

## 苔藓植物的药用途径\*

吴鹏程, 贾渝

(中国科学院植物研究所, 北京 100093)

**摘要:** 苔藓植物作为药物被人类利用已有较长历史, 但由于对苔藓植物的识别较困难而尚未被充分应用。目前, 可知在抗菌、抑制肿块、抗心脏缺氧、清热解毒以至制作医用敷料方面苔藓植物均有相当价值。期望今后在结合实验、临床和寻找更多苔藓药用资源方面作出更大努力。

**关键词:** 苔藓植物; 药用途径; 展望

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## The Medicinal Uses of Bryophytes

WU Peng-Cheng, JIA Yu

(Institute of Botany, The Chinese Academy of Sciences, Beijing 100093, China)

**Abstract:** Traditionally the plants are the main medicinal resource, and the bryophytes as one kind of herb medicines are used by mankind for a long period of time, however people still doesn't recognize the bryophytes very well for their rather small sizes. In fact, the resource of the bryophytes with more than 23 thousand species is very rich in the world, and they occur in different habitats including the Antarctic. We may say that the bryophytes can grow in the most places in the world, where the life is existed. In this paper, we try to give a brief introduction concerning the medicinal history and the uses of the bryophytes.

**Key words:** Bryophytes; Medicinal uses; Prospect

Plants, as the main medicinal resources, are very important to mankind. Most of the bryophytes are rather small and still not well know to the people, therefore their medicinal uses are usually overlooked. In fact, the bryophytes, containing more than 23 thousand species, are very rich in the world (Crosby *et al*, 1999; Wijk *et al*, 1959-1967; Schuster, 1966-1992). The bryophytes usually distribute to below five thousand meters above sea level, and occur in all the continents including Antarctic. The bryophytes can grow in the most habitats in the world, where the life is existed. In this paper, we try to give a brief introduction concerning the medicinal uses of the bryophytes.

## The medicinal history of the bryophytes

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After the historical record of mankind, the bryophytes were early used for curing the diseases. In the ancient period of Greece, "Discorides ascribed medicinal properties to *Marchantia polymorpha*" for their liver-form appearance (Schuster, 1966). In China, the bryophytes were usually called "green liverworts" in the ancient books and herbals. In "Qun Fan Pu" (群芳谱), the author said "in courts and dim rooms, if no one goes there long, the bryophytes grow up." "Ge Wu Zong Lun" (格物总论) described that "liverworts live at moist and shady ground." In Sixth century, in Min Dynasty "Famous Doctor's Bie Lu" (名医别录) said "Heng Ye (恒衣) can be used as a medicinal herb." In eleventh century, Jia You Ben Cao "Jia You Herbals" (嘉本草) recorded "Tu Ma Zong" (土马) is *Polytrichum commune*, which may be antipyretic. In Wan Li Chinese calendar twentyfourth of Min Dynasty, Li Shi-Zhen (1596)'s "Ben Cao Gan Mo" (本草纲目) reported that "*Polytrichum commune* grows on soil walls and is longer than Heng Ye, thus it named horse's mane, a moss." In 1848, Wu Qi-Jin (吴其浚)'s "Plant Names and Illustrations (植物名实图考)" divided *Polytrichum* into a kind of rocky herbs and "called it Tu Ma Zong. Heng Ye grows on soil walls with antipyretic and for detoxification." "The Selected Yunnan Medical Plants" (Medical Ministry of Rear Service Department, Kunming Military Area, 1970) described how *Polytrichum commune*, *Pogonatum inflexum*, *Sphagnum squarrosum* and *Marchantia polymorpha* could be used in orally and external application.

Up to date, this kind of mosses can be bought in the street markets in Yunnan and Sichuan. Traditionally, *Marchantia polymorpha* can cover skin hurted, as well, for curing jaundice and antipyretic.

## The medicinal uses of the bryophytes

In twenty century, the development of science and technology bring us the further knowledge of the bryophytes and the usage of the bryophytes enters a rather scientific stage instead of the initial usage according to their appearance and habitats. People changes research of external form into studying the utilization of chemical contents and their construction of the bryophytes, and curing thousands of wounded.

The structure of the leaves of *Sphagnum* containing large empty cells and small green cells can absorb the secretory substance of hurted skin, as well their *Sphagnum* acid can control and kill the bacteria, therefore the surgical dressings made by *Sphagnum palustre*, *S. magellanicum*, *S. girgensohnii*, *S. squarrosum et al.* are better than those of cotton ones for covering the hurted skin. During the first world war, millions *Sphagnum* surgical dressings have been produced and used for curing millions people (Ando and Matsuo, 1980).

Studies of the plant chemists show that the known chemical compounds of the bryophytes are almost similar to those of the vascular plants and the bryophytes are especially rich in containing sesquiterpenoids compounds and phenolic compounds (Huneck, 1983; Hu, 1987, Zhou, 1988; He, 1993, 1998). It can be confirmed that the bryophytes contains the substances for anti-tumor (Belkin *et al.*, 1952 - 1953), anti-strengthening the heart to increase the ability of anti-oxygen lack.

## 1. Anti-pyretic and detoxification

The liverworts and the mosses growing in rather moist habitats possess this kind of functions of anti-pyretic and detoxification, and among them the plants of Marchantiaceae, Conocephalaceae and Anthocerotaceae have this kind of functions for orally or external application. In mosses, *Fontinalis antipyretica*, *Cratoneuron commutatum* and *Brachythecium* spp. have also the similar functions. In China or foreign countries this kind of utilization of the bryophytes has a long history, and their curative effects are certainly believable (Ando, 1957; Ando and Matsuo, 1984; Pei and Zhou, 1958; Wu, 1998).

## 2. Anti-tumor

According to Belkin *et al.* (1952 – 1953)'s experiments, the alcohol extract of *Polytrichum juniperinum* can be inhibit the growth of tumors. Ohta *et al.* (1977) obtained the diplophyllin extracts from *Diplophyllum taxifolium* and *D. albicans*, which has effect of anti-tumor. In 1881 and 1982, Asakawa reported that *Marchantia polymorpha*, *Wiesnerella denudata* and *Conocephalum superadecompositum et al.* contained sesquiterpenoids which also have the ability of anti-tumor.

## 3. Anti-bacterium

A lot of species of the bryophytes contain the anti-bacterium substances. We tested the substances from more than 20 species of mosses. Microbiostatic test of tubercle bacillus was done by ethol extractive liquid of *Polytrichum commune*, and obtain the bacterium inhibitory ring up to more than 10 mm in diameter. Pavletic and Stilinovic (1963) and Gupta and Singh (1971) tested and found a lot of substances of mosses strongly against the gram positive and gram negative bacteria. Those substances came from the species of *Sphagnum*, *Polytrichum*, *Atrichum* and *Dicranum et al.*, and they were considered that the polyphenolic compounds and nonionized organic of these plants may bring the above results (McCleary and Walkington, 1966).

## 4. Anti-heart muscle oxygen lack

In 1980s', the Department of Biology and the Department of Chemistry of Yunnan University cooperated to analyze *Rhodobryum giganteum*, and this work shows the flavonoid, which the moss contains, might be the main substance to strengthen the ability to tolerate oxygen lack. Since then, the Traditional Chinese Medicine Research Group of The Shanghai Fourth Pharamceutical Factory did a series of animal tests and clinical trials of ethanol extract of the above mentioned species and in the test group of white mice given 10 g to 25 g/1 kg of crude drug mice can be extended double of their survival times. As well, the test for the rate of flour of coronary artery of white mice heart in vitro tolerating oxygen lack shows that increase 30 – 54% of the rate of flour of coronary artery, when 1 – 2 mg/1 ml of crude drug is given. Thus the effect is evident and *Rhodobryum giganteum* is a really good medicinal moss (Hu, 1987; Wu, 1977, 1982).

Medicinally, the bryophytes are a kind of less use plants, which is still not well known to the people. Therefore they hame probably giant potentials for the development of new drug in the future. Because the bryophytes occur in different habitats in the world, their various chemical substrates might bring us for multi-purpose medicinal test.

Table 1 The oxytolerant test of mice given the extractive fluid of *Rhodobryum giganteum*

Dosage	Average survival time	Control group *	Drug delivery group	P value
25 g	crude drug/1 kg	23.4	55.5	P < 0.001
25 g	crude drug/1 kg	20.4	35.6	P < 0.001
10 g	crude drug/1 kg	27.2	34.8	P < 0.05
10 g	crude drug/1 kg	21.2	28.2	P < 0.05

( From the Chinese Medicinal Research Group , Shanghai Fourth Pharmaceutical Factory )

Note : The biostatistical treatment shows that  $P < 0.05$  is evident effect and  $P < 0.001$  is very obvious effect.

Table 2 The test of the rate of flour of coronary artery of animal heart in vitro , given extractive fluid of *Rhodobryum giganteum*

Dosage	Testing number of time	I	II	III
		Increase/ %	Increase/ %	Increase/ %
1 mg	crude drug/1 ml	30	43	48
2 mg	crude drug/1 ml	54	50	-

( From the Chinese Medicinal Research Group , Shanghai Fourth Pharmaceutical Factory )

*Physcomitriella patense* had great ability of homologous recombination , and to transfer the medicinal gene from other plant group to the bryophytes .

In generally , for the future development on the medicinal uses of the bryophytes in China , we consider that several urgent works be needed to do .

1. The elemental studies are further determination and discovery on the Chinese bryological resources . Though the bryoflora of China is being published in Chinese and English , studies of the bryophytes in China number of which is about 10% of the world are still a hard work to be completed .

2. Further chemical analyses on the medicinal species of the bryophytes are expected in getting the taxonomists and phytochemists together , and the cooperation will stimulate the analyses on known medicinal species and encourage the sample collections of the bryophytes in China .

3. Physiology including molecular genetics might be one of the best way for propagating the medicinal species of the bryophytes and on the other hand the cultivation bases are necessary to be established .

4. Cooperation among bryologists of the world is prospective , especially the young taxonomists and phytochemists of China to be educated in the foreign universities are very necessary .

The next decade is very important to us , and more mosses and liverworts used as medicine are expected in China . Thus the multi-course and multi-way cooperation might be the mainstay for pushing the medicinal uses of the bryophytes to enter a further broad period of time .

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In present , some species , such as *Physcomitriella patens* can be useful to molecular genetics , as well as *Funaria hygrometrica* , *Ceratodon purpureus* and *Tortula ruralis* have been developing into powerful experimental tools . Schaefer and Zryd ( 1997 ; Shi *et al* , 2001 ) pointed out that

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