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AN ETHNOPHARMACOLOGICAL STUDY FROM KULU DISTRICT, HIMACHAL PRADESH, INDIA: TRADITIONAL KNOWLEDGE COMPARED WITH MODERN BIOLOGICAL SCIENCE

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ABSTRACT

A synthesis of ethnopharmacological knowledge and western biological science has been attempted in this paper. Thirty-four species of plants used by local women in hamlets of Banjar taluka, Kulu district, Himachal Pradesh have been recorded. The knowledge of medicinal plants that local women have is important as they have a lifetime experience in using them through caring for themselves, their families and others around them. For the plants recorded, information from scientific literature has been included in order to explain or justify the traditional medical use.

INTRODUCTION

The Himalayas comprise of a large mountain system and stretches over 3000 km in length from its junction with the Karakoram ranges in the west to the Arakan mountains on the Assam-Bhutan border in the east. The vegetation of Himalayas is distinct, i.e., tropical, temperate and alpine. This region is rich in floral diversity; a total of about 9000 plant species occur here. The richness is due primarily to a great variation in climate and habitat. Different types of flora exist within quite a short distance (Polunin & Stainten, 1984). Among the major geographical divisions of the Himalaya, Himachal Pradesh falls into the Kumaon-Garwhal or Western Himalayan region.

Keywords: Medicinal plants, ethnopharmacology/ethnobotany, Kulu district, Himachal Pradesh, women.

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The total population of Himachal Pradesh is 5,170,877. Out of these, 1,054,000 belong to scheduled castes, and 197,000 belong to scheduled tribes (Census, 1981). The State covers an area of 55,673 km^2 and is divided in to 12 districts of which Kulu district is one. This district has an area of 5503 km^2 with 3 talukas, Ani, Banjar and Nermand, and is situated at a height of about 1500 metres above sea level. The climate of the region ranges from warm to temperate type. The main seasons are summer (March to August), monsoon (August to October) and winter (November to February), the latter is often accompanied by snowfall in the months of December and January.

The field work was undertaken in the hamlets of Banjar taluka of Kulu district. The local people are predominantly Hindus but some aspects of Buddhism is also incorporated into their traditions. The dominant castes in the area studied are Brahmins, Rajputs, and Scheduled Castes. The language they speak is a dialect of Hindi and is called Kulluvi Pahari. This language exists only in spoken form.

The people are poor and the area is underdeveloped. Basic amenities such as clean water are not available and the hygienic conditions are therefore appalling. Their staple food is rice and rajma. Wheat is also consumed, but this habit is comparatively new. Some vegetables are also grown. Agriculture and grazing are practised only at subsistance level. Due to the availability of medicinal herbs in the region there is a thriving trade in herbs. The local people are involved in herb collection during the summer months and this is the only means of cash income for many of them. Barring a few locals, the traders in these herbs are mostly middlemen who do not belong to the area.

A survey of medicinal plants of western Himalayas was undertaken by Gupta (1962). Another survey of

medicinal and aromatic plants used for local purposes and those exploited in varying quantities for export outside the district was carried out in Chamba district by Gupta (1964, 1971). Uniyal and Chauhan (1973) have documented the traditional medicinal plants from Kangra valley in Dharmsala forest circle. Ethnobotanical surveys of Himachal Pradesh were carried out by Gupta (1981) and of Sirmur district by Chauhan and Chauhan (1986). An account of edible plants used by Gujjars and Gaddis from Mandi district was given by Singh (1966). However, Kulu district has not been surveyed from the ethnobotanical point of view, so far. Because of the diverse range of species there is a great deal of knowledge to be recorded. An inventory of plants used as medicine by the local women in Banjar taluka of Kulu district was undertaken. For these plants, literature from modern scientific investigations have been included wherever possible in order to explain or substantiate the traditional use.

MATERIALS AND METHODS

The interviews were conducted in Banjar taluka and surrounding hamlets. Banjar is about 28 km from the Kulu urban area. The hamlets from where the information was obtained are Devri Gaon, Ghat Ghar, Ropa, Shoja and also in Banjar. These lie within a span of 2–6 km from Banjar except for Shoja which is about 12 km away. The hamlets Shoja and Ropa are situated at an altitude of 2683 and 1524, respectively, and Banjar at 1680 m. Devri Gaon and Ghat Ghar are very close to Banjar, i.e., about the same level as that of Banjar.

The focus of the study was the to register the ethnopharmacological knowledge possessed by women, especially the elderly and the middleaged. Women were chosen in this study as they have a long experience in caring for themselves, their families and those around them. During the initial survey one woman who had been introduced by the villagers became the key person. This led the way to the introduction to other knowledgeable informants. The women from each area of the study accompanied one of the present authors to the field, showed her the plants, and they provided the local names and information as to which health condition the plants were used, and the method of preparation and administration of remedies.

The plant species described by the women were collected and herbarium sheets prepared. The Latin names of plants were identified with the help of scientists, A. Sakhlani and Bhaskar Dutt, from the National Botanical Research Institute, Lucknow, India. One set of the voucher specimens is kept at the Herbarium of the Botanical Garden and Museum of the University of Oslo at Tøyen, Norway, and three other sets at the following institutions/organisation in India: herbarium of the Tropical Botanic Gardens and Research Institute at Thiruvananthapuram, National Botanical Research Institute's herbarium, in Lucknow, and the office of the Research Foundation for Science, Technology and Natural Resources Policy, a non-governmental organisation in New Delhi.

The plant species have been arranged in alphabetical order, with the following information for each of them: Latin name, family, herbarium number, local name and plant part used in traditional treatment.

Literature Review

A survey of the literature was conducted to verify or substantiate the claimed medical use(s) of the plant. Data on chemistry and biology are described where these are available or relevant.

For the reference Harborne and Baxter (1993), the page numbers are given with the reference.

RESULTS

1. *Acorus calamus* L.; Araceae; *Bhanumathi* 9–96; Bach; rhizome.

The rhizomes are made into a paste with water and applied to the scalp in order to get rid of lice.

Insecticidal and antibacterial activities were observed with extracts prepared from the rhizome (Chopra et al.,1957; Mukerjea & Govind, 1960; Vashi & Patel, 1987). In addition, the compound 1-(*p*-hydroxyphenyl)–1-(*O*-acetyl)prop-2-ene isolated from the rhizome was found to be highly active against Gram-positive and Gram-negative bacteria (Chowdhury et al., 1993). Some of the volatile compounds identified by Mazza (1985) were terpineol, carvone, carvacrol and curcumin. The first three compounds have been shown to possess antiseptic properties and the fourth anti-inflammatory property (Harborne & Baxter, 1993: pp. 478, 558, 567). The above description may explain the traditional use of the plant against lice as infection caused by lice may lead to itching, eczematous dermatitis and if neglected for a long time, scratching may result in marked inflammation. Secondary infection by bacteria may also occur, with formation of pustules, crusts and suppuration.

Several sesquiterpenes (Iguchi et al., 1969; Yamamura et al., 1971; Niwa et al., 1975; Nawamaki & Kuroyanagi, 1996) and various fatty acids and sugars (Asif et al., 1984) have also been found in the plant.

2. *Adiantum phillipense* L., Adiantaceae; *Bhanumathi* 32–96; Matada; root.

The roots of the fern are pounded and eaten against painful urination.

No scientific investigation reports exist for this plant.

3. *Ajuga bracteosa* Benth.; Lamiaceae; *Bhanumathi* 10–96; Nilkant; aerial parts.

Dried aerial parts and about 7–10 white pepper corns are made into a powder, mixed with mustard oil and applied on areas affected by scabies.

Several neo-cleodane diterpenoids were identified from the leaves and have been shown to possess insecticidal and insect antifeedant activities (Kubo, 1980; Kubo et al., 1976, 1981, 1982, 1983). It is not clear, however if the above mentioned activities can be effectivite against scabies arachnid, the itch mite, *Sarcoptes scabii* var. *hominis*. Further investigations are necessary.

Pinenes and piperine of white pepper, *Piper nigrum* L. (Samuelson, 1992) are used as an insecticide (Harborne & Baxter, 1993: pp. 252, 565). An ethanolic extract showed antimicrobial activity (Perez & Anesini, 1994). One of the species from which mustard oil is extracted is *Brassica juncea*. The oil from the seeds of this plant has been shown to be efficacious against some Gram-positive and Gram-negative bacteria (Prasad et al., 1993). The antimicrobial property of pepper and mustard oil may help against secondary infections which may arise due to oozing or scratching thereby only partly explaining the traditional use of the plant.

4. *Anagallis arvense* L., Primulaceae; *Bhanumathi* 15–96; Jokhu Ghas; aerial parts.

The aerial parts of the plant are crushed with water and used as nose drops against some kind of a parasite or (micro)organism which causes bleeding from the nose and headache. This is claimed to occur when people drink water from the streams.

Compounds like kaempferol, quercetin and rutin have been isolated from the flowers (Rastogi & Narula, 1980). These compounds possess antibacterial and anti-inflammatory activities (Harborne & Baxter, 1993, pp. 402, 408, 474). The entry of a parasite or a microorganism may cause injury to the soft mucuous membrane of the nose and can result in bleeding. This may further lead to infections followed by inflammation and pain. The anti-inflammatory activity may help to reduce inflammation of the mucous membrane. The bleeding may be reduced and decongest the nostril. This can also reduce the headache. Further anti-inflammatory drugs are often used as analgesics because of their ability to inhibit prostaglandin synthesis (Katzung, 1984). All the above mentioned properties together with the antibacterial property may help against infections thereby probably explaining the traditional use.

5. *Berberis lycium* Royle-I; Berberidaceae; *Bhanumathi* 8–96; Makshohallo; roots, flowers.

The roots are boiled in water, filtered and the extract used to wash the eye several times against reddishness caused by heat.

Dried flowers are roasted with ghee (cured butter) over fire and given to children between 3 and 4 years of age, twice a day, morning and evening, for 5–6 days against diarrhoea.

Several alkaloids have been isolated from the roots. Tannins have also been found (Ikram et al., 1966; Miana et al., 1969; Sehdev et al., 1971; Ali & Khan, 1978; Chandra & Purohit, 1980). Berberine and berbenine, two of the alkaloids that have been isolated, possess antimicrobial activity (Harborne & Baxter, 1993, pp. 196, 197). Phenols and related compounds (tannic acid) are widely used as antiseptics (Friedman, 1980). The property of tannins and the antimicrobial activity may help against the infection of the eye and this may explain the traditional use of the plant.

The alkaloids berberine and berbamine possess some biological activities (Tai et al., 1981; Sack & Froehlich, 1982).

The flowers have not been studied so far.

6. *Bergenia stracheyi* (Hook f & Thomas) Engler; Saxifragraceae; *Bhanumathi* 26–96; Shabli; roots.

The roots are powdered and boiled with water and taken internally early in the morning on an empty stomach against dysentry where blood passed along with stools.

Bergenin and (+)-catechin-3-gallate (Bahl et al., 1974) have been isolated from the plant. None of the compounds identified can directly explain the traditional use although some compounds related to (+)-catechin-3-gallate possess antiviral (von Wacher & Eilmes, 1978; Wagner et al., 1985; Tadakatsu & Yukihiko, 1991) and antibacterial activities (Das, 1962; Nishino et al., 1987; Ahn et al., 1991) which may help

against dysentry as it can be due to bacterial or viral infection. It would therefore be worthwhile to investigate the plant further for compounds with antimicrobial properties, in order to substantiate traditional use.

7. *Calamintha umbrosa* Benth.; Lamiaceae; *Bhanumathi* 27–96; Babri; aerial parts.

The aerial parts are made into a paste with water and applied to boils. This treatment is recommended for children as well as adults.

Chemical and biological analyses should be carried out with this plant.

8. *Campanula colorata* Wall.; Campanulaceae; *Bhanumathi* 40–96; whole plant.

The whole plant is made into a paste with water and applied to boils.

Scientific investigations should be conducted for this plant.

9. *Dermatocarpon miniatum* (L.) Mann.; Verrucariaceae; *Bhanumathi* 38–96; Dach; whole thallus.

The thalli of the lichen is rubbed on a stone with water and jaggery and used for application against blemishes on the skin and dry skin accumulation.

Various carotenoids were found in *D. miniatum* (Czeczuga & Bubrick, 1986; Czeczuga & Alstrup, 1987). Certain carotenoids are precursors of vitamin A which can be important for certain dermatological effects. Further studies are necessary in order to substantiate traditional use.

10. *Elaeagnus umbellata* Auct. (non. Thunb.) syn. *E. parviflora* Wall ex. Royle; Elaeagnaceae; *Bhanumathi* 2–96; Gai; flowers.

Flowers are roasted in ghee and given to children for 3–4 days, a remedy used when children have difficulty in urinating due to heat.

Aliphatic alcohols, aldehydes, acetates and related substances, aromatics, terpenes, etc., have been identified from the flowers and their associated leaves. Of the main compounds, 4-methyl phenol (Potter, 1995) possesses antiseptic properties and is used as a local antiseptic (Harborne & Baxter 1993, p. 457). The traditional use may be justified by the antiseptic property as infections can cause difficulty in urination.

11. *Galium aparine* L.; Rubiaceae; *Bhanumathi* 3–96; Khashosho; aerial parts.

The aerial parts are made into a paste with water and the paste is applied 3–4 times to cuts.

From the aerial parts, several compounds were isolated, of which chlorogenic acid, scopoletin, rutin (Seabra et al., 1993; Tzakou et al., 1994) and aucubin (Tanker & Ergun, 1983; Ergun & Sener, 1986) were some. These compounds possess antibacterial and antiviral activities (Harborne and Baxter 1993, pp. 364, 410, 475, 572) which may partially explain the traditional use of the plant as infections very often follow cuts.

Sterols and fatty acids (Tzakou et al., 1990) have also been identified in the plant.

12. *Juncus glaucus* Ehrh.; Juncaceae; *Bhanumathi* 37–96; Moonja; leaves.

The leaves are boiled in water and the tea is given against coughs.

Neither chemical nor biological analyses have been conducted for this plant.

13. *Malva verticillata* L.; Malvaceae; *Bhanumathi* 12–96; Sochala; roots.

Roots, about seven black pepper corns and sugar are made into a paste with water and taken internally against leucorrhoea.

The roots have not been investigated so far for chemical contents or biological activities.

An ethanolic extract of the fruits of *P. nigrum* showed antibacterial activity (Perez & Anesini, 1994) and this effect may help against the problem as bacterial infection can cause leucorrhea. Although the traditional use appears to be substantiated by pepper, chemical and biological analyses should be conducted with the roots of *M. verticillata*.

Sugar is also used in the medicinal mixture. Its use may be to soothe the pungency of pepper.

14. *Oxalis corniculata* L.; Oxalidaceae; *Bhanumathi* 20–96; Millimalori; leaves.

The leaves are claimed to be mixed with pudina (*Mentha piperita* L.) or used separately, made into a paste with water and consumed early in the morning on an empty stomach for 2 days against stomachaches.

Tannins, lignins, etc., have been identified in the green parts of the plant (Marks et al., 1988). Tannins are used as antiseptics (as explained under *Berberis lycium*) and this property may help fight microbial infections as stomachaches can arise as a result of such infections. Thus, the traditional use may be verified.

Some flavones have been found in the plant (Gunasegaran, 1992). Seventeen different chemical compounds were isolated which included a series of esters, 2-heptenal, 2-pentylfuran and *trans*-phytol from

the plant (Lin et al., 1992). None of these compounds can explain the traditional use of *O. corniculata*.

The leaves of pudina, *Mentha piperita* L., were sometimes used along with the leaves of *O. corniculata* L. The leaves of pudina contain various compounds like flavonoids, triterpenes and carotenoids in addition to essential oil containing menthol, menthone and their isomers (Brillo, 1989; Bruneton, 1995). Further, the leaves also contained apigenin, caffeic acid, etc. (Gella et al., 1966). Apigenin and caffeic acid possess antibacterial, antiviral, antifungal and analgesic properties (Harborne & Baxter, 1993, pp. 391, 474). Menthol and methone possess analgesic and antiseptic properties and are used as a carminative and a gastric sedative (Harborne & Baxter, 1993, p. 563).

Stomachaches can be caused by a variety of reasons, most common being bacterial, viral or fungal infections or indigestion. Although the traditional use cannot be explained for the plant *O. corniculata* L., the compounds present in *M. piperata* L. may help against stomachaches. Further scientific investigations should be conducted with *O. corniculata* L. in order to verify the traditional use.

15. *Persicaria capitata* (Buch-Ham. ex D. Don) Gross syn. *Polygonum capitatum* Buch-Ham ex D. Don; Polygonaceae; *Bhanumathi* 39–96; Ludari; whole plant.

The whole plant is used to make a paste with water and applied to boils.

Chemical and biological analyses should be undertaken.

16. *Plagiochasma apendiculatum* L. et L.; Reboulia-ceae; *Bhanumathi* 18–96; Matada; leaves.

The thallus of the moss are made into a paste with water and applied on burns for both children and adults.

Scientific investigations should be conducted for the plant.

17. *Plantago lanceolata* L.; Plantaginaceae; *Bhanumathi* 6–96; Chashi; whole leaves.

The whole leaf is used against stubborn boils filled with puss. The leaf is slightly toasted over fire until warm, placed over the boil and warm mustard oil is poured over it. It is also optional to place the leaves over the boil without warming. This treatment is repeated 3–4-times until the puss is released.

Some of the several compounds that were isolated from the leaves/aerial parts are aucubin, protocatechuic, gentisic, vanillic, caffeic, ferulic and chlorogenic acids (Maksyntina, 1971; Swiatek, 1977; Handjieva et al., 1991). These compounds possess antibacterial, anti-inflammatory and analgesic properties (Harborne & Baxter, 1993, pp. 458, 461, 465, 474, 475, 480, 572). The antibacterial effect of these compounds may be helpful in fighting the bacterial infection of the boil. In addition, the use of mustard oil may also contribute to the antibacterial effect (see *Ajuga bracterosa)*. Acetoside and plantamajoside isolated from the leaves of *P. lanceolata* showed inhibitory effects on arachidonic acid-induced mouse ear edema (Murai et al., 1995). The anti-inflammatory and analgesic effect may help in reducing inflammation and pain thereby explaining the traditional use of the plant. Polysaccharides with anti-complementary effect have also been found in the leaves (Majed, 1996).

18. *Potentilla supina* L.; Rosaceae; *Bhanumathi* 28–96; Bimpad; aerial parts.

The aerial parts are made into a paste with water and applied to small boils filled with puss.

Chemical and biological investigations should be conducted with the aerial parts of the plant.

19. *Prinsepia utilis* Royle; Rosaceae; *Bhanumathi* 17–96; Deykhal; leaves.

The leaves are made into a paste with water and applied to boils filled with puss.

The leaves in particular should be the target of chemical and biological tests in order to substantiate the traditional use.

20. *Rabdosia rugosa* (Wall) Hara (*Plectranthus rugosus* Wall ex Benth.); Lamiaceae; *Bhanumathi* 4–96; Chichidi; leaves.

A few leaves are crushed with some water, made into a paste and applied on swelling of hands and legs for 3–4 days.

Ursolic acid, oleanolic acid, etc., were present in the whole plant (Misra et al., 1971) and have been shown to possess anti-inflammatory activity (Takagi et al., 1980; Kosuge et al., 1985; Singh et al., 1992; Liu, 1995). The traditional use against inflammation may be substantiated by the properties of the compounds. Yet, further studies should be conducted with the leaves alone.

Some other triterpenoids (Razdan et al., 1982 a,b) have also been isolated from the plant.

21. *Ranunculus laelus* Wall.; Rannunculaceae; *Bhanumathi* 14–96; Miga; aerial parts.

The aerial parts are made into a paste with water and applied to boils.

Scientific investigations should be conducted with the aerial parts of the plant in order to substantiate traditional use.

22. *Rhododendron arboreum* Sm.; Ericaceae; *Bhanumathi* 7–96; Brass; flowers.

Some flowers are roasted in ghee and given to children early in the morning on an empty stomach. This treatment is given to ease the evacuation of bowels and thereby stop bleeding that arises due to the difficulty in passing stools. It is claimed that this condition is caused due to heat especially during summer months.

Many sugars, flavones and other compounds have been isolated from the plant (Susheela & Pruthi, 1976; Rawat & Rawat, 1993; Kamil & Shafiullah, 1995). The traditional use cannot be supported by the compounds found in the plant.

23. *Rosa brunonii* Lindley; Rosaceae; *Bhanumathi* 34–96; Kuji; flowers.

The flowers are mixed with some sugar and made into a jam. One to two spoons of the mixture is taken once a day to reduce body heat.

Scientific investigations should be undertaken in order to substantiate the traditional use.

24. *Roylea cinerea* (D. Don) Baill.; Lamiaceae; *Bhanumathi* 19–96; Kori; aerial parts.

The aerial parts are mixed with equal parts of water and taken internally on an empty stomach early in the morning against stomachache. It is claimed that stomachache is caused due to cold weather.

The leaf extract showed slight analgesic activity (Kumar et al., 1981) which may substantiate the traditional use of the plant as the soft tissues in the stomach area may be prone to muscle cramps when the weather gets cold. More tests should be conducted with the aerial parts of the plant.

25. *Rumex hastatus* D. Don.; Polygonaceae; *Bhanumathi* 21–96; Mallora; leaves.

The leaves are mixed with pudina (*Mentha piperita* L.) leaves or the leaves alone are made into a paste, diluted with water and taken internally early in the morning on an empty stomach against stomachaches due to gas.

Relevant tests should be conducted with *Rumex hastatus*.

Sometimes the leaves of *R. hastatus* were mixed with pudina, *Mentha piperita* L. in the traditional treatment. The leaves of *M. piperata* L. contains several compounds (as discussed under the plant *Oxalis corniculata* L.). Bacterial growth may be the reason for gas formation in the stomach and can cause stomachaches. The antibacterial and carminative properties of the compounds present in *M. piperita* L. may give relief from gas, thereby stomachaches, and only partially explaining the traditional use. Further investigations with the plant, *R. hastatus* alone are necessary.

26. *Rumex nepalensis* L.; Polygonaceae; *Bhanumathi* 41–96; Malera; leaves..

Leaves are made into a paste with water and applied to boils which appear under the arm.

Relevant chemical and biological studies may be necessary in order to verify the traditional use.

27. *Salvia lanata* Roxb.; Lamiaceae; *Bhanumathi* 33–96; Soong; whole plant.

The whole plant is made into a paste with water and applied to burns.

From the essential oil of the flower tops several constituents of the triterpenoid type were identified (Sinha et al., 1977). Some of these like citronellal, citral 1,8-cineole, gerianiol, linalool and *p*-cymene possess antiseptic, sedative, fungistatic and analgesic properties (Harborne & Baxter, 1993, pp. 559–562). These properties may prevent infections. The analgesic and sedative properties can give relief from pain or numb it. Thus, the traditional use against burns may be acclaimed. Further investigations should be conducted with the whole plant in order to see if compounds that can help against burns are present.

28. *Sedum adenotrichum* Wall; Crassulaceae; *Bhanumathi* 1–96; Chichidi or kubiloo; leaves.

The leaves are made into a paste with water and applied to boils. Boils are claimed to arise due to heat which is often accompanied by itching. The treatment is continued until symptoms dissappear.

So far no scientific investigations have been conducted for the plant.

29. *Thalaspi arvense* L.; Cruciferae; *Bhanumathi* 24–96; Chaparu; leaves and seeds.

The leaves or seeds are made into a paste with water and applied to swelling caused by the bite of mosquito. This preparation is used mainly for children. The leaves are preferred to seeds.

Neither chemical nor biological analyses have been carried out for the plant.

30. *Thymus linearis* Benth. ex Benth.; Lamiaceae; *Bhanumathi* 23–96; Shakapar, Madroshad; aerial parts and flowers.

The aerial parts are chewed against swollen gums.

Dried aerial parts are rubbed into the palm greased with ghee and the palm just shown over fire. This is then applied on to the back of babies to prevent colds. Tea from the aerial parts is taken internally by adults against chest congestion. Flowers are made into a paste with some water and applied to boils.

Essential oil was extracted from the aerial parts of flowering plants/leaves, flowers and the whole plant. Compounds of the terpenoid and benzoid type were found (Agarwal & Mathela, 1978; Mathela et al., 1980; Avetisyan et al., 1988; Regnault-Roger, 1993). Some of the compounds isolated were α-terpineol, carvacrol, citronellal, geraniol, linalool, 1,8-cineole and thymol and these possess antiseptic properties (Harborne & Baxter, 1993, pp. 558, 559, 560, 562, 567, 568). Carvacrol is also used in mouth wash, *p*-cymene is used as a local analgesic (Harborne & Baxter, 1993, p. 561); whereas limonene, citronellal and linalool possess sedative activity. The properties of the above compounds may take care of bacterial infection and pain arising from swollen gums and boils.

Camphor (Harborne & Baxter, 1993, p. 558) has been shown to possess antiviral activity. This property could help in preventing cold in children. Chest congestion may arise due to cold. Limonene (Harborne & Baxter, 1993, p. 562) and 1,8-cineole possess expectorant properties which could help against cough and get rid of phlegm. In addition, analgesic properties of compounds mentioned above may help in relieving discomfort caused as a result of congestion of the chest. All the traditional uses can be verified by the properties of different compounds found in the plant.

31. *Trifolium repens* L.; Fabaceae; *Bhanumathi* 35–96; Shaytu; roots.

The roots are made into a paste with water and applied to boils for 1–2 days.

The roots should be a target of scientific investigations in order to explain the traditional use.

32. *Urtica dioica* L.; Urticaceae; *Bhanumathi* 36–96; Kungsh; leaves

The leaves are pounded, boiled in water, filtered and stored. Two spoons of this extract is taken three times a day against chest congestion.

The compounds caffeic, caffeic malic acid, ferrulic and sinapic acids were found present in the leaves/whole plant (Beschia et al., 1982; Obertries et al., 1996) and have been shown to possess antiviral, antibacterial and anti-inflammatory activities (Harborne & Baxter, 1993, pp. 474, 480, 487). Colds may cause chest congestion and this may be due to microbial infection. The properties of the above mentioned compounds might help against congestion of the chest by reducing the swelling of the mucous membranes thereby easing breathing and hastening the cure.

Chest congestion can also occur due to asthma and or allergic reactions. A freeze-dried preparation of the herb, *U. dioica*, showed effectiveness in the treatment of allergic rhinitis (Mittman, 1990). It might therefore also relieve asthmatic symptoms thereby substantiating traditional use.

33. *Valeriana wallichi DC.*; Valerianaceae; *Bhanumathi* 22–96; Neynu; roots

The rhizomes of the plant are pounded, mixed with water and used as shampoo against itching of the scalp.

Tannins and saponins have been identified from the rhizomes (Holzl, 1996; Bos et al., 1997).

Phenols and related compounds (tannic acid) are widely used as antiseptics (Friedman, 1980). In cases of *dermatitis seborrheica* limited to the scalp, itching can occur. Hence, frequent shampooing would help. The person may also scratch the scalp, thus causing oozing which may lead to infections by microorganisms easier. The antiseptic effect could therefore help against microbial infections. It would also be helpful against microbial infections of fungal nature, e.g., dandruff, thereby explaining the traditional use of the plant.

From the rhizome and its essential oil several compounds have been identified (Chari et al., 1977; Suri & Thind, 1978; Pande & Shukla, 1993 a,b).

34. *Viola canescens*; Violaceae; *Bhanumathi* 5–96; Banakash; flowers.

The flowers are fried in ghee and given to children in order to reduce heat of the body. Adults eat the flowers as such for the same purpose.

Both chemical and biological analyses should be undertaken with the flowers of the plant.

CONCLUSION AND DISCUSSION

The ethnobotanical and literature studies of 34 plants in the study revealed that the traditional use of ten plants could be substantiated. They are: *Acorus cala-*

mus, *Anagallis arvensis*, *Elaegnus umbellata*, *Oxalis corniculata*, *Plantago lanceolata*, *Rabdosia rugosa*, *Roylea cinera*, *Salvia lanata*, *Thymus linearis*, *Urtica dioica* and *Valeriana wallichi*. The traditional uses of the plants *Ajuga bracteosa*, *Berberis lycium*, *Galium aparine* and *Malva verticillata* have only been partially substantiated. For the plants *Adiantum phillipense*, *Bergenia stracheyi*, *Calamintha umbrosa*, *Campanula colorata*, *Dermatocarpon miniatum*, *Juncus glaucus*, *Persicaria capitata*, *Plagiochasma appendiculatum*, *Potentilla supina*, *Prinsepia utilis*, *Ranunculus laelus*, *Rhododendron arboreum*, *Rosa brunonii*, *Rumex hastatus*, *Rumex nepalensis*, *Sedum adenotrichum*, *Thalaspi arvense*, *Trifolium repens*, *Viola canescens*, the traditional uses have not been substantiated.

For the plants *Oxalis corniculata* and *Rumex hastatus* the traditional use has been substantiated not by the plant part itself but by the other substance, pudina or *Mentha piperita*. For another plant, *Malva verticillata*, black pepper, and sugar are used together with the roots. The traditional use can be substantiated by black pepper and not by *M. verticillata*. White pepper and mustard oil have been used together with the plant *Ajuga bracteosa*. Mustard oil is used together with the leaf of the plant *Plantago lanceolata*. It is not clear as to why the plant parts are mixed with another substance in the traditional treatment. Further investigations are necessary to see if any synergistic effect is responsible in bringing about the above discussed traditional effects.

There is an imminent danger that the knowledge of medicinal plants possessed by the local women may be lost. This is due to disappearance of species as well as commercialisation that favours the need for a limited number of species only. Therefore, there is an urgent need to record this knowledge. Scientific investigations should also be undertaken for many of the plants in the study.

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REFERENCES

Agarwal I, Mathela CS (1978): Chemical composition of essential oil of *Thymus serpyllum* L. *Proc Nat Acad Sci India Sect A 48*: 143–146.

Ahn Y, Kawamura T, Kim M, Yamamoto T, Mitsuoka T (1991): Tea polyphenols: selective growth inhibitors of *Clostridium* spp. *Agric Biol Chem 55*: 1425–1426.

Ali MN, Khan AA (1978): Pharmacognostic studies of *Berberis lycium* Royle, and its importance as a source of raw material for the manufacture of berberine in Pakistan. *Pak J For 28*: 25–27.

Asif M, Siddiqui MTA, Ahmad MU (1984): Fatty acid and sugar composition of *Acorus calamus* Linn. *Fette Seifen Anstrichm 86*: 24–25.

Avetisyan RG, Aslanyants LK, Arutyunyan EG, Akopyan SV (1988): Essential oils of *Mentha longifolia* (L.) Huds and *Thymus serpyllum* L. of Armenia. *Rastit Resur 24*: 605–610. C.A. 110: 5431g.

Bahl CP, Murari R, Parthasarathy MR, Seshadri TR (1974) Components of *Bergenia strecheyi* and *B. ligulata*. *Indian J Chem 12*: 1038–1039.

Beschia M, Leonte A, Oancea I (1982): Phenolic compounds with biological activity in vegetable extracts. *Bul Univ Galati Fasc 6* (5): 59–63.

Bos R, Woerdenbag HJ, Hendriks H, Smit HF, Wikstroom HV, Scheffer JJC (1997): Composition of the essential oil from roots and rhizomes of *Valeriana wallichii* DC. *Flavour Fragr J 12*: 123–131.

Brillo VA (1989): Composition of the essential oil of peppermint grown in Belorussia. *Vestsi Akad Navuk BSSR, Ser Boyal Navuk 4*: 11–14. C.A. 111: 191523r.

Bruneton J (1995): *Pharmacognosy, Phytochemistry, Medicinal Plants*. Intercept Limited, Andover, England, p. 433.

Census of India (1981): Scheduled tribes. Part II B (ii) and (iii). Office of Resgistrar. General and census committee of India. P.XXV. General population and population of scheduled castes and scheduled tribes.

Chandra P, Purohit AN (1980): Berberine contents and alkaloid profile of *Berberis* species from different altitudes. *Biochem Syst Ecol 8*: 379–380.

Chari VM, Jordan M, Wagner H, Theis PW (1977): A C-NMR study of the structure of an acyl-linarin from *Valeriana wallichi Phytochemistry 16*: 1110–1112.

Chauhan V, Chauhan NS (1986): Ethnobotany of trans-giri area of Sirmour district of Himachal Pradesh. *Bull Medethno-bot Res 9*: 19–22.

Chopra IC, Khajuria BN, Chopra CL (1957): Antibacterial properties of volatile principles from *Alpinis galanga* and *Acorus calamus*. *Antibiot Chemother 7*: 378–383.

Chowdhury AK, Ara T, Muhammed FH, Ahmed M (1993): A new phenyl propane derivative from *Acorus calamus*. *Pharmazie 48*: 786–787.

Czeczuga B, Alstrup V (1987): Investigation on carotenoids in lichens. Pt.14. The carotenoid content of lichens from Greenland. *Biochem Syst Ecol 15*: 297–301.

Czeczuga B, Burbrick P (1986): Investigations of carotenoids in lichens. IX. Carotenoids of lichens from Isreal. *Isr J Bot 35*: 41–46.

Das DN (1962): Studies on the antibiotic activity of tea. (1962) Studies on the antibiotic activity of tea. *J Indian Chem Soc 39*: 849–854.

Ergun F, Sener B (1986): HPLC determination of iridoids found in some *Galium* species. *J Fac Pharm Gazi Univ 3*: 59–63.

Friedman P (1980): Common poisons. In KJ Isselbacher, RD Adams, Braun Woods, RD Petersdorf, JD Wilson (Eds.), *Principles of Internal Medicine*. Mac Graw Hill, Japan, p. 962.

Gella EV, Makrova GV, Borisyuk Yu G (1966): *Mentha piperata* flavonoids III. *Farm Zh (Kiev) 22*: 80–85. C.A. *68*: 49985 t.

Gunasegarann R (1992): Flavonoids and anthocyanins of three Oxalidaceae. *Fitoterapia 63*: 89–90.

Gupta R (1962): Medicinal plants of West Himalayas. *J Agric Trop Bot Applied 9*: 1–54.

Gupta R (1964): Survey record of medicinal and aromatic plants of Chamba forest division, Himachal Pradesh. *Ind For 90*: 454–468.

Gupta R (1971): Medicinal and aromatic plants of Bhandal Range, Churah forest division, Chamba district, Himachal Pradesh. *J Bom Nat Hist Soc 68*: 791–803.

Gupta R (1981): Plants in folk medicine of the Himalayas. In SK Jain (ed.) *Glimpses of Indian Ethnobotany.* New Delhi: Oxford and IBH publishers, pp. 83–90.

Handjieva N, Saadi H, Evstatieva L (1991): Iridiod glucosides from *Plantago altissima* L., *Plantago lanceolata* L., *Plantago atrata* Hoppe and *Plantago argentea* Chaix. *Z Naturforsch c 46*: 963–965.

Harborne JB, Baxter H (1993): *Phytochemical Dictionary*. A *Handbook of Bioactive Compounds from Plants*. London: Taylor and Francis.

Holzl VJ (1996): Baldrian. *Dtsch Apoth Ztg 136*:751–759.

Iguchi M, Nishiyama A, Koyama H, Yamamura S, Hirata Y (1969): Isolation and sturcture of isocalamendiol. *Tetrahedron Lett 42*: 3729–3732.

Ikram M, Huq ME, Warsi SA (1966): Alkaloids of *Berberis lycium* Royle-I. *Pak J Sci Ind Res 9*: 343–346.

Kamil M, Shafiullah IM (1995): Flavonoidic constituents of *Rhododendron arboreum*. *Fitoterapia 66*: 371.

Katzung BG (1984): *Basic and Clinical Pharmacology.* Los Altos, California: Lange Medical Publications, pp. 400–405.

Kosuge T, Yokota M, Sugiyama K, Mure T, Yamazawa H, Yamamoto T (1985): Studies on bioactive substances in crude drugs used for arthritic diseases in traditional Chinese medicine. III. Isolation and identification of anti-inflammatory and analgesic principles from the whole herb of *Pyrola rotundifolia* L. *Chem Pharm Bull 33*: 5355–5357.

Kubo I (1980): X-Ray crystal structure of 12-bromoajugarin-I and conclusion on the absolute configuration of ajugarins. *J Chem Soc Chem Commun* 897–898.

Kubo I, Klocke JA, Asano S (1981): Insect ecdysis inhibitors from the East African medicinal plant *Ajuga remota* (Labiatae). *Agric Biol Chem 75*: 1925–1927.

Kubo I, Klocke JA, Ganjian I, Ichikawa N, Matsumoto T (1983): Efficient isolation of phytoecdysones from *Ajuga* plants by high-performace liquid chromatography and droplet counter-current chromatography. *J Chromatogr 257*: 157–161.

Kubo I, Klocke JA, Miura I, Fukuyama Y (1982): Structure of agugarin. IV. *J Chem Soc Chem Commun* 618–619.

Kubo I, Lee Y-W, Balogh-Nair V, Nakanishi K, Chapya A (1976): Structure of ajugarins. *J Chem Soc Chem Commun* 949–950.

Kumar S, Dobhal MP, Joshi BC, Barar FSK (1981): Chemical investigation and pharmacological screening of *Roylea elegans* Wall. Pt. II. *Herba Pol 27*: 99–102.

Lin B-B, Lin Y-S, Chen K-J, Chen F-C (1992): Constituents of *Oxalis corniculata*. *Zhonghua Xaoxue Zazhi 44*: 265–267.

Liu J (1995): Pharmacology of oleanolic acid and ursolic acid. *J Ethnopharmacol 49*: 57–68.

Majed BKG (1996): Isolering, karakterisering og biologisk testing av polysaccharider fra *Plantago lanceolata*. Hovedfagsoppgave, Oslo: University of Oslo.

Maksyutina NP (1971): Hydrociannamic acids from *Plantago major* and *Plantago lanceolata*. *Khim Prir Soedin 7*: 824–825. C.A. 76: 110307g.

Marks DL, Swain T, Goldstein S, Richard A, Leighton M (1988): Chemical correlates of Rhesus monkey food choice: The influence of hydrolyzable tannins. *J Chem Ecol 14*: 213–233.

Mathela CS, Agarwal Mrs I, Taskinen J (1980): Composition of essential oil of *Thymus serpyllum* Linn. *J Indian Chem Soc* 57: 1249–1250.

Mazza G (1985): Gas chromatographic and mass spectrometric studies of the constituents of the rhizome of calamus. II. The volatile constituents of alcoholic extracts. *J Chromatogr 328*: 195–206.

Miana GA, Ikram M, Holubek J (1969): Spectral studies on alkaloids Part IV- The identification of berbericinine hydroiodide as palmatine iodide. *Pak J Sci Ind Res 12*: 309.

Misra PS, Misra G, Nigam SK, Mitra CR (1971): Constituents of *Plectranthus rugosus*. *Lloydia 34*: 265–266.

Mittman P (1990): Randomized, double-blind study of freeze-dried *Urtica dioica* in the treatment of allergic rhinitis. *Planta Med 56*: 44–47.

Mukerjea TD, Govind R (1960): Studies on indigenous insecticidal plants: Part III- *Acorus calamus* Linn. *J Sci Ind Res 19*: 112–119.

Murai M, Tamayama Y, Nishibe S (1995): Phenylethanoids in the herb of *Plantago lanceolata* and inhibitory effect on arachidonic acid-induced mouse ear edema. *Planta Med 61*: 479–480.

Nawamaki K, Kuroyanagi M (1996): Sesquiterpenoids from *Acorus calamus* as germination inhibitors. *Phytochemistry 43*: 1175–1182.

Nishino C, Nobuyasu E, Tawata S, Mori A, Kobayashi K, Fukushima M (1987): Antibacterial activity of flavonoids against *Staphylococcus epidermidis*, a skin bacterium. *Agric Biol Chem 51*: 139–143.

Niwa M, Nishiyama A, Iguchi M, Yamamura S (1975): Sesquiterpenes from *Acorus calamus* L. *Bull Chem Soc Japan 48*: 2930–2934.

Obertreis B, Giller K, Teucher T, Behnke B, Schmitz H (1996): Antiphlogistic effects of *Urtica dioica* folia extract in comparison to caffeic malic acid. *Arzneim - Forsch 46*: 52–56.

Pande A, Shukla Y (1993a) Naphthoic acid derivative from *Valeriana wallichi*. *Phytochemistry 32*: 1350–1351.

Pande A, Shukla YN (1993b) Some chemical constituents from *Valeriana wallichi*. *Indian Drugs 30*: 138–139.

Perez C, Anesini C (1994) Antibacterial activity of alimentary plants against *Staphylacoccus aureus growth*. *Am J Chin Med 22*: 169–74.

Polunin O, Stainton A (1984): *Flowers of the Himalaya*. Oxford: Oxford University Press, p. xiv.

Potter TL (1995): Floral volatiles of *Elaeagnus umbellata* Thunb. *J Essent Oil Res 7*: 347–354.

Prasad YR, Alankararao GSJG, Baby P (1993): Antimicrobial studies on the seed oil of *Brassica juncea*. *Fitoterapia 65*: 373–374.

Rastogi JN, Narula JL (1980): Chemical investigation of *Anagallis arvensis* flowers. *J Indian Chem Soc 57*: 761–762.

Rawat HS, Rawat GS (1993): Chemical analysis of some medicinal plants of Garhwal Himalayas. *Orient J Chem 9:* 254–255.

Razdan TK, Kachroo V, Harkar S, Koul GL, Dhar KL (1982a): Plectranthoic acid, acetylplectranthoic acid and plectranthadiol, three terpenoids from *Plectranthus rugosus*. *Phytochemistry 21*: 409–412.

Razdan TK, Kachroo V, Harkar S, Koul GL (1982b): Plectranthoic acid A and B, two new triterpenoids from *Plectranthus rugosus*. *Tetrahedron 38*: 991–992.

Regnault-Roger C, Hamraoui A, Holeman M, Theron E, Pinel R (1993): Insecticidal effect of essential oils from Mediterranean plants upon *Acanthoscelides Obtectus* (Coleoptera, Bruchidae), pest of kidney bean (*Phaseolus vulgaris* L.). *J Chem Ecol 19*: 1223–1244.

Sack RB, Froehlich JL (1982): Berberine inhibits intestinal secretory response of *Vibrio cholerae* and *E. coli*. *Infect Immun 35*: 471–475.

Samuelsson G (1992): *Drugs of Natural Origin*. Stockholm, Sweden: Swedish Pharmaceutical Press, p. 141.

Seabra RM, Silveira JA, Vasconcelos MH (1993): Composes phenoliques de *Galium aparine* et *G. broteroanum*. *Plant Med Phytother 26:* 49–51.

Sehdev RK, Handa KL, Rao PR (1971): A note on the alkaloids of *Berberis lycium* Royle. *Indian J Chem 9:* 503.

Singh GB, Singh S, Bani S, Gupta BD, Banerjee SK (1992): Anti-inflammatory activity of oleanolic acid in rats and mice. *J Pharm Pharmacol 44*: 456–458.

Singh PB (1966): Wild edible plants of Mandi district in north-west Himalaya. In SK Jain, (Ed.) *Ethnobiology in Human Welfare*. New Delhi: Deep Publications.

Sinha AK, Mehra MS, Sinha GK (1977): Chemical examination of essential oil of *Salvia lanata*. *Indian J Chem 15*: 498.

Suri RK, Thind TS (1978): Antibacterial activity of some essential oils. *Indian Drugs Pharm Ind 13*: 25–28.

Susheela R, Pruthi JS (1976): Studies on the chemical composition and utilization of *Rhododendron* (*Rhododendron arboreum*) flowers. *J Inst Chem (India) 48*: 68–72.

Swiatek L (1977): Phenolic acids and iridoid glucosides in some Polish medicinal *Plantago* species. *Herba Pol 23*: 201–210. C.A. *88*: 148981 h.

Tadakatsu S, Yukihiko (1991): Preventive and curative medicament against infection with influenza virus, containing tea or tea polyphenols. *European Patent Application Nr 90107386 6*: 20.3.1991.

Tai YH, Feser JF, Marnane WG, Desjeux J-F (1981): Antisecretory effects of berberine in rat ileum. *Am J Physiol 241*: G 253–G 258.

Takagi K, Park E-H, Kato H (1980): Anti-inflammatory activities of hederagenin and crude saponin isolated from *Sapindus mukorossi* Gaertn. *Chem Pharm Bull 28*: 1183–1188.

Tanker M, Ergun F (1983): Cruciata taurica (Pallas ex Willd.) Ehrend.s.l. Uzerinde Farmakognozik Arastirmalar. II. *Ankara Univ Eczacilik Fak Mecm 13*: 89–100.

Tzakou O, Couladi MM, Philianos S (1990): Fatty acids and sterols in spring and winter samples of *Galium aparine*. *Fitoterapia 61*: 93.

Tzakou O, Verykokidou E, Harvala C (1994): Comparitive HPLC analysis of polyphenolic compounds in four species of *Galium* L. *J Liq Chromatogr 17*: 4463–4467.

Uniyal MR, Chauhan NS (1973): Traditionally important medicinal plants of Kangra valley in Dharmasala forest circle, Himachal Pradesh. *J Res Ind Med 8*: 76–85.

Vashi IG, Patel HC (1987): Chemical constituents and antimicrobial activity of *Acorus calamus* Linn. *Comp Physiol Ecol 12*: 49–51.

von Wacker A, Eilmes-G H (1978): Antivirale wirkung von pflanzeninhaltsstoffen. *Arzneim.-Forsch 28*: 347–50.

Wagner H, Kreutzkamp B, Juric K (1985): Inhaltsstoffe und pharmakologie der *Okoubaka aubrevillei*-Rinde. *Planta Med* 404–407.

Yamamura S, Iguchi M, Nishiyama A, Niv M (1971): Sesquiterpenes from *Acorus calamus* L. *Tetrahedron 27*: 5419–5431.

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