Ethno-Botanical and Economic Significance of Edible Plants Used as Food by Tribal Community of the Western Himalaya

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Abstract

Nature has been very kind to humanity and offers services for its long-term survival and continuous regeneration. From the past decade, enormous spike in acceptance and people's interest in natural remedies have been observed in both developing and developed countries. Diversity, adaptability, easy accessibility in edible form, low cost, relatively fewer side effects, increasing economic importance, and low levels of technological input are some of the positive features of herbal medicine. It is believed that up to four billion people residing in the developing countries rely on herbal medicines as a primary source of healthcare. In this context, there is a basic need to standard conventional drugs into public healthcare to accomplish the objective of enhanced access to healthcare facilities. India has a distinct status in the world owing to the richness in medicinal plant diversity. About 17,000 species of higher plants are identified in India, of which 8000 are considered to have medicinal value. Western Himalaya region because

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of a wide range of altitudes, topography, and climatic conditions has vast diversity of medicinal plant species that are used by its unique tribal population for treating various health ailments since time immemorial. This chapter aims to explore the indigenous knowledge of locally available edible medicinal plants being used by the tribal community of western Himalaya region along with their documentation to expand the scope and scientific value of local use of these medicinal plant species.

Keywords

Edible medicinal plants · Phytoconstituents · Western Himalaya · Economical importance · Biological activities

11.1 Introduction

The Himalayas are known for its wide range of altitudes, topography and climatic conditions, is a rich repository of more than eight thousand species of tracheophyta, among which 1748 are acknowledged for their therapeutic wealth, which occupies an important place in Vedic treatise (Sharma et al. 2011). The people of countryside dwelling in hilly and mountain zones consume wild and uncultivated edible plants that constitutes a portion of their eating habits in several civilizations and closely related to nearly all characteristics of their wellbeing, socio-cultural and spiritual existence (Aryal et al. 2009; Hawksworth 2006). Wild edibles extensively include roots, shoots, leaves, flowers, fruits, seeds, nuts, and entire plants gathered from woods, hedgerow, grassland, and as weed that grow on their own besides the usual crop (Rijal 2011). Wild edible plays a key role to fulfill the dietary prerequisite of the tribal community in distant areas of the nation all around the year (Grivetti and Britta 2000). Plants of Himalayan region significantly contribute to monetary prospects for billions of people living in mountains. Tribes consuming plants in numerous ways as raw in salads and pickle fried and steamed depending on taste and boiled in kadha preparation, curries, and soups (Pieroni et al. 2005; Piya et al. 2011). The edible plants of the wild hold significant position in the sustenance of countryside or tribal societies in numerous emergent nations (Britta et al. 2003). Numerous wild and cultivated florae have lately acquired significance, not only as herbal remedies, but also as natural constituents for the cosmetic industry (Joshi et al. 2016).

The present chapter documents 33 medicinal plant species (Fig. 11.1) used traditionally by the tribal Community of the Western Himalaya for treating various ailments. The results are provided in (Table 11.1) with botanical name, local name, family, habitat, constituents, and ethnomedicinal use.

Fig. 11.1 Edible medicinal plants of Western Himalaya

11.2 Phytogeographical Distribution

Phytogeographic point of view, Western Himalaya region is comprises with the Indian states Jammu & Kashmir, Ladakh and Himachal Pradesh. This chapter intended to study the wide range of plant reserves in Jammu and Kashmir region exploited by native tribes for curative properties against numerous disorders and their socio-economical aspect. Jammu, Kashmir valley, and Ladakh union territories in the Western Himalayas cover a region of 2, 22,236 km^2, which is 6.76% of the geographical area of the country. Its elevation varies from 327 to 8611 meters to the sea level (Sharma et al. 2012a, b). Commonly referred as Terrestrial Paradise on Earth (Malik et al. 2011), the valleys of the Himalayas in Kashmir is furtherdistributed into 10 districts with a total region 15,948 km^2, formed by the rope chain of Pir Panchal Mountains of the Lesser Himalayas in the south, Zanskar range in to the south east and Western part of the Greater Himalaya (Dar and Khuroo 2013). The vegetation and species of forest can be classified into 4 groups: alpine

Table 11.1 Phytochemical constituents and traditional uses of Western Himalayan medicinal plants

S. No	Name of Plant with Family	Major Chemical Constituents	Traditional Uses	References
1	*Abies pindrow* (Pinaceae)	**Triterpenoid (pindrolactone)**: Ianosta-7,9(11)-dienes **flavonoids (chalcones)**: Okanin, Okanin-4′-b-d-glucopyranoside, Butein-4′-b-d-glucopyranoside, 2′,3′,4′,3,4-Pentahydroxychalcone-4′-1-arabinofuranosyla-1,4-b-d-glucopyranosid**carbohydrate**: Tricosane, Eicosane, Heneiocosane, Docosane, Tetracosane, Nonadecane, Octadecane, 1-Docosene, Heptadecane, 1-Octadecene, Tetramethylhexadecane **Fatty acids**: n-Tetradecanoic acid, 14-methyl-hexadecanoic acid, n-Pentadecanoid acid, 14-methyl-hexadecanoid acid, 16-methyl-heptadecanoic acid, Cis-9 Octadecenoic acid, 5,9-Octadecadienoic acid, Cyclopentane Undecenoic acid, 17-methyl-octadecanoid acid, Docosanoic acid, Tetracosoic acid. **Other**: Pinitol	Antidiabetic, antiulcerogenic, anti-inflammatory, analgesic, antispasmodic, remedy for fever, asthma, bronchitis, carminative, expectorant, cough, bronchitis, headache, hypoglycemic activity, increases appetite, dyspepsia	(Majeed et al. (2013); Sinha (2019); Singh et al. (2000)
2	*Achillea millefolium* (Asteraceae)	**Flavonoids**: Cynaroside, cosmosiin, casticin, centaureidin, apigenin, luteolin, artemetin, rutin, 1,8-cineole, quercetin, artemetin **Phenols**: Thymol, carvacrol, caffeic acid, salicylic acid, pyrocatechol,	Spasmodic gastrointestinal disorders, hepatobiliary, gynecological disorders, anti-inflammatory, wound healing, gastric problems, fever, hemorrhoids, diuretic, sedative, appetite enhancer, skin inflammation, diaphoretic,	Akram (2013); Ali et al. (2017)

		chlorogenic acid **Sesquiterpenoids:** Achimillic acids A, B, and C. **Oxygenated monoterpenes**: Camphor, borneol **Hydrocarbon monoterpenes**: Camphene, limonene, α-pinene, β-pinene, **Oxygenated sesquiterpenes**: Bisabolol, **Sesquiterpene hydrocarbon--s**: Germacrene-D, **Prozaulenes**: Chamazulene.	gastritis, diarrhoea, stop bledding, snake bite, tuberculosis.	
3	*Aconitum ferox (Ranunculaceae)*	**Alkaloids -** Aconitine, Pseudoaconitine, Chasmaconitine, Indaconitine, Hypoaconitine, Mesoaconitine, etc. **Flavanoids-** Clovin, robinin **Free fatty acids**	Body pain, diabetes, debility, asthma, ear and nose discharge, leprosy, Paralysis, rheumatism, and typhoid. Diaphoretic, diuretic, expectorant, Febrifuge, and dyspepsia.	Deore et al. (2013); Tamilselvan et al. (2014)
4	*Aconitum heterophyllum (Ranunculaceae)*	**Alkaloids –** Diterpenoid, **Flavonoids -** kaempferol and quercetin, phenylpropanoids, phenolics, and acids, **Terpenoids -** atisenol, Steroids, free fatty acids (FFAs), and polysaccharides	Expectorant, anti-inflammatory, diuretic, hepatoprotective, antipyretic and analgesic, antioxidant, alexipharmic, Anodyne, anti-atrabilious, anti-flatulent, anti-periodic, Anti-phlegmatic, and carminative propertet aies.	Paramanick et al. (2017); Yin et al. (2019)
5	*Arnebia benthamii (Boraginaceae)*	**Naphthaquinones** - Acetylalkannin, β, β- dimethylacrylalkannin, β-hydroxyisovalerylalkannin, **Benzoquinones**,	Free radical scavenging activity, antioxidant and cytotoxic activity, antimicrobial activity, hepatotoxic activity, antiseptic, antibacterial,	Hosseini et al. (2018)

(continued)

Table 11.1 (continued)

S. No	Name of Plant with Family	Major Chemical Constituents	Traditional Uses	References
		Alkaloids, **triterpenoids, steroids, and flavonoids**. **Essential oil**- Arnebinus. **Others-** artemidiol, hoslundal, shinkonin, ganoderiol, and 2-hexaprenyl-6-hydroxyphenol	antifungal and anti-inflammatory, diuretic and expectorant	
6	*Artemisia annua L. (Asteraceae)*	**Sesquiterpenoid artemisinin -** artesunate, artemether, arteether **Flavonoids-** artemetin, rutin, quercetin, casticin, eupatin, luteolin and their glucosides **Coumarins-** scopoletin **Essential oils-** cineole, camphene, a-pinene, germacrene, camphor, and ketone. **Others –** Phenolic acids, polysaccharides, and saponins, Phytosterols, potassium, selenium, gallium, bicarbonates, and nitrates.	Antihemorrhage, diarrhea, anemia, damp summer heat with nausea, intense fever, stifling sensation in chest, malaria, asthma, eye infections, bronchitis and sore throat, cholera, dengue fever, lupus erythematosus, Athlete's foot and eczema, Chagas disease, Schistosomiasis, viral hepatitis, chills and fever, skin disease, parasitic disease.	Koul et al. (2017); Mesa et al. (2015)
7	*Artemisia dracunculus L. (Asteraceae)*	**Flavonoids -** 5,6,7,8, 40 pentahydroxymethoflavone estragoniside 7-O-β-D-glycopyranoside 5,7-dihydroxyflavavone pinocembrin, 7-O-β-D-glucopyranoside, luteolin, quercetin, rutin, kaempferol, annangenin 5,7-dihydroxyflavone, naringenin, 3,5,40 trihydroxy-7-methoxyflavanone, 3,5,4 -trihydroxy-	Improve a malfunctioning digestive system by increasing appetite, to flush toxins from the body, and as a digestive stimulant, insomnia, anesthetic for aching teeth, sores, and cuts. Antiepileptic, laxative, antispasmodic, and carminative remedy	Aglarova et al. (2008)

		7,30-dimethoxyflavanone 20,40 -dihydroxy-4-methoxydihydrochalcone davidigenin sakuranetin **Phenylpropanoids-** chicoric acid, hydroxybenzoic acid (E)-2-hydroxy-4-methoxycinnamic chlorogenic acid caffeic acid 5-O-caffeoylquinic acid 4,5-di-O-caffeoylquinic acid. **Chromones/coumarins-** (−)-(R)-20-methoxydihydro-artemidin, (+)-(S,R)-epoxyartemidin dracumerin, (+)-(R)-(E)-30-hydroxyartemidin, capillarin isovalerate, 7,8-methylenedioxy-6-methoxycoumarin γ,γ-dimethylallyl ether of esculetin, scopoletin, scoparone, daphnetin methylene ether, daphnetin 7-methyl ether, artemidiol **Alkamides**- pellitorine, neopellitorine A, neopellitorine B		
8	*Asparagus racemosus (Liliaceae)*	**Isoflavones, polysaccharides, and Steroidal saponins-** Shatavarin I-IV, **Others-** 8-methoxy-5, 6, 4′-trihydroxyisoflavone 7-O-beta-D-glucopyranoside. Asparagamine, Racemosol, 9, 10-dihydrophenanthrene), Shatavaroside, Secoisolariciresinol Shatavari	**Roots-**Galactagogue, estrogenic, Antioxytoxin Immunomodulators, Antidyspepsia, Antiallergic, anticancer, Anti-inflammatory, antidiabetic, antioxidant, antitussive, Hepatoprotective, antibacterial, antiulcer, anti-diarrheal, Antilithiatic **Leaves-**cholinesterase, Antiparasitic. **Shoots-**Antiinflamatory, antidiabetic,	Alok et al. (2013); Singh et al. (2018)

(continued)

Table 11.1 (continued)

S. No	Name of Plant with Family	Major Chemical Constituents	Traditional Uses	References
			and diuretic. Whole plant-antimicrobial and cytotoxic, Nephroprotective, Hepatoprotective **Aerial parts** urolithiasis, Hypolipedimic, Antiasthmatic, and Antifertility **Seeds**-Antiparasitic **Flower**-diuretic	
9	*Bergenia ciliata* (Saxifragaceae)	**Phenol**: Bergenin, tannic acid, gallic acid, catechin, Alcohol: **Volatile organic compound**: Glucoside-2-pentanone, 2,4-dimethyl-3-pentanone, hexanal, 2-methyl-1-propanol, acetic acid, hexanol, **Terpenoids**: Camphor, limonene, linalool, β-phellandrene, α-terpineol, β-caryophyllene. **Fatty acids**: Decanoic acid, nonanoic acid methyl ester, 2-methyl butanoic acid. **Sterol**: β-sitosterol, **Glycosides**: Arbutin, Leucoanthocyanidin-4-(2-galloyl) **Flavonoids**: Afxelechin, quercetin-3-o-β-D-xylopyranoside, quercetin-3-o-α-L-arbinofuranoxide glycosides, **Carboxylic acids**: Pentanoic acid,	Gastrointestinal, skin diseases, renal/urinary disorders, muscular/skeletal disorders, respiratory diseases, fever, eye diseases, oral infections, worm infections, gynecological disorders, ENT, fever, cancer, stomach diseases, kidney stone	Ahmad et al. (2018); Kumar and Tyagi (2013); Yousaf et al. (2018)

		hexanoic acid, hexalactone, **Nitro compounds**: 2-notropropane		
10	*Bunium persicum* (Apiaceae)	**Essential oil:** Hydrocarbon monoterpenes, oxygenated monoterpenes, sesquiterpenes: γ-terpinene, cuminaldehyde, α-terpinene-7-al, caryophyllene, γ-terpinene-7-al, p-cymene, limonene, β-pinene, α-terpinene, camphor, terpinolene, cumin alcohol, 2-carene-10-al. **Carbohydrates**: Glucose, fructose, mannitol, sucrose, raffinose, pectin, hemicellulose. **Fatty acids**: Linoleic acid, octadecanoic acid, palmitic acid, petroselinic acid, 8,11,14-eicosatrienoic acid. **Phenolic compounds**: Caffeic acid, p-coumaric acid. **Flavonoids**: Kaempferol **Others:** Caryophyllene, gamma-terpene, cuminyl acetate, cuminaldehdye, gamma-terpene-7-al, trans-3-caren-2-ol, acetic acid, methatriene, p-cymene, cuminyl acetate, limonene.	Stimulant, carminatives, remedy for abdominal and colic pain, joint pain, tuberculosis, hiccup, hemorrhoids, antidiarrheal, dyspepsia, stomachache, fever, cold, headache, flatulence, heart problems, asthma, abdominal pain, diuretic, anticonvulsant, liver and kidney tonic, antihelmintic, toothache, eye diseases.	Bashir et al. (2014); Majidi et al. (2020); Shah et al. (2019)
11	*Costus speciosus* (Zingiberaceae)	**Saponins -** sapogenin, diosgenin, steroids, tigogenin**alkaloids**, sitosterol-β-D-glucoside, dioscin, α-tocopherol, 5α-stigmast-9(11)-en-	Antidiabetic activity, Hypolipidemic activity, hepatoprotective, antifertility, antioxidant activity, and antifungal	Bahshwan and Aljehany (2020); Pawar and Pawar (2014); Srivastava et al. (2011)

(continued)

Table 11.1 (continued)

S. No	Name of Plant with Family	Major Chemical Constituents	Traditional Uses	References
		3β-ol, prosapogenins A and B of dioscin, quinones, curcumin, gracillin, tricontanol, and tricontanoic acids, **acids-** oleic acid, linoleic acid, palmitic acid, stearic acid, and arachidic acid **Quinines-** dihyrophytilplastoquinone and its methyl derivatives including α-tocopherol quinone.**Sesquiterpene-** costunolide	activity. Various traditional uses are in rheumatism, Bronchial asthma, leprosy, and cardiotonic.	
12	*Curculigo orchioides (Amaryllidaceae)*	**Saponins –** Curculigenin A,B,C,K,L, M**phenolic compounds-** Curculigol, Curculigoside A,B, C, E & D, Xylopyranosyl-B-glyconoside, 25-Hydroxy-33-methyl pentatriconta-6-one, Orchioside A & B, 2,6-dimethoxy benzoic acid **Esters-** n-decan-3-olyl pent-3′-en-1′-oate, n-hexadec-9, 11-dienyl cinnamate, n-tridecanyl-hex-2′, 4′-dien-1′-oate, n-heneitriacont-13-en-5, 10 diol, hex-2′-en-1-oate	Adaptive activity, Immunostimulatory effect, Antiosteoporotic activity, vasoconstrictor activity, taste-modifying and sweet-tasting activities, estrogenic activity and the effect on sexual behavior, antioxidant activity, mast cell stabilization, antihistaminic activities and antiasthmatic activity, Hepatoprotective activity, neuroprotective effect, antibacterial activity, anti-inflammatory activity	Chauhan (2010); Kumari and Singh (2017); Nie et al. (2013)
13	*Curcuma zedoaria* (Zingiberaceae)	**Phenolic compounds –** Curzerenone, 1,8 cineole, Germacrone, cymene, a-Phellandrene, b-Eudesmol **Terpenes-** monoterpene hydrocarbon, oxygenated monoterpene, Sesquiterpene hydrocarbon, oxygenated sesquiterpene	Antiangiogenic activity, Antitumor activity, hypoglycemic activity, anti-gingivitis activity, Anti-inflammatory activity, activity, antifungal activity, insecticidal effect, Larvicidal effect. Antioxidant acitivity.	Dosoky and Setzer (2018); Lobo et al. (2009)

		Volatile oil- Epicurzerenone, Curzerene		
14	*Digitalis purpurea* (Plantaginaceae)	**Cardenolides:** Aglycone digitoxigenin, aglycone gitoxigenin, gitoxin, gitaloxigenin, glucogitaloxin, glucoverodoxin, diginin, digitalonin, digipurpurin	Used to treat ulcers, headaches, paralysis, boils, abscesses, external wounds. And it is also a life-saving cardiac drug.	Al-Snafi (2017)
15	*Ephedra geradiana* wall. (Ephedraceae)	**Alkaloids:** Ephedradine A,B,C,D, pseudoephedrine, norephedrine, methylephedrine, transtorine, kynurenic acid, ephedralone. **Flavonoids:** Herbacetin, kaempferol, quercetin, rutin, pollenitin, dihydroquercetin, catechin, epicatechin, hesperidin, tricin, luteolin, vitexin. **Tannins:** Ephedrannin **Lignans:** Syringaresinol, Sesquipinsapol B **Esters:** Ethyl caprylate **Phenolic acids:** Nebrodenside A, B, syringing, vanillic acid, caffeic acid, chlorogenic acid, physcion, rhein.	Hay fever, rheumatism, asthma, rashes originating out of allergy	Anonymous (1989); Zhang et al. (2018)
16	*Gloriosa superba* (Colchicaceae)	Conigerine, cholidonic acid, 3-demethyl colchicines, luteolin and its glucosides, lumicolchicine, colchicines, β-sitosterol.	Abortifacient, antipyretic, cure STD's, anthelmintic, expectorant, emetic, purgative, stomachic, treats dyspepsia, debility, hemorrhoids, anti-rheumatic, anti-asthamatic	Kavina et al. (2011)
17	*Hedychium spicatum* (Zingiberaceae)	α-Pinene, 1,8-cineole, 2-alkanones, linalool, camphor, limonene, β-pinene, linalyl acetate, γ-cadinene, terpinolene, benzyl cinnamate, lindylacetate, methyl	Anti-microbial, laxative, stimulant, stomachic, vasodilator, expectorant, emmenogogue, carminative, anti-pyretic, diarrhea, indigestion, asthma,	Sravani and Padmaa (2011)

(continued)

Table 11.1 (continued)

S. No	Name of Plant with Family	Major Chemical Constituents	Traditional Uses	References
		paracumarin acetate, β-phellandrene, p-cymene, d-sabinene, spicatanoic acid, spictanol, spicatanolmethyl ether.	bronchitis, used as a dye and in female impotency.	
18	*Hippophae rhamnoides* (Elaeagnaceae)	Oleanolic acid, 19-α-hydroxyursolic acid, 5-hydroxymethyl-2-furancarboxaldehyde, octacosanoic acid, 1-O-hexadecanolenin, ursolic acid, dulcioic acid, cirsiumaldehyde, palmitic acid.	Digestive tonic, abdominal dysfunctions, amenorrhea, expectorant, cough suppressant, anti-inflammatory, herbal remedy for ulcers, eczema, vulvitis, colon ulcers, trophic ulcers, wounds, colpitis, proctitis, anti-microbial, heral treatment for influenza	Panossian and Wagner (2013)
19	*Juglans regia* (Juglandaceae)	**Phenolic compounds:** Gallic acid, syringic acid, ellagic acid, caffeic acid, ferulic acid, p-coumaric acid, sinapic acid **Tannins:** Glansrins A, B, and C, stenophyllarin, casuarinin **Diarylheptanoides:** Juglanin A,B,C, sclerone Hydrocinnamic acid, palmitic acid, oleic acid, stearic acid, erucic acid, mono and polyunsaturated fatty acids.	Used for hyperhidrosis, ulcers, diarrhea, anti-microbial, astringent, chemoprotective, dysentery, aphrodisiac, brain tonic, constipation, wound healing property, arthritis, toothaches, skin diseases.	Al-Snafi (2018)
20	*Junipers communis* (Cupressaceae)	**Flavonoids:** Rutin, apigenin, luteolin, quercitrin, nepetin, scutellarein, bilobetin, bioflavones **Volatile oil:** α-pinene, myrcene, limonene, myrcene, glycolic acid, camphene, β-pinene, dihydrojunene, cadinene, camphor	Used as carminative, diuretic, digestive, anti-inflammatory, sudorific, emmenagogue, urinary antiseptic, stimulant. Used for rheumatism, infantile tuberculosis, piles, nephritic dropsy, gonorrhea, asthma, cough, chronic pyelonephritis, skin disorders.	Bais et al. (2014)

		Coumarins: Umbelliferone **Bicyclic Diterpenes:** Isocupressic acid, junicedral, imbricatolic acid, lignin deoxypodophyllotoxin, aryltetralin, 7α-hydroxysandaracopimaric acid.		
21	*Leucas aspera* (Lamiaceae)	Oleanolic acid, 3-sitosterol, ursolic acid, galactose, leucasperones A, B, maslinic acid, asperphetamate, nectandrin B, linifolioside, acacetin, macelignan, apigenin, chrysoeriol, u-farnesene, x-thujene, menthol, isoamyl propionate, linoleic acid, palmitic acid, oleic acid, linolenic acid, 3-ceryl alcohol, 3-sitosterol	Diaphoretic, stimulant, laxative, stimulant. Treats asthma, bronchitis, jaundice, dyspepsia, psoriasis, scabies, cough, cold, anti-malarial, anti-pyretic	Das et al. (2012a, b)
22	*Meconopsis aculeata* (Papaveraceae)	Phenols, phlobatannins, phytosterols, terpenoids, flavonoids, cardiac glycosides, alkaloids, carbohydrates.	Narcotic, febrifuge, analgesic, anti-inflammatory, cooling potency	Ahmad et al. (2016)
23	*Nardostachys jatamansi* (Valerianaceae)	Jatamansone, angelicin, alpha-patchoulense, β-atchoulense, β-eudesemo, β-sitosterol, elemol, calarene, n-hexacosanyl, oroselol, jatamansone, jatamansinol, valeranal, patchouli alcohol, nardostachone, seychelane, valeranal, valeranone, nardostachnol	Induces sleep, brain tonic, rejuvenative to the mind, digestive, alleviates mental dysfunctions, ceases burning sensations, stimulates hair growth, benefits complextion.	Purnima et al. (2015)
24	*Ocimum basilicum* L. (Lamiaceae)	**Monoterpene hydrocarbons:** Camphene, limonene, myrcene, sabinene, thujene, borneol, camphor, carvacrol, estragol, eugenol, fenchone, geraniol, linalool, nerol. **Sesquiterpene hydrocarbons:** Cadinene, germacrene A,B,D,	Treats cough, constipation, headache, diarrhea, kidney disorders, warts.	Sarfaraz and Faizal (2011)

(continued)

Table 11.1 (continued)

S. No	Name of Plant with Family	Major Chemical Constituents	Traditional Uses	References
		isoledene,δ-selinene, valencene **Triterpene:** Betulin, alphitolic acid, pomolic acid, oleonolic acid, ursolic acid, basilol, ocimol. **Flavonoids:** Quercetin, isoquercetin, kaempferol, rutin. **Polyphenols:** Rosamarinic acid, chicoric acid		
25	*Panax pseudoginseng* (Araliaceae)	**Saponins:** Prosapogenins, prosapgenin, ginsenosides, aglycones, 3-dammarane saponins. **Polysaccharides:** Poly furanosyl-pyranosylsaccharides, quinquefolans A, B,C **Others:** Polyacetylenes, Panaxydol, panaxynol, kaempferols.	Promotes vitality, improve physical performance, enhances resistance towards aging and stress, and causes immunomodulation.	Kim (2012)
26	*Picrorhiza kurroa* (Plantaginaceae)	**Iridoid glycosides**: Picroside I, II, III, IV, cucurbitacins (B,D,R), kutkoside **Flavonoids**: Vanilic acid **Carbohydrates**: D-mannitol Aromatic acids: Vanillic acid, cinnamic acid, ferulic acid **Others**: Veronicoside, 4-hydroxy-3-methoxy acetophenone, pikuroside, drosin, apocyanin	Stomachaches, antipyretic, to cure colds and cough issues, diarrhea, jaundice, dysentery, hepatic injuries, eye, blood, lung, metabolic disorders.	Arya et al. (2013); Kumar et al. (2013); Mulliken (2000); Salma et al. (2017); Sharma et al. (2012a, b)
27	*Piper longum* (Piperaceae)	**Alkaloids**: Piperine, piperlonguminine, piperlongumine, dehydropipernonaline, cepharadione A, norcepharadione A,	The long and pungent flavored pepper helps in provoking phlegm. Also it has potential to increase semen. It also is	Das et al. (2012a, b); Dutta et al. (1975); Liu et al. (2009); Mustafa et al. (2010); Varughese et al. (2016)

		cepharanone B, aristolactam AII, tetrahydropiperine, piperolactam A, tumerone, aphanamol, coumaperine, demethoxycurcumin, bisdemethoxycucurmin, pipercide, pellitorin, retrofractamide C, guineesine, piperloein B, dehydrofractamide C, pipyahyine **Lignans**: Sylvatin, diaeudesmin, sesamin **Essential oils**: α-pinene, myrcene, limonene, sabinene, δ-3-carene, a-copaene, 6-elemene, p-caryophyllene, o-elemene, 9-octadecene, 6-cadinene, p-selinene, caryophyllene oxide, eucalyptol, trans-ocimene, terpinyl acetate, heptadecane, β-phellandrene, δ-cadinol. **Flavonoids**: Luteolin, catechin, quercetin, kaempferol, naringenin, apigenin, epicatechin, myricetin. Amides: Sarmentine	used as antidote for hemlock and serves in people suffering from suffocation. It is capable of serving as a stimulating tonic. Its medicinal properties help in treating digestive ailments. It also serves as an important medicine in bronchitis, rheumatism, fever, leprosy, parasitic infections, and spleen dysfunctions.	
28	*Plantago ovata* (Plantaginaceae)	**Carbohydrates**: Glucose, xylose, fructose, rhamnose, sucrose, planteose, arabinose, galacturonic acid, galactose, raffinose, stachyose, galactoarabinan, galactan, plantaglucide, glucomannan **Lipids**: Arachidic acid, 9-hydroxy-cis-11-octadecenoic acid, palmitic acid, triterpene acids, oleanolic acid, ursolic acid **Alkaloids**: Indicain, plantagonin	Hypnotic, stimulant, in toothaches, antihelmintic, antimalaria, as an antidote to snake poison, as an anti-tumor agent, ailing skin burns, acne, bee stings, bruises, leishmaniasis, dermatitis, emollient, for pulmonary diseases, dysentery, urinary tract infections, diuretic, stimulant.	Ahmad et al. (1980); Bakker et al. (1998); Yokozawa et al. (1997); Yuting et al. (1990)

(continued)

Table 11.1 (continued)

S. No	Name of Plant with Family	Major Chemical Constituents	Traditional Uses	References
		Caffeic acid derivatives: Ethyl and methyl esters of caffeic acid, chlorogenic acid, neochlorogenic acid, plantamajoside, plantamajoside, acteoside **Flavonoids**: Luteoin-7-glucoside, hispidulin-7-glucuronide, luteolin-7-diglucoside, apigeni-7-glucoside, luteolin-6-hydroxy-4′-methoxy-7-galactoside, plantaginin, homoplantaginin, baicalein, hispidulin Iridoidglycosides: Asperuloside, aucubin, catapol, gardoside, geniposidic acid, majoroside, 10-actoxymajoroside, 10-hydroxymajoroside, melittoside Terpenoids: Glycyrrhetinic acid, sitosterol		
29	*Podophyllum hexandrum* (Berberidaceae)	Podophyllotoxin, podophyllin, lignans, epipodophyllotoxin, aryltetrahydronaphthalene lignans, podophyllotoxone **Flavonoids**: Quercetin, quercetin-3-glycoside, kaempferol, podophyllotoxin glycoside, kaempferol-3-glucoside **Lignans**: 4′-demethyl podophyllotoxin, podophyllotoxin-4-O-glucoside	Resin: Purgative, tumor necrotizing property. Roots, rhizomes and fruits: Anti-cancer, for treatment of ulcers, skin wounds and cuts, hepatic dysfunction, TB and gastric related issues. Whole plant: Cholagogue, cytostatic. For treatment of neoplasms and skin warty lesions, dermatological infections, inflammatory conditions of skin. Anti-malarial, anti-fungal and	Haddadian et al. (2014); Kamil and Dewick (1986); Sarfraz et al. (2017)

			anti-pyretic activities. Roots: Anti-rheumatic.	
30	*Potentilla fulgens* (Rosaceae)	**Triterpenoids:** Fulgic acid A, Fulgic acid B **Polyphenolic compounds**: Afzelechin, Epiafzelechin, catechin, epigallocatechin, epicatechin, epigallocatechin, catechin (4α-8) epicatechin, afzelechin (4β-8), epicatechin, epiafzelechin (4β-8) epicatechin **Phenolic compounds**: Ellagic acid, kaempferol, quercetin	Anti-diarrheal property. Used to treat high blood pressure. Astringent and tonic. Roots are used for wound treatment. Stomachic and aphthae. Some regions use it for curing peptic ulcer	Bhattari (1993); Choudhary et al. (2017); Rosangkima et al. (2010)
31	*Rheum emodi* (Polygonaceae)	**Anthraquinones with carboxyl group**: Rhein **Anthraquinones without carboxyl group**: Aloe-emodin, emodin, chrysophanol, physcion, emodin glycoside, chrysophanein **Alkyl derivatives of anthraquinones**: 6- methyl aloe emodin, 6-methyl rhein **Anthrone-C-glucosides**: 10-hydroxycascaroside D, 10-hydroxycascaroside C, cascaroside D, cascaroside C, 10R-chrysaolin-1-O-β-D-glucopyranoside, cassialoin. Tannins and condensed tannins Flavone derivatives: Catechin, leucocyanidin	Purgative, stomachic, astringent, diuretic, emmenagogue, aperients. Root: Expectorant, appetizer. Anti-inflammatory, alexentric, anti-dysentry	Aslam et al. (2012); Malik et al. (2010); Ye et al. (2007)

(continued)

Table 11.1 (continued)

S. No	Name of Plant with Family	Major Chemical Constituents	Traditional Uses	References
32	*Rubia cordifolia* (Rubiaceae)	Glycosides: 1-hydroxy-2-methoxy anthraquinone, rubiadin, 3-dimethoxy-2-carboxy anthraquinone, ruiearbonls, rubiprasin A,B,C Triterpenoids: Aborane triterpenoids Mangistin, alizarin, mollugin, furomollugin, garancin. Anthraquinones: Purpurin, pseudopurpurin, munjistin New anthraquinones: 2-hydroxy-6-methyl anthraquinone, 1-hydroxy-2,7-dimethyl anthraquinone, 1-hydroxy-2-methyl anthraquinone, 2,6-dihydroxy anthraquinone, physcion, nordamnacanthal, 1,4-dihydroxy-2-methyl anthraquinone, 1,4-dihydroxy-6-methyl anthraquinone, 1,5-dihydroxy-2-methyl anthraquinone, 1,4-napthoquinone, 3-prenyl methoxy-1,4-napthouinone, rubiadin Anthracene derivatives: Rubiasins A-C	Ailing skin diseases as well as in the disorders related to the spleen, healing major skin burns, fractured bones and ulcers, antitussive, antipyretic, protective effect against hemorrhages, abnormal uterine bleeding, rheumatism, bronchitis, kidney and gall bladder stones, dysentery, styptic, diuretic, expectorant and astringent.	Kannan et al. (2009); Pandey et al. (2007)
33	*Saussurea costus* (Asteraceae)	**Terpenes:** Costunolide, Dihydrocostunolids, Dihydrocostus lactone, Dehydrocostus lactone, 12-methoxy dihydrocostus lactone, α-cycloCostunolide, β-cycloCostunolide, Lappadilactones, β-hydroxyDehydrocostus, Cynaropicrin, Betulinic acid, Betulinic	Antispasmodic activity, asthmatic conditions, skin disorders, cholera, cough remedy, leprosy, ailing stomach issues, typhoid fever, snake repellent, for insence purposes.	Pandey et al. (2007)

		acid methyl ester, Mokko lactone, Saussureal **Sesquiterpenoids and its dihydro derivatives:** β-sitosterol, 12-methoxy dihydroCostunolide, aplotoxin, costol, α and β-costenes, betulin, stigmasterol, Costusic acid, β-elemence. Other constituents also contain flavonoids glycosides, and glucofructans.		

sub-alpine zone, temperate coniferous forest, and moderately broad-leaved forests. Work has been conducted on several tribes such as Gujjar, Bakarwal, Kashmiri, Pahari, and Boto in western region of Himalayas in India (Champion and Seth 1968; Singh and Bedi 2017).

11.2.1 Forest Collection Season

Collection of plants from forests that are edible varies from the month of May to August, being suitable for juvenile leaves, roots, and tubers; and from the month of August to October being suitable for the fruits and seeds. During cold season, the plants mostly perish owing to the heavy snow-fall in high elevation areas; hence, the natives dry edible parts and store them for their consumption during the wintertime.

11.3 Economic Significance of Wild Edible Plants

Over the past four-five decade studies, established the wild florae consumed by tribals happen to provide a suitable source of low cost nutrient content and herbal medicines, still demand popularization and recommendation for marketing purpose (Murugkar and Susbulakhmi 2005; Maikhuri 1991). It has been established that edibles from wild play a significant part in the rural progress in the central Mountains of Himalaya. People settled in the high altitude areas have restricted opportunities to earn money for their day-to-day necessities, due to low agricultural and industrial growth, poverty, and unemployment, majority of peoples are sidelined and survive on existence level (Rakesh et al. 2004). Ladakh plateau and Gilgit district of Kashmir, areas are characterized by mild summer to severely cold winter. The average annual temperature is 8 °C and annual rainfall is less than 150 mm. (Singh 2006). In the central part of west-Himalayas, florae is the primary basis of economy and health security. Nevertheless, the knowledge about traditional usage of plants as medications from the central parts of west-Himalaya such as Chhota Bhangal has not been acknowledged yet. It is pristine area with around 3500 plants described, out of which 500 plants are supposed to be of medicinal value (Chowdhery 1992). Chhota Bhangal is rich in moist temperate forests of Himalaya with some of *Quercus* species being dominant. Whereas, dry temperate forests of Himalaya lead with *Cedrus deodara* combined with certain additional species of trees like *Abies pindrow*, *Betula utilis, Picea smithiana,* and *Rhododendron campanulatum* forming the tree line. This area is also rich with canopy layer, viz. *Berberis lycium*, *Viburnum nervosum,* and *Prinsepia utilis*. Bhangalis represent a tribal community of this areafollow the religion of Hinduism and are extremely fearful of God. Owing to isolation and shortage of modern-day health amenitiesdependency by local tribes on florae for treatment is extremely elevated (Uniyal et al. 2006). *Podophyllum hexandrum* is an endangered species and export of parts and derivatives of plant are prohibited from India under CITES except for the formulation based products. However, artificially raised species are not

prohibited. Existing annual supply is less in comparison to 50–80 tonnes in 1970 and approximated rate per kg is Rs 60. Owing to growing marketable requirement for PPT, abstraction of *P. hexandrum* has adversely disturbed its wild inhabitants over the previous 20 years (Gupta and Dutta 2011; Lv and Xu 2011). The dried root of *Saussurea costus* was available as wild plant since 1920s. Its dried roots present value is Rs 150 per kg. Indian market required approximated 100–200 MT annually. Conversely, international market is even in larger demand. This is presented as an extremely economically potential crop in Western Himalaya. Phytoconstituents and traditional uses of some important plants of western Himalayan are tabulated under Table 11.1.

11.4 Conclusion

This chapter deduces that various parts of the wild plants are exploited as food and medication by the tribes of western Himalaya, which supports their existence. The most commonly exploited parts comprise stems, leaves, tubers, and fruits. Appropriate conservation and harvesting methods if employed for wild plants in this region might be the basis of extra revenue for the residents. Amid increasing requirement for bioceuticals of natural origin, wild plants that are edible have fascinated worldwide attention as they can act as a source of several micronutrients and active pharmacological ingredients. However, owing to steadfast revolution and urbanization, the conventional knowledge on the usage of plants is endangered. Consequently, there is a critical requirement to manuscript the conventional information allied with a specific tribe or else such customs and ethnic information would be vanished persistently. The efforts of tribal populations to safeguard must be acknowledged and both on-site and off-site conservation of critical documented plant species of wild origin must be rejuvenated.

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