



Tangled history of the European uses of *Sphagnum* moss and sphagnol



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ABSTRACT

Ethnopharmacological relevance: *Sphagnum* mosses and peat could have been utilized as wound dressings for centuries, however reliable data on this subject are ambiguous; sometimes even no distinction between *peat moss* (*Sphagnum* spp.) and *peat* is made or these terms become confused. The first scientific account on surgical use of peat comes from 1882: a peat digger who successfully, by himself and in the way unknown to the then medicine, cured an open fracture of his forearm with peat. The peat, and very soon the peat moss itself (which is the major constituent of peat) drew attention of the 19th-century surgeons.

Aims of the work: We search for reliable information on: (1) inspirations for *Sphagnum* usage for medical purposes and its beginnings in the 19th century, (2) substances or products named *sphagnol* and their connections with (1); (3) on the origin of this name, (4) and on the occurrence of this name in medical sources. **Materials and methods:** We have identified and studied published sources on the uses of peat-based and *Sphagnum*-based preparations and products of any processing level (including herbal stock, distillate, isolated pure or impure active principle, or a mixture of such) in surgery, pharmacy or cosmetics. A special attention was paid to the name *sphagnol*, which appeared many a time, in more than one context since 1899. Source publications were critically analysed from the taxonomical, pharmacognostical and ethnopharmacological points of view. Gathered data were cross-checked with the modern knowledge of the biologically active principles of *Sphagnum* and the prospects of their medical use.

Results: The application of peat in surgery started 1882. The use of peat moss as dressings was developed in the 1880's. It returned to surgical practice during WWI. The name *sphagnol* has two meanings: (1) A chemical substance isolated from the cell walls of *Sphagnum* mosses in 1899. A post-1950 research showed it to be a mixture of phenols dominated by sphagnum acid. (2) A product of dry distillation of peat contains solid and liquid fractions and was applied in skin diseases due to antiseptic properties. It was added to ointments and medicated soaps manufactured up to the late 1960's. Today none of these two sphagnols is in use.

Conclusions: Surgical application of peat had an ethnopharmacological origin: a case of wound treatment with peat as a remedy rather than a dressing (1880, published 1882) shortly shifted the surgeons' attention to peat moss as an absorptive dressing. The 1880's tests of antiseptic properties of peat and peat moss failed, the sterilization methods overrode the physiological effects of *Sphagnum* dressings. Sphagnan, a polysaccharide from *Sphagnum* cell walls, discovered 1983, inhibits microbial growth, tans the collagen and removes ammonia from microbial environments. Portions of raw peat could be sterile. The isolation of sphagnol (1899) from *Sphagnum* cell walls was not inspired by old surgery. Main component of sphagnol, the sphagnic acid, was used clinically during WW2, but was proved a weak antimicrobial agent. A homonymous name sphagnol appeared independently for a product of dry distillation of peat, introduced commercially probably about 1899, too, which gave rise to confusions: a) the commercial, "distilled" *sphagnol* was not the crystalline principle of *Sphagnum* cell walls. 2) the "distilled" sphagnol was hardly defined technologically or pharmacologically, never standardized in terms of the substrate (a variety of peat rather than *Sphagnum* herb) and the production process. This sphagnol, resembling pitch or tar, was an additive to medicated soaps and ointments for skin treatment and care. It must have been a low-scale product although advertised worldwide. Neither sphagnum acid nor sphagnan are used medicinally today.

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1. Introduction

Peat mosses form a very homogenous group of plants in morphological and anatomical view, classified as a class of Sphagnopsida within the division of mosses Bryophyta (Ochyra et al., 2003), or as a separate division Sphagnophyta (Séneca and Söderström, 2009; Fig. 1). The estimate number of *Sphagnum* species worldwide is 250 (Smith, 2004) with 50 species in Europe (Hill et al., 2006). *Sphagnum* mosses are told to have been utilized medicinally “for ages”. For example, in traditional Chinese medicine, they were applied in eye lesions, haemorrhages and as a heart tonic; some North American tribes used *Sphagnum* as a disinfectant carrier for berries that were rubbed on children's sores (Glime, 2008). In Europe, peat mosses were noticed at the early stage of development of botany, in L'Obel (1591) but without a description (Drobnik et al., 2016). Some authors suggest they were used for wound treatment already in the middle ages (Griffiths et al., 2013), however Drobnik and Stebel (2014, 2015) failed to find reliable accounts of the medical use of *Sphagnum* in botanical works up to the 19th century.

1.1. Hygienic uses

An account on the economical use of mosses as diapers or a cradle filling by the Sámi people in Lapland, was published already in the 1670's. In an English edition of *The history of Lapland* (Scheffer, 1674) we read: „In [...] a cradle, they lay and tie in the Infant, without any linen clothes or sheets, instead of they lay him on a sort of soft moss, of a red colour, which they dry in Summer, and have great plenty of it.” (page 123), and: “The 4th [moss] is also ground moss, short and soft, of a very fine colour, which because it is so fine, they use instead of feathers, to lay under Infants new born.” (page 142). These descriptions, however, contain no botanical hints on the identity of the mentioned mosses.

The identity of this moss was later provided by Linnaeus who explored Lapland in 1732. In his posthumously released journal of his expedition (edited by Smith (1811)) we find a very similar account: “The young children sleep in oblong leather cradles, without any thing like swaddling-clothes, enveloped in dried bog-moss (*Sphagnum palustre*), lined with the hair of the reindeer. In this soft and warm nest, they are secured against the most intense cold.” (page 154). In *Flora Lapponica* (Linnaeus, 1737, pp. 323–324) this information about *Sphagnum* is expanded again, including the use by the Sámi women as diapers which can absorb acrid urine, as pillows and covering for infants, and as hygienic material (menstrual pads). And the identity of the moss in question is *S. palustre* L.

The abovementioned testimonies on the uses of *Sphagnum* are usually cited as medical ones, but they in fact represent ethnobotany or hygiene.

1.2. Medical uses

In Europe, the medicinal use of peat and the peat moss (*Sphagnum*) should be distinguished. Published evidences of medicinal use of peat have been hardly known while the awareness of the use of peat moss (*Sphagnum*) in military surgery is narrowed to the period of The First World War (moss dressings) — see for example Painter (2003), Dickson et al. (2009), Ayres (2013), Griffiths et al. (2013). When fragments of *Sphagnum* were found in the 5200-year-old remnants of the Ice Man of Tirol, and two wounds were discovered on his body, a discussion about the possible surgical usage of *Sphagnum* started (see Dickson et al., 2009). *S. palustre* was once discovered in a Scottish Bronze Age site (early 15th century BC) in Paisley Abbey (Dickson and Dickson, 2000).

An occasional use of peat moss as a dressing material could occur independently in various regions of the world. For liverworts, similar medicinal applications were found in European and Chinese medicine (see: Drobnik and Stebel, 2015). For *Sphagnum* we can imagine that



Fig. 1. *Sphagnum subsecundum*: a habit. Phot. by Adam Stebel.

urgent surgical needs might push a surgeon to apply this (and any other) moss as a substitute of a cloth.

In our times, peat mosses are no longer used medicinally.

1.3. Economical uses

These plants are however of so high demand in modern gardening and agriculture that methods of their cultivation were developed. For example, the *Sphagnum* biomass is the most promising alternative for shrinking stocks of peat, utilized in great amount as called 'growing media' by modern agriculture (Gaudig et al., 2013/14). For a review of patents for peat moss-related technology, see Griffiths et al. (2013).

2. Aims of the work

We focus on the circumstances of discovery of *Sphagnum* (peat moss) and invention of sphagnol for medical purposes, including surgery, and on the scarcely known history of their usage *before* and *after* the World War 1. We conducted a critical appraisal of the information about: (1) inspirations of the research on *Sphagnum* from the medical view, (2) substances or products named *sphagnol*, (3) origins of this name and (4) displaying its occurrence in medicine, pharmacy and cosmetics. Ethnopharmacological (but not ethnobotanical or technical or archaeological) connotations are thoroughly presented.

3. Materials and methods

Bibliographical sources on the use of peat mosses as herbal stock and medical material have been identified and critically reviewed. Due to a big number of sources, mostly secondary or very general ones, and due to accumulation of errors and inaccuracies, we searched bibliographies for primary source of each information. Approximately 26 of such sources (1591–1985) were investigated from the pharmacognostical and ethnopharmacological points of view which involved botanical (taxonomical) approach. It enabled us to:

- identify taxonomically the herbal material which was the plant source to yield *sphagnol*,
- identify meanings and application of the name *sphagnol* (with possible homonyms),
- identify reliable sources which confirm real practical use of products and preparations of peat moss (a moss from the genus *Sphagnum*) low or highly processed (including the herb, distillate, active principle purified or impure, or a mixture of active principles) in surgery, pharmacy, cosmetics.

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