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Full Research Article

Folk Medicinal Plants of Sikkim Himalayas and their Pharmacological Use

Manish Kumar Singh[1*], Kumar Avinash Bharati[2] and Rajesh Kumar[3]

[1]Arid Forest Research Institute, Jodhpur (342 005), India
[2]Raw Materials Herbarium and Museum Delhi (RHMD), National Institute of Science Communication And Information Resources, Dr. K. S. Krishnan Marg, New Delhi (110 012), India
[3]Dept. of Botany, Bareilly College, Bareilly U.P. (243 005), India

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Correspondence to

[*]*E-mail*: kumar.manish21@yahoo.co.in

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Abstract

The aim of the present study is to find out the use of ethnomedicinal plants in alternative medicines and their scientific validation through literature review. A total of 32 medicinal plants were selected by random sampling method in study area. The selected medicinal plants were studied for pharmacological properties and their uses in different alternative systems of medicines in India viz., Ayurveda, Unani, Homeopathy, Siddha and Tibetan. The pharmacological properties and their earlier studies have shown that the percentage of natural products in modern drug is considerable, with estimates varying from 35%–50%. The data from indigenous systems of Sikkim have range of similarity with different traditional health care system like Ayurveda (59.37%), Unani (37.50%), Homeopathy (18.75%), Tibetan (15.62%) and Siddha (12.50%). Almost 72% of ethnomedicinal plant species shows scientific validations for their ethnic uses. The present study indicates that considerable numbers of ethnomedicinal plant species are used in two or more alternative medicinal systems for the treatment of same or similar ailment, suggesting potential pharmacological opportunities in the future.

1. Introduction

Ethnic medicines are informal systems that include folk belief, skills, techniques and tactics relating to the health care and are passed from generation to generation mainly through oral traditions (Gotage and Ramdas, 2008). In contrast, the principals and practices of alternative medicines are formulated and catalogued in Ayurveda, Siddha, Unani, Homeopathy, Chinese and Tibetan records. With the exception, of Chinese, all of these medicinal systems are used in India, but Ayurveda, Homeopathy and Unani, are the most common and provide health care for more than 60% of population. A comparative study was done to find out the correlation between ethnic uses of plants Sikkim Himalaya with various alternative medicinal practices including, Ayurveda, Siddha, Unani, Homeopathy, and Tibetan. The new challenges in form of drug resistant malaria and TB due to mutant microorganisms is major challenge for pharmacologists, it compel us to find out new drugs (Lewis, 2003). Traditional knowledge always play major role in medicinal chemistry from starting point, morphine from *Papaver sominferum*, atropine from *Atropa belladonna*, ephedrine from *Ephedra sinica*, etc. to present day, artimisinin from *Artimisia annua* (Klayman, 1985). Traditional medicine using herbal drugs exists in every part of the world (Vogel, 1991). However, few parts of the word have preserved the treasure of ancient medicinal tradition due to remote locations, poor infrastructure and poverty. Sikkim Himalayas is an area known for its wealth of diverse medicinal plants. The state of Sikkim is situated on the flanks of Eastern Himalayas between 27°10′−28°5′ N latitude and 88°30′−89° E longitude. The ethnic composition is unique. Apart from the three major ethnics-Bhutia, Lepchas, and Nepalese, a conglomerate of over 20 ethnic tribes and numerous sub-tribes inhabit the region (Rai and Sharma, 1994). Our goal was to find out the efficacy, scientific validation and the similarities between Sikkim ethnomedicine and other medicinal systems, as well as to demonstrate the value of integrating ethnobotanical and pharmacological studies. It will provide scientific support for the ethnic use of plants (if ethnic uses are contradictory to pharmacological studies then such use should be discouraged), relationship between various alternative systems of medicines and raw material for new drug.

2. Materials and Methods

Two year (i.e. 2013–14) field survey were conducted in different

areas of Sikkim like in Bitu, Thinghum, Phodong, Singik, Tong, etc. under North district, Namli, Rumtek, Kyongnslla, etc. under East district, Geyzing, Pelling etc. under West district and Jorethang, Gursay etc. areas under South district of Sikkim. The trips yielded 32 collections of different medicinal plants belonging to different species (Table 1). Collections were made from natural forest, roadsides, forests nurseries etc. Depending on population size, either random sampling from the population or selective sampling on individual plant basis was followed. Collected materials included live plants, rhizomes, cuttings, suckers, seeds etc. During the trips, tribal people including local healers, elderly persons, gardeners etc. were interviewed to get the ethnobotanical information like local names of the plants and their uses against different ailments following standard method. The collected materials were taken to the NISCAIR, New Delhi. Later on the plants were identified with the help of different floras.

The Sikkim state lies between 27°46′−28°7′48″ N latitude and 88°0′5″−88°55′25″ E longitude in the lap of Eastern Himalayas below Khangchendzonga with an area of 7299 sq km and a population of 496, 457, 88% of which live in villages. Administratively, Sikkim is divided into four districts, North, East, West and South. The main ethnic groups of the state are Lepchas, Bhutias, Limbus and the Nepalese. 36% of the total geographical area of the state is under forest, 15% is under agriculture, 10% is pasture and 25% is barren land. The state contains over 4000 species of flowering plants, which includes over 600 species of orchids and more than 100 species of medicinal plants. The elevation ranges from 300 m in the south to more than 6,000 m in the north with perpetual snowy mountain ranges. Depending on elevation, the climate of the state may be divided into tropical in lower hills (300−900 m), sub-tropical in mid-hills (900−1,800 m), temperate (1,800−2,700 m) and sub-alpine (2,700−4,000 m) in hills and alpine (4,000−5,000 m) climate in very high hills. The average rainfall of the state varies from 1,200 mm (at 300 m elevation) to 4,500 mm (at 2,000 m elevation), and over 80% of the rain comes during the monsoon season (June to September). Depending upon season and elevation, the average maximum temperature varies from 13 °C to 35 °C while the minimum temperature ranges from 0 °C to 23 °C.

3. Results and Discussion

The ethno-medicinal system of Sikkim Himalaya shows moderate to very little affinities sharing at least one common use with other alternative medicinal practices in India, as for example, 59.37% with Ayurveda, 37.50% with Unani, 18.75% with Homeopathy, 15.62% with Tibetan and 12.50% with Siddha. The present finding indicates that it is an independent medicinal system (Table 1). Further, 71.87% of species shows pharmacological support for their ethnic uses and in rest of the case pharmacological work is not available. It is very healthy result to support the ethno-medical system of Sikkim Himalaya for benefit of rural mankind. When compared the data with other traditional and alternative medicinal systems of India with scientific validations, it is found that *Swertia chirata* have at least one common use in all the systems that are Ayurveda, Homeopathy, Siddha, Tibetan and Unani. The *Terminalia chebula* is another important species; it has at least one common use in Siddha, Tibetan, Homeopathy and Unani. There are number of species shows affinities with Ayurveda and Unani systems, like *Asparagus racemosus, Centella*

Table 1: Some medicinal plant of Sikkim that are used in alternative medicine in India

Ethnomedicine at Sikkim	Use in alternative medicine in India	Pharmacological activity
1. *Acorus calamus* Linn. (Acoraceae) Bojo, Bojho (N), Vacha, Vaca (A), shu-dag nag-po (T), Waj-e-Turki (U)		
The rhizome used in epilepsy and other mental ailments, intermittent fever, chronic diarrhoea, asthma, cough, sore throat, colic pain and brain tonic (Hussain and Hore, 2007); skin disease, fever, cough (Pradhan and Badola, 2008).	A: (Rhizome) Voice clearance, CNS depressant (Anonymous, 2000); vata kapha disorders, pain and for the purification of stool and urine. It is used in constipation, abdominal pain, epilepsy, insanity and it also increase the memory, strength and intelligence of child (Panda, 2012). H: (rhizome) Gastric and respiratory diseases, dyspepsia, vomiting, spasmodic complaints (Nadkarani, 1976). T: Cures sores, aches and pains, boils on skin and discharge of pus and fluid, this disease known as Shu-ba. U: (rhizome) Desicant/Siccative, Inspissant to Semen, Demulscent, Thermogenic, Diuretic (Ahmed et al., 2005).	Sedative and analgesic effect, depression in blood pressure and respiration, hypotensive, hypothermic, CNS depressant, anticonvulsant, antimicrobial, carcinogenic, anthelmintic, insecticidal, sedative-tranquillizing (Anonymous, 2000).

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Ethnomedicine at Sikkim	Use in alternative medicine in India	Pharmacological activity
2. *Alstonia scholaris* (L.) R. Br. (Apocynaceae) Chation (N)		
Bark used in rheumatism, malaria, and skin disease. Root juice is used with milk in Leprosy. Latex used as vermifuge (Panda et al., 1991).	A: (stem bark) Anti-pyretic, anthelmintic, astringent, cardiotonic, depurative, digestive, febrifuge, galactagogue, stomachic, thermogenic, tonic (Anonymous, 2000); Catarrhal and malarial fever, Chronic diarrhoea and dysentery (Nadkarni, 1976); H: (stem bark) debility, diarrhoea, dysentery, lactation, leucorrhoea, hyperemesis gravidrum (Anonymous, 2008).	Anti-ascariasis, antidysentric, anti-pyretic, antibacterial, astringent, antimalarial, CNS depressant (picrinine), antimalarial (Anonymous, 2000).
3. *Amomum subulatum* Roxb. (Zingiberaceae) Alaichi (N), Sthoolaila (A), ma-ko-la (T), Qaqlah kibar, Qaqlah Zakar (U)		
Seed oil allay irritability of the stomach, decoction of fruit used as a gargle in affections of the teeth and gums, in the combination with the seeds of melons it is used as a diuretic in the cases of gravel of kidneys (Biswas and Chopra, 1982).	A: (Seeds) Halitosis, skin disease, wounds, ulcers, cough, fever and Gonorrhoea (Anonymous, 2000); T: Mental disease, fainting due to ill health. U: (Dried ripen fruits and Seeds) Tonic for heart and liver, astringent to bowels, hypnotic, and appetiser and cause belching, decoction of seed is used as a gargle in affection of gum and teeth. Seed in conjugation with quinine as an antidote in either snake or scorpion venom.	Antioxidant, hypoglycaemic, antimicrobial, antifungal (Gupta and Tandon, 2004); Ethanolic extract (50%) of the rhizome and roots showed hypoglycaemic activity (Anonymous, 2000).
4. *Artemisia vulgaris* Linn. (Asteraceae) Tetaypati, Teil (N), Damanaka, Topadhana (A), mkhan-dkar (T), Biranjasif, Shuwela (U)		
Leaf juice use to stop nose bleeding, asthma and disease pod brain (Hussain and Hore, 2007). Leaves use externally as an antiseptic and orally as anthelminthic (Panda et al., 1991).	A: (whole plant) Skin diseases, irritable bowel syndrome, bleeding, various toxic condition and to maintain the body humors (Panda, 2012). H: (whole plant) Congestion of brain (Hydrocephalus), coloured light produces dizziness in eye, pain and blurring of vision, profuse menses in female, profuse sweat and smells like garlic (Boericke, 2007); T: Bleeding from nose; U: (Whole plant) Inflammation, amenorrhea, retention of urine, fever, inflammation of visceral organs (Anonymous, 1992).	Anti-worm, anti-estrogenic, and progestational and anti-progestational effects (Khare, 2004); pollen is allergic (Caballero et al., 1997), anti-inflammatory (Tigno et al., 2000); analgesic (Pires et al., 2009), hepatoprotective (Gilani et al., 2005); Antispasmodic and bronchodilator (Khan and Gilani., 2009).
5. *Asparagus racemosus* Willd. (Aspragaceae) Satamuli (N), Shatavari (A), Sawa-gaaya (T), Satawar (U)		
Root used in stomach trouble (Chhetri, 2007); as tonic and aphrodisiac (Panda et al.,1991); anti-dysentery, diuretic, root powder taken with milk to cure piles (Biswas, 1956).	A: (root) Galactagouge, Nervine tonic, Vigour, weight gain (Anonymous, 2000); It increase the semen, milk, memory and used in abdominal discomfort, dysentery, inflammation and all vata pitta condition (Panda, 2012). T: Gout; U: (root) galactogouge, spermatogenic, diabetes (Ahmed et al., 2005).	Galactagogue, nematicidal, anticancer, antidysentric, antiabortifacient (Shatavarin I), antioxytoxic (Shatavarin II), antiviral, diuretic, antiamoebic, hypoglycaemic, hypotensive, anticoagulant, enzymatic (Anonymous , 2000); antidiabetic, anabolic, antyimicrobial, antiallergic, anthelmintic (Gupta and Tandon, 2004).

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Ethnomedicine at Sikkim	Use in alternative medicine in India	Pharmacological activity
6. *Bauhinia variegata* Linn. (Caesalpiniaceae) Koeralo, Takki (N), Kancanara (A)		
The bark is a wound healer, also used in cough, diarrhoea; root decoction is used in indigestion and in goitre (Panda et al., 1991), dysepepsia, flatulence and dried buds used for cough, bleeding piles, haematuria (Biswas, 1956).	A: (stem bark, flower) Psychotic syndrome, lymph tissue disorder, tumour like growth (Anonymous, 2008); S: flatulence, skin disease (Anonymous, 2008).	Antitumor, anti-inflammatory, anti-ulcer, antimicrobial (Anonymous, 2000).
7. *Bergenia ciliata* (Har.) Stenb. (Saxifragaceae) Pakhanbhed, Pakhin Bet (N), Pashanabheda (A), Pakhan Bed (U)		
The root is given in ulcer, tuberculosis, cough and spleen enlargement, cut and burn (Hussain and Hore, 2007); toothache, bronchitis (Chhetri, 2007).	A: (root) Tonic in fever, diarrhoea and cough, cuts and burns, ophthalmia, dissolving, kidney stone. Leaf juice is used for earache (Anonymous, 2000);U: (root) Anti-inflammatory, Diabetes (Ahmed et al., 2005).	Spasmogenic, antiprotozoal, anticancer, antilithic, cardiotoxic, CNS depressant, anti-inflammatory, diuretic (in mild doses), antidiuretic (higher doses), prevention of stress induced erosions (bergenin), lowering of gastric output (Anonymous, 2000).
8. *Cannabis sativa* Linn. (Cannabaceae) Ganja, Bhang (N), Vijaya (A), Kanca (S), Qinnab (U)		
Leaves are used as sedative (Chhetri, 2007); dried inflorescence is powdered into paste with warm water and taken orally to cure severe stomache caused due to indigestion (Dash et al., 2003); leaves used in body ache (Pradhan and Badola, 2008).	A: (Whole plant) Narcotic, Hypotonic, diarrhoea in children (Anonymous, 2000); H: (Male and female flowering tops) Ascites, asthma, cataract, corneal opacity, cystitis, glaucoma, gonorrhoea, hysteria, impotence, lecucorrhoea, nephritis, nose bleeds, phimosis, pneumonia, Priapism, Sexual disorders, urethral discharge (Anonymous, 2008); S: (leaf and tops) Cough with bouts, hunger, Pain in the nerve and nerve supplying areas, One sided headache (Uni lateral it may be right or left), dysfunctional uterine bleeding - Bleeding disorder in aged women (40–50), vomiting and diarrhoea (Anonymous, 2008); U: (fruit, leaf) insomnia, indigestion, spermatorrhoea (Anonymous, 2006); Headcheese, Migrain, insomnia, fever, orchitis, spermatorrhoea, premature ejaculation, acute pain (Anonymous, 2006).	CNS depressant, analgestic, antiepileptic, nematicidal, abortifacient, sedative, anticonvulsant, antibacterial, antifungal, antitumor, diuretic, anti-emetic, anti-inflammatory, antipyretic, hypothermic, antiestrogenic, euphoric, anti spasmodiac (Anonymous , 2000).
9. *Celastrus paniculatus* Willd. (Celastraceae) Ruglin (L), Jyotishmati (A), Malkangni (U)		
The seeds are used in rheumatism, paralysis and leprosy. Leaf juice is given as an anti-dote in overdoses of opium. Seeds made into a paste with cow's urine are applied to cure scabies, oil taken internally in beri-beri, seeds are used in chronic lumbago (Biswas, 1956).	A: (Bark, leaf, seed) The bark is brain tonic, abortifacient. Leaf juice used in dysentery, antidote for opium poisoning. Seed are useful in abdominal disorders, leprosy, pruritus, leucoderma, skin disease, paralysis, cerebral disorders, leprosy, pruritus, leucoderma, skin disease, paralysis, cerebral disorders, arthritis, asthma, cardiac debility, inflammation, nephropathy tonic in fever, diarrhoea and cough, cuts and burns, ophthalmia, dissolving, kidney stone. Leaf juice is used for earache. Seed oil is used in fever, sharper memeory, beri-beri, wound, eczema (Anonymous, 2000); U: (leaf) digestive, carminative, expectorant, aphrodisiac, brain tonic, stomachic and intestinal tonic, blood purifier, laxatives, thermogenics, stimulant (Ahmed et al., 2005).	Antihistaminic, sedative, anticonvulsant, antiprotozoal, antiviral, antipyretic, antiulcerogenic, anti-emetic, antibacterial, schizontocidal, emmenagogue, hypotensive, stimulant, central muscle relaxant, hypolipidaemic, antiatherosclerotic, spasmolytic, transquillizer, anti-inflammatory, antifertility (Anonymous, 2000).

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Ethnomedicine at Sikkim	Use in alternative medicine in India	Pharmacological activity
10. *Centella asiatica* (L.) Urban (Apiaceae) Ghod Tapre, Bhram Jhar (N), Mandookaparni (A), Brahmi (U)		
The whole plant is used as brain tonic (Panda et al., 1991).	A: (whole plant) Nervine tonic, Memory enhancer (Anonymous, 2000); H: (whole fresh plant) acne rosacea, constipation, elephantiasis arabum, favus, gangrene after amputation, ichthyosia, lupus, uterus, follicular inflammation, vagina pruritis (Anonymous, 2008); U: (whole plant) nervine tonic, teeth and gum tonic, brain tonic (Ahmed et al., 2005).	Anti-inflammatory, anti protozoal, spasmolytic, alternative, astringent, antifertility, sedative, CNS depressant, antitubercular, antileprotic, hepatoprotective, anti spasmodic, hypotensive (Anonymous , 2000).
11. *Cissampelos pareira* Linn. (Menispermaceae) Tamshaprip (L), Batul Pati (N), Patha (A)		
The root is used in diarrhoea, dysentery, indigestion and urinary disorder. Paste of leaves applied externally on wound (Panda et al., 1991); remedy against wasp, bees and scorpion string (Biswas, 1956).	A: (root, leaf) Fever, analgesic, anti-inflammatory (Sharma and Singh, 1989). The root used in fever, dysepsis, diarrhoea, dysentery, blood disorders, oedema, leprosy, asthma, lactation disorders. Leaves used in eye problems, skin disorders, tonic in fever, diarrhoea and cough, cuts and burns, ophthalmia, dissolving, kidney stone. Leaf juice is used for earache (Anonymous , 2000).	Hypoglycaemic, a potant neuromuscular blockingent, muscle relaxant, antibacterial, CNS depressant, curariform like activity, antileukemic, antifertility, fungitoxic, antitumour, activity against human carcinoma cells of nasopharynx in cell culture (Anonymous , 2000).
12. *Costus speciosus* Sm. (Costaceae) Bet Lauree (N), Kebuka (A)		
Leaves are used in fever; rhizome in urinary tract infection (Chhetri, 2007; Pradhan and Badola, 2008); rhizome is used in chest pain (Biswas, 1956).	A: (rhizome, root) cough, bronchitis, fever, rheumatism, urinary disorders, loss of appetite, loose motion and skin diseases (Panda, 2012).	Antifertility, estrogenic, ecbolic, abortifacient, anti-inflammatory, Cardio tonic, anti arthritic, oxitocic, antimicrobial, spasmolytic (Anonymous, 2000).
13. *Datura metel* Linn. (Solanaceae) Kalo Dhaturo (N)		
Four to five seeds are taken orally for seven days to cure mad dog bite (Dash et al., 2003).	A: (whole plant, leaf, flower, seed) The plant is used in asthma, cough, fever, inflammation, oedema, insanity, duodenal ulcer, renal colic, calculi. The root used in bites of rabies dogs. The leaf poultice in lumbago, sciatica, neuralgia, painful swellings (Deshpande, 2006); H: (seed) Convulsions, delirium, epilepsy, Eye affections of mania, timidity (Anonymous, 2008).	Anthelmintic, anticancer, antispasmogenic, blood pressure depressant, strong nematicidal, anticholinergic, antiviral, analgesic (Anonymous, 2000).
14. *Embelia ribes Burm*. f. (Myrsinacea) Buibidans, Pierlahara (N), Sangrik Asumbu (L), Vidanga (N), Vidanga (A), Vaivitankam (S), byi-tan-ga (T), Baobarang (U)		
The fruits are used as anti-worm (Panda et al., 1991).	A: (fruit) Worm infestation (Anonymous, 2000); S: (fruit) Acid peptic disease, toxic substances, worm infestations, toxic substances, worm infestations, due to gas obstruction and which creates pain in the related region, vayvu, anaemia (Anonymous, 2008); T: Swelling of abdomen due to indigestion and strengthens the digestion; acne; U: (Fruit, leaves and root) Kill and expel intestinal worms (Anonymous, 2008).	U: (fruit, leaf) insomnia, indigestion, spermatorrhoea (Anonymous, 2006); Headcheese, Migrain, insomnia, fever, orchitis, spermatorrhoea, premature ejaculation, acute pain (Anonymous, 2006).

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Ethnomedicine at Sikkim	Use in alternative medicine in India	Pharmacological activity
15. *Hedychium spicatum* Sm. (Zingiberaceae) Pankhaphool (N), Shati (A), Sga skya (T)		
The rhizome used in abdominal disorders and as stimulant (Panda et al., 1991); stomache, tonic, cuminative (Biswas, 1956).	A: (rhizome) Respiratory problems, Cough and cold, diarrhoea, breathlessness, piles, ulcers, promote growth of hair, liver disorder, hiccough, fever, rheumatoid arthritis, inflammation, pain, skin disease (Anonymous, 2000); T: Swollen stomach, indigestion, vomiting of phlegm, pain immediate after eating, and perspiration.	Hypotensive, hypoglycaemic, anti-inflammatory, vascodilatory, anti-spasmodic, tranquillizer, CNS depressant, hypothermic, spasmolytic, spasmolytic, analgesic, antimicrobial (Anonymous , 2000).
16. *Holarrhena antidysenterica* (L.) Wall. (Apocynaceae) Indrajow, Kurchi, Aulay Khirrn (N), Kutaja, Indrayava (A), dug-mo-nyun, dug-nyun (T), Inderjao Talkh (U)		
The stem bark is used in diarrhoea and dysentery (Chhetri, 2007); amoebic dysentery (Rai and Sharma, 1994).	A: (Bark and seeds) dysentery and diarrhoea, bark rubbed over body in dropsy (Anonymous, 2000); Bleeding (Anonymous, 2008); H: (stem bark) Acute and chronic dysentery, colicky pain, Tenesmus, Passing of blood and mucus with stools (Anonymous, 2008); T: Fever, vomiting, thirst, dryness and a bitter taste of mouth, vomiting of bile, cramp known as inflammatory glang-thabs; U: (stem bark) Dysentery, diarrhoea, anti-worm.	Antitubercular, hypotensive, anti protozual, hypoglycaemic, antispasmodic, anti giardiastic, antifungal, anti amoebicidal anti diarrhoeal, anti amoebicidal, anti diarrhoeal, anticancer, anti spinochetal (Anonymous, 2000).
17. *Lycopodium clavatum* Linn. (Lycopodiaceae) Nagebeli (N)		
The roots used in indigestion (Chhetri, 2007), diuretic, demulcent, anti-septic and pulmonary disorder, chronic kidney diseases, stop haemorrhage after child birth (Biswas, 1956).	H: (spores, fresh plant) albuminuria, aneurysm, angina pectoris, aphasia, asthma, impotency, metrorrhagia, nymphomania, otorrhoea, parkinson's disease, peritonitis, prostatitis, renal colic, rheumatism, taste abnormal, typhoid, water brash, warts, hernia (Anonymous, 2008).	Anti-inflammatory (Orhan et al., 2007), an acetylcholinesterase inhibitor (Orhan et al., 2007), anti-cancerous (Mandal et al., 2010).
18. *Mallotus philippinensis* Muell.-Arg. (Euphorbiaceae) Numboongkor, Purva, Tukla (L) Sinduri (N), Kampillaka (A), Qinbeel, Kambila (U)		
The ripen fruits are used as vermifuge (Panda et al., 1991).	A: (Glandular hair) Against worm and parasite, tumour problem (Anonymous, 2000); constipation, infestation and abdominal diseases (Panda, 2012); H: (Fruit, red powder on seeds) Anthelmintic (Anonymous, 2008); U: (Glandular hair) Remedy of guinea worm, cure wound (Anonymous, 1992).	Anti filarial, antifertility, anthelmintic, antibacterial, hypoglycaemic, anticancer, antispasmodic, haemostatic, anti-inflammatory, wound healing, cardiac depressant, antimicrobial (Anonymous, 2000).
19. *Mentha viridis* Linn. (Lamiaceae) Mentha, Babri (N), Pippermint (A)		
The leaves given in fever and bronchitis. Decoction used as lotion for aphthae. The oil is distilled from fresh flowering spearment. Oil is used in the rheumatism (Biswas, 1956).	A: (whole plant) Sickness, Flatulence (Nadkarni, 1976); H: (whole plant) Scanty urine with frequent desire (Boericke, 2007).	Antioxidant (Mkaddem et al., 2009; Arumugam, 2006), antimicrobial (Mkaddem et al., 2009).
20. *Oroxylum indicum* Vent. (Bignoniaceae) Totilla, Tatelo, Shivnak (N), Rip (L), Syenaka (A)		
The bark and seeds are used in fever and pneumonia (Pradhan and Badola, 2008).	A: Urinary bladder problems and used in stones, diarrhea and anorexia (Panda, 2012).	Diuretic, spasmogenic, anti-inflammatory, antifungal (Deshpande, 2006). Acridic, astringent, anodyne, anti-inflammatory, aphrodisiac, appetizing, anthelmintic, constipating, digestive, diuretic, expectorant, felrifuge, refrigerant, stomachic (Anonymous, 2000).

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Ethnomedicine at Sikkim	Use in alternative medicine in India	Pharmacological activity
21. *Picrorhiza kurroa* Royle ex Benth. (Scrophulariaceae) Kutki (N), Katuka (A), Katuku Rokini (S), kat-bee (T), Kutki (U)		
The rhizome and root are used in fever, cough and asthma (Pradhan and Badola, 2008).	A: (rhizome) Hepatic disorder (Anonymous, 2000); tonic, cathartic, stomachic, given in fever, dyspepsia, as strong purgative and also applied in scorpion and other insect bites (Panda, 2012); S: (rhizome) Fever, all type of Lung diseases, Eczema, gastro intestinal disorder in infants, A group of ulcers over the skin Surface (Anonymous, 2008); T: (rhizome) Suppress burning sensation due to acidity; U: (root) Antipyretic, makes skin pores clean, carminative, cause sneezing, stomachic and intestinal tonic, Analgesic, laxative (Ahmed et al., 2005).	Antipyretic, anti-inflammatory, antiviral, hepatoprotctive, smooth muscle relaxant, anti spasmodic diuretic, antibacterial, antiasthamatic, antihepatotoxin (Anonymous, 2000).
22. *Plantago major* Linn. (Plantaginaceae) Nasha Jhar (N), Lisan-ul-Hamal, Kaseer-ul-Azla (U)		
The whole plant is used in Pneumonia (Panda et al., 1991).	H: (Whole fresh plant) Bed wetting, mastitis, ciliary neuraligia, erysipelas, dysentery, toothache, wounds (Anonymous, 2008); U: (seed) Diarrhoea, dysentery, epitaxis, menorrhagia (Anonymous, 1992).	Antiviral (Chiang et al., 2003); antitumor (Ozaslan, 2007); immunoenhancing (Gomez-Flores et al, 2000); hepatoprotective and anti-inflammatory activities (Turel et al., 2009); anti diarrhoeal (Atta and Mouneir, 2005); analgesic.
23. *Rauvolfia serpentina* Benth. ex Kurz. (Apocynaceae) Sarpgandha (N), Sarpagandha (A), Asrol (U)		
The root is used in fever (Chhetri, 2007); antidote to the bites of poisonous reptiles and stings of insects, root decoction is helpful during child birth, root is remedy in painful affections of bowels, insomnia (Biswas, 1956).	A: (root) Decrease blood pressure, nervine tonic (Anonymous, 2000); H: (Roots) Addison's disease, angina pectoris, basedow's disease, coitis, dystonia, hypotension, parkinson's disease, thyroid disorders, vasomotor complaints (Anonymous, 2008); U: (root, leaf) depressant to heart, decoction facilitate child birth, dysentery, painful affection of the bowles, insomnia, leaf Juice in the treatment of opacities of cornea.	Anticholinergic, hypotensive, anticontractile, sedative, relaxant hyperthermic, antidiuretic, sympathomimetic, hypnotic, vasodilator, antiemetic, antiarrhythmic, nematicidal (Anonymous, 2000).
24. *Rubia cordifolia Linn*. (Rubiaceae) Lepcha-Vhyem, Vhyeni (L), Soth (B), Manjito (N), Manjistitha (A), btsod (T), Majeeth (U)		
The root is used in jaundice (Chhetri, 2007); urinary tract infection, skin disease (Pradhan and Badola, 2008); irregular monthly courses (Biswas, 1956).	A: (stem) Hormonal therapy in women, blood purifier, skin disorder (Anonymous, 2000); kaphapitta disorders. It has analgesic and inflammatory properties. It is used in the diseases of the uterus, pains in the joint, rheumatic conditions, leucorrhoea, blood disorder, etc. Also used as febrifuge and consider as best drug in gout (Panda, 2012); T: Fever, dysentery; wart; U: (Dried root) Amenorrhoea, diuretic, deobstruent (Anonymous, 2008).	Antioxidant, antibacterial, anticancer, anti-inflammatory, antiviral, haemostatic, anti-lipid peroxidative activity, hypoglycaemic (Anonymous, 2000).
25. *Sinopodophyllum hexandrum* (Royle) T.S. Ying syn. Podophyllum hexandrum Royle (Podophyllaceae) Papari, Panchpatey (N), Banakarkatee (A), ol-mo-se (T)		
The rhizome and root is used in diarrhoea, skin disease and as tonic (Hussain and Hore, 2007).	A: (root) blood purifier, purgative and alterative. It is considered as a cardiac tonic in small doses. It also finds use as a stimulant in peristalsis, allergy and skin inflammations (Panda, 2012); T: Gynaecological disorder, blood disorder, skin disease (Kletter et al., 1995).	Antioxidant (Arora et al., 2005); anticancerous (Giri and Narasu, 2000)

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Ethnomedicine at Sikkim	Use in alternative medicine in India	Pharmacological activity
26. *Swertia chirata* C.B. Clarke (Gentianaceae) Chirowto (N), Kiratatikta(A), tig-ta, rgya-tig (T), Chiraita (U)		
The leaves and stem are used in liver disorder, cough, constipation, fever, skin disease, worms and as tonic (Hussain and Hore, 2007).	A: (whole plant except root) Fever, tonic, astringent, stomachic, improves eye sight, pain in the joints, scabies (Anonymous, 2000); H: (Whole plant excluding roots) Dullness of mind, headache, halitosis, pain in throat, fever, liver and spleen enlarged, burning while urinating (Anonymous, 2008); T: Fever; U: (Whole plant except root) Anthelmentic, antipyretic, laxative, galactogue (Anonymous, 1992).	Antispasmodic, anti-inflammatory, antimalarial, hepatoprotective, antiulcerogenic, CNS depressant, laxative, stomachic, antidiarrhoeal, hydrocholeratic, cardiostimulant, antileishmanial, anthelmintic, anticarcinogenic (Anonymous, 2000).
27. *Symplocos racemosa* Roxb. (Symplocaceae) Palyok (L), Kaidai, Khoidai, Chumlane (N), Lodh Pathani (U)		
The bark is used in bowl complains, dysentery, dropsy and ulcers, used in stopping haemorrhage from teeth or prolonged bleeding of women, cures wound in vagina and prevents chance of abortion in right months (Biswas, 1956).	U: (Stem bark) Cicatrizant, inspissant to semen, analgesic, astringents and habitual abortion (Ahmed et al., 2005).	Antimicrobial, anti diarrhoeal, spasmogenic, heart depressant, blood pressure depressant (Despande, 2006).
28. *Taxus wallichiana* Zucc. (Taxaceae) Cheongbu (L.), Dhengre salla, Chharey salla (N), Talispatra (A)		
A tincture of young shoots is used in headache, giddiness, diarrhoea, liver disorder (Hussain and Hore, 2007); leaves are used in fever and epilepsy (Chhetri, 2007).	A: (Young shoots) A medicinal tincture made from young shoots has long been in use for the treatment of headache, giddiness, feeble and falling pulse, diarrhoea and severe biliousness (Panda, 2012).	Sedative, antispasmodic, antitumor, antifertility, anticancer, antimicrobial, anti-implantation, antiovulatory, cardiac-depressant, CNS depressant, antiulcerogenic, anti-inflammatory, antipyretic, diuretic (Anonymous, 2000).
29. *Terminalia bellirica* (Gaertn.) Rox. (Combretaceae) Barra (N), ba-ru-ra (T), Balela (U)		
The fruits are used in stomach upsets (Chhetri, 2007); stomach dysfunction (Rai and Sharma, 1994).	T: Decoction taken in eye disease, digestive disorders; skin becomes thick and heard with pimples on it, psoriasis, patches on skin devoids of pigment; U: (Bark, fruit, seed) Disease of gastro-intestinal tract and bronchitis, benign tumours (Anonymous, 2008).	Purgative, blood pressure depressant, antifungal, antihistaminic, activity against viral hepatitis and vitiligo, antiasthmatic, broncho-dilatory, anti-spasmodic, antibacterial, CNS stimulant, amoebicidal, antistress and endurance promoting activity (Anonymous, 2000).
30. *Terminalia chebula* Retz. (Combretaceae) Harra (N), Selim Pot (L), Katukkai (S), a-ru-ra (T), Halelaj Aswad (U)		
The fruits are used in tonsillitis (Chhetri, 2007); pharyngitis and other throat complications (Rai and Sharma, 1994).	H: (Semi mature fruits) Cardiac diseases, palpitation, haemorrhages, spermatorrhoea (Anonymous, 2008); S: (fruit) Jaundice, eye diseases, hyper tension, Laxative, Ascitis, Poison (Anonymous, 2008); T: Fever, swelling of stomach, indigestion, jaundice, tumours, dysentery; U: (Fruit before ripen) Beneficial in paralysis.	Antimicrobial, antifungal, antibacterial, antistress, antispasmodic, hypotensive, indurance promoting activity, antihepatitis B virus activity, hypolipidaemic, inhibitory activity, against HIV-1 protease, anthelmintic, purgative (Anonymous, 2000).
31. *Urtica dioica* Linn. (Urticaceae) Sisnu (N), Surang (L.)		
The leaves in high blood pressure (Chhetri, 2007); whole plant is used in bone fracture and dislocation, diarrhoea, cough, child delivery (Pradhan and Badola, 2008).	A: (Bicchu Booti; leaf) Diarrhoea (Sharma and Singh, 1989). H: (Fresh plant in flower) Agalactia, allergic reactions, bee-strings, gout, erythema, hives, leucorrhoea, renal colic, whooping cough (Anonymous, 2008).	Antirhenmatic, astringent, anthelmintic, antiasthmatic, antidiarrhoeal, diuretic, stimulant and tonic (Despande, 2006)

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Ethnomedicine at Sikkim	Use in alternative medicine in India	Pharmacological activity
32. *Zingiber officinale* Roscoe in Trans. (Zingiberaceae) Aduwa (N), Shunthi (A), Cukku (S), bcha'-sga, saga, sga-skya (T), Zanjabeel (U)		
The rhizome is used in cough, fever and throat pain (Pradhan and Badola, 2008); appetiser (Biswas, 1956).	A: (rhizome) Appetiser, anti-inflammatory, anti-cancerous, cough and cold (Anonymous, 2000). H: (rhizome, roots) Albuminuria, halitosis, diarrhoea, dysentery, hepatitis, food poisoning, nasal catarrh, colic, back ache, dyspepsia (Anonymous, 2008); S: (rhizome) Indigestion, cough, gastritis, burning sensation of oesophagus, loss of appetite, headache, Painful ulcer of duodenum (Anonymous, 2008); T: Phlegm, blood pressure irregularities, kidney disease; U: (rhizome) Indigestion, dyspepsia, flatulence, colic, vomiting, spasm, asthma (Ahmed et al., 2005).	Anti-inflammatory, hypolipidaemic, antiatherosclerotic, antiulcer, antipyretic, Cardiovascular, analgesic, anti depressant, hepatoprotective, intropic (Anonymous, 2000).

Note: Taxa are listed alphabetically by botanical name, family in parenthesis, local name (ethnic group in parenthesis). Ethnomedicinal use in alternative systems of medicines in India and pharmacological activities. A: Ayurveda; B: Bhutia; H: Homeopathy; L: Lepcha; N: Nepali; S: Siddha; T: Tibetan; U: Unani

asiatica, Embelia ribes, Holarrhena antidysenterica, Mallotus philippinensis, Terminalia bellirica and *Zingiber officinale*. The species sharing affinities with two or more systems of medicines with pharmacological validation may be play source of new drugs for modern medicine. Further, medicinal properties of such species should be propagate through extension education in remote areas after proper evaluation and standardization. Ethnic drugs have potential to play very crucial role in primary health care in rural areas of third world countries. New emerging disease and the development of resistance by microorganisms to current drugs will require novel compounds to control these inevitable events. A broad interdisciplinary effort involving experts in a number of fields embracing plant taxonomy, ethnobotany, pharmacognosy, biochemistry, analytical chemistry, pharmacology, pharmaceutics, and medicine is required to achieve the goal. This interdisciplinary effort will continue to be important into next millennium, until ultimately disease as we know it no longer exists (Lewis, 2003). Recent survey shows that the percentage of natural products in modern drug armamentarium is considerable, estimates varying from 35% to 50% (Holmstedt and Bruhn, 1995).

4. Conclusion

Under present study it has been proved that ethnic uses of some of the plants like *Asparagus racemosus, Cannabis sativa, Embelia ribes, Holarrhena antidysenterica, Mallotus philippinensis* etc. having similar healthcare use in different alternative medicinal system and is also confirmed by its pharmacological study which indicates that further research may lead to the development of a miraculous modern drug.

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