

**Review article**

**Samambaia - The future focus for Indian researchers in the  
treatment of psoriasis**

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**Abstract:**

Psoriasis is an issue of global and national public health concern. The traditional use of medicinal plants to treat this disease is widespread throughout India. The present review is an attempt for the beneficial effect of the South American originated fern *Polypodium* species which are used traditionally for various anomalies in health including Psoriasis condition. This review article has focused on the role of *Polypodium* species for the health management in India.

**Keywords:** *Polypodium*; Psoriasis

## Introduction

Psoriasis is a non-contagious skin disorder that most commonly appears as inflamed swollen skin lesions covered with silvery white scale. Among various types of psoriasis, there is plaque psoriasis, characterized by raised, inflamed (red) lesions. The scale is actually a buildup of dead skin cells. There is also guttate psoriasis characterized by small red dots of psoriasis, which may have some scales. Psoriasis is now believed to be linked to immunological mechanisms [1]. Traditionally many Indian herbal drugs extracted solely or composite mixtures are used to treat psoriasis disease in different formulations, but we have to find out the single plant like Samambaia which is most useful for curing the psoriasis ailment alone. Of late, the clinical effect of Samambaia has been demonstrated in a number of studies from 1974 to 1987 in which patients with psoriasis and atopic dermatitis have been successfully treated using an extract of the above ground parts of *Polypodium decumanum* [1]. Samambaia has been successful in treating psoriasis and dermatitis ever since. Scientists have shown that one possibility of its beneficial effects in psoriasis and immunomodulating activity with its phytochemical extracts [2, 3]. Its immunomodulatory effects were also demonstrated in clinical experiments with healthy volunteers, showing that Samambaia extracts increased the number of T-suppressor lymphocytes (T8+) without affecting the number of T-helper (T4+) lymphocytes or B-cells [1].

Samambaia (Family: Polypodiaceae) is a fern that grows in the rainforests of South America as well as drier tropical forests in Latin America. There are 75 species of plants in the *Polypodium* genus, many of which have been used medicinally for centuries [4]. The name is derived from *poly*, meaning "many," and *podus*, meaning "foot," for the many foot-like divisions of the root or rhizomes of polypody ferns. They are indigenous to the Honduran rainforests but also can be found throughout the South American tropics and in parts of Latin America and the Caribbean. In Brazil, the common name of this plant is *samambaia*. In Mexico and other

Spanish-speaking tropical countries, the plant is known as *calaguala*. Different species of this genus mainly *Polypodium decumanum*, *P. leucotomos* and *P. aureum* are in great demand. They survive under wet rainy seasons growing over the top of palm trees. There have been steady accumulations of information regarding clinical trails for the psoriasis treatment of this *Polypodium* species. The plant extract has been generally used for the treatment of inflammatory disorders and skin diseases. Recently, clinical research has shown that it has antioxidant and photoprotective properties [5, 6]. The extract of the plant is taken orally and provides protection against the harmful effects of ultraviolet (UV) radiation from the sun and other sources [7].

## Description

*Polypodium* species are terrestrial or epiphytic ferns with a creeping. The creeping rhizomes are 8-15 mm in diameter with the golden brown scales. They are densely hairy or scaly rhizome bearing fronds at intervals along its length. The species differ in size, general appearance and in the character of the fronds, which are evergreen, persisting for 1-2 years, pinnate (rarely simple) and about 10-80 cm long and 10-50 cm broad. It is having up to 35 pinnae with multiple colors from bright green to glaucous green with having undulate margins. Several round sori or groups of spore-cases (sporangia) are borne on the back of the frond and run along each side of the pinna midrib and the minute spores are wind dispersed [8].

## Synonyms

This plant also known as *Phlebodium decumanum*, *P. multiseriale*, *Chrysopteris decumana*.

## Other species

Some selected species of *Polypodium* include *Polypodium amorphum* Suksdorf, *Polypodium appalachianum* Haufler & Windham, *Polypodium asterolepis* Baker, *Polypodium californicum* Kaulf, *Polypodium calirhiza* S.A. Whitmore & A.R. Smith,

*Polypodium cambricum* L. (syn. *P. australe* Fée), *Polypodium excavatum* Roxb., *Polypodium feei* (Bory) Mett., *Polypodium furfuraceum* Schltldl. & Cham. *Polypodium glycyrrhiza* D.C.Eaton, *Polypodium hesperium* Maxon, *Polypodium interjectum* Shivas, *Polypodium lepidopteris* (Langsd. & Fisch) Kunze, *Polypodium macaronesicum* Bobrov., *Polypodium nigrescens* Blume, *Polypodium phymatodes* L., *Polypodium pycnocarpum* C. Chr., *Polypodium saximontanum* Windham., *Polypodium scouleri* Hooker & Greville., *Polypodium sibiricum* Sipliv., *Polypodium triseriale* Swartz., *Polypodium virginianum* L., and *Polypodium vulgare* L. (Common Polypody).

Several of the species form hybrids with other species in the genus; these may often be distinguished by being sterile, with very small, blind sori. Named hybrids include *P. x font-queri* (*P. cambricum* x *P. vulgare*), *P. x mantoniae* (*P. interjectum* x *P. vulgare*), and *P. x rothmaleri* (*P. cambricum* x *P. interjectum*) [9].

**Part used:** Rhizome and leaves.

#### **Habitat**

This fern is rarely terrestrial in habitat, usually colonizing the canopies of tropical rainforests and the dwarf palms of subtropical forests. It is common in the cloud forests of the Caribbean and northern South America. It grows in varied habitats in Florida, including swamps and hammocks and can thus apparently tolerate a wide range of microclimates. Its restriction to the tropics and subtropics is readily explained by its intolerance of anything other than very brief, light frosts [10]. High levels of light are also critical for the growth of the plant.

#### **Active constituents**

Samambaia contains flavonoids, alkaloids and lipids. It is a rich source of lipids and fatty acids [11]. The main plant chemicals identified in samambaia thus far include adenosine, alkaloids, arachidonic acid, arabinopyranosides, calagualine, ecdysone, ecdysterone, eicosapentaenoic acid, elaidic acid, juglanin, kaempferols, linoleic acids, linolenic acids, melilotoside, oleic acid,

ferulic acid, polypodaureine, ricinoleic acid, rutin, selligueain, and sulphoquinovosyldiacylglycerols [11, 12].

#### **Cultivation**

*Polypodium* species are well-adapted to cultivation and is valued both as an ornamental plant and in herbal medicine. It can be cultivated in greenhouses in nontropical climates if night temperatures do not fall below 5 °C. Several cultivars can be selected for garden planting, with varying leaf color from grey-green to silver-green and blue-green, or with very wavy frond margins [10].

#### **Propagation**

This plant species are propagated through spores. The spore surface sow in a pot of sterile compost in a shady part of the greenhouse and keep moist, this is most easily done by putting the pot in a plastic bag. Pot up small clumps of the plants when they are large enough to handle and keep them moist until they are established. Plant out in late spring of the next year. They are kept in a cold frame until they are growing away well [13].

#### **Medicinal uses**

The plant historically is used by the indigenous people of Honduras for malignant tumors, rheumatoid arthritis, and psoriasis. The Boras Indians (in the Peruvian Amazon) prepare the leaves in a drink for coughs. The Witotos Indians (in the northwest Amazon) use the rhizome for treating coughs. Other Peruvian indigenous tribes use the rhizome for problems of the pancreas. Indigenous groups in Latin America use the rhizome and leaves for many different maladies including cancer, psoriasis, peptic ulcers, kidney problems, diarrhoea, arthritis, and pains in joints and tendons. It is generally considered throughout the Amazon to be a general tonic, to detoxify the body and to support the immune system.

In Brazilian traditional medicine Samambaia is considered alterative, antirheumatic, tonic, pectoral and

expectorant; widely used for coughs, bronchitis, gripe, other upper respiratory problems as well as rheumatism and skin problems [14, 15]. In Peruvian herbal medicine the rhizome is used for coughs, fevers, urinary infections, as well as skin affections like psoriasis, boils, ulcers, and abscesses of the skin [16]. World wide applications of this plant are tabulated in Table 1 [11].

#### **Traditional preparation**

One-half to 1 cup leaf or root infusion 1-3 times daily or 2-3 ml of a 4:1 tincture or fluid extract twice daily. Traditionally, a simple, cold maceration of the rhizome and leaves is used for curing different anomalies in health [11].

#### **Dosage**

Leaves and rhizome are used for the preparation [11].

**Infusion:** 1/2 to 1 cup 1-3 times daily,

**Capsules:** 1-2 g twice daily

**Tincture:** 2-3 ml twice daily

#### **Drug interactions**

It may potentiate the effects of digitalis and/or other digitalis-type drugs. The absorption of samambaia has been reported to be reduced in the presence of antacids [11].

**Table 1.** Ethanomedical uses of *Polypodium* species [11]

Country	Uses
<b>Amazonia</b>	For cancer, coughs, detoxification, fever, immune disorders, kidney problems, pancreatic disorders, psoriasis, rheumatism, whooping cough
<b>Brazil</b>	For blood cleansing, bronchitis, colds, coughs, flu, gout, psoriasis, respiratory disorders, rheumatism, skin disorders, and as an expectorant, tonic, and to increase perspiration
<b>Colombia</b>	For coughs
<b>Mexico</b>	For coughs, fever, respiratory problems, and to increase perspiration
<b>Peru</b>	For abscesses, boils, cough, fever, psoriasis, skin disorders, ulcers (skin), urinary infections, whooping cough.
<b>United States</b>	For Alzheimer's, bronchitis, colds, cough, gout, dermatitis, detoxification, eczema, flu, psoriasis, hypertension, immune disorders, skin disorders, rheumatism, and to increase perspiration and urination
<b>Venezuela</b>	For venereal diseases and as a laxative
<b>Elsewhere</b>	For bronchitis, cancer, colds, coughs, fever, flu, gout, hypertension, immune disorders, kidney problems, psoriasis, respiratory disorders, rheumatism, skin disorders, tonic, tumors, urinary insufficiency.

### **Pharmacological evidence**

This plant species are used for many disease conditions as well in different pharmacological actions. Literature survey revealed some of the important actions of this *Polypodium* species. The fern *Polypodium decumanum*, commonly called Calaguala, has a clinical use in South America and Spain in the treatment of psoriasis as well as inhibitory activity in platelet-activating factor in the pathogenesis of psoriasis [17].

*Polypodium Leucotomos* extract was also reported in the treatment of psoriasis [2, 18]. It exhibits interesting antioxidant and anti-inflammatory as well as photoprotective properties [19, 20]. It also acts as immunomodulator [21] and decreases ultraviolet-induced damage of human skin [22]. Recent clinical study has been carried out to evaluate the oral administration of an extract of *Polypodium leucotomos* for the effective photoprotective activity. Total of 26 patients with polymorphic light eruption and two with solar urticaria were recruited for the study. Statistically significant reduction of skin reaction was observed [23].

The another study was investigated a photoprotective effect of oral administration of an extract of the natural antioxidant *Polypodium leucotomos* (PL) with a total of 9 healthy participants of skin types II to III were exposed to artificial UV radiation without and after oral administration of PL (7.5 mg/kg). At 24 hours after exposure the erythema reaction was assessed and paired biopsy specimens were obtained from PL-treated and untreated skin. Results suggested the significant protection of skin against UV radiation [7].

### **Mechanism of action**

The mechanism of action in treating psoriasis is thought to be related to the modulation of certain cellular processes found in inflammation and psoriatic skin. Scientists have shown that psoriatic skin has abnormally high quantities of chemicals produced in the body called leukotriene and PAF (platelet-activating factor) Both are implicated in the cause and progression of psoriasis. In clinical research samambaia

(and/or some of its novel chemicals) have shown to be effective in blocking excess leukotriene production as well as excess PAF [11].

The mechanism of action of *Polypodium leucotomos* extract (PLE) is summarized into the following main points [24]:

- PLE acts as a scavenger to mop up free radicals and reactive oxygen species (ROS), particularly superoxide anions (these high energy molecules cause direct cell damage and have long been associated with all types of cancer)
- PLE inhibits the depletion of Langerhans cells
- PLE reduces the number of sunburn cells
- PLE protects DNA by inhibiting the formation of cyclobutane pyrimidine dimers (cancer-causing cells) induced by UVB radiation
- PLE preserves skin tissue structure by inhibiting the infiltration of mast cells into skin (mast cells release chemicals in the body that cause inflammation, redness and itching)

### **Market product**

*Polypodium leucotomos* extract (PLE) is currently marketed in several countries. It is combined with two other antioxidants, green tea extract and beta-carotene.

### **Scope in India**

Detail study of the *Polypodium* species indicates the significant and potential prospect for medicinal uses particularly in the treatments of psoriasis and sun burn protection. Allopathic treatment has not been successful in curing this disease because it can damage the organs of the human body. There was lack of awareness in the society about this disease and people were committing suicide due to unavailability of proper treatment. To overcome this problem, Indian Psoriasis Foundation (IPF) was established for creating awareness about this disease and the availability of proper treatment in Ayurveda. Mostly herbs are formulated in combination for any disease conditions but unique

preparation of herbs for disease condition is very few likely *Polypodium* species for psoriasis treatment. In India *Polypodium* species are abundantly found in hill areas of South Karnataka, hilly part of Uttaranchal and northern region of West Bengal. There is lack of awareness as well as clinical evidences of this plant species for psoriasis condition, hence it is necessary to establish the specific agro technological parameters (conservation, propagation, cultivation, post-harvest handling), phytopharmaceutical technology for isolation of active constituents and formulate the dosage form of *polypodium* species.

## Conclusion

The over all description about the *Polypodium* species summarized in this review may draw the researchers' attention to the standardization of the cultivation for raw material availability and for clinical studies which would be of great scientific contributions for the treatment of psoriasis condition to the healthy society.

## References

- [1] K. Hostettmann. Phytochemistry of plants used in traditional medicine, *Proceedings of the Phytochemical Society of Europe*. Oxford University Press, Oxford, 1995.
- [2] B. P. Alvarez. 2 years personal experience in anapsos treatment of psoriasis in various clinical forms, *Med. Cutan. Ibero. Lat. Am.* 11: 65-72 (1983).
- [3] H.C. Padilla. A new agent (hydrophilic fraction of *Polypodium leucotomos*) for management of psoriasis, *Int. J. Dermatol.* 13: 276-282 (1974).
- [4] M. Grieve. *A Modern Herbal*, Dover Publications, New York, 1971.
- [5] L. Gombau, F. Garcia, A. Lahoz, M. Fabre, P. Roda-Navarro, and P. Majano, et al. *Polypodium leucotomos* extract: antioxidant activity and disposition, *Toxicol. In Vitro.* 20: 464-471 (2006).
- [6] J.L. Alonso-Lebrero, C. Dominguez-Jimenez, R. Tejedor, A. Brieva, and J.P. Pivel. Photoprotective properties of a hydrophilic extract of the fern *Polypodium leucotomos* on human skin cells, *J. Photochem. Photobiol. B.* 70: 31-37 (2003).
- [7] M.A. Middelkamp-Hup, M.A. Pathak, C. Parrado, D. Goukassian, F. Rius-Diaz, M.C. Mihm, T.B. Fitzpatrick, and S. Gonzalez. Oral *Polypodium leucotomos* extract decreases ultraviolet-induced damage of human skin, *J. Am. Acad. Dermatol.* 51: 910-918 (2004).
- [8] Wikimedia Foundation, Inc., USA. *Phlebodium aureum*, Cited 12 May 2007, Available from: <http://en.wikipedia.org/wiki/Phlebodium>.
- [9] Answers Corporation, Cited 23 Jun 2007, Available from: <http://www.answers.com/topic/polypodium-1>.
- [10] Wikimedia Foundation, Inc., USA. *Phlebodium aureum*, Cited 10 May 2007, Available from: [http://en.wikipedia.org/wiki/Phlebodium\\_aureum](http://en.wikipedia.org/wiki/Phlebodium_aureum).
- [11] Raintree Nutrition, Inc., Carson City, NV. *Topical plant database Samambaia*, Cited 10 May 2007, Available from: <http://www.rain-tree.com/samambia.htm>
- [12] R.E. Schultes, and R. Raffauf. *The healing forest: medicinal and toxic plants of the northwest Amazonia*, R.F. Dioscorides Press, Portland Oregon, 1990.
- [13] Plants for a future Co.,Ltd., UK. *Plants for a future: edible, medicinal and useful plants for a healthier world*, Cited 24 April 2007, Available from: <http://www.pfaf.org/database/plants.php?Athyrum+filix-femina>.
- [14] G.L. Cruz, and D. Das. *Plantas uteis do Brasil*, 5<sup>th</sup> ed., Bertrand, Rio de Janeiro, Brazil, 1995.
- [15] R. Coimbra, *Manual de fitoterapia*, 2<sup>nd</sup> Ed., Editora Cejup., Belem, Brazil, 1994.
- [16] M. Kember, and E. Reng, *Plantas medicinales de uso popular en la Amazonia Peruana*. AECI and IIAP, Lima, Peru, 1995.
- [17] M. Vasange-Tuominen, P. Perera-Ivarsson, J., L. Bohlin, and W. Rolfsen. The fern *Polypodium decumanum*, used in the treatment of psoriasis, and its fatty acid constituents as inhibitors of leukotriene B4 formation, *Prostaglandins Leukot. Essent. Fatty Acids.* 50: 279-284 (1999).
- [18] M. Vasange, W. Rolfsen, and L. Bohlin. A sulphonoglycolipid from the fern *Polypodium decumanum* and its effect on the platelet activating-factor receptor in human neutrophils, *J. Pharm. Pharmacol.* 49: 562-566 (1997).
- [19] H.C. Padilla, H. Lainez, and J.A. Pacheco. A new agent (hydrophilic fraction of *Polypodium leucotomos*) for management of psoriasis, *Int. J. Dermatol.* 13: 276-282 (1974).
- [20] S. Gonzalez, and M.A. Pathak. Inhibition of ultraviolet-induced formation of reactive oxygen species, lipid peroxidation, erythema and skin photosensitization by *Polypodium leucotomos*, *Photodermatol. Photoimmunol. Photomed.* 12: 45-56 (1996).
- [21] A.J. Gomes, C.N. Lunardi, S. Gonzalez, and A.C. Tedesco. The antioxidant action of *Polypodium leucotomos* extract and kojic acid: reactions with reactive oxygen species, *Braz. J. Med. Biol. Res.* 34: 1487-94 (2001).
- [22] E. Reyes, P. Jaen, E. de las Heras, F. Carrion, M.

- Alvarez-Mon, E. de Eusebio, M. Alvare, J. Cuevas, S. Gonzalez, and V.G. Villarrubia. Systemic immunomodulatory effects of *Polypodium leucotomos* as an adjuvant to PUVA therapy in generalized vitiligo: a pilot study, *J. Dermatol. Sci.* 41: 213-216 (2006).
- [23] M. Caccialanza, S. Percivalle, R. Piccinno, and R. Brambilla. Photoprotective activity of oral *Polypodium leucotomos* extract in 25 patients with idiopathic photodermatoses, *Photodermatol. Photoimmunol. Photomed.* 23: 46-47 (2007).
- [24] DermNet NZ.NZDS. Disclaimer. *Polypodium leucotomos*. Cited 12 May 2007, Available from: <http://dermnetnz.org/treatments/polypodium.html>.