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## ***Bacidia suffusa* (Lichenes: Bacidiaceae) in Adygheya (Caucasus), the first record outside America**

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### **Abstract**

*Bacidia suffusa* is recorded from Adygheya (Russian Federation, northwest Caucasus). Morphological and anatomical characters are compared with those of similar species present in the region, and the occurrence is briefly discussed from a biogeographical point of view.

### **Zusammenfassung**

***Bacidia suffusa* (Lichenes: Bacidiaceae) in Adygheya (Kaukasus), der erste Nachweis außerhalb Amerikas** – *Bacidia suffusa* wird aus Adygheya (Russische Föderation, Nordwest-Kaukasus) nachgewiesen. Morphologische und anatomische Merkmale werden im Vergleich zu ähnlichen Arten aus dem Untersuchungsgebiet dargestellt und das Vorkommen unter biogeographischem Gesichtspunkt kurz diskutiert.

Keywords: Caucasian *Bacidia* species, tertiary relicts

### **1. Introduction**

During an exploration of the lichen flora of Adygheya several species new to the NW Caucasus were observed (OTTE 2004). Usually species known from other parts of Eurasia, or even from other parts of Caucasia are concerned. More remarkably, also species so far only known from North America are involved. Details of one such species, *Bacidia suffusa* (Fr.) A. Schneid., are presented here.

### **2. Materials and methods**

During three excursions to the northwestern Caucasus (Republic of Adygheya) in July/August 2001, in August/September 2003, and in August/September 2005, lichen specimens were collected. The material collected in 2001 was deposited in the author's own herbarium. The material collected in 2003 and 2005 was deposited at the Staatliches Museum für Naturkunde Görlitz, Germany (GLM).

Among the material, a *Bacidia* was found that could not be determined with literature relating to Europe. Also the recently published Bacidiaceae volume of the Handbook of the lichens of Russia (GOLUBKOVA 2003) gave no result. Determination with EKMAN's (1996) treatment of the North American Bacidiae led to *Bacidia suffusa* (Fr.) A. Schneid.

This result was verified by comparison with American material of *Bacidia suffusa* borrowed from B (no. 78242, Oklahoma: Cherokee County, 23 April 1988, R. C. Harris 21373). The habit of the material as well as anatomical characters (using a light microscope) were examined. The chemistry of the thallus of one of the Caucasian specimens (no. GLM-L-15516) was examined by spot test with KOH and by the standard TLC method for the detection of lichen substances according to CULBERSON & AMMANN (1979) (only acetone was used for extraction and only solvent system »C« for the performance of the thin layer chromatography).

Furthermore, macroscopic and microscopic features of the material were compared with those of Caucasian material of some similar *Bacidia* species from GLM and the author's own herbarium and such cited in the literature relating to material from other geographic regions.

### 3. Results

The material from Adygheya was found to be conspecific with *Bacidia suffusa* from North America. A rather eye-catching feature of this species is the pruina on many apothecia, particularly on the margin of young ones, but often also on the discs. Moreover, in apothecial sections ca 4 – 6 layers of enlarged cells along the outer edge and usually radiating clusters of  $\pm$  large crystals among the excipular hyphae are characteristic.

These radiating clusters of crystals are abundantly developed in all Adyghean specimens, with most crystals about 1 – 2  $\mu\text{m}$ , and single ones larger. In the single available American specimen they are somewhat sparser, but of the same size<sup>1</sup>. This small difference is regarded to be within the range of variability of the species (see EKMAN 1996) and of no taxonomic value. Therefore the Adyghean material is assigned to this species. The internal pigmentation of the apothecia varies with the colour of the apothecia as a whole. A markedly more intensive pigmentation of the outer part of the exciple similar to the photograph in EKMAN (1996) was observed in a part of both the American and the Adyghean specimens. In any case, the inflated outer excipular cells in ca 4 – 6 layers give a distinguishing feature of this species. In the outer layers, however, the excipulum often irregularly desintegrates; this was observed in the Caucasian material as well as in the American specimen.

In the specimen analysed chemically, atranorin was detected by TLC and a clear yellow reaction of the thallus with KOH was observed. This is in accordance with the chemistry of American *B. suffusa*, but is not a distinguishing feature from a number of other species.

The species is superficially similar to several other epiphytic Bacidiae that are frequent in the northwest Caucasus. Young apothecia of *B. fraxinea* Lönnr. may be somewhat pruinose, while *B. rubella* (Hoffm.) A. Massal. and even more *B. polychroa* (Th. Fr.) K rb. are rather similar in the colour of their apothecia. Therefore the main separating features are given here, according to own observations and literature data (see Tab. 1).

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<sup>1</sup> According to EKMAN (1996), in the American material the crystals are » $\pm$ « large, with the boundary between »large« and »small« at 1  $\mu\text{m}$ .

Tab. 1 Main distinguishing features of *Bacidia suffusa* and some similar *Bacidia* species frequent in the NW Caucasus

	<i>B. suffusa</i>	<i>B. rubella</i>	<i>B. fraxinea</i>	<i>B. polychroa</i>
apothecial pruina	frequent; often abundant on the margin of young apothecia	not observed in Caucasian material (n = 16); partly present in American material according to EKMAN (1996)	occasionally present on the margin of young apothecia (more conspicuous in 3 of 11 Caucasian specimens; in single apothecia of some further specimens)	not observed in Caucasian material (n = 14); sometimes present in American material according to EKMAN (1996)
colour of apothecia	orange to dark lilac-brown; the margin sometimes darker, but usually covered with a strongly contrasting whitish pruina	pale to dark orange	orange to red-brown	(orange to) dark red-brown; when wetted, first the rim, then the disc darkening
apothecial reaction with KOH	none/intensifying colour	none/intensifying colour	none/intensifying colour	colour noticeably changing to purple-violet
crystals among the excipular hyphae	usually present and often abundant, in radiating clusters; most crystals 1 – 2 µm, single ones up to 5 – 10 µm; soluble in HNO <sub>3</sub> , insoluble in KOH	occasional; soluble in KOH, insoluble in HNO <sub>3</sub> (LLOP & GÓMEZ-BOLEA 1999)	occasional; soluble in HNO <sub>3</sub> , insoluble in KOH (LLOP & GÓMEZ-BOLEA 1999)	without or with radiating clusters of minute crystals up to 1 µm (EKMAN 1996)
outer cells of excipular hyphae	ca 4 – 6 layers of inflated cells rather distinct from the thin medulla hyphae; often darker than the interior parts of the excipulum	with or without a single layer of enlarged cells (EKMAN 1996)	in 1 – 2 layers, ± inflated or clavate, ± gradually widening from the interior parts of the hyphae	with or without a single layer of enlarged cells (EKMAN 1996)
thallus	a warted-tuberculate, predominantly ± continuous crust	dissolved into distinct, more or less rounded, convex to globose squamules	a continuous to cracked crust, or areoles tightly attached to the substrate	a warted, ± continuous crust

In Adygheya, *Bacidia suffusa* was found at the following two closely neighbouring localities:

- Russian Federation: Republic of Adygheya: Maykop district; mount Shibaba, approx. 2 km E of village Sakhray (= Novoprokhladnoye), approx. 700 m a.s.l., approx. 44°08'N – 40°18'30"E (according to Soviet top. map. 1 : 25 000, first edition 1960); on *Fraxinus*; leg. V. Otte 2 August 2001; herb. Otte no. L 4126
- Russian Federation: Republic of Adygheya: Maykop district; near cascade »Man'kin shum«, approx. 2 km E of village Sakhray (= Novoprokhladnoye), approx. 650 m a.s.l., GPS (Potsdam datum) 44°08'11.5"N – 40°19'5.5"E: on *Fraxinus*: GLM-L-15516, leg. V. Otte 31 August 2003; on *Acer campestre*: GLM-L-23104 and on *Crataegus*: GLM-L-23108, leg. V. Otte 30 August 2005

#### 4. Discussion

The fact that all four specimens are found within a circle of a few hundred metres suggests that the Caucasian distribution of *Bacidia suffusa* is very incompletely known as yet. However, it is remarkable that the species was not observed in several other mountain belts during the investigation of Adygheya's lichen flora during the last years (see OTTE 2001, 2004). Perhaps it is restricted to the lower mountain belt (oak belt and lower beech belt). This behaviour would be in line with its global distribution (hitherto known from eastern North America, see EKMAN 1996) and the concentration of this biogeographical element in the lower mountain belt of the northwest Caucasus (OTTE 2004). The species could then belong to the tertiary relict that is not rare in parts of Caucasia. In any case, *B. suffusa* is another example of a lichen with disjunct distribution in eastern North America and parts of Eurasia including Caucasia, but rare or absent in Europe; a feature that is not unusual in lichens (see discussion in OTTE 2004).

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