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SANTESSONIA (LECANORALES, BUELLIACEAE) IN THE NAMIB DESERT (SOUTH WEST AFRICA)

by

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SUMMARY

Three species are recognized in the genus *Santessonia* : *S. lagunebergii* Sérusiaux & Wessels sp.nov., *S. namibensis* Hale & Vobis, and *S. sorediata* Sérusiaux & Wessels sp. nov. The genus is a member of the Buelliaceae and is endemic to the Namib desert. The lacunose cortical layer displayed by the genus is interpreted as a remarkable adaptation for the interception of fog. *Dactylospora hafellneriana* Sérusiaux sp. nov. is a new lichenicolous fungus found on *Santessonia lagunebergii*.

INTRODUCTION

In 1978 the attention of lichenologists was opportunely drawn to the coastal desert of the Namib along the west coast of South West Africa by the description of a new fruticose lichen genus, *Santessonia* Hale & Vobis. The Namib desert comprises the sandy or rocky coastal strip, some 2000 km long and mostly less than 200 km wide. It lies to the west of the Great Western Escarpment between the Olifants river (Republic of South Africa) in the south and the Carunjamba river (Angola) in the north (Ward & al. 1983).

It varies in height from sea-level to 1000 m locally. It is one of the most arid parts of the world : virtually the entire area receives less than 100 mm of rain per year and parts have received less than 10 mm in fifty per cent of the years during which records have been kept (Van Zinderen Bakker 1975; Werger 1978). The coastal fringe however experiences mist or fog on more than 120 days per year. The intercepted amount for 1958 was equivalent to 130 mm of rainfall which is more than seven times the mean annual rainfall (Nagel 1962). According to Goudie (1972), this precipitation is extremely rich in salts, e.g. 120 kg/ha/year at Swakopmund. Such a persistent and regular mist permits a very rich, and adaptively interesting, lichen development, as in similar areas elsewhere (Rundel 1978).

Several lichen collections have been made in the area, some dating back to the early days of the european presence in southern Africa. F. Welwitsch for example collected many lichens in the most northerly part of the Namib desert, the Mossamedes area. They were studied by Nylander (1868) and later by Vainio (1901); the major part of these collections are preserved in BM and LISU. German botanists earlier in this century gathered other samples, mainly near Lüderitz. Although these collections suggest a rich and diverse lichen flora and vegetation, they are scanty, inadequate and unrepresentative of the entire flora of the desert. Thus, contrary to the other two coastal deserts where on-shore fog induces an exuberant lichen development (the Atacama desert in Peru and Chile and Baja California in Mexico), the lichen flora of the Namib is very poorly known. In a survey of the lichen flora of this type of deserts, Rundel (1978) is only able to speculate about the Namib.

For several years, one of us (D.W.) has been traveling through the central part of the Namib desert (in an area from Walvisbaai northwards to the Skeleton Coast Park) and has commenced an ecological study of the lichen communities. In 1983, both of us collected intensively in the same area making large and representative gatherings of the lichens growing there. These will form the basis for a complete taxonomic survey of the lichen flora of the central Namib which we plan to complete as soon as we are able. A major objective of our foray was to search

for *Santessonia*. This proved to be highly successful as three species were collected, of which two are new to science. This paper gives descriptions of these two new taxa and adds further information on the genus that our study brought to light.
The specimens cited were analyzed by thin-layer chromatography (TLC) by means of standard methods (Culberson & Amann 1979).

THALLUS ANATOMY

The thallus anatomy of *Santessonia* is rather simple; the internal symmetry is consistently radiate in structure, even when the branches are flattened as they sometimes are in *Santessonia namibensis*. Three kinds of plectenchyma are easily distinguished :

(1) - The cortical layer (fig. 1-5) consists of loosely to strongly aggregated hyphae with many dead cells, especially towards the outer surface. In the most typical parts (e.g. not eroded by the sand-blasting winds), the cortex can be described as lacunose : the walls of the living cells as well as those of dead ones are ± thickened but not carbonized and form a reticulate network between ± spherical or isodiametric lacunae. This enlarges considerably the surface contact between the lichen and the atmosphere and ensuring a rapid and lasting hydration during the periods of fog (Larson 1981). Such an adaptative plectenchyma can thus rapidly take advantage of any formation of fog. We are not aware of any other lichen genus where such an adaptation to fog or humidity interception is reported (see Rogers 1977, Rundel 1978 and 1982 for a review on morphological adaptation to aridity), although some comparison may be made with the entirely reticulate thallus of *Ramalina menziesii*. Rundel (1974) showed that "morphological studies in that species indicate that the reticulate structure has an adaptational value in increasing water holding capacity of the thallus". As one might expect, the thallus surface of the *Santessonia* species is heavily salt- and dust-encrusted : water precipitation derived from fog is extremely rich in salt and it never rains enough to wash the salt away. Moreover, the wind always blows dust and salt particles that can accumulate on the lichen surface. Follmann (1967) and Rundel (1978) demonstrated that those hydrophilic salt crusts improve the water potential of the lichen by "forming favorable water gradient for uptake of moisture".

The cortex structure and the salt crusts on its surface therefore appear to represent the strategy adopted by the genus to survive in the harsh environment of the Namib desert. The thickness of the cortex in *Santessonia* varies from 20 to 45 µm in the three species.

(2) - The phycobiont layer (fig. 2, 5) is usually organized in ± defined glomerules containing several necrotic algal cells interspersed with living ones. In old or eroded parts of thalli, most algal cells are dead. Rather large hollows are thus present in some parts of the algal layer which may then act as an enlargment of the lacunose plectenchyma of the cortex.

(3) - The central axis (fig. 3) is composed of thick-walled hyphae which are periclinally orientated and constitutes a pachydermatous prosoplectenchyme as defined by Hale (1976). The axis is extremely dense and compact in *Santessonia lagunebergii*, *S. sorediata* and in young and cylindrical parts of *S. namibensis*. In flattened parts of *S. namibensis*, it can be much more lax and irregular as pointed out by Hale & Vobis (1978).

APOTHECIAL ANATOMY AND ONTOGENY

Apothecia are always present and usually plentiful in both *Santessonia lagunebergii* and *S. namibensis*; they are unknown in *S. sorediata*. Their ontogeny has been briefly described by Hale & Vobis (1978) and their findings are confirmed by our studies. Apothecial primordia first appear as black, irregular and

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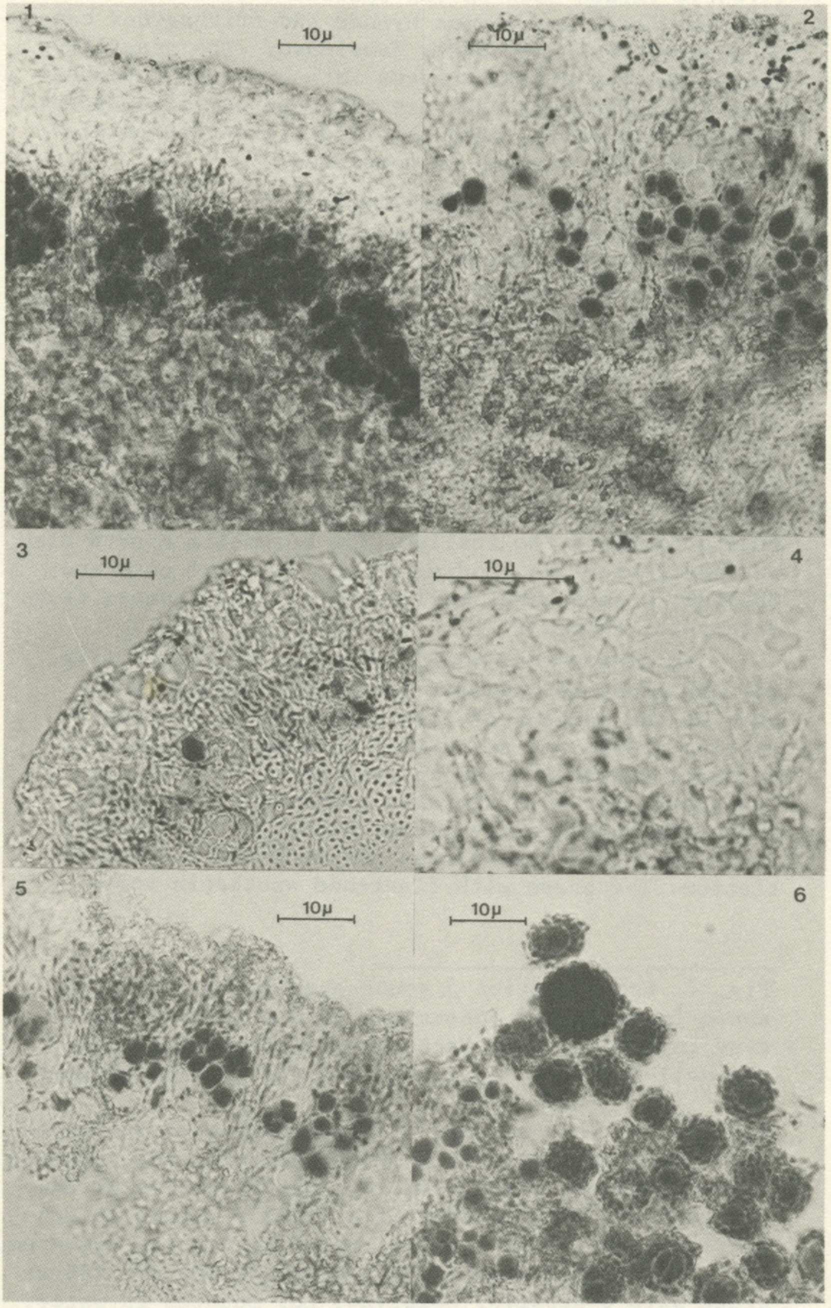
Fig. 1-5. Cross-sections of main branch of *Santessonia lagunebergii* (Sérusiaux 5218 & Wessels, holotype, LG), mounted in lactophenol-cotton blue.
1 : the three layers are clearly seen : cortex, photobiont layer and central axis. 2 and 5 : photobiont layer ± arranged in glomerules with many dead cells. 3 : water-washed section showing the lacunose cortex and the prosoplectenchymatous central axis. 4 : detail of the lacunose cortex.
Fig. 6. Cross-section of a young soredium of *Santessonia sorediata* (Sérusiaux 5171 & Wessels, holotype, LG), mounted in lactophenol-cotton blue.


1
10μ
2
10μ
3
10μ
4
10μ
5
10μ
6
10μ

slightly raised dots on the thallus : just under the cortical layer ascogenous hyphae and trichogynes can be observed but only badly developed. The generative tissue quickly differentiates into hymenium, hypothecium and excipulum; asci are produced and ripe spores ejected very early, even before differentiation of the apothecial tissues is completed.

In *Santessonia lagunebergii*, the apothecia (fig. 7) grow laterally on the thallus branches. At first they have a flat disc and a well-developed and slightly proeminent margin soon becoming strongly convex to hemispherical as a result of the formation of a columella initiated by the lateral growth of the thallus central axis pushing into it from below. In cross-section the apothecia are very similar to those of *Pilophorus robustus* (see Jahns 1970, fig. 87.7) but the excipulum remains distinct. The columella reaches about 200-250 µm in height, then ceases growing, so that the apothecia are only slightly raised and remain close to the thallus. The columella growth also induces geniculate bending at the level of each apothecium, a phenomenon well-known in other genera (e.g. *Alectoria, Sulcaria*).

In *Santessonia namibensis*, the apothecia (fig. 21) are produced randomly (apically, laterally or even on the margins of flattened lobes). Obviously thallus growth and apothecial development appear to be badly coordinated as in some specimens, the thallus growth actually disrupts primordia. Some young apothecia consequently become elongated or split by invading vegetative tissues and stop their differentiation. The phase with flattened apothecia and a

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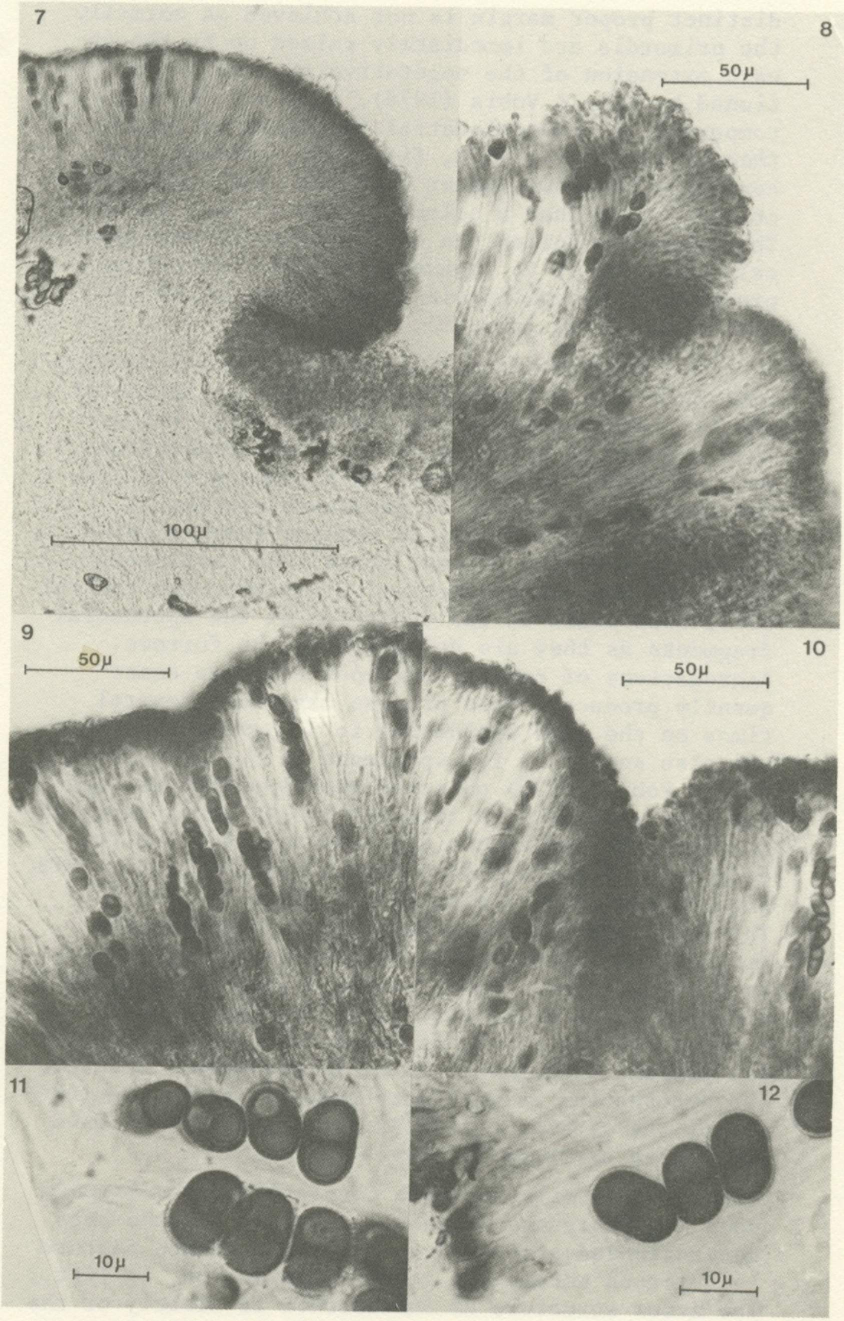
Fig. 7. Cross section a young apothecium of *Santessonia lagunebergii* (Sérusiaux 5218 & Wessels, holotype, LG), mounted in lactophenol-cotton blue. Note the well-developed excipulum and the growing columella.

Fig. 8-10. Cross-section of an apothecium of *Santessonia namibensis* (Sérusiaux 5219 & Wessels, LG), mounted in lactophenol-cotton blue. 8 : proliferation of the excipulum. 9 : initiation of a sterile column at epithecium level. 10 : sterile furrow within the hymenium.

Fig. 11-12. Spores of *Santessonia lagunebergii* (Sérusiaux 5218 & Wessels, holotype, LG) mounted in water.


7
8
50µ
100µ
9
50µ
10
50µ
11
10µ
12
10µ

distinct proper margin is not achieved as normally the primordia are immediately raised up by the upward extension of the vegetative thallus. As mentioned by Hale & Vobis (1978), this situation is comparable to pseudopodetial formation in *Thysanothecium* (see Jahns 1970, fig. 103). However, the central axis grows faster than the algal and cortical layers so that a columella can be distinguished. The columella forces the apothecia to be hemispherical. Contrary to *S. lagunebergii*, the excipulum proprium of *S. namibensis* is much reduced in the mature apothecia (fig. 8).

In *Santessonia namibensis*, apothecial development can proceed further by the differentiation of sterile columns within the hymenium (fig. 9-10); this results in a bundle of up to 25 cerebriform apothecia. The primary sterile columns are initiated near epithecium level in mature apothecia; externally they are seen as shallow furrows which gradually assume a concave shape. The continuous growth of the pseudopodetium, especially the central axis, then leads to the isolation of the apothecial fragments as they are delimited by the furrows. Aggregations of cerebriform apothecia are consequently produced. This process may occur several times on the same apothecium in *S. namibensis*. It was also seen in a few specimens of *S. lagunebergii*. Hale & Vobis (1978) observed that spores that have not been ejected were retained in the lower parts of the hymenium and in the hypothecium, as it is the case in *Catolechia wahlenberghii* (see Hafellner 1978, fig. 4) and other lichen genera (*Fuscidea* spp.). This situation has been observed in both fertile species, but more clearly in *Santessonia namibensis* than in *S. lagunebergii*. In the former species, the hypothecium is quite tall (reaching 150 μm) and loose : old and partly disintegrated asci and spores are present throughout. In *S. lagunebergii* however, the hypothecium is much more compact, being compressed by the growing columella, but nevertheless asci and spores are usually present in it.

This similarity with *Catolechia wahlenberghii* does not imply any close relationship between both genera;indeed atrophied spores are a common feature in numerous ascomycete genera (Hawksworth, in litt.). The ascus structure of *Santessonia* is clearly of the *Physcia*-type (Hafellner & al. 1979, confirmed by our observations), while the ascus of *Catolechia* is definitely of different type, similar to that of *Epilichen*, but differs from both the *Physcia* and the *Rhizocarpon*-type (Hafellner 1978, Bellemère & Hafellner 1983, see also Honegger 1980).

The paraphyses (fig. 13) are always anastomosed at their bases, remaining simple above. They are septate and distinctly inflated at the apices where some branching occurs. The walls of their apical cells are typically pigmented brown or almost black, rarely dark green. The spores (fig. 11-13) are 8 per ascus, ellipsoid, 1-septate, first hyaline but soon turn dark blue-green and later dark brown before being ejected. They belong to the *Beltraminia*-type as circumscribed by Mayrhofer (1982); their walls are somewhat evenly thickened. A torus (equatorial ring) and an oil droplet in each cell are easily seen in the immature state. Their outer surface becomes minutely papillose or rarely rugose as soon as they turn dark brown. Ascocarp ontogeny, ascus structure and the spore type leave no doubt as to the placement of the genus in the family Buelliaceae (Hale & Vobis 1978, Hafellner & al. 1979).

DISTRIBUTION AND ECOLOGY

Santessonia now comprises three species, all of which restricted to the Namib desert in South West Africa. To our knowledge it is so far the only lichen genus endemic to that area. Rundel (1978) claimed that the monotypic genus *Combea*, a member of the Roccellaceae, is also endemic to the Namib. Although *Combea mollusca* (Ach.) Nyl. is frequent on the coastal rocks of the desert, it also grows in the Cape Province of South Africa, an area with markedly different ecological conditions and phytogeographical affinities. The distribution pattern of *Combea mollusca* (mapped by Almborn 1966, fig. 13) is shared by several other species, e.g. *Roccella hypomecha* (Ach.) Bory, *Trichoramalina melanothrix* (Laur.) Rundel & Bowler, *Xanthoria flammea* (L. f.) Hillm. and others. *Santessonia namibensis* has been collected three times near Spencer Bay and once near Ugabmond, more than 500 km further north. At the latter locality it is extremely common on a marble ridge running east-west from the shore, being the most conspicuous lichen growing on it. It obviously avoids the spray-zone and appears in perfect condition in the rock crevices at about 500 m away from

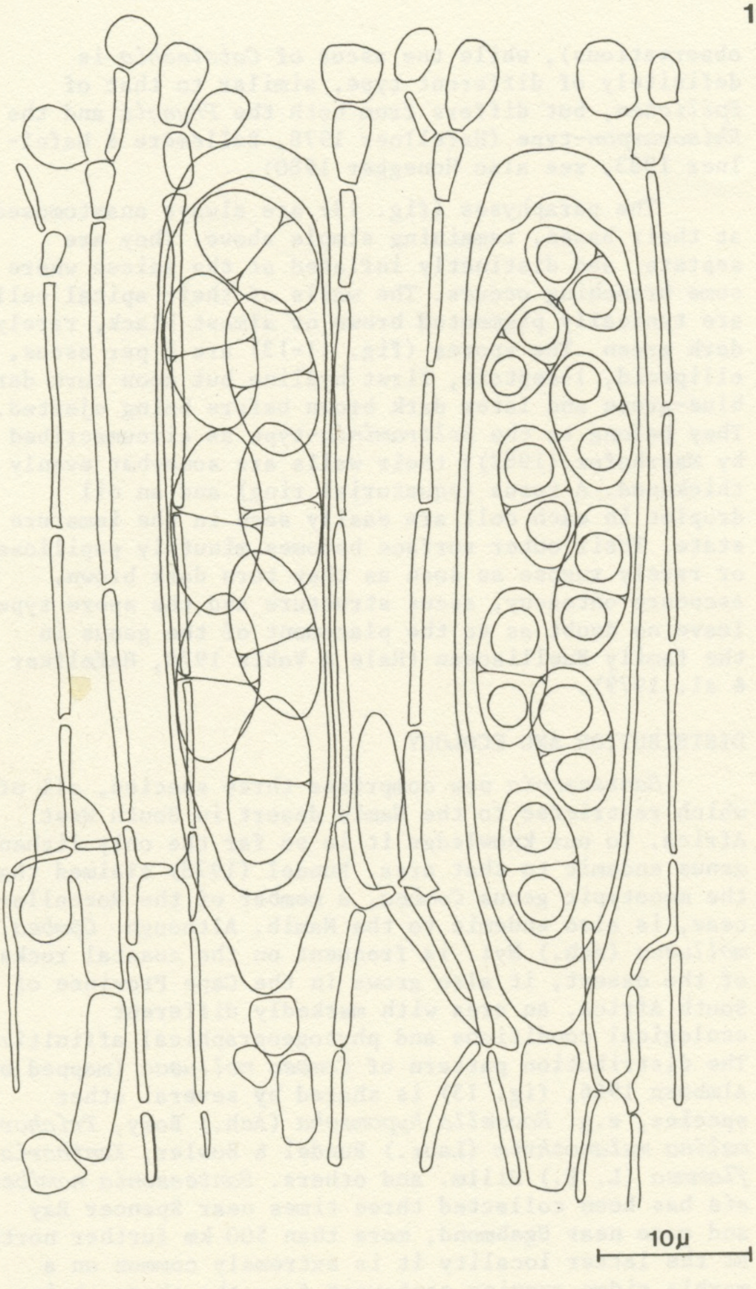


Fig. 13. Cross-section of the hymenium of *Santessonia namibensis* (Sérusiaux 5219 & Wessels, LG).

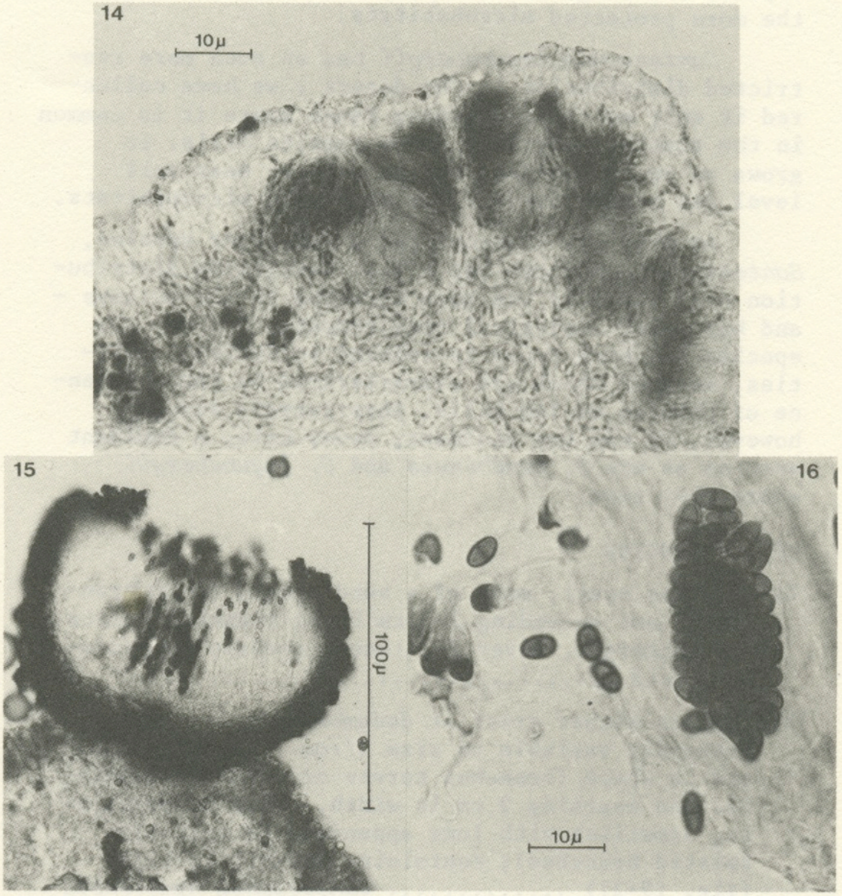


Fig. 14. Cross-section of young pycnidia of *Santessonia lagunebergii* (Sérusiaux 5218 & Wessels, holotype, LG) mounted in lactophenol-cotton blue.
Fig. 15-16. *Dactylospora hafellneriana* (Sérusiaux 5218b & Wessels, holotype, LG). 15 : cross-section of a mature apothecium growing on *Santessonia lagunebergii*, mounted in lactophenol-cotton blue. 16 : portion of hymenium showing a multispored-ascus and several spores.

the beach. Moreover, 1-2 km inland, it colonizes the tops of the ridge as well as (but to a lesser degree) the more protected microhabitats.

Santessonia lagunebergii has an even more restricted distribution in the desert : we have collected it only on the Laguneberg Range where it is common in the southern parts of these granite hills. It grows on small boulders and on pebbles near soil level and rather prefers the sheltered microhabitats.

As might be expected for a sorediate species, *Santessonia sorediata* has a less restricted distribution - at least in the area surveyed by the authors - and has wider ecological requirements. Indeed, the species has been found in several scattered localities, most of which are characterized by the occurence of pebbles on low hills. Surprisingly enough however, it was not abundant, never being a dominant species as are *S. namibensis* and *S. lagunebergii* where they grow.

KEY TO SPECIES

1a. Thallus erect, made of a bundle of 3 to 10 branches, not exceeding 2-3 cm high; branches terete or subterete, never flattened; containing psoromic acid 2

1b. Thallus either erect or decumbent on the ground, extremely variable in size (from 1 to 16 cm long) and in shape (branches terete or strongly flattened and reaching 2 cm in width, erect or prostrate, sometimes with long appendage of spirally twisted branches); containing norstictic acid (fig. 19-21) .... *Santessonia namibensis*

2a. Thallus fertile, always with apothecia, never with soredia (fig. 17)...*Santessonia lagunebergii*

2b. Thallus sterile, always with soredia (fig. 18) .... *Santessonia sorediata*

SANTESSONIA LAGUNEBERGII Sérusiaux & Wessels, sp. nov. Fig. 17

Thallus fruticosus, pallide cinereo-griseus, 1-2(-3) cm altus, valde ad rupes affixus; rami ± cylindrici, 0.4-1.0 mm diam, plerumque simplices vel dichotome ramosi, ± recti, ad apotheciarum positio-

17

18

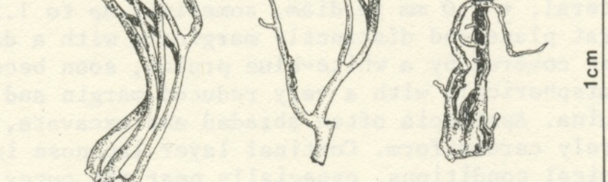


Fig. 17. Habitus of *Santessonia lagunebergii* (Sérusiaux 5218 & Wessels, holotype, LG).
Fig. 18. Habitus of *Santessonia sorediata* (Sérusiaux 5171 & Wessels, holotype, LG).
Drawings by E. Favaux.

nem geniculati, semper rigentes et fragillimi , laevigati vel pruinosi vel rugosi. Apothecia semper praesentia, lateralia, ± 1.0 mm diam, primo plana et marginata deinde hemisphaerica et reducta margine. Corticale stratum lacunosum cum numerosis mortuis cellulis; algae ± in glomerulis dispositae; centralis axis prosoplectenchymaticus. Excipulum pseudoparenchymaticum, nigro-brunneum; hymenium 90-110 μm crassum, hyalinum; hypothecium 20-30 μm crassum, nigrobrunneum; paraphyses simplices, ad basim anastomosantes et ad apicem ramosae; asci clavati, 8-spori; sporae ellipsoideae, 1-septatae, ad *Beltraminia*-typum pertinentes sed cum toro et crassa pariete, (11-)12-14(-15) x 7-8 μm . Pycnidia numerosa; conidia bacilliformia, 2-3 x 1 μm.Acidum psoromicum continens.

Thallus fruticose, pale ash-gray, 1-2(-3) cm high, made of a bundle of 3 to 10 erect branches, firmly attached to the rocks by a rather thick and compact holdfast; branches cylindrical or slightly flattened, 0.4-1.0 mm in diam (measured at mid-height), ± even in diameter, usually simple or with an isotomic-dichotomous branching pattern (branching angle acute), straight or little flexuose but always rigid, geniculate at the level of apothecia which are born laterally, apices attenuated. Surface smooth, or pruinose, or rugose due to the cortical abrasion, sometimes almost scaled and locally decorticated and then becoming dark grey or black. Thallus very fragile and brittle, even when moistened, especially near the base. Apothecia always present, usually plentiful, lateral, ± 1.0 mm in diam, sometimes up to 1.5 mm, at first plane and distinctly marginate with a dark blue disc covered by a white-blue pruina, soon becoming hemispherical, with a very reduced margin and without pruina. Apothecia often abraded and excavate, very rarely cerebriform. Cortical layer lacunose in typical conditions, especially near the outer surface. Phycobiont layer arranged in ± well-defined glomerules containing many dead cells interspersed with living ones. Central axis dense and compact, made of thick-walled periclinally arranged hyphae. Excipulum composed of radially arranged rows of parallel cells, cells dark brown; hymenium 90-110 μm thick, hyaline; hypothecium 20-30 μm thick, dark brown to dark violet, made of densely interwoven hyphae; paraphyses simple or rarely branched near the apices, anastomosed at their bases, apices distinctly inflated with dark brown walls; asci claviform, 8-spored; spores ellipsoid, (11-)12-14(-15) x 7-8 μm, 1-septate, at first blue-green with a smooth outer surface, then turning dark brown with a papillose outer surface, of the *Beltraminia*-type but with a distinct torus and an evenly thickened wall (less than 1 μm). Pycnidia frequent, but absent on a few thalli, appearing as small blackish sometimes aggregated knobs, partially and irregularly covered by the thallus cortex (their external appearance is thus quite variable); conidia mostly formed terminally from conidiogenous cells, following the phialid pattern, bacilliform to ± ellipsoid, 2-3 x 1 μm. TLC : psoromic acid.

Type : SW Africa, Namibia, southern part of the Laguneberg Range, 2-3 km N of Myl 72 on the road going from Swakopmund to the Skeleton Coast Park, ± 150 m, granite hill running parallel to the coastline, ± 6 km inland, 2.1983, Sérusiaux 5218 & Wessels (LG-holotype; Univ. North Pietersburg, BM, GZU, US, UPS, herb. Vězda-isotypes).

Other specimen examined : Ibid., but on the northern part of the Laguneberg Range, 4-5 km N of Myl 72 on the road going from Swakopmund to the Skeleton Coast Park, ± 200 m, granite hill running parallel to the coastline, ± 8 km inland, 2.1983, Sérusiaux 5198 & Wessels (LG, Univ. North Pietersburg).

SANTESSONIA NAMIBENSIS Hale & Vobis Fig. 19-21

Specimens examined : SW Africa, Namibia, Spencer Bay, Robinson (both collections cited by Hale & Vobis 1978: 2, including the type, US). Ibid., coast southern Namib, Spencer Bay, Dolphin Head, rocks close to the sea, 1.1974, Giess s.n. (WIND). Ibid., Skeleton Coast Park, 11 km N of the outpost at Ugabmond, following the coastal road, 30 m, marble ridge running in an east-westerly direction, 2.1983, Sérusiaux 5219 & Wessels (LG, Univ. North Pietersburg; to be distributed in the Vězda Lichenes Selecti Exsiccati).

This species was described by Hale & Vobis (1978 : 2-5) from two collections made near Spencer Bay. A further specimen from this area is preserved in the herbarium at WIND : it is quite similar to the type collection. A small rocky ridge near Ugabmond was found covered by a *Santessonia* which is here re-

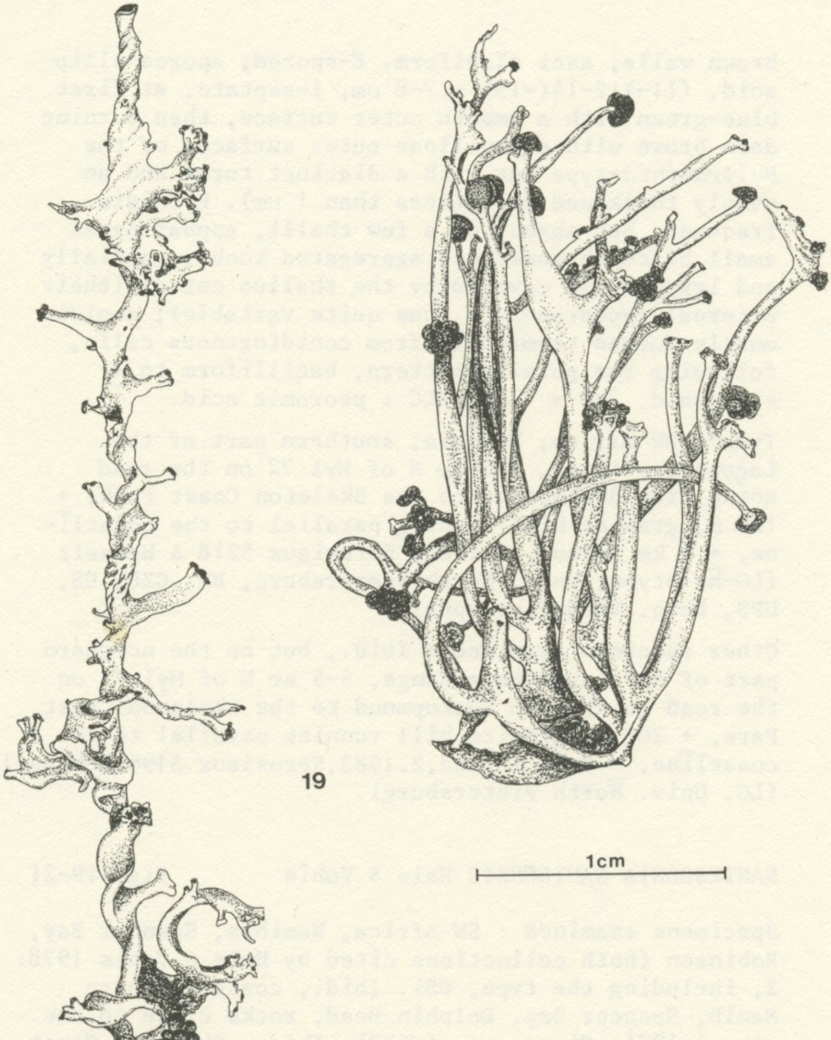


Fig. 19. Habitus of *Santessonia namibensis* (Sérusiaux 5219 & Wessels, LG). Left : long appendage of spirally twisted lobes; the appendage was detached from the entire thallus for this drawing. Right : a specimen with flattened lobes (except at the branches tips) with apothecia mainly on terminal position. Drawings by E. Favaux.

Fig. 20. Habitus of *Santessonia namibensis* (Sérusiaux 5219 & Wessels, LG). A specimen with subterete lobes with apothecia mainly on lateral pseudopodetia. Arrow a : holdfast; arrow b : this branch carried an appendage of ± 10 cm long.
Drawing by E. Favaux.

Fig. 21. Habitus of *Santessonia namibensis* (Sérusiaux 5219 & Wessels, LG). A specimen with an extremely wide and flattened lobe. Arrow a : bundle of cerebriform apothecia producing mature spores; arrow b : apothecial primordia disrupted by invading vegetative tissue; arrow c : pycnidia. Drawing by E. Favaux.

ferred to *S. namibensis* with some hesitation. The thallus morphology in this material is extremely variable and specimens with almost any shape one can imagine were found. The branches vary from cylindrical (0.3-0.4 mm in diam) to markedly flattened and reaching 2 cm in width; individuals with erect branches 2-3 cm high were seen with a long (15-16 cm !) appendage of spirally twisted lobes lying on the ground growing on one side, etc. Apothecial primordia can appear on all terminal positions, as well as pycnidia (which can also grow on lateral branchlets). The pycnidia are extremely variable in shape, old ones usually appear as deformed black bursting dots on the surface of branches or branchlets. Although disarmingly variable, the Ugabmond population belongs to a single species. Thallus anatomy, apothecial ontogeny, spores measurements and secondary products (norstictic acid) are similar for all specimens and are in agreement with the type collection of *Santessonia namibensis*. However, the conidia are different : in the Ugabmond specimens, they measure 2-3 x 1 μm and are ellipsoid to bacilliform, whereas in the type of *S. namibensis*, they are cylindrical and reach 5-6 x 1 μm . Thus the Ugabmond population may represent an additional taxon different but nevertheless close to *S. namibensis*. We choose not to take a final decision on this problem; we were so surprised by the extreme variability of the species at Ugabmond that we think wise to see and collect the species at Spencer Bay before describing a fourth taxon in the genus.

SANTESSONIA SOREDIATA Sérusiaux & Wessels, sp. nov. Fig. 18

Thallus ut in *Santessonia lagunebergii* sed semper sterilis et soredia producens; soralia subtuberculiformia, typice rotundata vel difformia et confluentia ubi veteria; soredia minuta, caesia vel atrobrunnea ubi veteria.

The thallus of *S. sorediata* closely ressembles that of *Santessonia lagunebergii* except that it is never fertile and that it produces soredia. The branches also are sometimes more slender and more irregular than those of its fertile counterpart. Soredia usually arise within discrete soralia which can be described as subtuberculate. Typical soralia are almost round and have a narrow and irregular cortical rim but as they are not distinctly raised, they cannot be compared with genuine tuberculate soralia. Their shape however can vary considerably : in old specimens, they are difformed and so abundant that they become confluent. They are mostly produced in the upper parts of the branches and certainly induce torsion and some twisting on them. Soralia are small (20-40 μm in diam), bluish or dark brown when old (fig. 6). TLC : psoromic acid.

In a recent paper about the species pair concept in lichenology, Tehler (1982) claimed that recognition of the species rank to sorediate counterpart of fertile species is without any natural basis. His arguments are unquestionably coherent but are based on theoretical assumptions. In the particular case dealt with here (*Santessonia sorediata* vs *S. laguneberqii*), we paid extreme attention to the populations of both species at the sole locality where they grow together (see collections 5197 and 5198). Production of soralia or apothecia is obviously not an age related effect and not a single specimen with both soralia and apothecia was seen. We therefore decided that the species rank was appropriate. Nevertheless we are aware that our choice could be questionned by future experimental studies on the relationships between asexual and sexual counterparts.

Type : SW Africa, Namibia, 4 km E of the road going from Swakopmund to the Skeleton Coast Park, on undulating low hills SW of the Messum Crater Range, 120 m, low hills covered with large pebbles, 2.1983, Sérusiaux 5171 & Wessels (LG-holotype; Univ. North Pietersburg, BM, US, UPS, herb. Vězda-isotypes).

Other specimens examined : Ibid., northern part of the Laguneberg Range, 4-5 km N of Myl 72 on the road going from Swakopmund to the Skeleton Coast Park, ± 200 m, granite hill running parallel to the coastline, ± 8 km inland, 2.1983, Sérusiaux 5197 & Wessels. Skeleton Coast Park, 23 km N of the outpost at Ugabmond following the coastal road, 30 m, undulating stabilized dunes covered with pebbles, 2.1983, Sérusiaux 5244 & Wessels. Namib Naukluft Park, E of Swakopmund, road to Goanrikontes, 200 m, undulating hill, pebbles-covered low hills, 2.1983, Sérusiaux 5262 & Wessels (all in LG and Univ. North Pietersburg).

LICHENICOLOUS FUNGI

In the area investigated by the authors, the *Santessonia* species host several parasitic or parasymbiontic fungi. These were almost completely overlooked in the field but they are undoubtely rare as only few of the numerous thalli collected are attacked. Their identification turns out to be quite difficult, even at the generic level. Nevertheless, one species is easily referred to *Dactylospora* Körber, a genus monographed by Hafellner (1979). The ascus structure of this genus is extremely typical (thick external gelatinous cap that reacts blue upon iodine treatment) and besides is used to distinguish a separate family (Bellemère & Hafellner 1982). The parasymbiont collected on *Santessonia lagunebergii* represents a new species, described here and named in honour of J. Hafellner whose contribution to the taxonomy of the genus is outstanding. This new species is close to *Dactylospora pertusaricola* (Willey in Tuck.) Hafellner, the only other species with more than 8 spores per ascus. In *D. hafellneriana*, the apothecia are much smaller and distinctly urceolate, the spores are smaller and always with a single septum only and the paraphyses apices are much less pigmented than those of *D. pertusaricola*. The latter species is only known from Massachussetts, U.S.A., growing on a saxicolous species of *Pertusaria*.

DACTYLOSPORA HAFELLNERIANA Sérusiaux, sp. nov.

Apothecia crescentia ad thallum *Santessoniae lagunebergii*, plus minusve numerosa, 0.1(-0.2) mm diam., primum semiimmersa, deinde proeminentia, ad basim constricta et urceolata, margine distincto rugulosoque. Excipulum pseudoparenchymaticum, cellulis plus minusve radiatim dispositis, parietibus atrobrunneis. Hymenium hyalinum; hypothecium brunneum vel nigrum; paraphyses simplices, superne paulum ramosae et apicibus incrassatis et brunneis. Asci clavati, cucullis gelatinosis iodo caerulescentibus circumdati, 20-40 spori. Sporae ellipsoideae, 1-septatae, brunneae, 5-7 x 3-4 μm.

Apothecia growing on the thallus of *Santessonia lagunebergii*, especially at the bases of branche sometimes also on apothecia, more or less numerous, first half-immersed in the host thallus but soon distinctly superficial and strongly constricted at the base, urceolate, with a distinct and persistent margin, appearing rugose at high magnification, black, ± 0.1 mm in diameter, sometimes reaching 0.2 mm, up to 90 µm high. Excipulum pseudoparenchymatous, with more or less radiately arranged isodiametric cells, cell walls dark brown on the outer parts, becoming paler inwards, 10-15 µm thick. Hymenium hyaline, 40-60 µm high; hypothecium brown to blackish, made of irregularly interwoven cells, sometimes almost parenchymatous. Paraphyses simple and septate, sparsely branched and inflated at apices, walls of apical cells brownish. Asci clavate with a I+ intensely blue gelatinous cap, internal layers I-. Spores 20-40 per ascus, usually about 30, ellipsoid, 1-septate, not constricted at the septum, brown, 5-7 x 3-4 µm.

Type : SW Africa, Namibia, southern part of the Laguneberg Range, 2-3 km N of Myl 72 on the road going from Swakopmund to the Skeleton Coast Park, ± 150 m, granite hill, growing on *Santessonia lagunebergii*, 2.1983, Sérusiaux 5218b & Wessels (LG-holotype; GZU-isotype).

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