



ORIGINAL RESEARCH ARTICLE

Medicinal Ferns of Kashmir, India.Wani M. H.*¹, Shah M. Y.² and A. R. Naqshi³^{1, 2}Department of Pharmaceutical Sciences, University of Kashmir, Srinagar, India.³Department of Botany, University of Kashmir, Srinagar, India.

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Abstract: A comprehensive account is presented of fern-allies and ferns known to occur in Kashmir Valley, Gurez (Kishenganga Valley) and Ladakh, which have recognized medicinal value. Out of the total number of 113 taxa (7 taxa of fern allies and 106 taxa of ferns) recorded from the area, a significant proportion (34%) is medicinally important. Amongst these, the genera *Dryopteris* (07) and *Asplenium* (06) have the highest number of medicinally important taxa. For each taxon included is provided the botanical name, family, common/vernacular name (wherever available), parts used, medicinal properties, chemical constituents *etc.*

Key words: Chemical constituents; Comprehensive account; Fern allies; Medicinal value; Vernacular names.

Introduction

The pteridophytes, which include the fern-allies and ferns, are a group of ancient or primitive land vascular plants with worldwide distribution. As per the latest estimates (Wani *et al.*, 2012), the area of study has 6 species and 1 subspecies (total 7 taxa) of fern-allies, in 3 genera, belonging to 3 families; and 80 species, 22 subspecies and 4 hybrids (total 106 taxa) of ferns, in 29 genera, belonging to 13 families. 47 taxa (42%) are recorded to be rare or endangered. The fern flora is made up mostly of a combination of Sino-Himalayan ($\geq 75\%$), Euro-Mediterranean ($\geq 15\%$), and a few S.E. Asian elements ($\leq 8\%$).

The economic value of pteridophytes including their medicinal applications has been known to man for more than 2000 years. Theophrastus (*c.* 327-287 BC) and Dioscorides (*c.* 50 AD) had referred to medicinal attributes of certain ferns. Sushruta and Charaka (*c.* 100 AD) mentioned medicinal uses of *Marsilea minuta* and *Adiantum capillus-veneris* in their Samhitas (Singh, 2003).

Though recent ethnobotanical, phytochemical, pharmacological and biological researches have revealed medicinal, pharmaceutical and phytochemical attributes of pteridophytes, which have valuable potential applications for health and industry, still many species of pteridophytes are yet to be explored for their potential applications for future use and to isolate new active principles from them (Singh, 2003). A proper utilization of their pharmacological value requires a detailed phytochemical analysis of the active principles contained in them, and the application of the same in modern system of medicine. The chemical properties and the nutritive contents of these ferns have to be understood for their proper and sustainable utilization.

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Area of study

The Kashmir Valley lies embedded within the Himalaya at an average height of about 1600 m, between the coordinates 33.20° to 34.54° N and 73.55° to 75.35° E, and is approximately 135 Km in length and 32-40 Km in breadth. Range after range of mountains to the North, the East and the West separate the Valley from the outside world.

Kashmir is quite different from surrounding regions due to its distinct orographic features and snow clad peaks, characteristic altitude, and land locked position. It resembles the mountainous and continental areas of temperate latitudes. The main Valley has a Continental climate marked by well-defined seasonality. Gurez (Kishenganga Valley), lying between the coordinates 34.38° N and 74.56° E, to the north, at an elevation of about 2500 m above the sea, is accessible to Kashmir Valley *via* the Rajdhan Pass. The Kishenganga (Neelam) River flows through it, and on either side tower mountain scarps of indescribable grandeur. The climate is mild and dry. The mountainous region of Dras and Ladakh, between the coordinates 34.10° N and 77.34° E, towards the north-east, is accessible to the main Valley *via* the Zoji La Pass. This region is a cold desert, comprising extensive chains of naked, icy mountains (the Zaskar Range), and receiving a very meagre rainfall averaging about 100 mm annually; the vegetation being mostly confined to isolated pockets near river courses or small valleys, or on steep moist cliffs.

Materials and Methods

The present communication is primarily based on observations from the field and personal interactions with people and traditional healers (*bakims*) with herbal knowledge; and practitioners practicing *Yunani* and Ayurvedic system of



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medicine were also consulted, to add to the knowledge of medicinal ferns. In documenting the medicinal uses of ferns, an exhaustive literature survey was carried out and an attempt made to provide comprehensive information on their potential medicinal applications. These studies were undertaken as an essential part of the main author's Ph.D. work between the years 2004-2010.

In the present communication, every effort has been made to make the work up to date by incorporating the latest nomenclature; however, in case of those taxa that have been split into subspecies due to recent taxonomic considerations, only the main species has been listed. For the presentation of data, all the species are arranged alphabetically for easy reference. Botanical name, family, common/vernacular name (wherever available), parts used, medicinal properties, chemical constituents *etc.* for each species are provided.

Alphabetical list of medicinal pteridophytes of Kashmir

Fern Allies

Equisetum arvense L.

Family: *Equisetaceae*.

Common Name: *Common Horsetail/Field Horsetail* (English).

Parts Used: Whole plant.

Medicinal Properties: The plant is used in fractured bones, bone cancer, diabetes, diarrhoea, gout, dyspepsia, piles, sores, tuberculosis, wound healing, dropsy, stone and kidney affections (Singh, 2003).

Chemical Constituents: 3-Methoxy pyridine, Aconitic acid, Articulatin, Ascorbic acid, Beta-carotene, Beta-sitosterol, Caffeic acid, Campesterol, Dihydrokaempferol, Dihydroquercetin, Equisetin, Equisetonin, Equisetoside, Flavonoids, Galuteolin, Gossypitrin, Herbacetin, Iron, Isofucosterol, Isoquercetoside, Kaempferol, Luteolin, Naringenin, Niacin, Oxalic-acid, p-Coumaric acid, p-Hydroxy-benzoic acid, Palustine, Palustinine, Phenolic acid, Quercetin, Rhodoxanthin, Riboflavin, Selenium, Sterols, Thiamin, Vanillic acid, Vitamin C, Zinc (Singh, 2003).

Activities: Anti-fungal, Anti-rheumatic, Anti-viral, Diuretic, Haemopoietic, Haemostatic (Singh, 2003).

Equisetum diffusum D. Don

Family: *Equisetaceae*.

Common Name: *Himalayan Horsetail* (English).

Parts Used: Whole plant.

Medicinal Properties: Whole plant is used in gonorrhoea, as a cooling medicine and in arthritis (Singh, 2003).

Equisetum ramosissimum Desf.

Family: *Equisetaceae*.

Common Name: *Branched Horsetail* (English).

Parts Used: Whole plant; Rhizome; Young shoot.

Medicinal Properties: The rhizome decoction of this plant is given to barren women to facilitate fertilization in S. Africa (May 1978). An extract made into a paste of the plant is used as local application for treatment of fracture and dislocation of bones (Kumar *et al.*, 2003). The plant is also an astringent; used in diarrhoea, gonorrhoea and improving fertility in women (Singh, 2003).

Chemical Constituents: 3-Methoxy pyridine, Palustine, Dimethyl sulphane, Iso-quercetrin Epigenin, Galiteolin, Equisetrin, Equisetonin, Ascorbic acid, Kaempferol, Vitamin C, Lipids and sterols (Singh and Vishwanathan, 1996).

Activities: Anti-fungal, Anti-rheumatic, Anti-viral, Diuretic, Haemoprotic, Haemostatic. (Kumar *et al.*, 2003).

FERNS

Adiantum capillus-veneris L.

Family: *Pteridaceae*.

Common Name: *Common Maiden Hair Fern* (English); *Geuntheer/Dumtuli* (Kashmiri); *Hamaspadi/Hansraj* (Hindi).

Parts Used: Whole plant; Fronds.

Medicinal Properties: This plant is used in the preparation of '*Sirope de Capillaire*' of Europe. This syrup is largely used in Italy and Greece in the treatment of chest complaints (Watt, 1889-1892). The herb has also entered into many compositions in the West. It is employed as an emmenagogue under the names of '*Polytrichi*,' '*Polytrichon*' or '*Kalliphylon*,' administered as a sweetened infusion of 1 oz (30 cc) to a pint (568 cc) of boiling water (Khare, 2004).

This plant is a weak expectorant, bechic, weak emmenagogue and weak diuretic, and is principally employed in chest complaints such as respiratory catarrh and coughs. Once it was used in the treatment of both pleurisy and asthma, but with little effect in the latter (Stuart, 1979).

Whole plant is demulcent, expectorant and febrifuge, and also used as a hair tonic. Powdered fronds are given with honey against bad cold (Kaul, 1997), extract used against fever (Naqshi *et al.*, 1992), used as an emmenagogue (Chopra *et al.*, 1956). It has anti-microbial and hypoglycaemic properties (Mahmoud *et al.*, 1989; Neef *et al.*, 1995). It is anti-odontalgic and anti-inflammatory. Powdered fronds are applied on gums and tooth cavities during toothache and dental abscesses (Teresa Palmese *et al.*, 2001). Ethanol extract of 1 gm of rhizome per ml of alcohol exhibits strong activity against Vesicular Stomatitis Virus (Husson *et al.*, 1986). The fern is used as a pectoral demulcent. It is boiled in wine in cases of hard

tumours of spleen, liver and other viscera (Anonymous, 1986).

Chemical Constituents: *Maiden Hair Fern* contains Astragalol, Iso-querucitrin, Kaempferol-3-o-Rutinoside Sulphate, Nicotiflorin, Rutin (Singh and Vishwanathan, 1996; Singh, 2003; Sood et al., 2005); 1-Caffeoyl Glucose, 1-Coumaroyl Galactose and Homoserine isolated from fronds (Singh and Vishwanathan, 1996; Sood et al., 2005); bitter principle- Capillarine, Gallic acid, minute quantities of an essential oil, Mucilage, Tannins, Sugars (Stuart, 1979; Bhattacharjee, 2004; Prajapati et al., 2004). It also contains Flavonoids, tanning material- Mucin, terpenoids and heterosides of Kaempferol, Luteolol and Quercetol (Bhattacharjee, 2004; Prajapati et al., 2004); Genistein, Hesperidin, Naringenin and Sulphuretin (Singh, 2003).

Activities: Anti-bacterial, Anti-cancer, Anti-fungal, Anti-implantation, Anti-viral, Febrifuge, Hair tonic, Purgative, Wound healer (Singh, 2003); Anti-pyretic (Watt, 1889-1892; Duke and Ayensu, 1985); Astringent, Emmenagogue (List and Hohammer, 1969-1979; Singh, 2003); Demulcent, Hypoglycaemic (Duke, 2002; Singh, 2003); Depurative, Diaphoretic, Diuretic, Emetic, Emollient, Stimulant, Tonic (Duke and Ayensu, 1985; Singh, 2003), Expectorant (Duke and Ayensu, 1985; Duke, 2002; Singh, 2003); Laxative (Duke and Ayensu, 1985); Pectoral (Watt, 1889-1892; Duke and Ayensu, 1985; Duke, 2002).

Indications: Alopecia, Asthma, Cephalosis, Childbirth, Chill, Constipation, Cystosis, Dropsy, Head cold, Hepatosis, Pulmonosis, Sclerosis, Snakebite, Stone, Water retention (Duke and Ayensu, 1985); Bronchosis, Cough, Diabetes, Gray hair, Hyperglycaemia, Pain, Pertussis (Duke, 2002); Catarrh, Fever (Watt, 1889-1892; Duke and Ayensu, 1985); Cold (Duke and Ayensu, 1985; Anonymous, 2000); Dysmenorrhoea, Rhinosis (Duke and Ayensu, 1985; Duke, 2002); Gravel (Grieve, 1931; Duke and Ayensu, 1985); Headache (Anonymous, 2000); Insanity, Rheumatism, Sting (Moerman, 1998); Jaundice, Nephrosis, Pleurisy, Swelling (Grieve, 1931); Respirosis (List and Hohammer, 1969-1979; Duke and Ayensu, 1985; Duke, 2002).

Contraindications: Not for use during pregnancy (Duke, 2002); also emetic in large doses (Khare, 2004).

Adiantum incisum Forssk.

Family: Pteridaceae.

Common Name: *Hansraj* (Hindi).

Parts Used: Whole plant; Fronds; Pinnules; Petioles.

Medicinal Properties: The fern is aromatic, astringent, febrifuge and tonic. It is also used in hemicranias. The fronds are externally used in skin diseases and their juice for diabetes (Khare, 2004). The leaf powder of this fern is mixed with butter and used for controlling the internal burning of

body; also used in cough, diabetes and skin diseases (Bhattacharjee, 2004). The young primules of this fern are eaten raw to cure diabetes (Sood et al., 2005).

The aqueous and acetone extract of pinnules and petiole of this fern have shown inhibitory effect against *Salmonella typhi* (Parihar et al., 2003). In India, fronds of *Adiantum incisum* are largely used as a substitute for *Adiantum capillus-veneris*. A typical Indian application for this fern is promoting conception in women, which is based on indirect inference from the genito-urinary healing properties of ferns (Khare, 2004).

Chemical Constituents: Adiantone, Adiantanoreiso-adiantone, Fernene steroids, Hentriacontane, 16-Hentriacontanone, β -sitosterol (Singh, 2003; Khare, 2004; Sood et al., 2005); Tri-terpenoids and Flavonoids (Sood et al., 2005).

Activities: Anti-bacterial, Anti-cancer, Anti-diabetic, Anti-pyretic, Anti-tussive, Aromatic, Astringent, Emetic, Febrifuge, Hypoglycaemic, Tonic (Singh, 2003).

Contraindications: Emetic in large doses (Khare, 2004).

Adiantum pedatum L.

Family: Pteridaceae.

Common Name: *Northern Maiden Hair Fern* (English).

Parts Used: Rhizome; Fronds.

Medicinal Properties: This is the French official species used in the preparation of the '*Siróp de Capillaire*.' The leaves are bitterish and aromatic, and have been supposed to be useful in chronic catarrhs and other pectoral affections. *A. capillus-veneris* has similar properties though is feebler (Watt, 1889-1892). It is still used in North America as a pectoral in chronic catarrhs (Kirtikar and Basu, 1935). *A. pedatum* is used like *A. capillus-veneris* "in similar ways and more highly valued by many" (Grieve, 1931).

Chemical Constituents: Adiantone, Adipeditol, Caffeic acid, Fatty acids, Fernene, Ferulic acid, Filicene, Filicinal, Iso-fernene, p-Coumarin, p-Hydro Benzoic acid, Protocatechuic acid, Sterols, Tannin, Vanillic acid, Volatile oil (Singh, 2003).

Activities: Astringent, Emmenagogue, Stimulant, Tonic (Singh, 2003); Anti-rheumatic (List and Hohammer, 1969-1979); Demulcent (Duke, 2002; Singh, 2003); Diuretic (Moerman, 1998; Anonymous, 2000); Emetic (Moerman, 1998); Expectorant (List and Hohammer, 1969-1979; Duke, 2002; Singh, 2003); Pectoral (Watt, 1889-1892; Duke, 2002); Propeptic (Duke, 2002); decoction of rhizome used in chronic catarrh, cold, cough, hoarseness (Singh, 2003).

Indications: Abortion, Ague, Backache, Cardiopathy, Childbirth, Cramps, Debility, Dysentery, Dyspepsia, Fever, Gastrosis, Gonorrhoea, Hysteria, Insanity, Mastosis, Metrorrhagia, Paralysis, Pneumonia, Snakebite,

Sore, Sting (Moerman, 1998); Asthma (Grieve, 1931; Moerman, 1998); Bronchosis, Dysmenorrhoea, Grey hair, Pain, Pertussis, Respirosis (Duke, 2002); Catarrh (Watt, 1889-1892); Cold, Headache (Anonymous, 2000); Cough (Grieve, 1931; Duke, 2002); Gravel, Jaundice, Nephrosis, Pleurisy (Grieve, 1931); Rheumatism (List and Hohammer, 1969-1979; Moerman, 1998); Water retention (Moerman, 1998; Anonymous, 2000).

Contraindications: Not for use during pregnancy (Duke, 2002).

***Adiantum venustum* D. Don**

Family: Pteridaceae.

Common Name: *Gewwtheer* (Kashmiri).

Parts Used: Whole plant; Fronds; Rhizome.

Medicinal Properties: The native physicians consider this fern to be deobstruent and resolvent, useful for curing the *prima viae* of bile, adust bile and phlegm; also pectoral, expectorant, diuretic and emmenagogue. Used as a plaster, it is considered to be discutient, and is applied to chronic tumours of various kinds (Watt, 1889-1892). It is recommended by *Hakims* for hydrophobia. It is resolvent and is also used for the prevention of hair from falling. For internal use, it is given in the form of syrup (Watt, 1889-1892).

It possesses aromatic and astringent properties, is emetic in large doses, and is an expectorant, febrifuge and tonic. In Chamba, it is pounded and applied to bruises *etc.*, and the plant appears to supply in the Punjab most of the official *Hansraj*, which is administered as an anodyne in bronchitis, and is considered diuretic and emmenagogue (Watt, 1889-1892; Kirtikar and Basu, 1935).

The plant is very useful as mild tonic, especially during convalescence from fevers. A vapour bath medicated by a decoction from this plant is regarded useful in fever. It is resolvent, and is used for the prevention of hair from falling (Watt, 1889-1892; Kirtikar and Basu, 1935).

An oil extract of this plant is applied to piles and tuberculous glands and wounds; also to bring out a thorn, which has penetrated into the body (*Yunnani*) (Kirtikar and Basu, 1935). The plant has diuretic and astringent properties. Fronds are used as tonic, expectorant and in scorpion sting (Razdan, 1986). The fern is commercially gathered from Chakrata Hills for dermatological pharmaceutical preparations (Khullar, 1994).

Chemical Constituents: Adiantone, α Carotene mono-epoxide, Kaempferol, Leuco-pelargonidin, Quercetin glucosides, traces of 3-Filicene (Singh, 2003; Sood *et al.*, 2005); a new Ketol-2-1-Hydroxy-3-o-Norhopan-22-one (I), Triterpenoid keto alcohol (Sood *et al.*, 2005); 21 Hydroxy Adiantone (Singh, 2003).

Activities: Aphrodisiac, Bitter, Deobstruent, Purgative, Resolvent (Kirtikar and Basu, 1935); Anodyne, Anti-cancer, Anti-tuberculosis, Antiviral, Aromatic, Astringent, Emetic, Febrifuge, Tonic; used in bronchitis, ophthalmia and prevents hair fall (Singh, 2003); Diuretic (Kirtikar and Basu, 1935; Razdan, 1986; Singh, 2003); Emmenagogue; Expectorant (Kirtikar and Basu, 1935; Singh, 2003).

Indications: Bilioussness, Colds, diseases of the chest, Headache, Humours, Hydrophobia, Inflammations, Ophthalmia, Phlegmatic tumours (Kirtikar and Basu, 1935).

***Aleuritopteris leptolepis* (Fraser-Jenk.) Fraser-Jenk.**

Family: Pteridaceae.

Parts Used: Fronds; Rhizome.

Medicinal Properties: Fronds have anti-fungal properties; rhizome is anti-bacterial (Singh, 2003).

Chemical Constituents: Genkwanin, Kaempferol, Kumatakenin, Quercetin, Rhamnocitrin (Singh, 2003).

***Asplenium adiantum-nigrum* L.**

Family: Aspleniaceae.

Common Name: *Black Spleenwort* (English); *Sheen-gassa* (Kashmiri).

Parts Used: Whole plant; Rhizome.

Medicinal Properties: The plant is bitter, diuretic, laxative, and is useful in treatment of ophthalmia, jaundice (Kirtikar and Basu, 1935; Razdan, 1986; Singh, 2003) and diseases of the spleen (Kirtikar and Basu, 1935; Razdan, 1986). It also lessens inflammation, hiccup and produces sterility in women (*Yunnani*; Singh, 2003). A decoction or syrup of the fronds is used as an expectorant (Razdan, 1986), pectoral and emmenagogue in Europe (Kirtikar and Basu, 1935). The rhizome is used as an anthelmintic by the Sutos (Kirtikar and Basu, 1935; Singh, 2003).

***Asplenium ceterach* L.**

Family: Aspleniaceae.

Common Name: *Rusty Back Fern* (English).

Parts Used: Whole plant.

Medicinal Properties: The plant has diuretic properties, is used against complaints of spleen (Razdan, 1986; Singh, 2003) and is astringent (Razdan, 1986).

***Asplenium dalhousiae* Hook.**

Family: Aspleniaceae.

Parts Used: Whole plant.

Medicinal Properties: Whole plant is anti-bacterial (Singh, 2003).

***Asplenium ruta-muraria* L.**

Family: Aspleniaceae.

Common Name: *Tent Wort/ Wall Rue* (English).

Parts Used: Whole plant; Fronds.

Medicinal Properties: This small herb is used as

deobstruent and expectorant (Kirtikar and Basu, 1935; Singh, 2003). It is likewise good for them that have cough, or are short-winded, or be troubled with stitches in the sides. The leaves are used as a remedy for the cure of rickets (Kirtikar and Basu, 1935; Singh, 2003); also used against knots and swellings (Singh, 2003).

***Asplenium trichomanes* L.**

Family: Aspleniaceae.

Common Name: *Delicate Maiden Hair Spleenwort* (English).

Medicinal Properties: It is used as laxative and expectorant (Kirtikar and Basu, 1935; Razdan, 1986; Singh, 2003). The leaves are smoked by the Sutos for colds in the head and chest (Kirtikar and Basu, 1935; Razdan, 1986).

Chemical Constituents: Catechol, Gallic acid, Pyrogallol (Singh, 2003).

Activities: Anthelmintic, Expectorant, Insecticidal, Laxative, Pectoral, Pesticidal, Refrigerant, Tonic (Singh, 2003).

***Asplenium viride* Huds., nom. cons.**

Family: Aspleniaceae.

Common Name: *Green Spleenwort* (English).

Parts Used: Fronds.

Medicinal Properties: Fronds are applied on burns (Singh, 2003).

***Athyrium schimperi* Moug. ex Fee**

Family: Woodsiaceae.

Parts Used: Sporophyll.

Medicinal Properties: The sporophylls of this fern possess anti-bacterial properties (Singh, 2003).

***Azolla pinnata* R. Br.**

Family: Azollaceae.

Parts Used: Whole plant.

Medicinal Properties: Anti-bacterial, Anti-fungal (Singh, 2003).

Chemical Constituents: Proteins, Carotenoids (Singh, 2003).

***Botrychium lunaria* (L.) Sw.**

Family: Ophioglossaceae.

Common Name: *Moonwort* (English).

Medicinal Properties: The plant is a good vulnerary and is used in dysentery also (Kirtikar and Basu, 1935; Singh, 2003). It is culinary and has anti-cancer properties (Singh, 2003).

***Botrychium virginianum* (L.) Sw.**

Family: Ophioglossaceae.

Parts Used: Whole plant; Rhizome.

Medicinal Properties: Whole plant is anti-dysenteric and anti-bacterial; rhizome is vulnerary (Singh, 2003).

Chemical Constituents: Caffeic acid, p-coumaric acid, p-Hydroxybenzoic acid (Singh, 2003).

***Cyrtomium caryotideum* (Wall. ex Hook. et Grev.) Presl**

Family: Dryopteridaceae.

Parts Used: Whole plant.

Medicinal Properties: Whole plant is anti-bacterial and anthelmintic (Singh, 2003).

***Cystopteris fragilis* (L.) Bernh.**

Family: Woodsiaceae.

Common Name: *Fragile Fern/Brittle Fern/Bladder Fern* (English).

Parts Used: Rhizome.

Medicinal Properties: Decoction of rhizome is used as an anthelmintic (Razdan, 1986; Singh, 2003).

***Dryopteris barbigera* (T. Moore ex Hook.) Kuntze**

Family: Dryopteridaceae.

Parts Used: Rhizome.

Medicinal Properties: Rhizome is anthelmintic (Singh, 2003; Mittal and Bir, 2006).

Chemical Constituents: Filicene (Singh, 2003); Oleoresin (7-9%), Filicin (2.2%) (Mittal and Bir, 2006; 2007).

***Dryopteris blanfordii* (Hope) C. Chr.**

Family: Dryopteridaceae.

Parts Used: Rhizome.

Medicinal Properties: Rhizome is anthelmintic (Singh, 2003; Mittal and Bir, 2006).

Chemical Constituents: Filicene (Singh, 2003); Oleoresin (8-10%), Filicin (2.6%) (Mittal and Bir, 2006; 2007).

***Dryopteris chrysocoma* (Christ) C. Chr.**

Family: Dryopteridaceae.

Parts Used: Rhizome.

Medicinal Properties: Rhizome is anthelmintic (Singh, 2003; Mittal and Bir, 2006).

Chemical Constituents: Filicene (Singh, 2003); Oleoresin (14-17%), Filicin (4.3%) (Mittal and Bir, 2006; 2007).

***Dryopteris filix-mas* (L.) Schott**

Family: Dryopteridaceae.

Common Name: *Male Fern* (English).

Parts Used: Whole plant; Fronds; Rhizomes; Oleoresin extracted from the root.

Medicinal Properties: *Male Fern* root or its oleoresin is used as a specific treatment for tapeworms. It acts by paralyzing the muscles of the worm, forcing it to relax its hold on the gut wall. The root is prescribed with non-oily purgative. Preparations of *Male Fern* are used externally for rheumatism, muscle pain, neuralgia and sciatica (Khare, 2004).

Chemical Constituents: Desaspidin, Filicin, Filicinic acid, Paraspidin, Trisflavaspic acid (Singh, 2003; Khare, 2004); Albaspidin, Arachidic acid, Aspidin, Aspidinol, Butanonephloroglucosides, Butyric acid, Caffeic

acid, Fernene, Ferulic acid, Filicylbutanone, Filmarone, Flavaspidic acid, Glucose, Hexanol, Hopadiene, Hopene, Hydroxybenzoic acid, Isobutyric acid, Linoleic acid, Linolenic acid, Margaspidin, Octanol, Palmitic acid, p-Coumaric acid, p-Protocatechuic acid, Phlobaphene, Phloraspidinol, Phloraspinphloraspyrone, Phloroglucin, Phloropyron, Protocatechuic acid, Pseudoaspidin, Sugars, Tannins, Trisaspidin, Trisdesaspidin, Vanillic phenolic acids (Singh, 2003). In addition, the fern contains triterpenes, alkanes, a volatile oil and resins (Khare, 2004).

Activities: Abortifacient, Anti-bacterial, Anti-septic (Gupta, 1995); Anthelmintic (Razdan, 1986; Singh, 2003); Anti-viral (Duke, 2002; Singh, 2003); Anti-cancer, Anti-fungal, Anti-rheumatic (Singh, 2003); Contraceptive (Gupta, 1995; Singh, 2003); Cytotoxic (Duke, 2002); Aperient, Astringent, Cyanogenic, Insecticide (Duke, 1985; Singh, 2003); Laxative, Poison (Duke, 1985); Pectoral (Steinmetz, 1957; Duke, 1985); Taenifuge (Duke, 1985; Williamson and Evans, 1988); Vermifuge (Grieve, 1931; Duke, 1985; Razdan, 1986; Williamson and Evans, 1988; Duke, 2002).

Indications: Bacteria, Flu, Herpes, Stomatosis (Gupta, 1995); Cancer, Constipation, Epistaxis, Metrorrhagia, Puerperium (Duke, 1985); Dentition, Ear ache, Fluke, Hepatosis, Myalgia, Neuralgia, Ophthalmia, Pain, Rheumatism, Toothache (Duke, 2002); Induration (Hartwell, 1982); Infection, Virus (Gupta, 1995; Duke, 2002); Rickets (Grieve, 1931); Sciatica (List and Hohammer, 1969-1979; Duke, 2002); Tapeworm (Duke, 1985; Williamson and Evans, 1988; Duke, 2002); Worm (Grieve, 1931; Duke, 1985; Williamson and Evans, 1988; Duke, 2002); Wound (Grieve, 1931; Duke, 1985; Duke, 2002).

Contradictions: Canadians do not allow its use as a non-medical ingredient for oral use products (McGuffin et al., 1997). In too large doses, it is an irritant poison, causing muscular weakness and coma, particularly injurious to eyesight, even causing blindness. Other symptoms include convulsion, delirium, diarrhoea, nausea, tremors, vertigo and cardiac or respiratory failure; allergenic to some and can be fatally poisonous if misused. It should be used only by prescription from a doctor, and "I doubt many doctors will prescribe it" (Duke, 1985); also contraindicated in anaemia, cardiopathy, diabetes, hepatitis and nephrosis (Duke, 2002).

Dryopteris ramosa (Hope) C. Chr.

Family: Dryopteridaceae.

Parts Used: Rhizome.

Medicinal Properties: Rhizome is anti-bacterial (Singh, 2003) and anthelmintic (Mittal and Bir, 2006).

Chemical Constituents: Oleoresin (12-15%), Filicin (3.8%) (Mittal and Bir, 2006; 2007).

Dryopteris serrato-dentata (Bedd.) Hayata

Family: Dryopteridaceae.

Parts Used: Rhizome.

Medicinal Properties: Rhizome is anthelmintic (Mittal and Bir, 2006).

Chemical Constituents: Oleoresin (8-11%), Filicin (2.9%) (Mittal and Bir, 2006; 2007).

Dryopteris xanthomelas (Christ) C. Chr.

Family: Dryopteridaceae.

Parts Used: Rhizome.

Medicinal Properties: Rhizome is anthelmintic (Mittal and Bir, 2006).

Chemical Constituents: Oleoresin (9-11%), Filicin (2.3%) (Mittal and Bir, 2006; 2007).

Marsilea minuta L.

Family: Marsileaceae.

Common Name: *Paflu* (Kashmiri); *Chaupatti* (Hindi).

Parts Used: Whole plant; Leaves; Petiole; Rhizome.

Medicinal Properties: The decoction of leaves, along with ginger is used against bronchitis and cough (Bhattacharjee, 2004). Plants are used in cough, spastic condition of leg, muscles etc., and also in insomnia and sedatum. The plants are known to be acrid, anodyne, aphrodisiac, astringent, depurative, diuretic, emollient, expectorant, febrifuge, hypnotic, ophthalmic and refrigerant. It is useful in diarrhoea, dyspepsia, fever, haemorrhoids, leprosy, ophthalmia, psychopathy, skin diseases and strangury (Warrier et al., 1996; Kumar et al., 2003).

Aqueous extract of leaflets and acetone extract of petiole and rhizome have shown inhibitory effect on human pathogenic bacteria, *Salmonella typhi* (Parihar et al., 2003). The herb has also shown anti-fungal activity against *Aspergillus flavus* (Parihar et al., 2002).

Chemical Constituents: β -carotene, Calcium, Phosphorus, Potassium, Protein (24-36%), Sodium (Kumar et al., 2003; Singh, 2003); Marsilene (Singh, 2003).

Activities: Alexiteric, Anti-bacterial, Anti-convulsant, Anti-fungal, Anti-rheumatic, Anti-tussive, Diuretic, Refrigerant, Resolvent, Sedative (Singh, 2003).

Indications: Abscess, Backache, Diarrhoea, Dyslactation, Fracture, Impetigo, Inflammation, Menorrhagia, Myalgia, Snakebite, Sore, Trauma (Singh, 2003).

Onychium cryptogrammoides Christ

Family: Pteridaceae.

Parts Used: Whole plant.

Medicinal Properties: Whole plant is anti-bacterial (Singh, 2003).

Onychium japonicum (Thunb.) Kunze

Family: Pteridaceae

Parts Used: Leaves; Rhizome.

Medicinal Properties: Juice of crushed leaves prevents falling of hairs. Leaves and rhizomes contain glycoside which yields Kaempferol and Rhamnose on hydrolysis (Benniamin, 2011).

***Ophioglossum reticulatum* L.**

Family: Ophioglossaceae.

Common Name: *Chonchur* (Kashmiri).

Parts Used: Fleshy fronds; Rhizome.

Medicinal Properties: The herb is used as a cooling agent and in the treatment of inflammations and wounds; fronds used as a tonic and styptic; also in contusions and haemorrhages (Singh, 1999; Kumar et al., 2003).

***Osmunda claytoniana* L.**

Family: Osmundaceae.

Common Name: *Interrupted Fern* (English).

Parts Used: Whole plant; Rhizome.

Medicinal Properties: The rootstock and stipe bases of this fern are employed as adulterant, as a substitute for the *Male Fern* (Razdan, 1986); whole plant is anti-bacterial (Singh, 2003).

***Polystichum squarrosus* (D. Don) Fee**

Family: Dryopteridaceae.

Parts Used: Fronds; Sporophylls.

Medicinal Properties: The sporophyll extract of this fern is used as an anti-bacterial agent (Singh, 1999; Kumar et al., 2003; Singh, 2003); fronds are anti-rheumatic (Singh, 2003).

***Pteridium revolutum* (Blume) Nakai**

Family: Dennstaedtiaceae.

Parts Used: Rhizome; Fronds.

Medicinal Properties: Rhizome is astringent, anthelmintic, and is useful in diarrhoea and for the treatment of inflammation in the gastric and intestinal mucous membranes. Decoction of rhizome and frond is given for the chronic disorders of viscera and spleen. Rhizome is boiled in oil and is made into an ointment for healing wounds. Fronds are reported to be poisonous and sometimes fatal to the grazing animals (Benniamin, 2011).

***Pteris cretica* L.**

Family: Pteridaceae.

Parts Used: Fronds.

Medicinal Properties: The fronds, which are anti-bacterial, are made into paste and applied to wounds (Singh, 1999; Kumar et al., 2003; Singh, 2003).

***Pteris vittata* L.**

Family: Pteridaceae.

Common Name: *Chinese Brake Fern* (English).

Parts Used: Whole plant; Fronds.

Medicinal Properties: Plant extract is used as anti-bacterial and anti-viral agent (Singh, 1999; Kumar et al., 2003); anti-fungal (Bhattacharyya et al., 2009); demulcent, hypotensive, tonic (Singh,

1999; Kumar et al., 2003; Singh, 2003). The tribal *Chenchu* people of Andhra-Pradesh (India) use the herb juice in curing diarrhoea and dysentery.

Chemical Constituents: Phenols (Singh, 2003; Bhattacharyya et al., 2009); Proteins (Bhattacharyya et al., 2009).

***Thelypteris arida* (D. Don) C.V. Morton**

Family: Thelypteridaceae.

Parts Used: Rhizome.

Medicinal Properties: Rhizome is used against veterinary larval infections (Singh, 2003).

***Thelypteris dentata* (Forssk.) E.P. St. John**

Family: Thelypteridaceae.

Parts Used: Fronds; Rhizome.

Medicinal Properties: Phenol extract from rhizome of vegetative and reproductive parts contain antifungal properties, and shows inhibitory effect against *Trametes hirsuta* and *Curvularia* sp. (Bhattacharyya et al., 2008). Rhizome and fronds inhibit the growth of the fungi *Rhizopus* sp. and *Fusarium udum* (Bhattacharyya et al., 2009).

Chemical Constituents: Amino acids, Phenols, Proteins (Bhattacharyya et al., 2009).

Conclusion

Out of the total fern allies and ferns recorded from the area, a significant proportion (34%) is medicinally important. Amongst these, the families Pteridaceae and Dryopteridaceae contain the most number of medicinally important genera. Seven ferns from genus *Dryopteris* and six from *Asplenium* are medicinally important. Many of these medicinally important ferns have been used ethnobotanically by traditional healers and the local *bakims* against various ailments, and these still constitute a significant bulk of medication in the *Yunnani* and Ayurvedic systems of medicine. With developments in phytochemistry and pharmacology there is a scope that the active principles contained in them can be identified and characterized and these can be put to effective therapeutic use.

Since many of the medicinally important taxa recorded from Kashmir have shown a marked decline in their numbers as well as in their spatial distribution over the years, particularly due to rampant over-exploitation and habitat destruction, hence there is an urgent need to conserve various pteridophytic habitats, and also to make the local public aware about their potential medicinal applications, so that this precious bio resource is not lost.

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