia is clothed with tufts of broader, colourless, septate hyphae up to 4 µm in diameter, apex up to 6 µm in diameter. The base of these latter hyphae is variously swollen, rounder and broader than the rest of the hyphae, and with shorter distance between the septa. Excipulum of textura intricata, with pale rose intercellular pigment, below with protruding hyphae at the outer surface.

Asci eight-spored, broadly clavate, apex truncate, the base long-tapering, 120–150 × 29–35 µm, strongly protruding above the level of the hymenium at maturity, the wall deep blue in Melzer's reagent.

Spore clusters 39–43 × 15–18 µm, arranged



Figs. 4–6. *Saccobolus tuberculatus*. Fig. 4. Spore cluster with two gelatinous excrescences. Fig. 5. Spore clusters with gelatinous excrescences. Wart-like ornamentation is not drawn. Fig. 6. Ascospores.

according to pattern II in van Brummelen's classification, consisting of two rows of three and one row of two spores, and a single longitudinal plane of symmetry. The spore clusters with two isolated, more or less globose to ellipsoid gelatinous excrescenses, one at each end of the spore cluster.

Ascospores 15–18 × 9–10 µm, at first hyaline, then violet, becoming brown at maturity, ellipsoid, with the one side much more convex than the other. Spore ornamentation consisting of coarse, irregular isolated warts with dark pigment. At the end of each spore the warts are often confluent, while in the middle part there is lighter pigmentation between each isolated wart. In some cases isolated warts could not be seen at all; instead a more or less confluent wart-like ornamentation of uneven thickness was observed.

Paraphyses unbranched or branched, septate, colourless, 1.5–2 µm thick, at apex enlarged to 3 µm in diameter. Intercellular pigment was not observed.

On dung of sheep.

Type collection: Norway: Hordaland: Eidfjord: Halne, 1250 m above the sea level. UTM: 32 V MM2799, 31.8 1977 O. Balle & D. Moe leg. No. 111 a (BG). Holotypus.

Saccobolus tuberculatus is related to *S. verrucisporus* Brumm. in having cylindrical apothecia, the latter species with 'cylindrical to subglobular shape' (van Brummelen 1967, p. 199), in having the outer surface covered with tufts of thin-walled, septate hyphae, and in having the episporium consisting of coarse warts. In addition to spore sculpture and spore size, *S. tuberculatus* is characteristic in having the spore-clusters furnished with two isolated gelatinous excrescences. Examination of living material showed no exception to the two-fold gelatinous excrescence. *S. verrucisporus* has one unilateral gelatinous excrescence on the side of the spore cluster having two rows of three spores. In addition, the latter species has smaller spores, spore clusters, and apothecia, and also shorter and more slender asci.

The arrangement of the ascospores is somewhat irregular, but pattern II in van Brummelen's classification (van Brummelen 1967, p. 41) seems to be most appropriate. Contrary to *S. verrucisporus*, the paraphyses are lacking intercellular pigment in *S. tuberculatus*.

The shape of the ascospores in *S. tuberculatus* nearly agree with that of *S. obscurus* (Cooke) Phill., but the latter has another shape and colour of its apothecia, and different spore ornamentation and arrangement of the ascospores. The related *S. beckii* Heimerl differs in having larger ascospores with slightly different shape, in addition to more coarse and darker epispore ornamentation. *S. thaxteri* Brumm. has smaller ascospores with quite another shape. It has also smaller asci, somewhat different arrangement of the ascospores, and another shape of its apothecia.

The excipular structure in these related species mentioned above is all of the same kind, consisting approximately of a textura intricata.

S. parvisporus Brumm. may also be related, owing to its ascospores which are ornamented with warts and granules. But this species has much smaller spore clusters and ascospores, and also an excipulum consisting of textura globulosa (van Brummelen 1976, p. 425). The description of *S. tuberculatus* is based upon living material. So far I regard it as an alpine species.

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