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Ethnomedicinal importance of fern and fern allies traditionally used by tribal people of Palani Hills (Kodaikanal), Western Ghats, South India

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ABSTRACT

Numerous studies have focused on the medicinal properties of angiosperms; however, only limited amount of studies have explored the medicinal potentials of fern and fern allies. The present study focuses on the ethnomedicinal values of fern and fern allies that are traditionally used by the tribal people of Palani hills in South India through a survey of the area. In the present study, information on 50 species belonging to 35 genera in 19 families were recorded for their medicinal values with their botanical name, family, habitat, and manner of using recipes have been recorded.

KEY WORDS: Ethnomedicine, fern and fern allies, Palani hills, Western Ghats, South India

INTRODUCTION

Natural environment comprises of both biotic and abiotic components. Of the biotic component, plants play an important role on earth surface, without which other living system cannot survive. About 250 million years ago, pteridophytes were the dominant plant group on this planet. However, they are now replaced by seed-bearing plants, but still grow luxuriantly in moist tropical and temperate forests (Dixit, 2000). There are about, 13,600 species of fern and fern allies distributed worldwide (Moran, 2006). India is one of the mega biodiversity regions, with the major distribution of fern and fern allies observed in the Himalayas, Western and Eastern Ghats, and Pachmarhi Biosphere Reserve. The maximum number of pteridophytes in India occurs in the Eastern Himalayas. About 400 species of pteridophytes occur in Southern India (Singh and Upadhyay, 2010). Most of the South Indian pteridophytes are found in the Western Ghats. In Western Ghats, members belonging to Aspleniaceae, Polypodiaceae, Thelypteridaceae, Selaginellaceae, and Pteridaceae families are predominantly found (Sumesh *et al*., 2012). Palani hills are the easternmost spur of the Western Ghats of India; this is one of the 34 biodiversity hotspots of the world (Myers, 2003). Manickam, 1984; Manickam, 1986; Manickam and Irudayaraj, 1988; Manickam and Irudayaraj, 1992 have recorded the fern floral diversity of Palani hills of Western Ghats in South India. Even today, in Palani hills, tribal communities are highly dependent on the natural resources obtained from the surrounding forest regions for treatment of various ailments and diseases. The most common ailments treated are skin problems, burns, wounds, and cuts. Other illnesses alleviated by herbal medicines include respiratory infections, coughs, fevers, colds, gastrointestinal problems, abdominal pains, stomach aches, throat infections, snake bites, and nervous disorders (Ignacimuthu *et al*., 2006). Though, lot of studies have focused on the medicinal properties of angiosperms, information on the medicinal potentialities of the pteridophytes are limited (Abraham *et al*., 1962; Beddome, 1864; Benniamin *et al*., 2008; Bir and Vasudeva, 1971). Hence, in the present investigation, an attempt has been made to collect the information on the medicinal value of fern and fern allies traditionally used by the inhabitants of Palani hills tribes.

MATERIALS AND METHODS

Study Area

Ethnomedicinal survey from tribal inhabitants (Paliyar) from Palani hills (10°6'38"N to 10°26'57"N Latitudes and

77°16'00'E to 77°44'56"E) was undertaken during the year of 2011 to 2012 at four different places, Perumalmalai (Site A), Pannaikadu (Site B), Savarikadu (Site C), and Pillar rock (Site D) [Figure 1]. Ethnomedicinal information was gathered from the local inhabitants and intensive interviews were conducted as per the described method (Jain, 1983). Samples of all the specimens were collected and identified in the Department of Plant Biology and Plant Biotechnology, St. Xavier College, Palayamkottai, Tirunelveli, Tamil Nadu. The collected plants were identified with the help of pteridophytic floras (Manickam and Irudayaraj, 2003).

RESULTS

In the present investigation, 50 species of fern and fern allies (belonging to 35 genera in 19 families) were recorded [Table 1]. Among the 50 species, maximum number of species (30) was collected from Pannaikadu (Site B) and minimum number of species (6) was collected from Pillar rock (Site D) [Figure 2]. Among 50 species examined 74% were terricolous, 18% were saxicolous, 4% were epiphytes, and 4% was hydrophytes [Figure 3]. Adiantaceae and Woodsiaceae is the largest families with 7 species each, followed by *Polipodiaceae* (6) and *Thelypteridaceae* (5), *Dryopteridaceae* (4), *Aspleniaceae* (3), *Dennstaedtiaceae* (3), *Selaginellaceae* (3), *Cyatheaceae* (2), species and other families having one species each [Figure 4]. Regarding the dominant genera, an analysis were made and found that the genus like Asplenium (3), Dryopteris (3), Selaginella (3), and Diplazium (3) are the dominant ones, followed by the other genera like, Cheilanthes, Cyathea, Leptochilus, Pyrrosia, Christella, Adiantum (2), and Athyrium are having two species each and other genera having one species each [Figure 5]. All plant parts such as rhizomes, roots, fronds, leaves, stem, and spores are used as medicine. Leaves were the most popular plant part utilized in herbal preparations (37%), rhizome (26%), and whole plant (23%), while fronds (including spores) were used infrequently (14%). This study revealed the therapeutic potential of nearly 20 applications from 50 species for treating different diseases and ailments. The present investigation has brought to highlight the therapeutic value employed to cure skin diseases, burns, wounds and cuts, respiratory infections, coughs, fevers, colds, epilepsy, leprosy, rheumatism, abdominal pains, kidney pains, stomach aches, throat infections, snake bites, nervous disorders, urinary problems, menstrual problem, gastrointestinal problems, and cardiac problems.

DISCUSSION

From this study, high incidence of ethnomedicinal in fern and fern allies in Palani Hills of Western Ghats is

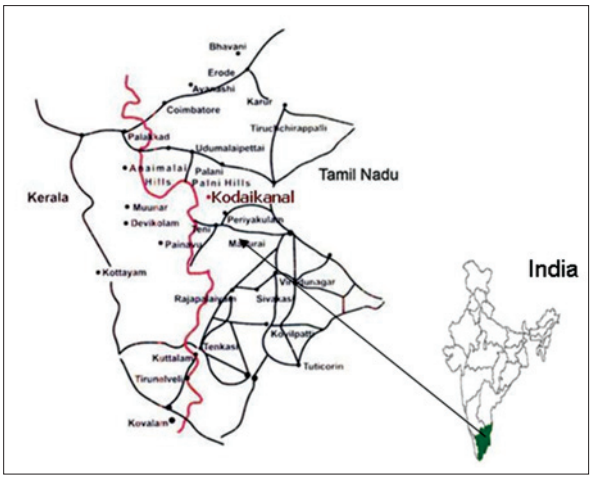

Figure 1: Location map of Palani hills, Western Ghats

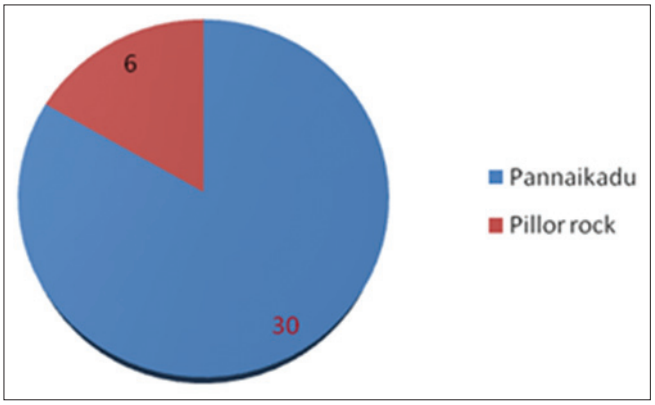

Figure 2: Analysis of field area on ethnomedicinal of fern and fern allies in Palani hills of Western Ghats

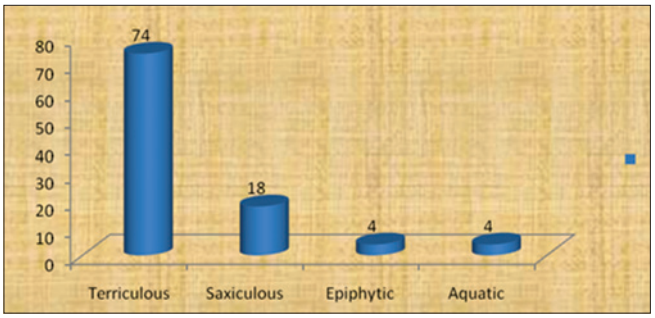

Figure 3: Analysis of habitat on ethnomedicinal fern and fern allies in Palani hills of Western Ghats

accordance with studies of Blasco, 1971; Foreau, 1961; Gupta, 1960b; Gupta, 1960a; Parihar and Parihar, 2006; Benjamin and Manickam, 2007; Perumal, 2010; Singh and Upadhyay, 2012; Singh and Singh, 2012. The observations of the present study; however, contradict those studies (Kirtikar and Basu, 1935; Warrier et al., 1996; Liu et al., 2012; Das and Choudhury, 2014) where a low incidence of ethnomedicine has been reported in fern and fern allies. In primitive time, pteridophyte possesses an important

Table 1: Medicinal important ferns and fern allies from Palani Hills, Western Ghats of South India

Botanical name	Site	Habitat	Parts used	Ethno medicinal uses
Adiantaceae				
Adiantum incisum Forssk.	C, B	SX	Frond	The frond powders used to relief body heat, cough, diabetes, fever and skin diseases. Decoction of young fronds used as treatment against malaria and bronchial diseases
Adiantum raddianum C.Presl	A, B, C	SX	Whole plant	Whole plant is used to cure cough, asthma, fever, leprosy and hair falling
Cheilanthes bullosa Kunze	C	TE	Whole plant	The plant juice is mixed with rice starch to cure urinary problem
Cheilanthes swartzii Webb and Berthel.	B, C	TE	Frond	The juice is mixed with hot water along with honey to treat throat pain
Doryopteris concolor (Langsd. and Fisch.) Kuhn	A, B, C	TE, SX	Rhizome and fronds	Decoction of fresh rhizome and fronds are given in chronic disorders arising from obstructions of viscera and spleen
Hemionitis arifolia (Burm.f.) T. Moore	B, C	SE, TX	Root	The root powder is used to treat hypertension and also good remedy for healing wound
Pityrogramma calomelanos (L.) Link	B	TE	Whole plant	Whole plant parts are boiled with water and the decoction thus obtained is taken orally early in the morning to treat kidney problem
Actiniopteridaceae				
Actiniopteris radiata (Sw.) Link	B, C	SX	Frond	The dry fronds are used to treat tuberculosis, bronchitis and gynecological disorders
Aspleniaceae				
Asplenium nidus L.	A	TE	Whole plant	The plant used to cure fever, elephantiasis, jaundice and urinary problem
Asplenium inaequilaterale Willd.	A, B	TE	Frond	The leaf paste applied over the affected parts of the body for body pain
Asplenium unilaterale Lam.	A	TE	Whole plant	It is used for curing digesting problem
Blechnaceae				
Blechnum orientale L.	B, C	TE	Frond Rhizome	Fronds showing good antioxidant and antibacterial activities. The hot decoction is used to treat typhoid
Cyatheaceae				
Cyathea gigantean (Wall. ex Hook.) Holttum	A, B	TE	Rhizome	Fresh rhizome used to cure for loose motion and antidiabetic
Cyathea nilgirensis Holttum var. lobatus Manickam & Irudayaraj	A	TE	Rhizome	The endemic species used for antidiabetic
Davalliaceae				
Nephrolepis cordifolia (L.) C. Presl	A, B, C	TE, EP	Rhizome, frond and tubers	Rhizome extract is used to cure Menstrual problem. frond paste is applied on wounds to check bleeding. Decoction of tubers is used cure cough and intestinal disorders.
Dennstaedtiaceae				
Microlepia speluncae (L.) T.Moore	A	TE	Whole plant	It used against eye disease
Pteridium aquilinum (L.) Kuhn	D	TE	Whole plant	Decoction of rhizome and fronds is used to act as worms cleaner. It also relieve stomach cramps and increases urine flow
Odontosoria chinensis (L.) J. Sm.	A, B, C	TE	Fronds	The decoction is used for diuretic and chronic enteritis
Dryopteridaceae				
Dryopteris atrata (Wall . ex Kunze) Ching	D	TE	Fronds	The juice obtained from the fronds is given in epilepsy and antibiotic
Dryopteris cochleata (D. Don) C. Chr	B	TE	Whole plant	The whole plant extract is applied for snake bite. Powdered rhizome is taken with water to cure rheumatism and leprosy.
Dryopteris sparsa (D. Don) Kuntze	B	TE	Fronds	Young fronds are edible. It used to cure anthelmintic
Polystichum auriculatum (L.) C. Presl	A, B	TE	Fronds	Hot fronds used to treat groin swelling
Equisitaceae				
Equisetum ramosissimum Desf.	B	AQ	Whole plant	Whole plant paste is externally applied to cure scabies, itches and allied skin infections
Gleicheniaceae				
Dicranopteris linearis (Burm. f) Underw.	A, B	TE	Whole plant	Decoction of plant is used to treat throat pain. Fronds are used in asthma and antibacterial activity
Lycopodiaceae				
Lycopodiella cernua (L.) Pic. Serm.	B	SX	Whole part	The decoction of the plant is used for lotion (reducing swelling and itching). The plant also used to cure cough and skin eruption
Marsileaceae				
Marsilea minuta, L.	A	AQ	Leaves	The plant leaf is used to cure cough, bronchitis, diarrhea, leprosy and fever
Marattiaceae				
Angiopteris evecta (G. Forst.) Hoffm.	B	TE	Fronds rhizome	Frond decoction is used to treat intestinal ulcer, stomach ache and relief body pain. The rhizome paste is applied externally in case of bone fracture
Polypodiaceae				
Drynaria quercifolia (L.) J.Sm.	B	TE	Rhizome	The rhizome juice is inhaled internally cures cardiac and blood coagulation problem. The fronds are useful in poulticing swellings
Leptochilus decurrens Blume	A, B	TE	Whole plant	Decoction of the plant is used as a lotion. Cures cough and chest pain
Leptochilus lanceolatus Fee	A, B, C	TE, SX	Fronds	The frond is used to cure fever, jaundice and anti-inflammatory disorder
Microsorum punctatum (L.) Copel.	B	SX	Fronds	Leaf is ground into juice applied over the affected places twice a day with hot water to heal wounds. It also used for anti-inflammatory and antibacterial activity

Contd...

Table 1: Continued

Botanical name	Site	Habitat	Parts used	Ethno medicinal uses
Pyrrosia porosa (Presl.) Hovenkamp	A, B	EP	Whole plant	The whole plant paste is applied over cut injuries
Pyrrosia lanceolata (L.) Farw.	A	EP	Fronds	Leaf is made into paste with pepper and taken orally to treat sore throat
Pteridaceae				
Pteris confusa T.G. Walker	A, B, C	TE	Rhizome	Rhizome paste is applied to reduce body heat
Selaginellaceae				
Selaginella tamariscina (P.Beauv.) Spring	A, B	SX	Root, leaves	Used to control fever, headache and menstruation
Selaginella radicata (Hook.and grev) Spring	A, B	SX	Root	The decoction of root is given for cough
Selaginella involvens (Sw.) Spring	A, B	SX	Root	The plant prevents cough, bleeding piles, gravel amenorrhea and as an antibacterial
Thelypteridaceae				
Christella dentata (Forssk.) Brownsey and Jermy	A	TE	Fronds	The paste obtained from the frond is applied over the swellings over the body
Christella parasitica (L.) Holttum	A	TE	Fronds	The decoction orally used to treat cure swellings, spermatorrhea and rheumatism
Sphaerostephanos unitus (L.) Holttum	B, C	TE	Rhizome	The rhizome extract is used as an antibacterial agent
Trigonospora caudipinna Sledge	D	TE	Rhizome	Juice of rhizome given in case of fever
Cyclosorus ciliatus Panigrahi	D	TE	Fronds	The frond is used to cure sores problem
Vittariaceae				
Antrophyum plantagineum (Cav.) Kaulf.	A	SX	Fronds	The plant is edible. The leaf juice is used to treat fever and refreshing agent
Woodsiaceae				
Athyrium falcatum Bedd	C	TE	Fronds and root	The young unfurled fronds have been eaten to treat internal ailments such as cancer of the womb. The roots are anthelmintic and diuretic
Athyrium lanceum (Kunze) T.Moore	C	TE	Root	A tea of the boiled roots has been used to treat general body pains to stop breast pains caused during childbirth, and to induce milk flow in caked breasts. The dried powdered root has been applied externally to heal sores
Deparia petersenii (Kunze) M. Kato	A	TE	Fronds	The young fronds is used to cure cold and cough
Hypodematium crenatum (Forssk.) Kuhn and Pecken	B	TE	Frond	Frond is used to cure menstrual problem and gynecological disorder
Diplazium beddomei C. Chr.	D	TE	Whole plant	Plant juice is used to cure cold and cough
Diplazium esculentum (Retz.) Sw.	D	TE	Rhizome	Young frond and rhizomes are used as green vegetables. Leaves are made into juice and taken orally twice a day to get relief from cold and cough
Diplazium subsinuatum (Wall. ex Hook. and Grev.) Tagawa	C	TE	Whole plant	It is used as diuretic and hydragogue

TE: Terrestrial, SX: Saxiculous, EP: Epiphytic, AQ: Aquatic, A: Perumalmalai, B: Pannaikadu, C: Savarikadu, D: Pillar rock

role in folklore medicine Ayurvedic, Unani, Homeopathic and other systems. However, now they are neglected due to the migration activity. In the past, several studies in the literature have reported medicinal uses of some fern and fern allies of India Kirtikar and Basu, 1935 have described 27 species of ferns having varied medicinal uses. Chopra *et al*., 1956 have included 44 species and Nadkarni, 1954 recorded 11 species of pteridophytes having medicinal importance. Nayar, 1959 recorded 29 medicinal ferns. May, 1999 published a detailed review of the various uses of ferns and listed 105 medicinal ferns. Singh, 1999 reported 160 species of useful pteridophytes in India on the basis of phytochemical, pharmacological, and ethnobotanical studies. Similar reports on the use of pteridophytes as medicinal purposes are very limited (Benjamin and Manickam, 2007).

Contrarily, Sumesh *et al*., 2012 revealed that the leaf extract of *Angiopteris evecta* is used in treatment of dysentery whereas the spores are effective in the treatment of leprosy and other skin diseases (Kirtikar and Basu, 1935). *Actiniopteris radiata* possesses the properties like anthelmintic, astringent, sweet, cooling, acrid, febrifuge, and is used for treating severe conditions of diarrhea, dysentery, helminthiasis, hemopstysis, and fever (Warrier *et al*., 1996). Recently, Das and Choudhury, 2014 recognized the paste of *Adiantum incisum* is useful in the healing of wounds. In contrast to the general belief that extant *Equisetum arvense* is used in nasal polyps and kidney infections and acidity, *Lycopodium clavatum* decoction used in rheumatism and diseases of lungs and kidneys. The paste of the leaves of *Ophioglossum reticulatum* is used in headache. The fronds of the gleicheniaceous fern *Dicranopteris linearis* Underwood is used for asthma and in woman's sterility, and the rhizomes of *A. evecta* are used for scabies. Liu *et al*., 2012 suggested *Blechnum orientalis* rhizomes are used for food sources (eaten). In India, a stem of *A. evecta* is eaten for starch. *Pteridium aquilinum*, is the most controversial species its fronds and starch have been eaten by billions of people in the world. However, it is a problematic, dangerous, and poisonous plant due to its special chemical composition, especially the

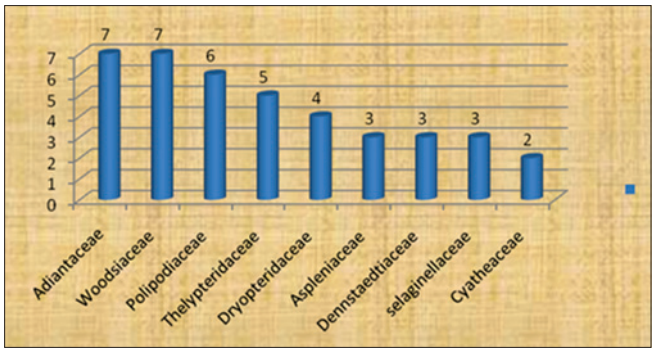

Figure 4: Analysis of dominant families of ethnomedicinal of fern and fern allies in Palani hills of Western Ghats

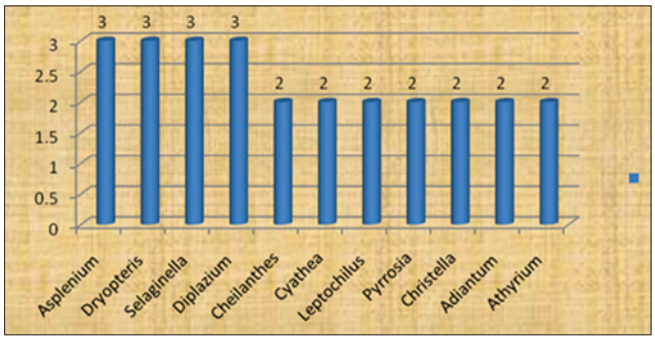

Figure 5: Analysis of dominant genera of ethnomedicinal of fern and fern allies in Palani hills of Western Ghats

content of ptaquiloside, a highly carcinogenic compound. Although Singh and Singh, 2012 found that 23 species of pteridophytes belonging to 15 families and 18 genera are traditionally used in treating 16 different gynecological and reproductive health-related diseases by the tribal women, which contribute about 18.66% of total pteridophytic diversity (134 species) of the area, about 85% of traditional medicines used for primary healthcare globally derived from plants in India. *Cyathea nilgirensis*, a southern Indian endemic tree fern was seen growing in the deep shade of the swampy forest of Kathalekan in Uttara Kannada. This is a new report of its distribution anywhere from north of 140 latitude in the Western Ghats. Similarly, Singh and Upadhyay, 2012 reported to be young leaves of the ferns *Diplazium esculentum*, *Nephrolepis cordifolia* are cooked as vegetables by the tribal people in Indian mountains. The fronds of the gleicheniaceous fern *D. linearis* underwood are used for asthma and in woman's sterility. The rhizomes of *A. evecta* are used for scabies (Vasudeva, 1999).

In this present study, presume that all the fern and fern allies have remarkable effective of medicinal value. To my knowledge *Blechnum orientale* rarely present in this study area, while their fronds showing good antioxidant and antibacterial activities, as well as their hot decoction is used to treat typhoid. *C. nilgirensis* endemic species are widely present in the road side of Perumalmalai, it is used for anti-diabetic. Nevertheless, *P. aquilinum* is mostly present in the upper hills of Kodaikanal, decoction of rhizome, and fronds is used to act as worms cleaner, stomach cramps, and increases urine flow. In addition, *Hemionitis arifolia* herb mostly available in terrestrial as well as saxiculous nature, the root powder is used to treat hypertension and also good ailment for healing wound. *Dryopteris cochleata* extract is applied for snake bite; powdered rhizome is taken with water to cure rheumatism and leprosy. *Equisetum ramosissimum* paste is externally applied to cure scabies, itches, and allied skin infections. *Lycopodiella cernua* decoction of the plant is used for lotion (reducing swelling and itching) and also used to cure cough and skin eruption. *A. evecta* leaf decoction is used to treat intestinal ulcer, stomach ache, and relief body pain, rhizome paste is applied externally in case of bone fracture. *Drynaria quercifolia* rhizome juice is inhaled internally cures cardiac and blood coagulation problem and fronds are useful in poulticing swellings. *Pyrrosia lanceolata* leaf paste along with pepper orally used to treat sore throat. *Deparia petersenii* young leaf is used to cure cold and cough. *Hypodematium crenatum* rare species of rhizome is used to cure the menstrual problem and gynecological disorder.

CONCLUSION

In the primitive time, the ancestors of Paliyars were lived interior forest. They are now settled in the footsteps of the hills and used to venture into their lifestyle is very simple and sacrosanct. From this study, it is concluded that ethnomedicinal uses of 50 pteridophytic species used by Paliyar tribes Palani Hills of the Western Ghats in South India local inhabitants have inherited with rich traditional knowledge on the use of medicinal plants or plant parts for their regular food and medicine. In developing countries, many people still rely on traditional healing practices and medicinal plants for their daily healthcare needs, in spite of the advancement in modern medicine. However, documentation of this indigenous knowledge of healing system still remains at a minimum level. It thus becomes necessary to acquire and preserve this traditional system of medicine by proper documentation and identification of specimens. According to last census 2011, an estimated 65% of Indian population still depend on the traditional medicine, because modern medicine is simply too expensive and treatment is too capital intensive. Therefore, the ethnomedicinal species listed above may be subjected to intensive phytochemical screening and pharmacognosy in view of their immense potential to cure certain vital diseases and ailments.

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