

Market Chain Analysis, Usage and Market Linkages of *Parmelia* and *Coleus* Harvested from the Wild in Uttarakhand



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“Market chain analysis, usage and market linkages of *Parmelia* and *Coleus* harvested from the wild in Uttarakhand”

Executive Summary

The state of Uttarakhand located in Himalayas is especially rich in the vegetation wealth. This wealth has received significant attention. It is also among the major suppliers of medicinal and aromatic plants in the Indian market. For medicinal use any of the parts of the plant might be considered as herb including leaves, roots, flowers, seeds, resin, root bark, inner bark (cambium), berries and sometimes the pericarp or other portions of the plant. While the demand for plants and plant based products is growing, some of them are increasingly being threatened in their natural habitat and some others are rejected due to their low percentage of active contents attributed to their geographic habitat.

Uttarakhand once considered being the largest supplier of *Coleus barbatus* is witnessing negligible demand these days. At the same time collection of *Parmelia* in India has considerably declined in last five decades.

***Coleus barbatus*:** It may be termed as a medicine of modern days. The pharmacological activities are attributed to forskolin, located in root tubers. Forskolin is the active constituent of *Coleus barbatus*. It is used mainly as food supplement. Forskolin content of the tubers varies with the strain and locality of its cultivation (0.1 - 0.58%, going as high as 1.1% in some cases).

During the growing period flowers are nipped off to obtain more biomass in case of cultivation. The plant is harvested manually by uprooting the individual plants. The tubers are separated, cleaned chopped into pieces and shade dried. There is no information available on grading of the roots. However, dried tuberous roots are preferred over fibred one.

Price of *Coleus* is dependent on area of its origin. Wild variety collected from Uttarakhand fetches low price when compared to the cultivated variety obtained from Southern parts of India. Price for Uttarakhand wild variety ranges from Rs.75.00 to Rs.95.00, whereas south Indian cultivated variety is sold at a range from Rs.270.00 to Rs.300.00 per kg. The dried roots are packed in sacks weighing 40 to 50 kg for transportation.

It is not much used in India. It is exported in the form of extract, food supplement and proprietary medicine mainly to U.S.A., Australia and Japan. The extracts containing 10 - 20% forskolin are generally marketed. There are four major trading centers for *coleus*, namely Delhi, Mumbai, Chennai and Bangalore. In actual practice extraction units depend mainly on contract farming or direct procurement from the cultivators.

***Parmelia spp.*:** The lichens are collected from trees trunks and rocks. Collection is permitted from January to June by Uttarakhand Government. The whole collection is handed over to the Uttarakhand Van Vikas Nigam. The material is then auctioned by the Uttarakhand Van Vikas Nigam at its collection centers; viz., Ramnagar, Rishikesh and Tanakpur.

Apart from Uttarakhand, in India the material is available in Himachal Pradesh, North Eastern States and Tamil Nadu. Few tons are also imported from Nepal.

The material is cleaned and is exposed to sunlight for drying then is divided into three grades. Price of grade one and two are too high when compared to grade three. grade one range from Rs.120 to Rs.160, grade two range from Rs.90 to Rs.130 and grade three range from Rs.10 to Rs.25. The material is packed in 10 to 15 kg bags.

The important users industries are Ayurvedic medicine, spice, perfumery and dyeing. Ramnagar is the main trading center for this material in Uttarakhand. Maharashtra, Madhya Pradesh, Gujrat, Tamil Nadu, Andhra Pradesh and Uttar Pradesh consume almost 80% of the total production.

Background

Several plants are commercially important and are being used in a number of pharmaceutical compositions, fragrances, spices and other industries. However, a sustained supply of the source material often becomes difficult due to the factors like environmental changes, cultural practices, diverse geographical distribution, labour cost, and selection of the superior plant stock and over exploitation.

Over 70% of the wild plant collections involve destructive harvesting because of the use of parts like roots, bark, wood, stem and the whole plant in case of herbs. Non sustainable use of biodiversity poses a definite threat to the genetic stock and to the diversity of medicinal plants. While the demand for plants and plant based products is growing, some of them are increasingly being threatened in their natural habitat and some other are rejected due to their low percentage of active contents attributed to their geographic habitat.

Coleus barbatus and *Parmelia spp.* falling in this category are no exceptions.

Uttarakhand, once considered to be the largest supplier of *Coleus barbatus* is witnessing negligible demand these days. Through selection of a high forskolin-yielding variety and the determination of conditions for its optimum cultivation, forskolin yield has increased substantially in the southern states especially in Tamil Nadu.

Parmelia spp. has many economic uses like antibiotics, decorations, dyes, natural remedies, spices, condiments and stabilizers for perfumes. In the last five decades collection of *Parmelia* in India has considerably declined. The raw material required for the various uses of lichens is quite high. The factors responsible for this decline may include the change in the ecological conditions, forest cover, and increasing urbanisation. Over exploitation by local people may be another important factor.

Methodology

Components of the Methodology:

1. Secondary Research

The information on trade of *Coleus barbatus* and *Parmelia spp.* is documented but not readily available at one place to cover all the stages - wild collection to traditional traders to industries within the country or to the industries in other countries.

Information on production, market, marketing, quantity of domestic consumption and other trade related coefficients is not documented, and if documented the authenticity of the source was doubtful.

Therefore, efforts were made to use the documented information available with different institutions and organisations of repute within and outside India.

2. Primary Research

Bearing in mind the limited information base on trade and quantity of production, the market study was dependent to a large extent on primary research.

Research tool

After considering several methods of data collection, 'Personal Interview' was selected as a tool to collect information for this study. Personal interview is direct and allows face-to-face interaction between the interviewer and the respondent.

Justification of the tool

'Personal Interview' as a tool in survey techniques has great potential of being applied to different situations and to various categories of respondents. It is of prime importance among population for whom dialogue is the most important medium of communication. Hence, in this situation this market indicative interview was considered a valuable tool.

More information can normally be obtained through observation of the respondent's surroundings. Personal interviewing is expensive, but it offers a great deal of flexibility and allows for visual stimuli.

The target group for the study was selected carefully and refers to the group of traders from the states that represent our specific target audience. They helped generate adequate data. The findings from the target group have been used to provide general information but do not suffice to give absolute quantifiable information.

Justifications and formation of questionnaires

The requirement of primary data is highly essential for this study. For the purpose of collecting primary data surveys were conducted. Surveyors had prior experience of surveys in the field of herbal trade.

The questionnaire was tested to find out the inconveniences, limitations and most importantly reactions of the traders towards the questions in terms of their willingness to answer. The respondents were keener on discussing and giving an open ended answer.

The final questionnaire was framed after taking into account the positive and negative factors of the test questionnaire. To sum up, the following were taken care of in the final survey questionnaire:

- Biased questions were avoided.
- No double-barreled question was used to avoid incomprehensible answers.
- It was made sure that the questions were direct to avoid unreliable answers.
- The questions were very specific and directly related to the survey.

Sampling

Sample size:

The population size being small, the criteria considered to determine the appropriate sample size were:

- the level of accuracy,
- the level of confidence or risk, and
- the degree of variability

Sample Selection:

Non-probability sampling method was used during research efforts to get a gross estimate of the results. The reasons for choosing Judgment sampling method were:

Judgment sampling is selected based on the judgment of the consultants so that the chosen sample can truly represent the entire target population. This is the method of choosing a sample drawn from a larger population based on one's own judgment, grounded in relevant experience. The sample, and the variables included in it are based on three primary areas:

- Their value
- Their "relative risk" and
- The extent to which they are representative of the larger population.

Interviewing

None of the respondents agreed to talk to the consultants at the first approach because of their fear that the disclosure of information may lead them to unknown complications from government departments.

The goodwill and popularity of Medherb Green Pages published by Rawal Medherbs Consultants Private Limited helped to overcome the fear of the interviewees. Secondly, the surveyors explained that Rawal Medherbs Consultants Private Limited was conducting the survey on behalf of TRAFFIC India, with the intention to create a sustainable trade environment. Despite all the adversities the interviewees have shown tremendous patience in collecting the data.

Findings

Coleus barbatus



Parmelia spp.

Coleus barbatus
Distribution in India



Map not to scale

Coleus barbatus

Botanical Name

Coleus barbatus Briq.

Coleus aromaticus Benth.

Coleus amboinicus Lour.

Coleus barbatus (Andr.) Benth

Vernacular Names

Bengali	Paterchur
English	Coleus barbatus, Country borage, Indian borage
Hindi	Coleus, Fiwain, Pashan bhedi, Patharchur
Marathi	Pathurchur, Karmelo
Sanskrit	Pashanabhedi
Tamil	Karpurvalli, Pashanbheda, Patharchur
Urdu	Pathar chatta, Patharchur, Pathri tor

Useful part

Leaves, Roots (Commonly in use)

Distribution in India

It grows wild in the warm subtropical temperate areas in India on sun-exposed arid and semi-arid hill slopes of the Himalayas in Uttarakhand. It is also found in Sikkim, Eastern Ghats, Eastern Plateau and rain shadow regions of the Western Ghats. It has been cultivated in India as a condiment for heart ailments and stomach cramps.

Plant description

Coleus barbatus is a branched perennial aromatic herb, 1-2 ft high with fleshy, fibrous roots, with a thick rootstalk. Leaves are teardrop shaped, shimmering green framing a bright purple center; leaf color varies depending on the amount of shade. It is a cluster of stalked pale purple or blue flowers branches off a single stem. The rootstock is typically golden brown, thick, fibrous, and radially spreading. The roots are harvested in the fall, when forskolin is at its most concentrated and the color is the brightest. The root material may be tuberous, semi-tuberous or fibrous depending upon the growth conditions. Fresh root yield in different populations ranges from 1 to 500 g per plant.

Identification of suitable agro-climatic regions

Suitable agro-climatic regions for commercialization of *C. barbatus* were identified by the pilot cultivation at some sites, having different agro-climates. The investigation included the superior non-flowering cultivar variety and one or both of the two the varieties characterized above.

Chemical contents

In the 1970s, researchers isolated a chemically active ingredient in the herb and called it forskolin. The diterpene forskolin, derived from the root of the plant, is the primary constituent of clinical interest. It was discovered in 1974 and was initially referred to as coleonol. Afterwards Forskolin was named after the Finnish botanist, Forskal. Forskolin content in roots varied from 0.07 to 0.58% of dry matter within and between the populations.

Medicinal properties

It has been used to treat hypertension, congestive heart failure, eczema, colic, respiratory disorders, painful urination, insomnia, and convulsions. Clinical studies of the plant and the forskolin constituent support these traditional uses, but also indicate it may have therapeutic benefit in asthma, angina, psoriasis, and prevention of cancer metastases.

Developments related to plant

Although the development activities were spread over 13 years, the species was commercialized in 1986, subsequent to identification of the superior strain and suitable agroclimatic zones.

- Discovery of *C. barbatus* as a potential drug (1974-1981)
- Natural habitats and intraspecific variation (1982-1985)
- Collection of germplasm and its evaluation (1983-1985)
- Identification of suitable agroclimatic regions (1985-1986)
- Optimization of growth conditions (1985-1987)
- Genetic improvement (1989-1994)

Status

Being endangered in India there is restriction for wild collection, but not for cultivation. Cultivation is on in Tamil Nadu, Gujarat & Karnataka.

Notes: Contains the labdane diterpene forskolin. Plant derivatives are the subject of several international patents by Sabinsa Corp. (see Cropwatch Newsletters). *C. forskohlii* isolates Inhibit melanin formation hence use in cosmetic formulations as skin whitener. Activates adenylyl cyclase reaction & lowers blood pressure.

Price status

Average price of the item for that particular year is calculated on the basis of price range mentioned by the respondents. The mathematical formula used for calculation of average price is the sum total of minimum price and maximum price divided by two.

The mathematical representation is as under:

$$Av. = (m+n)/2$$

Where “Av.” represents the average value “m” represents the minimum price, “n” represents the maximum price.

Uttarakhand Market Price (in INR) per Kg.

Tab. no. 1

S.N.	Interviewee code	2007			2008			2009		
		Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.
1	Tanakpur-1	40.00	50.00	45.00	50.00	60.00	55.00	70.00	90.00	80.00
2	Tanakpur-2	40.00	50.00	45.00	40.00	55.00	47.50	75.00	95.00	92.50
3	Ramnagar-1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
4	Ramnagar-2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
5	Dehradun-1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Year wise average price				45.00			51.25			86.25

Min.: Minimum, Max.: Maximum, Ave.: Average

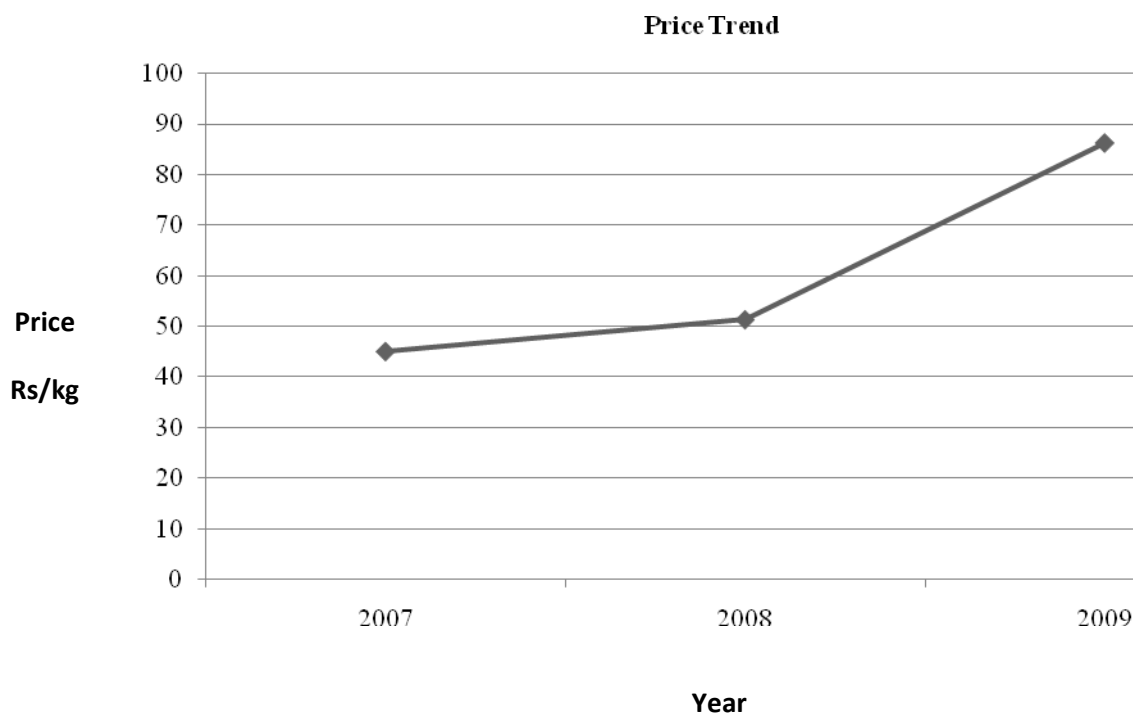


Fig. 1 Price trend of *Coleus barbatus* in different years.

Table 2: Uttarakhand Market Volume (in Ton) * 1Ton=100kg

S.N.	Interviewee code	2007		2008		2009	
		Range	Ave.	Range	Ave.	Range	Ave.
1	Tanakpur-1	11-25	18	11-25	18	11-25	18
2	Tanakpur-2	101-150	125.50	101-150	125.50	26-50	38
3	Ramnagar-1	Not Applicable		Not Applicable		Not Applicable	
4	Ramnagar-2	Not Applicable		Not Applicable		Not Applicable	
5	Dehradun-1	Not Applicable		Not Applicable		Not Applicable	
Year wise average market volume			71.75		71.75		28

Source: Field study by Rawal Medherbs Consultants Pvt. Ltd.

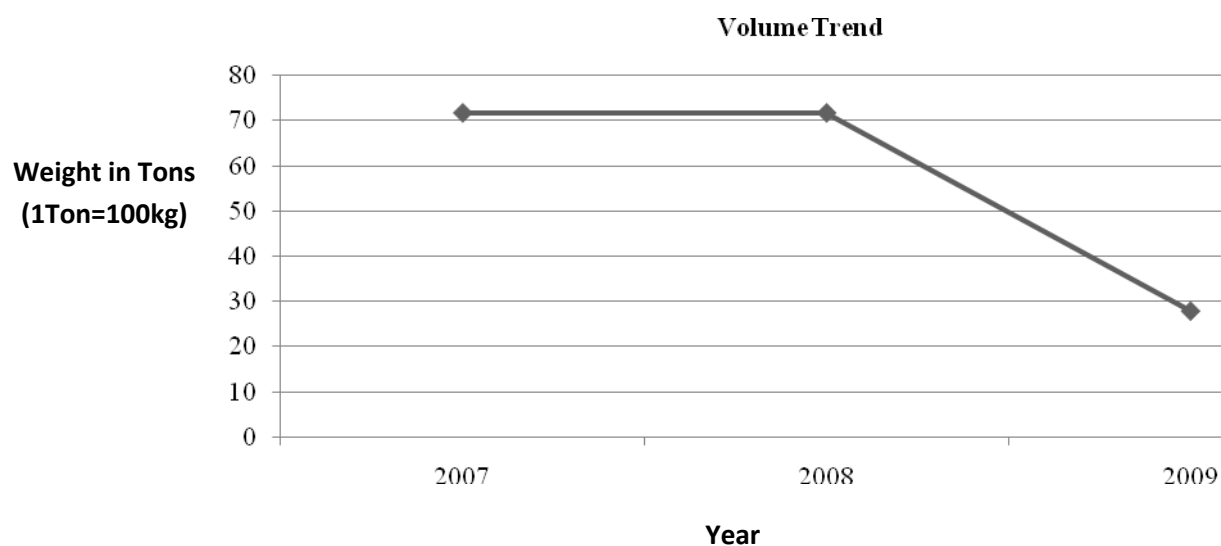


Fig. 2. Volume trend of *Coleus barbatus* in different years.

Table 3: All India Market Volume (in Ton)

S.N.	Source markets	Volumetric range	Average
1	Andhra Pradesh	51-100	75.50
2	Karnataka	500-1000	750.00
3	Madhya Pradesh and adjacent states	101-250	175.50
4	Tamil Nadu	1001-1500	1300.50
5	Uttarakhand	1-50	25.50
All India market volume		2000-2500	2327

Source: Field study by Rawal Medherbs Consultants Pvt. Ltd.

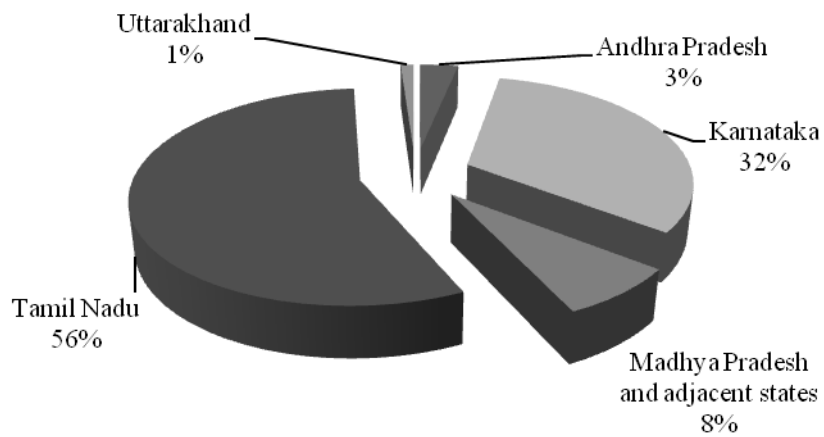


Fig. 3: Sourcing Markets within India

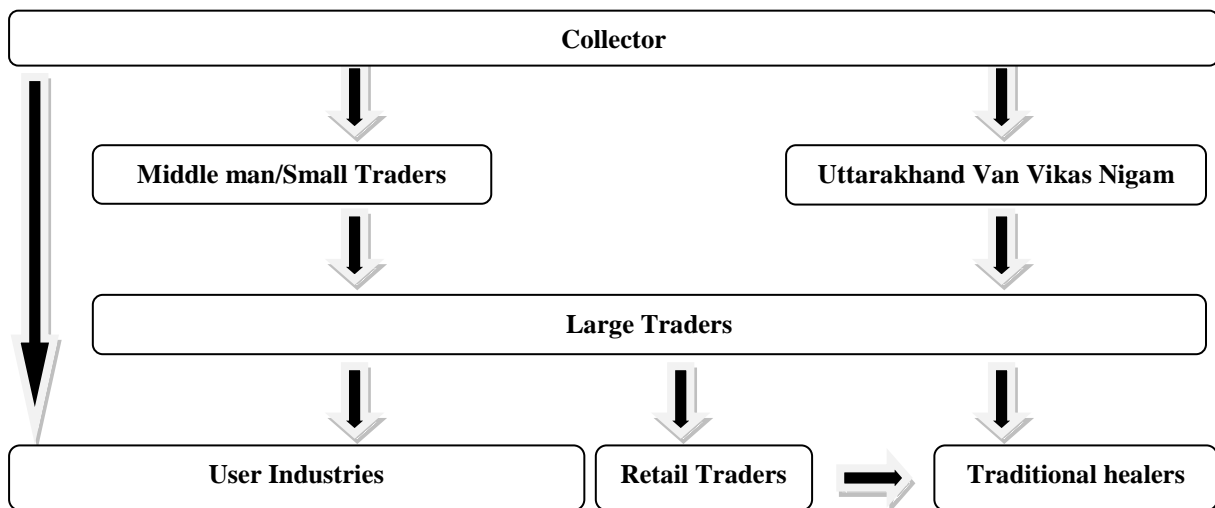


Fig. 4: Pictorial Presentation of Chain of Custody of *Coleus* in Uttarakhand (By Rawal Medherbs Consultants Pvt. Ltd.)

Plant Details (Secondary Source)

1. Name

Botanical name	<i>Coleus barbatus</i>
Family name	Lamiaceae
Synonyms	Coleus barbatus, Plectranthus barbatus
Trade name	Coleus, Pashanbhed
Local name (UK)	Patharchoor
English name	Coleus

2. Description

Habit	Erect, procumbent or decumbent herbaceous with annual stems, perennial root stock.
Habitat	Sub tropical and warm temperate climate. Grows wild in sun exposed and semi arid hill slopes of the Himalayas from Shimla Eastward to Sikkim and Bhutan, Deccan Plateau, Eastern Ghats, Eastern Plateau and rain shadow regions of Western Ghats, UP. Cultivated in Maharashtra, Gujarat and Karnataka.
Leaves	Petioled, Ovate, Obtuse, Crenate and hairy
Flowers	Inflorescence length 3 - 40 cm, Pale blue in colour
Flowering season	July to November
Fruiting season	July to November
Altitude	600 - 1800 m.
Source	Wild and Cultivated

3. Parts

Part used	Roots, Leaves
Common marketable parts	Root
Active constituents	Labdane diterpene, forskolin (0.07 - 0.58%)
Pharmacognosy	Established / Not established
Clinical status	Used

5. Industry

Used in system	Pharmaceutical (Aryurved / Aromapathy / Homeopathy / Siddha / Unani/ Veterinary) Food suppliment
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7. Adulterants/ Substitutes

Not known

Parmelia spp.

Distribution in India



Map not to scale

Parmelia species

Botanical Name

Parmelia spp. (Huds.) Ach. (Groot schildmos) [Syn. *Parmotrema chinense*];
Parmelia coniocarpa,
Parmelia trichotera,
Parmelia nepalensis Tayl. Hook,
Parmelia nilgherrensis Nyl. ,
Parmelia tinctorium Nyl.
Parmotrema perlatum

Vernacular Names

English	Stone flower, Litho lichen
Hindi	Cadila, Charela, Pathar ka phul, Phathar-ke-phul
Kannada	Kalluhuvu, Kallu hoo
Malayalam	Celeyam, Kalppuvu
Marathi	Dagadaphula, Mothadagadaphula
Sanskrit	Asmapuspam, Saileya, Saileyam, Shailaja, Silapuspa,
Tamil	Kalap-pach-chi, Kalap-pu, Kalpasi, Kalap-pu, Karpasi
Telugu	Ratipuvvu, Rathipachi
Urdu	Charela (Chadela), Rihankarmani, Charila, Ushna
Uttarakhand	Jhula

Useful part

Whole lichen

Distribution in India

Throughout India, in rocky areas, old tree trunks. (Commercial collection is from Uttarakhand, Himachal Pradesh, North Eastern States, Tamil Nadu and Karnataka)

Plant description

Lichens are dual organisms composed of a symbiotic relationship between an alga and a fungus. *Parmelia* is lichen growing on the substratum in irregular fashion. It is composed of a symbiotic colony of fungi and alga. *Parmelia* spp. is lichen growing in rosettes or irregularly spreading over the substratum giving the appearance of a flower - hence the name. It is mainly composed of fungal mycelia which form a network enclosing algal cells or gonidia. Reproduction takes place through spores, dispersed by wind.

Chemical Contents

Chemical Composition: The chromogenic bodies in the lichens are crystallizable phenols and phenol acids. To the latter class belong lecanoric acid, discovered in 1842 by Schunck, with which beta-orsellinic acid of Stenhouse (1848) is identical; erythrinic and roccellic acids (Heeren, 1830), usnic acid, evernic acid, etc.

1. Atranorin: Benzoic acid, 3-formyl-2, 4-dihydroxy-6-methyl, 3-hydroxy-4-(methoxycarbonyl)-2, 5 dimethylphenyl ester.
Atranorin is a component of oak moss, a lichen variety. Extracts from this lichen are often used in cosmetic products to add a male, tangy fragrance. Atranorin can be found in perfumes, shaving lotions, deodorants, body lotions.
2. Lecanoric acid: 2, 4-dihydroxy-6-methylbenzoic acid 4-carboxy-3-hydroxy-5-methylphenyl ester
Lecanoric, an organic acid which is obtained from several varieties of lichen (*Lecanora*, *Roccella*, etc.), as a white, crystalline substance, and is called also orsellin, / diorsellinic acid, lecanorin, etc.

Medicinal properties

It is kapha and pitta suppressant. It is a good pain reliever and also promotes early healing of wounds due to its bitter taste. It helps treating skin related problems due to its cold potency. It acts as expectorant, antibiotic and astringent. It helps in avoiding the calculi and helps in maintaining normal body temperature. It is also used as anti-fungal and anti-viral agent. It helps in relieving pain when applied on head. It also helps in itching and skin related problems. It helps in reducing all kinds of body inflammation. Its antibacterial activity is effective against Protozoans. Its decoction is given for laryngitis. It helps against baldness, period aches, worms and lice.

Allergy: Most occupational contact dermatitis to lichens occurs in forestry workers who have contact with lichens growing on the bark of trees. Usnic acid is insoluble in water but is carried down tree trunks by rainwater. The sensitizing capacity of atranorin, component of some perfumes and cosmetics has been confirmed.

Cross reactions: A number of patients are allergic to both lichens and liverworts. This probably represents multiple sensitisation, rather than cross-sensitisation, as both lichens and liverworts (*Frullania*) coexist on trees.

Safety and Toxicity

The plant is astringent, bitter, acrid, cooling, anti-inflammatory and aphrodisiac.

This is generally considered as safe and no toxic data is available.

Status

Export of Charila is banned by Nepalese Government in 1993. This does not apply to processed material. Approx 1000 tons per year *Parmelia* lichens (including *P. tinctoris* & *Usnea spp* which may be co-extracted with *P. nepalensis*) processed for aroma & incense industry – up to 800 tons + imported into India. (Cropwatch: unpublished information). Lichen “oil” W. Nepal is actually an oleoresin produced by ethanolic extraction of the lichen.

Lichen Uses in general

Fodder uses: Lichens are used as food and fodder, particularly in the common condiments, bread, porridge or gruel for human consumption.

Brewery: Lichens have been used instead of hops for brewing beer.

Dyeing: Lichen dyes were renowned for their high quality and colour. Litmus paper was originally manufactured by the Dutch from lichens.

Perfumery: With improvements in manufacturing techniques, lichen extracts have been combined into toilet powders and scented sachets. Today the principal species are used in perfumery

Medicine: *Parmotrema chinense*, *Parmotrema perforatum*, and/or *Everniastrum cirrhatum* are sold in Indian bazaars as crude drug and used in Ayurvedic and Unani systems of medicine. The smoke of Chharila is believed to relieve headaches. When powdered it is applied on wounds, and it is considered to be a good cephalic snuff. Chharila has also been considered useful in dyspepsia, spermatorrhoea, amonorrhoea, calculi, diseases of the blood and heart, stomach disorders, enlarged spleen, bronchitis, bleeding piles, scabies, leprosy, excessive salivation, soreness of the throat, toothache, and pain in general.

Price status

Average price of the item for that particular year is calculated on the basis of price range mentioned by the respondents. The mathematical formula used for calculation of average price is the sum total of minimum price and maximum price divided by two.

The mathematical representation is as under:

$$Av. = (m+n)/2$$

Where “Av.” represents the average value “m” represents the minimum price, “n” represents the maximum price.

Market Price per Kg. (in INR)

Tab. no. 4

S.N.	Interviewee code	2007			2008			2009			
		Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.	
1	Tanakpur-1	25.00	90.00	57.50	30.00	110.00	70.00	40.00	150.00	95.00	
2	Tanakpur-2	25.00	80.00	52.50	25.00	100.00	62.50	45.00	140.00	92.50	
3	Ramnagar-1	23.00	95.00	59.00	28.00	105.00	66.50	40.00	145.00	92.50	
4	Ramnagar-2	23.00	90.00	59.00	30.00	115.00	72.50	42.00	150.00	96.00	
5	Dehradun-1	25.00	80.00	52.50	28.00	90.00	59.00	40.00	155.00	97.50	
6	UK Van Vikas Nigam			56.08			58.21			81.40	
Year wise average price				56.10				64.79			

Min.: Minimum, Max.: Maximum, Ave.: Average



Fig. 5: Price trend of *Parmelia* species in different years.

Uttarakhand Market Volume (in Ton)* 1Ton=100kg

Tab. no. 5

S.N.	Interviewee code	2007		2008		2009	
		Range	Ave.	Range	Ave.	Range	Ave.
1	Tanakpur-1	1000-1500	1250	1500-2000	1750	1500-2000	1750
2	Tanakpur-2	2000-2500	2250	1500-2000	1750	2000-2500	2250
3	Ramnagar-1	2000-2500	2250	2000-2500	2250	2000-2500	2250
4	Ramnagar-2	1500-2000	1750	1500-2000	1750	1500-2000	1750
5	Dehradun-1	1000-1500	1250	1500-2000	1750	2000-2500	2250
6	UK Van Vikas Nigam	1400-1500	1450	1100-1200	1150	1400-1500	1450
Year wise average market volume			1700		1733		1950

Source: Field study by Rawal Medherbs Consultants Pvt. Ltd.

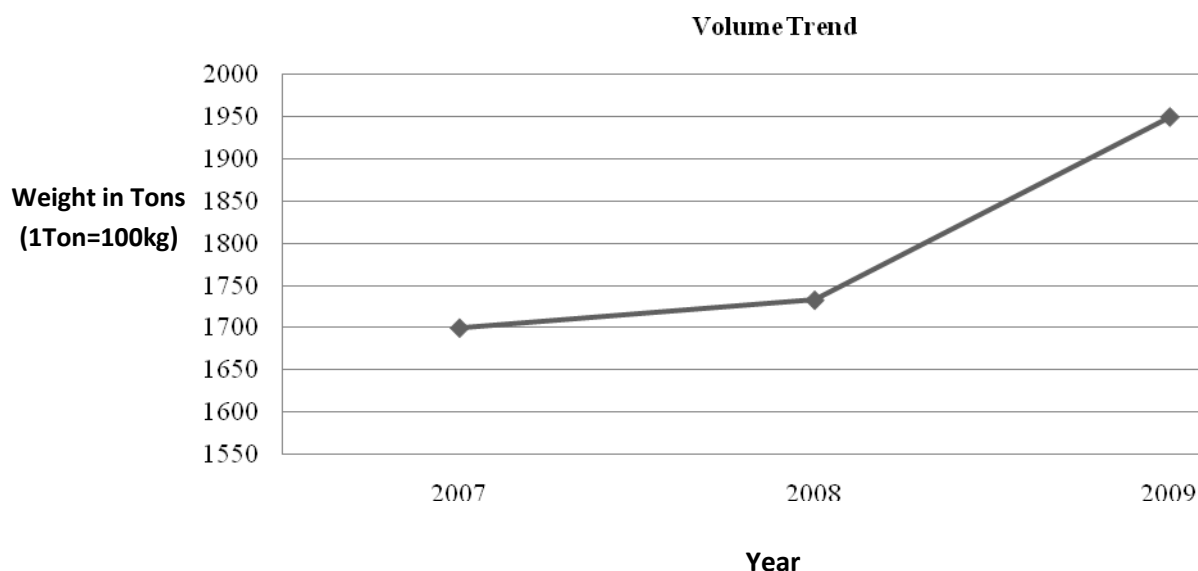


Fig. 6: Volume trend of *Parmelia* species in different years

Table 6: All India Market Volume (in Ton)

S.N.	Source markets	Volumetric range	Average
1	Himachal Pradesh	750-1000	875
2	North Eastern States	100-250	175
3	Tamil Nadu	100-250	175
4	Uttarakhand	2000-2500	2250
5	Import from Nepal	50-100	75
All India market volume			3550

Source: Field study by Rawal Medherbs Consultants Pvt. Ltd.

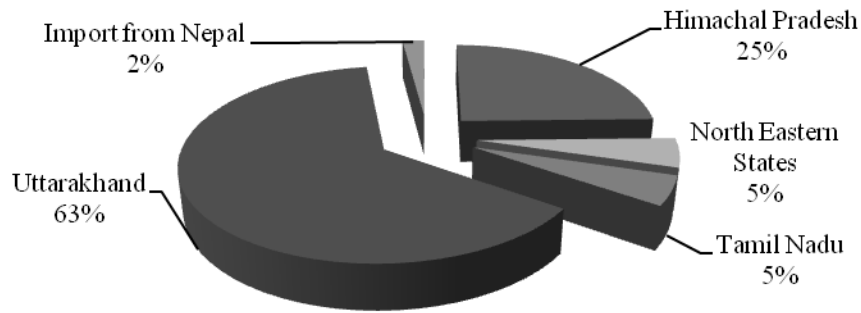


Fig. 7: Sourcing Markets within India

Table 7: Grade vs. Use.

S.N.		Grade 1	Grade 2	Grade 3
1	Morphology	Large and Black coloured	Medium and greenish	Greenish yellow
2	Used by / as	Spices Industry	Spices industry, Fragrance industry, Dyeing Industry	Hawan Samagri
3	Price	Rs.120.00-Rs.160.00	Rs.90.00-Rs.130.00	Rs.10.00-Rs.25.00

Source: Field study by Rawal Medherbs Consultants Pvt. Ltd.

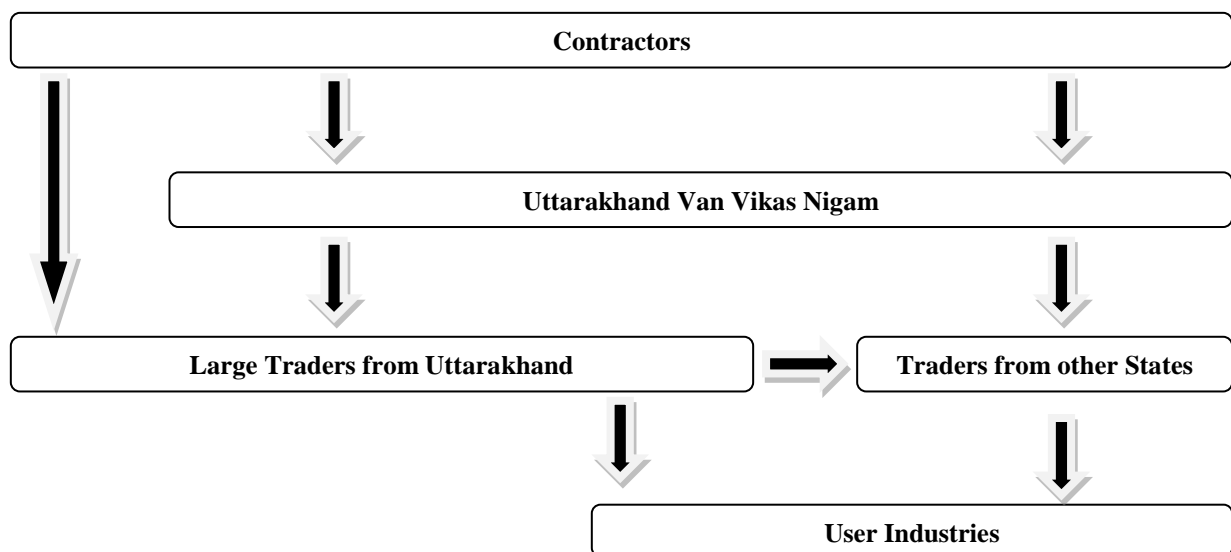


Fig. no. 8 Pictorial Presentation of Chain of Custody of *Parmelia* species in Uttarakhand (By Rawal Medherbs Consultants Pvt. Ltd.)

Plant Details (Secondary Source)

1. Name

Botanical name	<i>Parmelia spp.</i> (Huds.) Ach.
Family name	Parmeliaceae
Synonyms	Parmotrema chinense
Trade name	Chharila, Chhadila
Local name (UK)	Jhula
English name	Stone Flower, Rock Moss

2. Description

Habit	Lichen
Habitat	Found on rocks and trunks of old trees in temperate region
Altitude	600-1800 mt.
Source	Wild, mainly from hills of Himachal Pradesh, Uttarakhand, North Eastern States and Western Ghats

3. Parts

Part used	Whole plant
Common marketable parts	Whole plant (dried)
Active constituents	Atranorin and Lecanoric acid
Pharmacognosy	Not well established
Clinical status	Used in hair oils and in drugs to treat spermatorrhea

5. Industry

Used in system	Pharmaceutical (Aryurved / Siddha / Unani) Food supplement, Cosmetics, Perfumery, Spices, Dye, Raw eaten as soup and salad
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7. Adulterants/ Substitutes

Usnea sp. and other species of Parmelia such as Parmelia perforata , Parmelia cirrhata
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Discussion

Coleus barbatus

The name coleus is not found in the traditional Indian system of medicine, Ayurveda. Hence it may be termed as a medicine of modern days. The pharmacological activities are attributed to forskolin, located in root tubers. Forskolin is the active constituent of *Coleus barbatus*. It is been clinically used in cardiovascular disease, glaucoma, cancer metastasis, asthma and allergies, psoriasis, obesity and weight loss. It is generally considered a safe drug without any side effects or toxicity at the recommended dosage. It is used mainly as food supplement.

Forskolin content of the tubers varies with the strain and locality of its cultivation (0.1 - 0.58%, going as high as 1.1% in some cases).

Harvest

The plant is ready for harvest after about 140-180 days of planting. During the growing period flowers are nipped off to obtain more biomass in case of cultivation. The plant is harvested manually by uprooting the individual plants. The tubers are separated, cleaned chopped into pieces and shade dried.

Grading

There is no information available on grading of the roots. However, dried tuberous roots are preferred over fibred one.

Price

Price of *Coleus* is dependent on area of its origin. Wild variety collected from Uttarakhand fetches low price when compared to the cultivated variety obtained from Southern parts of India. Price for Uttarakhand wild variety ranges from Rs.75.00 to Rs.95.00, whereas south Indian cultivated variety is sold at a range from Rs.270.00 to Rs.300.00 per kg.

Packing

The dried roots are packed in sacks weighing 40 to 50 kg for transportation.

Users

It is not much used in India.

Sales

It is purchased by the extractors in raw form for removal of forskolin. It is exported in the form of extract, food supplement and proprietary medicine mainly to U.S.A., Australia and Japan. The extracts containing 10 - 20% forskolin are generally marketed.

Trading Centers

There are four major trading centers for coleus, namely Delhi, Mumbai, Chennai and Bangalore. In actual practice extraction units depend mainly on contract farming or direct procurement from the cultivators.

Parmelia Species

Collection

The lichens are obtained from the rocks and tree trunks. These are picked by hand, or sometimes scraped, from the lower branches, trunks, and fallen twigs of trees by the labourers engaged by authorized forest contractors. Collection is permitted generally from January to June by the Forest department of Uttarakhand Government. From July to December, collection of this item is banned by the Government.

The raw collection of lichens contains some amount of stone chips and wood barks. The whole collection is supposed to be handed over to the Uttarakhand Van Vikas Nigam. But it is observed that a good quantity of the collected material comes to the traders either by the contractors or by the labourers engaged by the contractors for collection. This happens for quick encashment against the material.

Sales

The whole material collected by the Uttarakhand Van Vikas Nigam is auctioned in three collection centers; viz., Ramnagar, Rishikesh and Tanakpur. Traders from the state normally participate in the auctions. Seldom traders from other States participate in the process. No information was available on participation of user industries.

It is learnt through interactions with the stakeholders that, user industries are not interested in investing money in procuring the ungraded material as they do not have any idea if the quantity of the required quality will be available from the lot. Again they do not want to waste their time in grading the raw material. At the same time they are afraid that this may cost those more as after grading it will be difficult on their part to find a buyer for the balance material causing their warehousing costlier. Moreover it involves hard cash in the auction which needs much administrative actions and dependable human resource.

Traders prefer to participate in the auctions as they don't mind cash purchase. The second point is the places of auction are within their proximity. Third and most important point is that as the participants know each other competition is much discouraged through mutual understanding resulted in lower auction quote.

Other sources of availability

Apart from Uttarakhand, in India the material is also collected in Himachal Pradesh, North Eastern States and Tamil Nadu and contribute to the domestic market volume. The combined contribution from North Eastern States and Tamil Nadu amounts to 10% of the total domestic market volume. A little undocumented quantity (around two percent) comes from neighboring country Nepal.

Grading

The material owned through the auction is dried in open area under sunlight. The dried material is cleaned by separating stone chips and wood barks. The cleaned material is graded according to their size and colour. Grade one - contains blackish large flower shaped thallus, grade two - contains mixture of bit greenish medium and small thallus and grade three - contains almost dust of the thallus.

Pricing

Price of the material is fixed after grading.

Price: Price of grade one and two are too high when compared to grade three.

Grade one - Rs.120 to Rs.160

Grade two - Rs.90 to Rs.130

Grade three - Rs.10 to Rs.25

Packing

The graded material is transported in 10 to 15 kg bags in case of grade one and two and in 20 to 25 kg bags in case of grade three materials to various cities in India.

Users

It is used in preparation of medicines in Indian system of medicine 'Ayurveda' and Unani system.

The common condiments used in food dishes called 'Gharm Masala', 'Meat Masala', 'Sambar Masala' contain lichen powder or whole plant as a major ingredient and this industry is considered as the largest consumers of the item.

The second largest sector is perfumery industry. The plant material is used in extraction of resinoids which is used in high - grade perfumery. An indigenous perfume named 'Otto' (the Hina Attar) is manufactured at Kannauj.

It is also sold in the grossary shops by the name of 'charila' and used as soup thickner.

Trading Centers

Ramnagar is the main trading center for this material in Uttarakhand. However depot of Uttarakhand Van Vikas Nigam at Risikash auctions the largest quantity that is almost double of the quantity of the combination of Ramnagar and Tanakpur depot. It is found that more than 70% of the material collected from Uttarakhand is routed through Ramnagar only. The feeder areas for the depots are:

- Ramnagar: Chamoli, Almora, Nainital, Pauri Garhwhal, part of Rudraprayag
- Rishikesh: Haridwar, Tehri garhwal, Dehradun, Uttar Kashi, part of Rudraprayag
- Tanakpur: Champawat, Pithoragarh

Other major trading centers in India are Silong in Meghalaya, Guwahati from Assam, Kolkata from West Bengal, Chennai, Dindigul and Madurai from Tamil Nadu and Mumbai from Maharashtra.

Major markets

Seven states in India are consuming almost 80% of the total production. Maharashtra - Aurangabad, Jalgaon, Kolhapur, Mumbai, Nagpur, Nanded, Nasik, Pune and Ratnagiri; Madhya Pradesh - Indore and Bhopal; Gujrat - Ahmedabad, Jamnagar, Rajkote and Vadodara; Tamil Nadu - Chennai; Andhra Pradesh - Hyderabad and Uttar Pradesh - Kanauj. Other markets include Kolkata, Lucknow, Delhi and Varanasi.

All the places except Kanauj are consuming the material mainly for spice industries, Ayurvedic medicine and hawan samagri.

Recommendations

(A) *Coleus* is an important commercial drug from Uttarakhand but needs more attention in the following areas:

1. Cultivation of *Coleus* may be taken up on scientific lines
 - Elite strains with better yield and forskohlin content may be introduced and taken up for more studies
 - Agro-techniques for cultivation may be standardized
2. Germplasm of *Coleus* species from Uttarakhand may be collected to find out elite strains.
3. Small experimental extraction unit for forskohlin may be set up for value addition.
4. Detailed chemical analysis of different parts of the plant may be taken up to optimize the use of the plant.
5. Since the plant is also being used in folk medicine, the details of these uses may be documented properly.

(B) *Parmelia* is an important raw material resource from Uttarakhand.

1. Multiplication of *Parmelia* in situ may be taken up on scientific bases
2. Exact species and varieties may be determined to optimize the uses
3. Chemical and pharmacological studies on *Parmelia* may be taken up to standardize the crude drug and put it to various applications
4. Biotechnological and other techniques may be used to help in these areas

Item: **Coleus barbatus** / English name: **Coleus** / Trade name: **Coleus** / Part Used: **Root**

1. Approximate Market Volume Uttarakhand (in tons)

1-10	11-25	26-50	51-100	101-150	151-250	251-500	501-750
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2. Approximate Mandi Volume (in tons)

1-5	6-10	11-25	26-100	101-150
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3. Current Price

Price range in INR	Minimum	Maximum
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4. Source of Procurement

Source	Approximate Percentage		
	On Total	Cultivated	Wild
Uttarakhand			
Other states			
Other countries			

5. Present point/s of procurement (chain of custody)

Collector	Cultivator	Broker	Small Trader	Local Mandi	UK Van Nigam	Importer
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6. Assumed Trade Volume of India (in tons)

1-1000	1001-2000	2001-3000	3001-4000	4001-5000
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8. Tax

VAT	
CST	
Local Mandi	

Item: **Parmelia spp.** / English name: **Stone Flower, Rock Moss** / Trade name: **Chharila** / Part: **Whole Plant**

1. Approximate Market Volume Uttarakhand (in tons)

1-100	101-250	251-500	501-1000	1001-1500	1501-2000	2001-2500
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2. Approximate Mandi Volume (in tons)

1-100	101-250	251-500	501-1000	1001-1500
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3. Current Price

Price range in INR	Minimum	Maximum
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8. Tax

VAT	
CST	
Local Mandi	

References

- Ammon, H.P. and Muller, A.B. Forskolin: From an Ayurvedic Remedy to a Modern Agent. *Planta Medica* Dec.6 (1985) : 473-77.
- Badmaev, V., et al., Diterpene Forskolin (*Coleus barbatus*, Benth.): A Possible New Compound for Reduction of Body Weight by Increasing Lean Body Mass," *Sabinsa report*, January 2000.
- Bone, K. Clinical Applications of Ayurvedic and Chinese Herbs, Queensland, Australia: Phytotherapy Press, 1996.
- Chandra, S. and Singh, A crude lichen drug (chharila) from India. *Journal of Research in Indian Medicine* 1971, **6**: 209-215
- De Souza, N.J., Industrial Development of Traditional Drugs: the Forskolin Example. A Mini-Review, *Journal of Ethnopharmacol* (1993) **38**(2-3): 177-80.
- Hawksworth, David L. Rediscovery of the original material of Osbeck's Lichen chinensis and the restatement of the name Parmotrema perlatum (Parmeliaceae), *Herzogia* 2004,**17**,37-44
- Kies, L and Kremer BP Typification of the Glaucocystophyta, *Taxon*, 1986 - jstor.org
- Majeed, M., et al., "Method of Preparing a Forskohlin Composition from Forskohlin Extract and Use of Forskohlin for Promoting Lean Body Mass and Treating Mood Disorders," US Patent No. 5,804,596, Sept. 8, 1998.
- Malhotra, S. Lichens- Role in Traditional Medicine and Drug Discovery. *The Internet Journal of Alternative Medicine* 2008: Volume 5 Number 2
- MB Research Laboratories and BioReliance Laboratories, "Oral Toxicity in Rats LD50 and AMES Test of 10% Standardized Extract of *Coleus barbatus* Roots (ForsLean)," November 2000.
- Mitra S.K.and Kannan R. A Note on Unintentional Adulterations in Ayurvedic Herbs, *Ethnobotanical Leaflets* 2007, **11**: 11-15.
- Nadkarni, K.M. Indian Materia Medica. .1976. Pages 922
- Saklani, A. and Upreti, D.K. Folk uses of some lichens in Sikkim. *Journal of Ethnopharmacology* 1992. **37**: 229-233.
- The Ayurvedic Pharmacopoeia of India, Vol. III, Monograph No 76
<http://ccras.nic.in/PharmacopoeialWork/Links/API/API-Vol-3.pdf>