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Pteridophyta Diversity of South Odisha, India, with Special Reference to Medico Folk Lore Claims: A Brief Review

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ABSTRACT This paper focuses on the ethno-medicinal utility of eight Pteridophyte species from Kerandimal Hills of Ganjam and Gajapati districts of South Odisha, India, includes three new reports including *Drynaria quercifolia* (Linn) J. Smith which has extensive laboratory tested medicinal property as per its folk lore claim.

INTRODUCTION

India is proud to be one of the richest areas in biodiversity at global perspective. It provides nearly three fourth of the drugs and perfumery products used in the world in natural state. India possesses almost 8 percent of the estimated biodiversity of the world with around 1, 26,000 species. It is one of the 12 mega biodiversity centers with 2 hot spots of biodiversity in Western Ghats and north-eastern region. There are about 400 families in the world of flowering plants; at least 315 are present in India. According to WHO, around 21,000 plant species have the potential for being used as medicinal. About 5000 species have been studied (*vide* Thallophytes-230 + Bryophytes-39 + Pteridiphytes-382 + Gymnosperms-55 + Angiosperms: Monocotyledons 676 + Dicotyledons-3495= Total of 4877 species) which speaks about the therapeutic value of different plant groups (Jiaxiang 1997).

Odisha state comprises 155,707 sq.km carries 4.7 percent of Indian landmass (Fig. 1). It has 450 km coastline, in its South-East at the shore line of Bay of Bengal. The state is divided into three broad regions as coastal plains, middle mountainous hill tops and rolling upland plateaus. Odisha is considered as an abode to India's ancient civilization comprises tribal and aboriginals mostly concentrated around the Eastern Ghats hills range encompasses the region of South.

South Odisha comprises eight districts namely Ganjam, Gajapati, Rayagada, Koraput, Nawrangpur, Malkanagiri, Kandhamals and Kalahandi with diversified physiographic status. This southern part of the state extends from coastal plains to interior hill regions of Eastern Ghats. The hill tops and the plateau are found to be with vegetation comprising deciduous, dry deciduous, to the extent few moist deciduous that is, ever green flora intermingled with terrestrial cryptogrammic species. Since most of the mountains of South Odisha being rich in minerals are the sources of origin for perennial hill streams and hence, the forest ecosystems are rich in species diversity.

Odisha state comes under the middle India tribal zone along with other adjacent states like Bihar, Madhya Pradesh, West Bengal, Jhadakhand and Chhattisgarh. This zone constitutes the major tribal population of India, which includes about 65 tribes (Danda 1996). As per 1981 census the different scheduled tribes and different sub-groups of the tribes found in the Odisha state, is of sixty two types.

Most of the forest habitats of South Odisha are covered by aboriginal tribes out of which Khond (Kondha) and Soura D Langia Soura considered ethnically to be most primitive and are found especially in undivided Ganjam, Khondmals and Kalahandi districts. Since the tribal communities are exclusively forest dwell-

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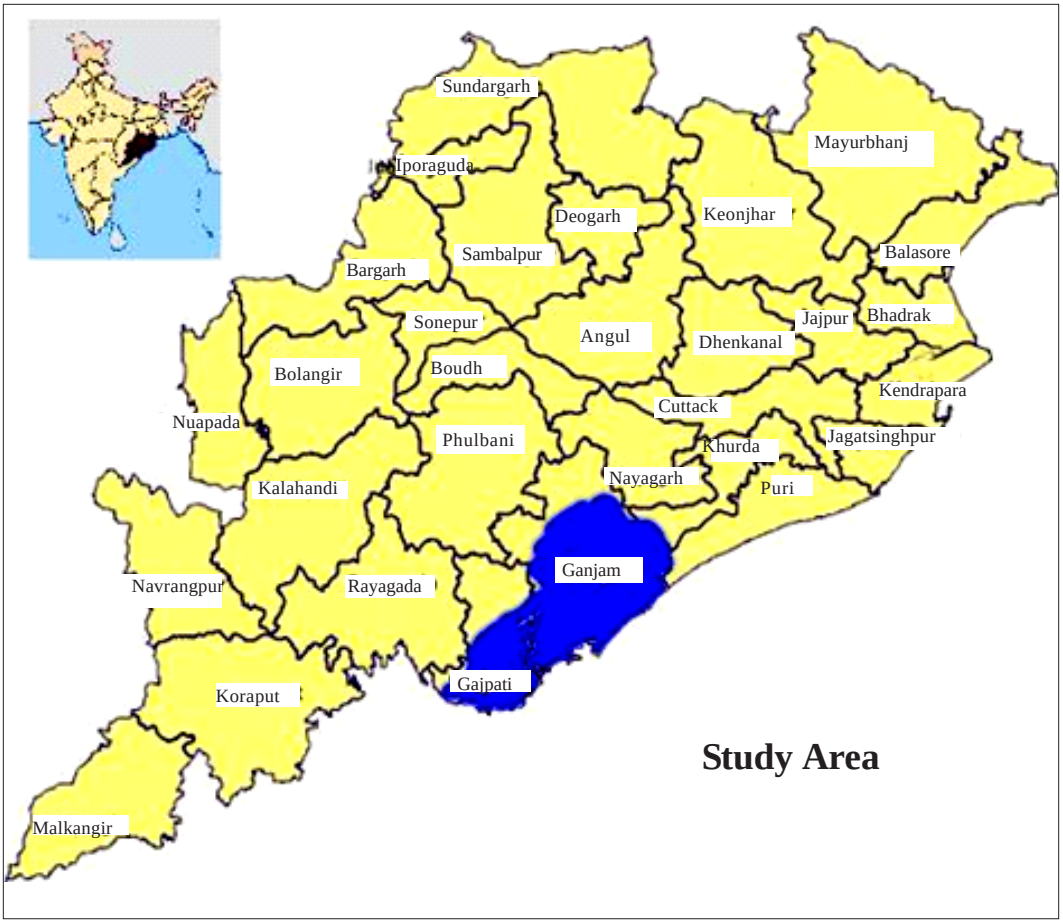

Fig. 1. Map of Odisha (India) with demarcated study area

ers, their health care status and medical know-how's over ages interpreted as Traditional health care system, which mostly depends on herbals and psychosomatic lines of treatments associated with medico-religious belief, mysticism and magic etc. The combination of such health care therapy associated with modern allopathic system of treatment may become more affordable by poor and its scientific evaluation needs to be established (Balgir 1997, 2000, 2005). Much of the ethno medicinal knowledge spread among the common man and tribals of Odisha is recovered and published from time to time (Das et al. 2003). The present work is an attempt to compile a list of Pteridophytes of South Odisha with special emphasis on their ethno medicinal value.

MEDICINAL VALUES OF PTERIDOPHYTES

All Cryptogams are recognized as *Vanaspati* (plants bear fruits without flowers) in Vedic age (Dash and Padhy 1997). Modern science has named the Pteridophytes as lower vascular plants. Even in Ayurveda Pteridophytes are poorly explored for their medicinal utility. The economic utility of this group of plants has been less explored due to negligence and very less attention towards assessing its potentialities for human welfare (Vasudeva 1999). Time to time, the ethno botanical studies across the globe drew attention of many, out of which the explorative studies (Hershberger 1896; Nwosu 2002)

considered to be of great significance. It is the fact that, next to flowering plants Pteridophytes from medicinal perspectives should be given due priority. Pteridophytes with medicinal utility were listed and studied (Nayar 1959; Kaushik and Dhiman 1995; Joshi 1997; Chopra et al. 1956; Singh et al. 2001; Gogoi 2002; Mahapatro et al. 2012) which seems to be encouraging to explore the hidden treasure in this group of plants. Some selected Pteridophytes with ethno medicinal utility, reported from different corners of India and abroad are focused as follows.

Pteridophytes with Ethno-medicinal Utility

1. *Acrostichum aureum* L. Family-Pteridaceae. Plant is used as styptic and anthelmintic, wormicidal and astringent in hemorrhage (Chopra et al. 1956) and reportedly used as traditional medicine by Nicobarese tribes (Dagar 1989).
2. *Adiantum latifolium* Lamk. (= *A. denticulatum* Sw.) Family- Adiantaceae. The whole plant used as medicinal. Plant parts mucilaginous, pectoral expectorant and emmenagogue. Leaves used as febrifuge and catarrhal affections and commonly used against cough and for all throat infections (Nayar 1959).
3. *Acrostichum aureum* L. Family-Pteridaceae. Plant is used as styptic and anthelmintic, wormicidal and astringent in hemorrhage (Chopra et al. 1956) and reportedly used as traditional medicine by Nicobarese tribes (Dagar 1989).
4. *Blechnum orientale* Linn. Family- Blechnaceae. The plants used as poultice for boils by central Indian tribes. Rhizomes used as anthelmintic. Plants used as medicine against diarrhea and stomach disorders (Vasudeva 1999).
5. *Cheilanthes bullosa* Kunze. Family-Sinopteridaceae. Plant juice filtered and mixed with rice starch given thrice daily against discharge of yellowish urine with oral dose of 20 - 30 ml (Lal et al. 1996).
6. *Cheilanthes tenuifolia* Sw. Family- Sinopteridaceae. Tribal's use as general tonic (Nayar 1959).
7. *Christella parasitica* (Linn.) H. Lev. Family- Thelypteridaceae. Used against wounds (Gogoi 2002).
8. *Dicranopteris linearis* var. *linearis* Holttum. Family- Gleicheniaceae. Tender fronds macerated with cow milk, given internally to overcome woman's sterility. The rhizomes used as anthelmintic (Vasudeva 1999). Also, externally applied as wound healer (Futscher 1959).
9. *Diplazium esculentum* (Retz.) Sw. Family- Athyriaceae. Cooked tender fronds eaten by tribals for maintaining good health (Kaushik and Dhiman 1995).
10. *Diplazium cochleata* Sw. Family- Athyriaceae. Used against epilepsy / Seizures (Dhiman 1998).
11. *Dryopteris cochleata* (D. Don) C. Chr. Family- Dryopteridaceae. Powdered plant rhizome taken with water twice daily to cure rheumatism, epilepsy and leprosy (Shah and Singh 1990). The crushed plant extract given orally twice daily against all poisonous stings; in case of snake bite besides above, the plant paste also applied on the bite wound to prevent infection (Verma *et al.*. 1995). Rhizome used in swellings and pain and is with antifungal properties (Asolkar et al. 1992).
12 *Dryopteris concolor* Kuhn Family-Sinopteridaceae. Decoction of fresh rhizome and fronds are given in chronic disorders arising from obstructions of viscera and spleen. (Chopra et al. 1956).
13. *Dryopteris hirtipes* (Blume.) Kountz. (*Aspidium hirtipes* Blume.) Family- Dryopteridaceae. Juice obtained from tender fronds given in epilepsy. Also, used as antibiotic. (Vasudeva 1999).
14. *Lindsaea ensifolia* Sw. Family- Lindsaeaceae. Fronds used to produce red dye. Plants on internal use cure chronic enteritis (Forsberg 1942).
15. *Lygodium flexuosum* (L.) Sw. (=*Ophioglossum fluxuosum* Linn.). Family-Schizaceae. The plant has been described as an expectorant and its roots extract in mustard oil is considered an effective remedy for the treatment of wounds and eczema. Leaf paste also applied over the skin to treat skin disease (Nayar 1959).
16. *Marsilea minuta* Linn. Family- Marsileaceae. Decoction of leaves mixed with ginger given in bronchitis and cough by the tribals (Vasudeva 1999). Also, used

as eye drop against eye affections (Dhiman 1998).

17. *Microsorum punctatum* (Linn.) Copel. Family- Polypodiaceae. Plant Used as traditional medicine among Nicobarese tribes (Dagar 1989). Reported to be anti-inflammatory and antibacterial (Whistler 1992).
18. *Odontosoria chinensis* (Linn.) J. Sm. Family- Lindsaeaceae. Used for treatment of chronic enteritis (Nayar 1959).
19. *Osmunda regalis* L. Family- Osmundaceae. Cultivated as ornamental by local tribals of Madhya Pradesh, India, utilized its first frond of the year to cure toothache (Vasudeva 1999).
20. *Pteris quadriaurita* Retz. Family- Pteridaceae. Used as anthelmintic (Nayar 1959). Decoction of fresh rhizome and fronds are given in chronic disorders arising from obstructions of viscera and spleen. (Chopra et al. 1956).
21. *Pyrrosia heterophylla* (Linn.) Price Family- Polypodiaceae. Plants used to cure urinary calculus and rheumatism (Caius 1935).

BIODIVERSITY OF PTERIDOPHYTES IN SOUTH ODISHA

About 382 Pteridophytes are reported from India, out of which Odisha has 132 species and significantly their number from South Odisha is 46 (Table 1). In order to explore the ethno medicinal value of these plants a study was conducted during the year 2010-2013 in Kerandimal regions encompassing Ganjam - Gajapati districts of South Odisha.

To get information, survey was conducted in the villages Chikiti, Tamana, Kamalapur and Pudamari (all from Ganjam), Luhagudi, Mohana, Gundriguda, Amalaguda, Ludruma, Betarasing, Khani, Kamiliguda, Chapadapanka, Dhepalanju, Brahmanigam and Chandragiri areas (all from Gajapati district) spread through Kerandimal Hills of South Odisha. These spots were included in the survey based on prior information gathered regarding use of small lower plants as medicine.

To establish and verify the fact, a well structured questionnaire based on standard norms prescribed, was prepared pertaining to availability, ecology, economic transaction of species and the various medico folklore uses with percentage contribution of the species to the economic viability of people dependent on it (Padhy 2015).

Ethno-medicinal Information

The medico folklore uses of the Pteridophyte species from the area were enumerated with Botanical name, Family (in parenthesis), vernacular name (VN), plant parts and their uses. This above survey provided information on 08 species under 08 genera and 07 families. Out of the 08 species, three are new reports from South Odisha. Some of the enlisted plants were found to be used as food, for beautification purpose, mythological beliefs and protection from reptiles *etc*, apart from their use as herbal drug. The list of Pteridophytes with their therapeutic uses, reported from Kerandimal hills of Ganjam- Gajapati districts of South Odisha, was as follows:

*1. Actinopteris radiata (*Sw.) L. (Actiniopteridaceae); VN: Morpankhi

Whole plant acts as astringent and anthelmintic; used against severe irritations of helminthiasis including diarrhea, dysentery, *kapha* and *pitta*, fever *etc* with children.

2. Adiantum caudatum L. (Pteridaceae); VN: Mayurshikha

Extracts prepared from fronds of the plants were used in healing of wounds. Rhizomes are used as anthelmintic and also used against Cough and fever.

3. Dryopteris cochleata (D.Don) C.Chr. (Dryopteridaceae); VN: Kakolisag / Kandadhenu

Whole plant extract used orally twice daily to patients suffer from snakebite. Powdered rhizome is taken twice daily with water by patients suffering from rheumatism and also externally applied to heal leprosy wounds. Rhizome is antifungal and applied on spots of swellings, pains and ulcers; also, taken before meal that cures colic pain due to amoebic dysentery.

4. Lygodium flexiosum (Linn.) Sw. (Lygodiaceae); VN: Kala-mahajala

These plants were used as an expectorant and its root extract along with mustard oil is con-

Table1: List of Pteridophytes reported from South Odisha.

S. No.	*Name of the plant species*	*Family*
1.	*Actinopteris radiata* (SW.) link.	Actiniopteridaceae
2.	*Adiantum caudatum* Linn.	Pteridaceae
3.	*Adiantum phillipanse* Linn.	Pteridaceae
4.	*Aleuritopteris albomarginata* C. B. Clark	Pteridaceae
5.	*Drynaria quercifolia* (Linn.) J. Sm.	Polypodiaceae
6.	*Dryopteris cochleata* (D. Don) C. Chr.	Dryopteridaceae
7.	*Dryopteris cochleata* (Ham. ex D. Don) C. Chr.	Dryopteridaceae
8.	*Dryopteris oteria* (Kunze) O. Ktze.	Dryopteridaceae
9.	*Dryopteris sparsa* (D. Don) Kuntze	Dryopteridaceae
10.	*Equisetum debile* Roxb.	Selaginellaceae
11.	*Equisetum ramossissimum* Desf.	Selaginellaceae
12.	*Helminthostachys zeylanica* (Linn.) Hook.	Ophioglossaceae
13.	*Lycopodiella cernua* (Linn.) P. Sermolli	Lycopodiaceae
14.	*Lygodium flexiosum* (Linn.) Sw.	Lycopodiaceae
15.	*Macrothelypteris ornate* (Wall. ex Bedd.) Ching	Thelypteridaceae
16.	*Macrothelypteris torresiana* (Gaud.) Ching	Thelypteridaceae
17.	*Macrothylipteris setigera* (Bl.) Ching	Thelypteridaceae
18.	*Macrothylipteris torresiana* (Gaud.) Ching	Thelypteridaceae
19.	*Marsilea minuta* Linn.	Marsileaceae
20.	*Ophioglossum reticulatum* Linn.	Ophioglossaceae
21.	*Parahemionitis arifolia* (N. Burm.) Panigr.	Adiantaceae
22.	*Paraleptochilus decurrens* (Bi.) Copel	Polypodiaceae
23.	*Pronephrium nudatum* (Roxb. ex Griff.) Holt.	Thelypteridaceae
24.	*Psilotum nudum* (Linn.) P. Beauv	Psilotaceae
25.	*Pteridium aquilinum* (Linn.) Kuhn	Pteridaceae
26.	*Pteris vittata* Linn.	Pteridaceae
27.	*Pteris biaurifa* Linn.	Pteridaceae
28.	*Pteris heteromorpha* F. G. Fil.	Pteridaceae
29.	*Pteris linearis* Poir.	Pteridaceae
30.	*Pteris quadriaurita* Retz.	Pteridaceae
31.	*Pteris vensuta* Linn.	Pteridaceae
32.	*Pteris vittata* Linn.	Pteridaceae
33.	*Pyrrosia lanceolata* (Linn.) Farwell.	Polypodiaceae
34.	*Pyrrosia mannii* (Gies.) Chiang.	Polypodiaceae
35.	*Pyrrosia nayariana* Chiang.	Polypodiaceae
36.	*Pyrrosia nuda* (Giesenh) Ching	Polypodiaceae
37.	*Securinega virosa* (Roxb. *ex* Willd.) Baill.	Selaginellaceae
38.	*Selaginella cataractrum* Alston	Selaginellaceae
39.	*Selaginella cillaris* (Retz.) Spring.	Selaginellaceae
40.	*Selaginella indica* (Milde) Tryon	Selaginellaceae
41.	*Selaginella kurzii* Barker	Selaginellaceae
42.	*Selaginella nairii* Dixit	Selaginellaceae
43.	*Selaginella repanda* (Desf.) Spring.	Selaginellaceae
44.	*Selaginella tenera* Hook. and Grev.	Selaginellaceae
45.	*Selaginella vaginata* Spring.	Selaginellaceae
46.	*Thelypteris confluence* (Thumb.) C. Morton.	Thelypteridaceae

Source: Mahapatro et al. 2012; Padhy 2015

sidered effective external liniment remedy for the treatment of wounds and eczema. Leaf paste applied over the effected skin for remedy. Macerated paste of the fronds applied to conjoin fractured bones. Powdered root (2g) compounded with *Piper nigrum* (1g) in 100 ml of water were orally administered twice daily for 3 days to check bloody fax. Rhizome boiled with mustard oil was locally applied on carbuncle and in the treatment of rheumatism, sprains, scabies and ulcers. Aqueous rhizome extract was used for the treatment of sex abused affections. One teaspoonful of plant juice given for internal use twice daily relieves fever.

5. Pteris quadriaurita Retz. (Pteridaceae); VN: Bhanjabasa

Plants used as anthelmintic. Decoction of fresh rhizome and fronds were given in chronic

disorders arising from obstructions of viscera and spleen. Leaf juice (10ml) along with fresh Date palm (*Phoenix sylvestris*) toddy (200 ml) for five days internal use, early in the morning before sunrise and in the evening after sunset in empty stomach, normalizes menstrual cycle.

New Reports

6. Marsilea minuta Linn. *(*Marsileaceae*);* VN: Sunisunia

Leaves fried with cow ghee, taken internally to overcome insomnia; also increases memory, induces sedation. Plants were used against cough and bronchitis, cramp of legs and thigh muscles. Tender leaves were crushed to extract the juice and 2 drops of juice twice daily as nasal drop acts effective remedy in migraine. Fresh plant paste (10g) mixed with curd (100g) prepared from black skinned cow's milk. The dosage was given orally once a day in empty stomach for one month against epilepsy.

7. Selaginella tenera Hook. and Grev. (Selaginellaceae); VN: Sanjivani

Dried plants were used as diuretic; also, used in treatment of gonorrhea affections and against hallucination. Dosage form was not revealed properly by the source informant and hence unascertained.

8. Drynaria quercifolia (L.) J. Sm. (Polypodiaceae*)*; VN: Ashvakatri / Gorudapakshini

This plant was reported earlier by Nayer 1959 and May 1978 from some other place for its use against Typhoid, Hectic fever, Dyspepsia, Cough, Phthisis and Swelling.
The decoction of whole plant normally used by locals in typhoid fever and the fronds were useful in poultice swellings. Also, rhizomes alone were used in treatment of typhoid, hectic fever, dyspepsia and cough. Tender shoots were shade dried, powdered and mixed with root powder of Ashok (*Saraca asoca*) plant in 1:1 ratio and administered with one glass of milk after dinner for 15 days for one week to generate strength and sexual vigor. All the medico-folk lore data of *Drynaria* is reflected in Table 2.

Some of its ethno-medicinal information is new from South Odisha and some extensive work was carried out on *Drynaria quercifolia* (Padhy 2016). Attempts were taken to justify the scientific validity of the folk lore's through laboratory experiments using animal and bacterial systems

Table 2: Medico folklore data recorded in Kerandimal regions of South Odisha on *Drynaria quercifolia*

S.No.	*Part used*	*Dosage form*	*Type of use*	*Ailments recovered*
1	Rhizome	20gm pounded with water (50ml) mixed with black piper (*Piper nigrum*) berries = 1 dose.	Internal use orally twice a day.	Diarrhea
2	Rhizome	10-15gm macerated with cow milk = 1dose.	Internal use	Abdominal – renal colic pain relief.
3	Rhizome	Aqueous extract prepared from grounded rhizome (50gms), made to volume 250ml/vol.	Orally administered once or twice daily for two days.	Hectic and intermittent fever
4	Rhizome and sterile fronds	Macerated to paste	External application on scalp	Remove Baldness and hair falls
5	Rhizome along with *Attropa belladona*.	Macerated paste	Externally applied as poultice (bandaged)	Anti-inflammatory setting of fractured bones
6	Rhizome	Hot aqueous extract	Internal use	Removes cough and acts as expectorant
7	Rhizome	Macerated paste	External application	Quickened Wound healing
8 t	Whole plant	Clean and dried pieces	Masticator	Cures bleeding gums and oothaches etc.
9	Whole plant	Not revealed	Internal use	Cardiac tonic, peptic ulcer, birth control.
10	Rhizome	Dried rhizome powder	20 gm twice daily for 1month.	Internal use Remove impotency

are discussed elsewhere (Padhy et al. 2015; Padhy and Dash 2015; Padhy 2016). An observation from the toxicity studies reveals the plant extract is safe to be used as drug. The folk lore antidiarrheal claim is also scientifically validated with the test extract containing different Phyto constituents with anti diarrheal property. The use of rhizome extract in treatment of ulcer justifies its anti ulcerogenic activity as it inhibits the formation of ulcers in various animal models. The plant is also a potential source of antibacterial activity combating various inflammatory diseases and also with healing potential at quicker rate in diabetic and non-diabetic induced wound sites.

Amidst, a huge repository of angiosperms with elaborate exposure by different workers, here in this review it has been tried to focus on lower plants (Cryptogams) with special reference to Pteridophytes enriched with huge medicinal properties from South Odisha. The review reflects on 46 species from 23 genera of Pteridophytes inhabited in this area. The plants were found to be with varied medicinal utilities. Three new species *Marsilea minuta, Selaginella tenera* and *Drynaria quercifolia* with special medicinal utility, were reported from Kerandimals Hills of South Odisha used for different ailments with mythological, horticultural and as protective plant against snakes and other reptiles compared to other species. The reported herbals were claimed to be with high efficacy; however, it entails detail clinical evaluation for establishing better amenability of such ethno therapeutic reports.

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