Plant Archives Vol. 24, No. 2, 2024 pp. 2621-2635 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2024.v24.no.2.375

HERBAL REMEDIES: DISCOVERING ETHNOMEDICINAL PLANTS IN TRIBAL REGIONS OF HIMACHAL PRADESH INDIA

Jagdish Singh*, Maheshwar, Krishan Lal, Swaran Lata and Vaneet Jishtu

ICFRE-Himalayan Forest Research Institute, Conifer Campus, Panthaghati, Shimla (H.P.) - 171 013, India.

*Corresponding author Email: jaggy1964@gmail.com

(Date of Receiving-21-06-2024; Date of Acceptance-08-09-2024)

ABSTRACT

The study aimed to document ethnomedicinal plants utilized by indigenous populations across various tribal regions of Himachal Pradesh. Data were gathered from 400 local inhabitants, including traditional healers and *vaids* from tribal areas. The survey spanned 80 villages between 2021 to 2023. A total of 119 plant species, encompassing 106 genera and 64 families, were identified for their medicinal properties. Of these species, 66% were herbs, 23% trees, 5% shrubs, 4% climbers, with 1% species each of fungus and lichen. The families Asteraceae and Ranunculaceae were found to contribute the highest number of medicinal species. Roots were the most frequently used plant part, followed by leaves. The study revealed that approximately 49% of the population lacks ethnomedicinal knowledge, indicating a decline in traditional knowledge due to the rise of allopathic medicine. Furthermore, a significant reduction in indigenous knowledge was observed among younger and middle-aged individuals compared to those over 70 years old. This trend underscores the necessity of conserving ethnomedicinal knowledge for future generations.

Introduction

The Himalayan Region comprises a vast mountain system stretching over 3000 km from its junction with the Karakoram ranges in the west to the Arakan mountains on the Assam-Bhutan border in the east (Natarajan *et al*., 2000). This region is a critical source of medicinal plants used in Ayurvedic medicines. Notably, more than 95% of the 400 plant species utilized by the Indian herbal industry are harvested from wild populations. In the Hindu scripture "Ramayana," Lord Hanuman travelled from Lanka (Sri Lanka) to the Himalayas to collect the "Sanjeevani," the only herb capable of reviving Lakshman. This herb was found on the slopes of Dronagiri mountain, currently in the Chamoli district of Uttarakhand, underscoring the Himalayas' significance in Ayurveda. The documentation of Himalayan flora began in the 19th century with Hooker, who studied the Indian subcontinent from 1872 to 1897 (Bargali *et al*., 2021). Singh and Pusalkar (2020) recorded 8700 species of angiosperms, 51 species of gymnosperms, 766 species of pteridophytes, and 1955 species of bryophytes in the Himalayan region.

Himachal Pradesh, a hilly state in the Northwest Himalayas, has a longstanding tradition of using herbs for household remedies and extracting herbal wealth from forests for local trade. The state is home to a diverse array of medicinal plants due to its varied climatic zones, ranging from sub-tropical to temperate, alpine, and cold deserts, and an elevational range from 350m (Una district) to 6816m (Reo Purgyil). The regions with elevations ranging from 350 m to 1500 m above mean sea level (amsl) exhibit subtropical climates, particularly in Una, Hamirpur, Bilaspur, Kangra, Sirmaur and Solan. In contrast, elevations above 1500 m amsl are characterized by temperate, subalpine, and alpine climates, found in Kangra, Chamba, Kullu, Shimla, Mandi, Solan, Sirmaur, and Kinnaur. The Lahaul and Spiti district is distinguished by its alpine and cold desert climates.

Himachal Pradesh boasts a rich cultural and traditional diversity, with numerous tribal communities, including the Gaddi (Chamba and Kangra), Gujjar (Solan, Kangra and Mandi), Kinnaura (Kinnaur, Shimla and Kullu), Bhot (Lahaul & Spiti and Kullu), Pangwal (Chamba and Kullu),

Swangla (Lahaul & Spiti and Kullu), Lahaula (Lahaul & Spiti and Kullu), and Khampa (Kullu and Solan). These tribes have their unique culture, traditions, and ways of life. The tribal regions are primarily located in the remote and mountainous areas of the state, where the harsh terrain and climate have shaped the lifestyles and practices of these communities over centuries. Different tribes employ various traditional practices to treat diseases, predominantly using locally available medicinal plants. For instance, the Gaddi tribes of Kangra have local sayings such as, "Bana, basuti te bare jethi houan thethi manu kian more," meaning a person cannot die of disease in areas where *Vitex negundo* (Bana), *Adhatoda vasica* (Basuti), and *Acorus calamus* (Bare) are found, and "Harad, bahera amla bich payi giloye, jithonye char chijan utho admi kyon moye," meaning a person will not succumb to disease in areas where *Terminalia chebula* (Harad), *T. bellerica* (Behera), *Emblica officinalis* (Amla), and *Tinospora cordifolia* (Giloye) are available (Uniyal *et al*., 2006).

Due to the high diversity of flora, the export of plant resources from the state is high. Around 90% of the medicinal plants being used are collected from the wild and exported (Butola and Badola, 2008). Most of these collections are following the unsustainable path of harvesting. High-value medicinal plants in Himachal Pradesh face heavy exploitation due to unsustainable harvesting practices. So, there is an urgent need to conserve and restore these species in the state. Ecological restoration depends on the effective coordination of scientific research and traditional environmental knowledge (Uprety *et al*., 2012).

Material and Method

Study area

The study was conducted in the tribal regions of Himachal Pradesh. Himachal Pradesh is a state in northern India, characterized by its diverse and mountainous terrain. It is part of the western Himalayas and features a range of altitudes from the low Shivalik hills to the high peaks of the Greater Himalayas. The state is known for its scenic valleys such as Kullu, Kangra, and Spiti, dense forests, and significant rivers including the Beas, Sutlej, and Ravi. The climate varies from subtropical in the lower regions to alpine and glacial in the higher altitudes. This varied topography and climate support rich biodiversity and numerous natural resources. The diverse flora includes dense forests of deodar, pine, oak, and rhododendron in the lower and middle elevations, while higher altitudes feature juniper, birch, and extensive alpine meadows. The Great Himalayan National Park, a UNESCO World Heritage site, showcases the region's floral diversity with over 1,000 plant species, many of which have medicinal properties.

Method

The study was conducted from 2021 to 2023, targeting tribal regions to gather traditional knowledge from various ethnic groups with diverse knowledge of medicinal plants. The study began by selecting regions known for their plant diversity and indigenous communities, outlined objectives, such as identifying medicinal plants, understanding their cultural significance and documenting

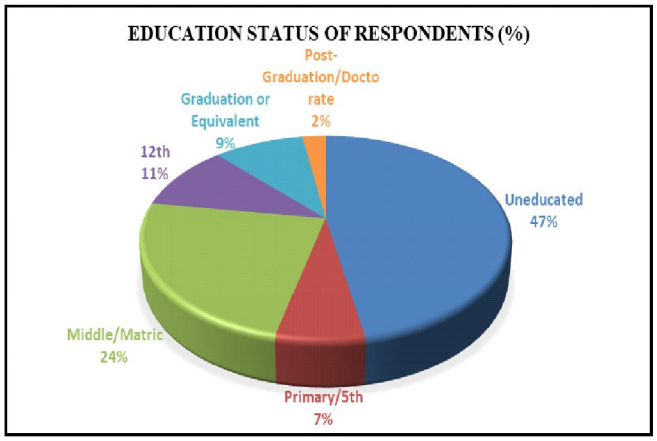

Fig. 1: The education status of respondents.

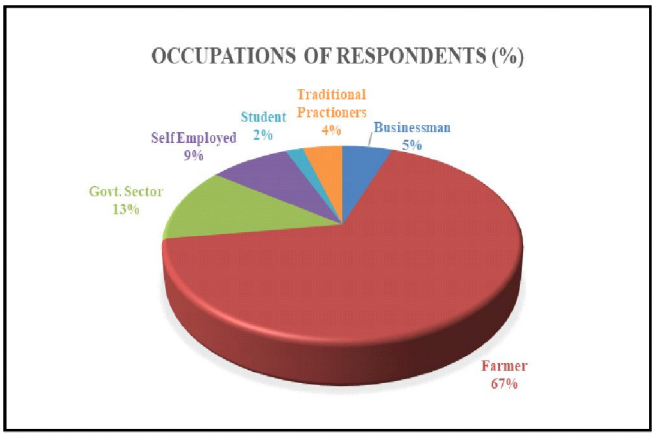

Fig. 2: Occupation status of respondents.

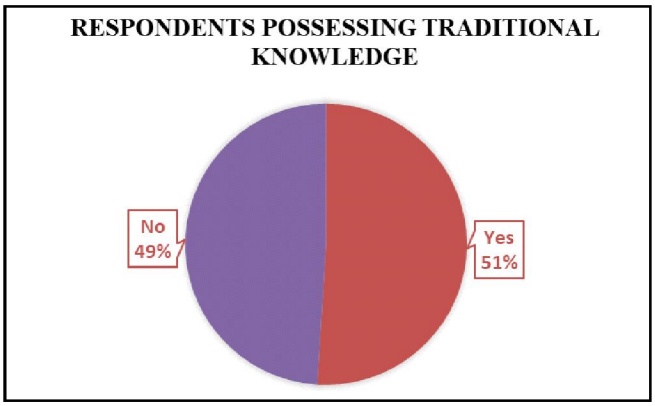

Fig. 3: Percentage of respondents possessing traditional knowledge of the medicinal plants.

traditional practices. The survey was conducted through semi-structured interviews among people of different age groups in different tribal communities. Interviews were conducted with 400 individuals, including 295 males and 105 females, from 80 villages. Villages were visited randomly and only once to collect data on the use of medicinal plants by different ethnic groups.

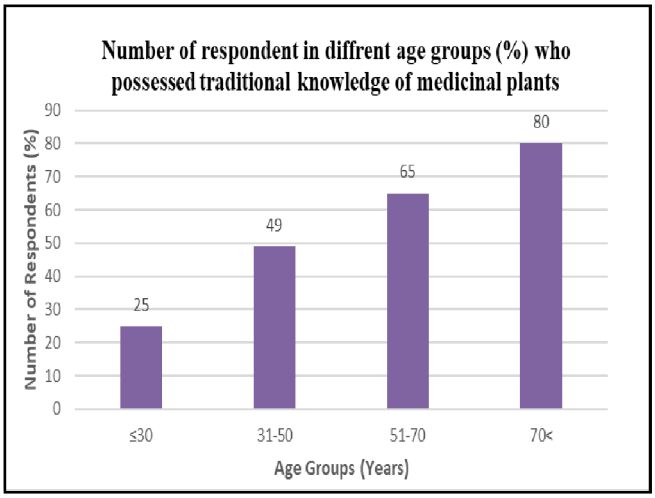

Fig. 4: Traditional knowledge in different age groups.

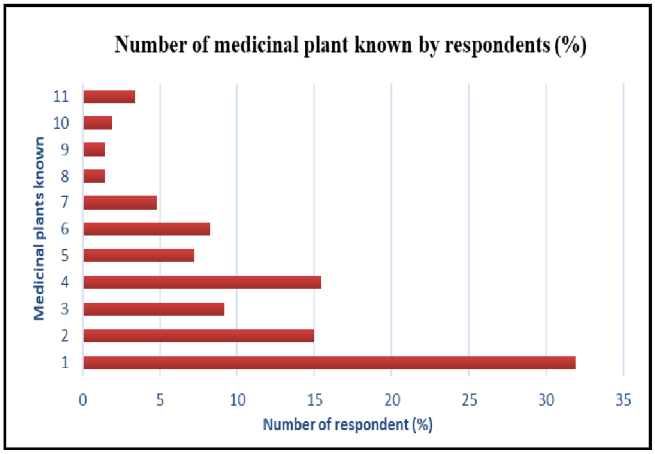

Fig. 5: Number of medicinal plants known by respondents.

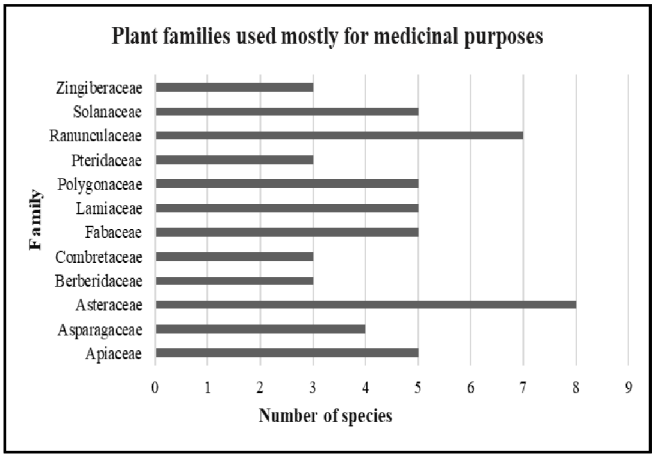

Fig. 6: Most involved plant families in traditional ethnomedicinal uses.

Result and Discussion

Education and Occupation of different respondents in the study area

The survey included participants aged 19 to 91 years with 65 individuals aged 30 years or below, 200 individuals between 31-50 years, 115 individuals between 51-70 years and 20 individuals above 70 years. Around 22% of the participants had an education level higher than matriculation, whereas 47% were uneducated while the rest had primary, middle or matric level education (Fig. 1). The occupational distribution of the respondents was

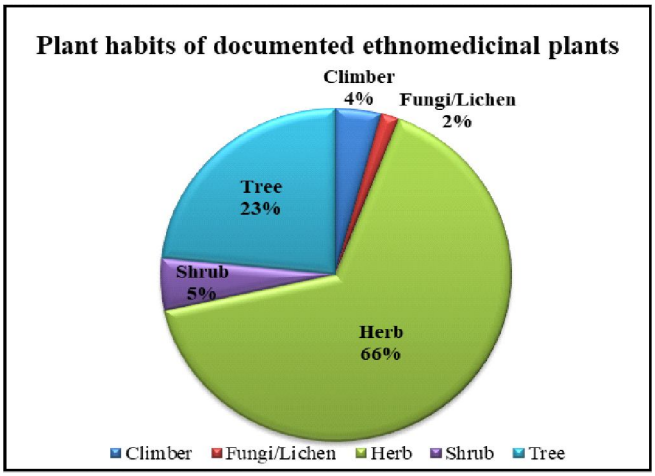

Fig. 7: Habit.

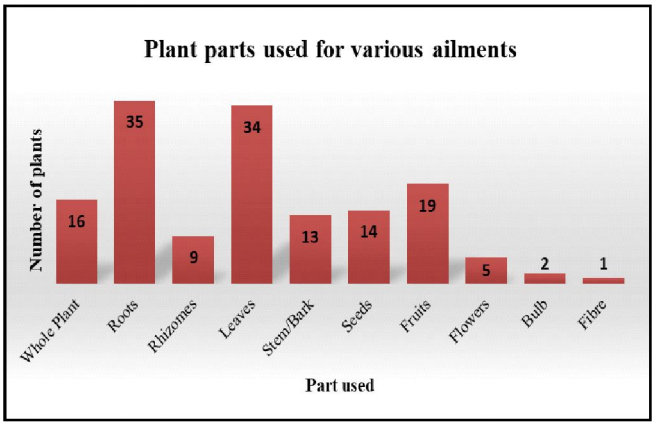

Fig. 8: Plant parts.

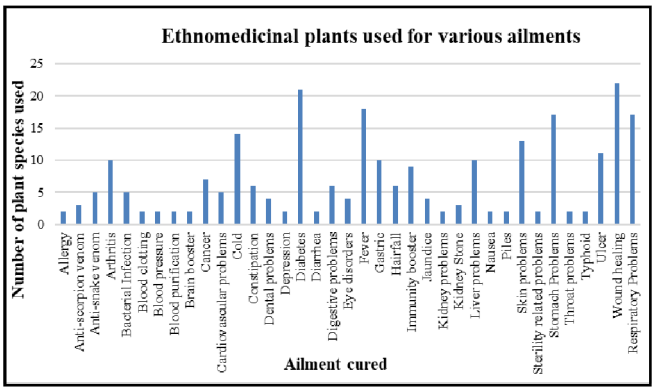

Fig. 9: Ailments cured using ethnomedicinal plants.

Table 1. Ethnomedicinal plant species documented from tribal regions of Himachal Pradesh

Botanical Name	Local Name	Family	Habit	Habitat	Part Used	Mode of Consumption	Ethnobotanical Usage
Achillea millefolium L.	Losar	Asteraceae	Herb	Alpine, Subalpine meadow, Moist	Fl	Powder/ Decoction	Skin problems like Itching or inflammation, Cold, Fever, Cough
Achyranthes aspera L.	Apmarg	Amaranthaceae	Herb	Subtropic, Dry	WP	Powder/ Decoction/ Paste (Root)	Dental problems, Liver tonic, Urine & sterility-related problems (Decoction), Snakebite (Paste), Scorpion bite (Paste), Skin diseases (Paste)
Aconitum heterophylloides (Brühl) Stapf	Mawra	Ranunculaceae	Herb	Alpine, Moist	Rt	Powder	Fever
Aconitum heterophyllum Wall. ex Royle	Patish	Ranunculaceae	Herb	Alpine, Moist	Rh & Sd	Powder (Powder consumed in a minimal quantity)	Diabetes, Cold, Stomach Problems, Allergy, Liver problems, Healing, Typhoid
Aconitum violaceum Jacquem. ex Stapf	Dudhi mawra	Ranunculaceae	Herb	Alpine, Moist	WP	Raw/ Powder/ Paste	Snake & Scorpion bite, Inflammation
Acorus calamus L.	Bach	Acoraceae	Herb	Subtropic, Moist, Wetland	Lf	Decoction	Antibiotic, Stomach worm problems
Actinidia chinensis var. *deliciosa* (A. Chev.) A. Chev.	Kiwi	Actinidiaceae	Climber	Temperate, Subtropic, Moist	Fr	Raw	Blood Pressure
Adiantum caudatum L.	Fern	Pteridaceae	Fern	Temperate, Subtropic, Moist	WP	Decoction	Diabetes
Adiantum venustum D. Don	Pathar Ghas	Pteridaceae	Fern	Temperate, Subtropic, Moist	Lf	Paste	Healing (fire burn)
Aesculus indica (Wall. ex Cambess.) Hook.	Khanor	Sapindaceae	Tree	Subtropic, Temperate, Moist	Sd	Seeds are washed, soaked in water for	Asthma, Digestion, Diabetes, Stomach Problem

Continue ....

						1 to 3 months, washed, powdered and pudding is prepared.	
Ageratina adenophora (Spreng.) R. M. King & H. Rob.	Bowkumbh	Asteraceae	Herb	Subtropic, Temperate, Moist	Lf	Paste	Healing (wound)
Ajuga integrifolia Buch.- Ham. ex D.Don	Neel Kanthi	Lamiaceae	Herb	Temperate, Moist	WP	Decoction (Dried plant is used to make decoction and for cattle, its fresh leaves are fed.	Blood purification, Bleeding in cattle, Blood pressure, Diabetes.
Allium sativum L.	lehsun	Amaryllidaceae	Herb	Agricultural land, Temperate, Moist	Bl	As spices, Roasted	Stomach problem, Gastric, Hair fall, Arthritis
Aloe vera (L.) Burm.f.	Ghee Kwar	Asphodelaceae	Herb	Subtropic, Arid	Lf & St	Gel and latex applied externally	Skin problems, Arthritis
Anacyclus pyrethrum (L.) Lag.	Akarkara	Asteraceae	Herb	Subtropic, Arid	Fl	Raw (Flowers chewed)	Teeth, Gums problems
Andrographis paniculata (Burm.f.) Wall. ex Nees	Kalmegh	Acanthaceae	Herb	Subtropic, Moist	Lf	Paste, Decoction	Mental, Sleeping disorder
Angelica glauca Edgew.	Chora	Apiaceae	Herb	Subalpine, Moist	Rt	Spices in food/Tea	Gastric, Stomach problems, Spices
Arnebia euchroma (Royle ex Benth.) I. M. Johnst.	Ratanjot	Boraginaceae	Herb	Alpine, Cold desert, Arid	Rt	Powder, dipped in oil and applied on hairs	Cardiovascular diseases, Hair growth, Fever, Skin diseases
Artemisia vulgaris L.	kubash	Asteraceae	Herb	Temperate, Arid	Lf & St	Paste	Healing (wound), Ulcer

Continue ....

Asparagus racemosus Willd.	Shataver	Asparagaceae	Shrub	Subtropic, Temperate, Moist	Rt	Paste/ Decoction	Constipation, Kidney problems, Skin problems
Asplenium dalhousieae Hook.	Ghas	Aspleniaceae	Fern	Subtropic, Temperate, Moist	Rt	Used with *Viola* sp. and *Geranium* sp. (purple flower)	Ulcer
Azadirachta indica A. Juss.	Neem	Meliaceae	Tree	Subtropic, Dry	Lf	Decoction	Skin problems, Diabetes
Bauhinia racemosa Lam.	Sanapati	Caesalpiniaceae	Tree	Subtropic, Moist	Lf	Powder	Stomach Problem
Berberis aristata DC.	Kashmal	Berberidaceae	Shrub	Temperate, Moist	Rt & Fr	Raw (Fruits), Powder (Roots). Fresh fruits are directly consumed. Roots washed, cut into small pieces, dried, ground and consumed.	Diabetes, Liver, Jaundice, Eyes, Piles
Berberis lycium Royle	Kashmal	Berberidaceae	Shrub	Subtropic, Dry	Rt & Fr	Raw (Fruits), Paste (Roots)	Eye disorder, Diabetes, Healing (wound)
Bergenia ciliata (Haw.) Sternb.	Saplator	Saxifragaceae	Herb	Subalpine, Temperate, Moist, Rocky meadows	WP	Powder/Decoction. Roots are powdered and used to make decoction or powder consumed with water. Leaves are used to make fritters.	Burn, Stone
Bergenia stracheyi (Hook.f. & Thomson) Engl.	Dhonkudu (Pashanbhed)	Saxifragaceae	Herb	Alpine, Subalpine, Temperate, Moist, Rocky meadows	Lf & Rt	Decoction (Roots), Leaves are used to make fritters.	Diabetes, Kidney stone
Betula utilis D. Don	Bhojpatar	Betulaceae	Tree	Subalpine, Moist	Br	Bark extracted	Medico-religious, Letter writing
Boerhavia diffusa L.	Punernava	Nyctaginaceae	Herb	Subtropic, Arid	WP	Dried and Consumed, Decoction	Kidney, Liver swelling

Continue ....

Cannabis sativa L.	Bhang	Cannabaceae	Herb	Temperate, Subtropic, Tropic, Moist, Agricultural land	Sd	Dried and consumed	Cardiovascular diseases
Carica papaya L.	Papita	Caricaceae	Tree	Subtropic, Moist, Dry, Agricultural land	Fr & Lf	Raw (Fruits) and leaves given to cattle to cure the lumpy virus	Diabetes, Lumpy virus
Cassia fistula L.	Amaltas	Fabaceae	Tree	Subtropic, Dry	Fr (Legume)	Powder	Liver Problems
Cedrus deodara (Roxb. ex D. Don) G. Don	Deodar	Pinaceae	Tree	Temperate, Subalpine, Moist	Rt	Oil is extracted through boing and used externally	Arthritis, Tuberculosis, Cough, Skin diseases (Oil)
Centella asiatica (L.) Urb.	Brahmi	Apiaceae	Herb	Wetland, Forest edges, Riverside	Lf	Powder	Brain booster
Chlorophytum borivilianum Santapau & R. R. Fern.	Safed Musli	Asparagaceae	Herb	Subtropic, Moist	Rt	Powder. One gram of powder mixed in 1 gram of milk and consumed	Immunity booster, Aphrodisiac
Citrus × limon (L.) Osbeck	Lemon	Rutaceae	Tree	Agricultural land, Subtropic, Temperate, Dry, Moist	Fr	Raw	Source of Vitamin C
Clematis buchananiana DC.	Loan	Ranunculaceae	Climber	Subtropic, Temperate, Moist	Lf & St	Paste	Ulcer, Skin diseases
Cocos nucifera L.	Coconut	Arecaceae	Tree	Subtropic, Moist	Fb	Fibres burnt and ash eaten with curd	Piles
Curcuma longa L.	Haldi	Zingiberaceae	Herb	Subtropic, Moist	Rh	Powder, Direct consumption with honey	Antiseptic, Cold, Cough, Cardiovascular problems, Asthma, Diabetes, Anticancerous, Gastric
Cynodon dactylon (L.) Pers.	Joob	Poaceae	Herb	Subtropic, Temperate, Meadow, Arid	Lf & St	Pressed/rubbed and sap applied on snake bite with enchantment	Snake bite, Spiritual purpose

Continue ....

Cyperus rotundus L.	Nagarmatha	Cyperaceae	Herb	Subtropic, Wetland, Riverside, Moist	Rh/Tb	Powdered/Decoction	Fever, Diarrhoea
Dactylorhiza hatagirea (D. Don) Soó	Hath Panja	Orchidaceae	Herb	Alpine meadow, Moist	Rt & Tb	Raw/Powder/Paste/ Concoction (Tuber). Leaves are used to make fritters	Healing (wound), Aphrodisiac, Fumigant, Magico-religious, Immunity booster
Datura stramonium L.	Dhatura	Solanaceae	Herb	Subtropic, Arid	Sd	Raw (Consumed orally)	Stomach problem, Hallucination
Delphinium denudatum Wall. ex Hook.f. & Thomson	Nirvishi	Ranunculaceae	Herb	Alpine, Subalpine meadows, Moist	Rt	Paste (Paste of the dried/fresh roots is applied externally.	Snake & Scorpion venom, Ulcers
Dioscorea deltoidea Wall. ex Griseb.	Shingli-Mingli	Dioscoreaceae	Climber	Subtropic, Moist, Dry	Rt & Climber	Powder, Decoction	Intestinal worms, Natural Cleanser
Diplazium esculentum (Retz.) Sw.	Lingad	Athyriaceae	Fern	Temperate, Moist	Lf & St	Raw, As vegetable	Diarrhoea
Dolomiaea costus (Falc.) Kasana & A.K.Pandey	Kuth	Asteraceae	Herb	Alpine, Moist, Agriculture land	Fl & Rt	Oil used externally as well as consumed	Arthritis, Gastric, Respiratory problems, Stomach problems, Body itching
Dolomiaea macrocephala DC. ex Royle	Guggal Dhoop	Asteraceae	Herb	Alpine meadows, Moist	Rt	Powder/ Dried roots are dipped in ghee/clarified butter and burnt on coal	Fever, Fumigant, Hair Growth, Aromatic (used as dhoop in rituals)
Eclipta prostrata (L.) L.	Bhringraj	Asteraceae	Herb	Subtropic, Moist	Lf	Powder used with oil	Hair fall, Eye disorder
Elaeocarpus angustifolius Blume	Rudraksh	Elaeocarpaceae	Tree	Subtropic, Moist	Fr	Garland made and worn around the neck or wrist	Stress relieving, Improve health
Elwendia persica (Boiss.) Pimenov & Kljuykov	Kala Zeera	Apiaceae	Herb	Temperate, Subalpine, Dry, Rocky	Sd	As Spices	Stomach, Cold, fever
Ephedra gerardiana Wall. ex Klotzsch & Garcke	Somlata	Ephedraceae	Herb	Alpine, Arid, Dry	Rt	Powder	Asthma, Nausea
Fagopyrum esculentum Moench	Ogla	Polygonaceae	Herb	Agricultural land, Subalpine, Moist	Sd	Powder (Seeds are dried in sunlight, ground and used for stuffing)	Diabetes

Continue ....

Fagopyrum tataricum (L.) Gaertn.	Fafra	Polygonaceae	Herb	Temperate, Moist	Lf	Raw (Fresh leaves are used to make vegetable curry)	Diabetes
Fritillaria cirrhosa D. Don	Jungli Lehsun	Liliaceae	Herb	Alpine meadows, Moist	Bl	Powder consumed with milk	Asthma, Arthritis, Gastric
Gentiana kurroo Royle	Karru	Plantaginaceae	Herb	Alpine, Subalpine, Moist	Rt & Lf	Powder/Decoction	Typhoid, Fever, Gastric, Diabetes
Glycyrrhiza glabra L.	Mulathi	Fabaceae	Herb	Temperate, Moist, Agricultural land	Rt	Roots are used with Dalchini (*Cinnamomum verum*) bark and ginger. Powdered mixed in apple cider vinegar and taken half spoon daily	Cardiovascular problems, Throat clearing
Gonostegia hirta (Blume) Miq.	Loan	Urticaceae	Herb	Temperate, Subtropic, Moist	Lf & St	Paste	Ulcers
Grewia optiva J.R. Drumm. ex Burret	Beul	Malvaceae	Tree	Temperate, Subtropic, Dry, Moist	Br	Bark sap used to wash hairs	Hair problems
Hedychium spicatum Sm.	Van Haldi	Zingiberaceae	Herb	Temperate, Subtropic, Moist	Rh	Powder, Paste	Skin Problems
Hemionitis albomarginata (C. B. Clarke) Christenh.	Gha	Pteridaceae	Fern	Subalpine, Temperate, Moist, Rocky areas	WP	Paste	Healing (fire burn)
Juglans regia L.	Akhrot	Juglandaceae	Tree	Temperate, Moist, Agricultural land	Br	Chewing of bark	Sore mouth
Juniperus communis L.	Dhoop	Cupressaceae	Tree	Alpine, Subalpine, Arid	Rt	Burnt as dhoop/insence stick	Fumigant
Justicia adhatoda L.	Basuti	Acanthaceae	Herb	Subtropic, Moist	Lf, Rt & Fl	Plant boiled and used as nasal steam	Cough, Cold, Asthma
Kalanchoe pinnata (Lam.) Pers.	Patharchat	Crassulaceae	Herb	Ornamental, Subtropical, Arid	Rt	Powder/Concoction	Kidney stone, Diabetes

Continue ....

Lichen	Foliose Lichen	Lichen	Herb	Temperate, Subalpine, Moist	WP	Paste or Sap used	Fire burn
Linum usitatissimum L.	Alsi	Linaceae	Herb	Subtropic, Temperate, Moist, Agricultural land	Sd & Lf	Powder consumed	Diabetes
Mentha spicata L.	Pudina	Lamiaceae	Herb	Temperate, Moist, Home Garden	Lf	As chutney/tea	Gastric
Mesua ferrea L.	Nagkesar	Calophyllaceae	Tree	Subtropic, Moist	Sd	Raw/Powder	Ingestion, Dysentery
Morchella esculenta	Guchhi	Morchellaceae	Fungi	Temperate, Moist	WP	As raw/vegetable	Stomach problems, Gastric, Weakness
Nicotiana tabacum L.	Tambaku	Solanaceae	Herb	Subtropic, Arid	Lf	Concoction with ghee	Ulcer
Ocimum tenuiflorum L.	Tulsi	Lamiaceae	Herb	Subtropic, Moist	Lf	Raw	Health tonic, Antibiotic
Phyllanthus emblica L.	Amla	Phyllanthaceae	Tree	Subtropic, Moist, Agricultural land	Fr	Raw/Roasted/Pickle/ Powder mixed with *T. chebula* & *T. bellerica*	Constipation, Immunity Booster, Throat problems, Cough, Cold
Picrorhiza kurroa Royle ex Benth.	Karru	Plantaginaceae	Herb	Alpine, Moist	Rt	Raw/Powder. Sometimes powder is consumed with *A. heterophyllum* powder.	Stomach Problems, Allergy, Liver problems, Jaundice, Diabetes, Fever, Cold
Pinus gerardiana Wall. ex D. Don	Newja	Pinaceae	Tree	Subalpine, Arid	Sd	Raw	Healthy and Nutritious
Pistacia chinensis subsp. *integerrima* (J.L.Stewart) Rech.f.	Kakad Singhi	Anacardiaceae	Tree	Subtropic, Arid	Fr	Powder/Concoction /Spices	Respiratory problems
Plumbago zeylanica L.	Chitrak	Plumbaginaceae	Herb	Subtropic, Moist	Rt	Raw/Powder	Anticancerous
Podophyllum hexandrum Royle	Ban Kakdi	Berberidaceae	Herb	Subalpine, Moist	Rt & Rh	Powder	Anticancerous, Healing (wound), Stomach problem
Polygonatum cirrhifolium (Wall.) Royle	Mahameda	Asparagaceae	Herb	Subalpine and temperate, Moist	Rh	Paste	Arthritis, Ulcers

Continue ....

Polygonatum verticillatum (L.) All.	Salam Mishri	Asparagaceae	Herb	Subalpine and temperate, Moist	Rt	Powder consumed with milk	Immunity booster
Prinsepia utilis Royle	Bekhal	Rosaceae	Shrub	Temperate, Subalpine, Moist	Lf	Paste	Ulcers
Prunus armeniaca L.	Chulli	Rosaceae	Tree	Agricultural land, Temperate, Moist	Fr & Sd (Kernel)	Raw (F), Seed oil applied externally	Arthritis, Bone related problems
Pueraria tuberosa (Roxb. ex Willd.) DC.	Vish Khapra	Fabaceae	Climber	Subtropic, Arid	Lf	Concoction	Healing (wound)
Punica granatum L.	Anar dana	Lythraceae	Tree	Subtropic, Arid	Fr	Arils consumed	Anticancerous
Ranunculus repens L.	Ghas	Ranunculaceae	Herb	Temperate, Moist	Lf	Leaf sap is used to kill insect pests in cereals	Kill grain borer pests
Rheum australe D. Don	Chukhri	Polygonaceae	Herb	Alpine, Subalpine, Moist	Lf, Rh & Rt	Powder, Paste (Externally applied)	Healing (wound), Ulcers, Detoxification (L), Blood purification (L)
Rheum webbianum Royle	Archu	Polygonaceae	Herb	Alpine, Subalpine. Moist	Rt	Paste	Healing (wound), Ulcers, Swellings
Rhododendron arboreum Sm.	Burans	Ericaceae	Tree	Temperate, Moist	Fl (Petals)	As Juice	Nose bleeding
Ricinus communis L.	Castor	Euphorbiaceae	Shrub	Subtropic, Moist	Lf & Rt	Powder consumed with salt	Jaundice, Asthma
Rubia cordifolia L.	Kruri	Rubiaceae	Herb	Subtropic, Temperate, Moist	WP	Paste applied externally along with *Urtica dioica*, Powder consumed	Eye-related problem, Anticancerous, Reddish patches b/w toes like athlete's foot
Rumex hastatus D. Don	Khata mitha	Polygonaceae	Herb	Subtropic, Temperate, Moist	Rt & Lf	Paste (Leaves), Chewing (Roots)	Burning sensation, Swelling in jaws
Sapindus mukorossi Gaertn.	Ritha	Sapindaceae	Tree	Subtropic, Moist	Fr & Sd	Paste/Concoction	Snake bite, Cleansing
Sedum multicaule Wall. ex Lindl.	Ghas	Crassulaceae	Herb	Temperate, Subalpine, Moist	WP	Powder/Paste	White patches b/w fingers (Toes mostly)
Selinum vaginatum (Edgew.) C. B. Clarke	Bhutkesi	Apiaceae	Herb	Alpine, Sub-Alpine, Moist	Rt & Fl	Dried plant parts kept in wallet/bag/pocket.	Believed that it keeps negative energies apart.

Continue ....

Senegalia catechu (L.f.) P. J. H. Hurter & Mabb.	Khair	Fabaceae	Tree	Subtropic, Moist	HW	Decoction	Cold, Fever, Diarrhea
Solanum nigrum L.	Makoy	Solanaceae	Herb	Temperate, Moist	Fr	Fruit is de-pulped and seed powder consumed	Liver tonic
Solanum virginianum L.	Rakse-Kshotri	Solanaceae	Herb	Subtropic, Arid	Lf & Fr	Spines are removed from leaves & fruits and pressed between teeth for 10 to 15 minutes so leaf sap can penetrate b/w teeth	Dental pain, Kill teeth worms
Swietenia macrophylla King	Kadwa Badam	Meliaceae	Tree	Subtropic, Moist	Sd	Powder	Diabetes
Syzygium cumini (L.) Skeels	Jamun	Myritaceae	Tree	Tropic, Subtropic, Moist	Fr	Raw	Diabetes
Taraxacum officinale F. H. Wigg.	Dandelion	Asteraceae	Herb	Temperate, Moist	Rt	Powder and Paste	Arthritis and Cholesterol related problems
Taxus wallichiana Zucc.	Rkhal	Taxaceae	Tree	Temperate, Subalpine, Moist	Br & Lf	Powder/Decoction	Anticancerous, Liver, Cold, Sneezing
Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	Arjun Chhal	Combretaceae	Tree	Subtropic, Moist	Br	Powder	Blood clotting
Terminalia bellirica (Gaertn.) Roxb.	Behra	Combretaceae	Tree	Subtropic, Moist	Fr	Powder consumed with lukewarm water	Cough, Constipation
Terminalia chebula Retz.	Harad	Combretaceae	Tree	Subtropic, Moist	Fr	Raw/Powder/ Roasted and dipped overnight in water and water consumed	Constipation, Cough
Thalictrum foliolosum DC.	Ghas	Ranunculaceae	Herb	Temperate, Subalpine, Moist	Lf	Pressed and sap applied externally	Burn
Thymus serpyllum L.	Van Ajwain	Lamiaceae	Herb	Subtropic, Temperate, Subalpine meadow, Arid	WP	Powder/Decoction/ Concoction	Cough, Cold, Diabetes, Digestive disorders

Continue ....

Tinospora cordifolia (Willd.) Hook. F. & Thomson	Giloy	Menispermaceae	Climber	Subtropic, Moist	WP	Powder (as spices)/ Decoction	Immunity booster, Headache, Diabetes, Cardiovascular problems, Antibiotic, Diabetes
Trachyspermum ammi (L.) Sprague	Ajwain	Apiaceae	Herb	Subtropic, Arid	Sd	As spices	Constipation
Tribulus terrestris L.	Gokhru	Zygophyllaceae	Herb	Subtropic, Arid	Rt	Paste externally applied	Ulcers, Healing (wound)
Trigonella foenum-graecum L.	Methi	Fabaceae	Herb	Subtropic, Arid, Agricultural land	Sd & Lf	Powder, As spices	Indigestion
Trillium govanianum Wall. ex D.Don	Nagchhatri	Melanthiaceae	Herb	Alpine, Subalpine, Moist	Rh	Powder/Concoction/ Paste	Stomach Problems, Healing (wound), Fever, Indigestion, Cancer, Immunity Booster
Urtica dioica L.	Bichhu butti	Urticaceae	Herb	Temperate, Moist	Lf & Rt	Powder/As vegetable/ Leaves pressed against old injuries or Arthritis	Digestive problems, Hypertension, Arthritis, Healing (old injuries).
Valeriana jatamansi Jones ex Roxb.	Nihani	Caprifoliaceae	Herb	Temperate, Subalpine, Moist	Rt & Rh	Raw/Powder/ Concoction/Spices	Liver problems, Epilepsy
Viola canescens Wall.	Banafsha	Violaceae	Herb	Alpine, Subalpine, Temperate, Moist	WP	Concoction/tea	Cough, Cold, Fever, Respiratory problems, Sneezing
Viola pilosa Blume	Banafsha	Violaceae	Herb	Alpine, Subalpine, Temperate, Moist	WP	Concoction/tea	Antibiotic
Vitex negundo L.	Nirgundi	Lamiaceae	Herb	Subtropic, Moist	WP	Oil/Paste applied externally and juice consumed orally	Asthma, Stomach problem, Muscle relaxant
Withania somnifera (L.) Dunal	Ashwa-gandha	Solanaceae	Herb	Subtropic, Arid, Dry	Fr	Raw/Powder	Immunity booster, Increase fertility, Brain booster, Stress related problems, Antibiotic
Zanthoxylum armatum DC.	Tirmur	Rutaceae	Shrub	Subtropic, Temperate, Moist, Riverbanks	St & Fr	Raw/Powder/As brush	Dental problems, Fever, Scabies
Zingiber officinale Roscoe	Sonth	Zingiberaceae	Herb	Subtropic, Moist, Agricultural land	Rh	Spices/Powder/Raw/ Decoction/Concoction	Cold, Fever, Cardiovascular problems

Br- bark, Bl- Bulb, Fb- Fibre, HW- Heartwood, Lf- Leaf, Fl- Flower, Fr- Fruit, Rt- Root, Rh- Rhizome, Sd- Seed, St- Stem, Tb- Tuber, WP- Whole Plant

as follows: farmers (67%), government sector (13%), self-employed (09%), business (5%), traditional practitioners (04%) and students (4%) (Fig. 2).

Ethnomedicinal knowledge possessed by respondents of the study area

Some of the documented medicinal plants were identified in the field, while others were brought to the herbarium of ICFRE-HFRI in Shimla for identification. Among the respondents, 51% possessed some form of traditional knowledge, while 49% did not (Fig. 3). Notably, one-third of the female respondents and 58% of the male respondents knew the traditional medicinal uses of plants. In the age group above 70 years, a maximum of 80% of the total respondents possessed some form of traditional knowledge followed by 65% (51-70 years), 49% (31-50 years) and the least in the age group of or below 30 years *i.e.*, only 25% (Fig. 4). It has been seen that a maximum of around 32% of people have traditional knowledge about a single medicinal plant followed by ≈15% (2 and 4 plants), 9% (03 plants) and ≈27% (5 or more plants) (Fig. 5).

Ethnomedicinal plants in the tribal regions of Himachal Pradesh

A total of 144 plants were documented to be used for medicinal purposes. Of these, 119 species belonging to 106 genera and 64 families of Angiosperms (55), gymnosperms (04), pteridophytes/fern (03), fungi/lichen (02) were identified while 25 documented plants remained unidentified (documented through vernacular/local names). These species are listed in Table 1. of these, the family Asteraceae was the most dominant followed by Ranunculaceae and Fabaceae (Fig. 6). Sixty-six per cent of the species identified were herbs, 23% trees, 5% shrubs, 4% climbers, 1-1% fungi and lichens (Fig. 7). Roots (35) were the most used plant parts for ethnomedicinal purposes followed by Leaves (34), fruits (19), whole plant parts (16), Seeds (14), stem/bark (13), rhizome (09), flowers (05) and bulb (02) and fiber (01). (Fig. 8). Among the ailments that were mostly cured by locals using ethnomedicinal plants are: Wound healing (22), diabetes (21), stomach problems (20), fever (18), respiratory problems (like asthma, tuberculosis, cough etc.) (22), cold (14), skin problems (13) and ulcers (11) (Fig. 9).

A literature review provides evidence indicating that the ethnomedicinal properties recorded align with findings from previous studies. For instance, *Achillea millefolium* has been reported to treat colds and skin conditions such as inflammation and itching, as documented by Lakshmi *et al*., (2011). *Achyranthes aspera* has been documented to be effective against sterility-related issues by improving sperm motility (Paul *et al*., 2006). The hepatoprotective properties of *Aconitum heterophyllum* have been reported by Paramanick *et al*., (2017). Additionally, He *et al*., (2019) recommend the intake of kiwi fruit for proper blood circulation. *Angelica glauca* has been noted to alleviate stomach pain (Singh *et al*., 2020). Ethnomedicinal plant species such as *Gentiana kurroo* (Skinder *et al*., 2017), *Aloe vera* (Sahu *et al*., 2013), *Allium sativum* (Tesfaye, 2021), *Saussurea costus* (Mujammami, 2020), *Taraxacum officinale* (Jalili *et al*., 2020), and *Urtica dioica* (Bhusal *et al*., 2022) have been reported to cure arthritis. *Adhatoda vasica* (Shamsuddin *et al*., 2021), *Ephedra gerardiana* (Khan *et al*., 2017), and *Fritillaria roylei* (Kumar *et al*., 2021) have been reported to possess therapeutic effects against respiratory diseases. In contrast, although *Ricinus communis* is documented in the present study as a potential treatment for asthma, other studies have indicated its toxic effects on the respiratory system (Polito *et al*., 2019).

Conclusion

The study revealed the important plants, their medicinal uses and formulations from the tribal people in different regions of Himachal Pradesh. The survey was conducted among the people of age group between 19 to 91 years. Fifty-one per cent of the total interviewed people possessed some form of traditional ethnomedicinal knowledge while 49% did not. The ratio of respondents having traditional knowledge to the total number of respondents in age groups (≤ 30 years, 31-50 years, 51-70 years and above 70 years) decreased, showing a decrease in ethnomedicinal knowledge in young age people, indicating the extinction of this knowledge with time. A total of 119 medicinal plants from 64 families were recorded. Dominant plant families were Asteraceae and Ranunculaceae. Herbs were mostly used as medicines *i.e.*, around 66% followed by trees (23%) whereas, among the plant parts used, roots (24%) and leaves (23%) have shown dominance. In the survey, medicinal plants were found to cure wounds, diabetes, stomach problems, respiratory problems and fever.

The decline in traditional knowledge among young people poses a significant challenge for the future preservation and practice of traditional remedies. The reason behind this may be the easy availability of allopathic drugs, fast treatment, less interest of youth in traditional medicinal practices, not sharing knowledge with persons other than descendants and unavailability of medicinal plants. So, there is an urgent need to preserve such knowledge, and avoid its extinction in future.

References

Bargali, H., Mathela M., Sharma R., Sharma M., Yaming D. and Kumar A. (2021). Plant studies in Himachal Pradesh, Western Himalaya: a systematic review. *Journal of Mountain Science*, **18(7)**, 1856-1873.

Butola, J.S. and Badola H.K. (2008). Threatened Himalayan medicinal plants and their conservation in Himachal Pradesh. *J. Trop. Med. Plants*, **9(1)**, 125-142.

Bisht, A., Jain S., Misra A., Dwivedi J., Paliwal S. and Sharma S. (2021). Cedrus deodara (*Roxb. ex D. Don*) G. Don: A review of traditional use, phytochemical composition and pharmacology. *Journal of Ethnopharmacology*, **279**, 114361.

Bhusal, K.K., Magar S.K., Thapa R., Lamsal A., Bhandari S., Maharjan R. and Shrestha J. (2022). Nutritional and pharmacological importance of stinging nettle (*Urtica dioica* L.): A review. *Heliyon*, **8(6)**.

He, X., Fang J., Chen X., Zhao Z., Li Y., Meng Y. and Huang L. (2019). *Actinidia chinensis* Planch.: A review of chemistry and pharmacology. *Frontiers in pharmacology*, **10**, 1236.

Jalili, C., Taghadosi M., Pazhouhi M., Bahrehmand F., Miraghaee S.S., Pourmand D. and Rashidi I. (2020). An overview of therapeutic potentials of Taraxacum officinale (dandelion): A traditionally valuable herb with a reach historical background. *W.C.R.J. World Cancer Res. J.*, **7**, e1679.

Khan, A., Jan G., Khan A., Gul Jan F., Bahadur A. and Danish M. (2017). *In vitro* antioxidant and antimicrobial activities of *Ephedra gerardiana* (root and stem) crude extract and fractions. Evidence-Based Complementary and Alternative Medicine, 2017.

Kumar, P., Partap M. and Warghat A.R. (2021). *Fritillaria roylei*. In Himalayan medicinal plants (57-66). Academic Press.

Lakshmi, T., Geetha R.V., Roy A. and Kumar S.A. (2011). Yarrow (*Achillea millefolium* linn). A herbal medicinal plant with broad therapeutic use-A review. *Int. J. Pharm. Sci. Rev. Res*., **9(2)**, 136-141.

Mujammami, M. (2020). Clinical significance of Saussurea Costus in thyroid treatment. *Saudi Medical Journal*, **41(10)**, 1047.

Natarajan, B., Paulsen B.S. and Korneliussen V. (2000). An ethnopharmacological study from Kullu District, Himachal Pradesh, India: traditional knowledge compared with modern biological science. *Pharmaceutical biology*, **38(2)**, 129-138.

Polito, L., Bortolotti M., Battelli M.G., Calafato G. and Bolognesi A. (2019). Ricin: An ancient story for a timeless plant toxin. *Toxins*, **11(6)**, 324.

Paul, D., Bera S., Jana D., Maiti R. and Ghosh D. (2006). In vitro determination of the contraceptive spermicidal activity of a composite extract of *Achyranthes aspera* and *Stephania hernandifolia* on human semen. *Contraception*, **73(3)**, 284-288.

Paramanick, D., Panday R., Shukla S.S. and Sharma V. (2017). Primary pharmacological and other important findings on the medicinal plant "*Aconitum heterophyllum*" (aruna). *Journal of Pharmacopuncture*, **20(2)**, 89.

Singh, D.K. and Pusalkar P.K. (2020). Floristic diversity of the Indian Himalaya. In: Dar G, Khuroo A (eds.), Biodiversity of the Himalaya: Jammu and Kashmir State. Topics in Biodiversity and Conservation, 18. Springer, Singapore.

Singh, J., Rennu Dhupper S.S. and Jindal T. (2020). Traditional knowledge on ethnomedicinal plants among local people of Sarain range, Chopal forest division, Himachal Pradesh, India.

Skinder, B.M., Ganai B.A. and Wani A.H. (2017). Scientific study of Gentiana kurroo Royle. *Medicines*, **4(4)**, 74.

Sahu, P.K., Giri D.D., Singh R., Pandey P., Gupta S., Shrivastava A.K. and Pandey K.D. (2013). Therapeutic and medicinal uses of Aloe vera: a review. *Pharmacology & Pharmacy*, **4(08)**, 599.

Shamsuddin, T., Alam M.S., Junaid M., Akter R., Hosen S.M., Ferdousy S. and Mouri N.J. (2021). *Adhatoda vasica* (Nees.): A review on its botany, traditional uses, phytochemistry, pharmacological activities and toxicity. *Mini Reviews in Medicinal Chemistry*, **21(14)**, 1925-1964.

Tesfaye, A. (2021). Revealing the therapeutic uses of garlic (Allium sativum) and its potential for drug discovery. *The Scientific World Journal*, 2021.

Uniyal, R.C., Uniyal M.R. and Jain P. (2000). *Cultivation of Medicinal Plants in India. A Reference Book*. TRAFFIC India and WWF India, New Delhi, India.

Uniyal, S.K., Singh K.N., Jamwal P. and Lal B. (2006). Traditional use of medicinal plants among the tribal communities of Chhota Bhangal, Western Himalaya. *Journal of ethnobiology and ethnomedicine*, **2**, 1-8.

Uprety, Y., Asselin H., Bergeron Y., Doyon F. and Boucher, J.F. (2012). Contribution of traditional knowledge to ecological restoration: practices and applications. *Ecoscience*, **19(3)**, 225-237.