



## RESEARCH PAPER

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## Ethnomedicinal Exploration of Tracheophytes of Hangrai, District Mansehra, Khyber Pakhtunkhwa, Pakistan

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### Abstract

The ethnomedicinal exploration was conducted in the area of Hangrai which falls in Tehsil Balakot of District Mansehra. Balakot is located between 34°33'N 73°21'E Latitude and 34°33'N 73°21'E Longitude. It is the gateway to Kaghan valley of the Northern Pakistan. The study area harbors rich ethnobotanical resources being the part of Western Himalaya. Extensive field visits were made in the study area during years 2015 and 2016. Data was collected from aboriginal peoples by questionnaire method comprising of open-ended and close-ended interviews. Three hundred informants (180 male and 120 female) were interviewed for various medicinal uses of plants. A total of 143 plant species belonging to 70 families were recorded which were used as medicinally by the local rural inhabitants. Habit wise categorization of plants showed 73.33% herbs, 16% trees and 10.66% shrubs. This study first time not only revealed unique ethnomedicinal uses of plants but also side effects of traditional herbal remedies. Furthermore this study will help to discover novel drugs from medicinal plants and it will also set guidelines for conservation of local flora.

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## Introduction

Hangrai is situated in Tehsil Balakot of Lower Khaghan valley. This area shows rich plant biodiversity with hub of many endemic species. Ecologically, the area is divisible into sub-tropical, moist temperate and sub-alpine zones (champion *et al.*, 1965). The highest peak of the study area is Mossa-ka-Musallah at an altitude of 12000 feet. Plants are an important source of traditional medicines for the treatment of various diseases (Bako, 2005). Approximately 4,22,000 flowering plants documented around the globe, more than 50,000 have been used worldwide medicinally (Walter and Hamilton, 1993) and from Pakistan 6000 plants have been reported among which only 600 plants have been accounted for ethnomedicinal studies (Shinwari *et al.*, 2003). It has been estimated that herbal medicines are used by more than 80% of the world's population in developing countries to meet their primary healthcare needs (WHO, 2002). According to a report of the World Health Organization, over three-fourths of the World population cannot afford allopathic medicines and have to depend on the use of traditional medicines of plant origin. In the context of modern health care system, it is imperative to explore some alternate therapies for the treatment of different ailments, especially for common disorders (Baquar, 1989). Presently, the ethnomedicinal information of indigenous plants has attained prime importance in scientific researches (Heinrich, 2000). Medicinal plants got attention due to higher prices of allopathic (Hoareau and Da Silva, 1999).

A number of researches have also been conducted on ethno medicinal resources of Pakistan (Farooq, 1990, Hussain and Khaliq, 1996, Shinwari & Khan, 1999; Gilani *et al.*, 2001; Siyal, 2003, Sher and Hussain, 2007, Shah, 2007; Baquar, 1995; Qureshi *et al.*, 2008, Abbasi *et al.*, 2010, Hazrat *et al.*, 2011; Noor & Kalsoom, 2011; Shaheen *et al.*, 2012, Shah *et al.*, 2012, 2013; Akhter *et al.*, 2013; Shah *et al.*, 2013; Saqib *et al.*, 2014; Ahmad *et al.*, 2015; Shah *et al.*, 2015) but none of these researches documented the side effects of local herbal therapies.

This study is based upon ethno-medicinal uses of plants in context of indigenous uses. As the study area is remote having conserved and aboriginal culture so, a large section of the community dependent upon natural resources especially plants. The local wisdom was interrogated regarding uses of plants and their products.

This study is aimed to analyze the traditional knowledge of most commonly used medicinal plants of unique to study area Hangrai. Moreover, it is first ever attempt to document the side effects of ethnomedicinal flora.

## Materials and methods

### *Field and Data Collection*

For this ethnomedicinal analysis a comprehensive and frequent field trips were made during 2015-2016. The local wisdom was interrogated by interviewing shepherds, local herbalists (Hakeems) and household women. Both open-ended and close-ended interview patterns were used in this work.

### *Identification and preservation*

During field visits, plant specimens were collected, pressed, dried, poisoned and mounted on standard sized Herbarium sheets. The specimens were preliminary identified by matching with already identified specimens of Department of Botany, GPGC, Mansehra, Pakistan. The identification was authenticated with the help of Flora of Pakistan (Nasir and Ali, 1970-1989; Ali and Nasir, 1990-1991; Ali and Qaiser, 1993-2001). The identification was further updated with the help of online data sources. The voucher specimens were deposited in the Herbarium of Department of Botany, GPGC, Mansehra.

### *Data Analysis*

The data collected was statistically analyzed using common office software.

## Results

The results of this detailed ethnomedicinal exploration produced one hundred and fifty plant species belonging to 135 genera, 77 families were recorded during the first exploration of Hangrai (Table 1).

The ethnobotanical information of the local flora of study area showed 94.66% angiosperms, 02% gymnosperm and 3.33% Pteridophytes. The dominant family of the study area was Asteraceae comprising of 16 species. The habit wise analysis depicts 110 herbs, 16 shrubs and 24 trees (Fig. 1). The percentage of plant parts are as leaves 44.66%, whole plant 12%, stem, root 10.66%, fruit bark 5.33%, stem bark 2%,

rhizome 5.33%, bulb 3%, shoot 1.33%, resin 1.33%, and come, pedicle, capsule are 0.66%. The highest percentage was found of wild plants is 94% whereas a small portion of cultivated plants were also reported in this research work. This study also revealed a considerable percentage of ethno medicinally important weeds.

**Table 1.** Ethno-medicinal plants of Hangrai, Tehsil Balakot, District Mansehra, Pakistan.

SL	Botanical Name	Family	Local Name	Parts used	Action	Folk Recopies
1	<i>Asplenium ceterach</i> L.	Aspleniaceae	Sujii boti	Leave (Pinnae)	suppression of urine	The juice of leaves is used to cure the suppression of urine.
2	<i>Araucaria columnaris</i> (G.Forst.) Hook.	Araucariaceae	Saroo	Resin	Edema formation	The resin used to cure edema formation. The bulbs are collected, Washed, Dried in the presence of sunlight then grinded into powder and these powder mixed with milk add a few teaspoon sugar make syrup locally called Hasbii syrup used daily at night before sleeping to cure pulmonary disease.
3	<i>Aconitum heterophyllum</i> Wall. ex Royle	Ranunculaceae.	Patreas	Seed, Bulb and leaves.	Leaves and shoot are used to apply on throat tonsillitis and Diuretic.	
4	<i>Aloe vera</i> (L.) Burm.f.	Asphodelaceae	Koor ghandal	Stem	Heal cricks	The juice which extracts from stem applied on heal cricks for healing.
5	<i>Anaphalis triplinervis</i> (Sims) C.b. Clarke.	Asteraceae	Neki chitt boti	Leaves and stems	Constipation.	Leave and stems are collected, dried, crushed into powder make tea drink at night before sleep for constipation.
6	<i>Allium cepa</i> L.	Alliaceae	Piaz	Bulb and leave	The bulbs are used in heart diseases and hypertension also used diuretic, antiseptic and hair loss.	The tops are cooked and are eaten by the people in urinary diseases. Infusion is used to treat inflammation of the pharynx. The bulbs grinded, extract its fluid mixed with water and wash hair with juice daily to reduce hair fall.
7	<i>Artemisia absinthium</i> L.	Asteaceae	Chahuu	Leaves	Earache	The juice which extract from leaves and then add water and Poured a small drop in ear for earache.
8	<i>Adiantum capillus-veneris</i> L.	Adiantaceae	Kokva	Whole plant	The plant used as demulcent, expectorant, diuretic and febrifuge as well as hair tonic and in sore throat	The leaves are crushed and kept in a glass of water for a night and this water is taken before the breakfast, for Diuretic, hair tonic and in sore throat.
9	<i>Adiantum incisum</i> Forssk.	Adiantaceae	Kali dandi wali boti	Fronds	Cough and Diabetes	The fronds are used for curing skin diseases, Cough, Diabetes.

SL	Botanical Name	Family	Local Name	Parts used	Action	Folk Recopies
10	<i>Amaranthus viridis</i> L.	Amaranthaceae	Ganhar	Whole plant	Diarrhea and Dysentery	The Leaves are cooked and used as sagg for the treatment of dysentery diseases and its Infusion is used to treat diarrhea.
11	<i>Ajuga integrifolia</i> Buch.-Ham.	Lamiaceae	Korribooti	Whole plant	Wate come in mouth and sugar	Plant is dried in the presence of sun light and grinded in to powder form and mixed with milk taken in early morning for sugar. Leaves are collected, washed and then dried in the presence of sun light these dried leaves are crushed in to powder form these powder taken 1 table spoon after meal at night.
12	<i>Anagalis arvensis</i> L.	Primulaceae	Phularni	Leaves and root	Urethral Irritation, Skin itches and Wound healing	Leaves and roots are collected, dried, crushed into powder and make decoction used daily twice in day for skin itches.
13	<i>Aesculus indica</i> (Wall. ex Cambess.) Hook.	Sapindaceae	Band khor	Roots bark	Roots bark used for dysentery and influenza	The dry bark of roots grinded into powder make tea drink at night before sleeping influenza and diarrhea.
14	<i>Acacia modesta</i> Wall.	Mimosaceae	Legumes and leave	Legumes and leave	Back bone pain	The young Leaves are cooked for one hour its water are used one tea cup daily at Night. Legumes are grinded into powder taken in morning with milk for leucorrhea.
15	<i>Alternanthera pungens</i> Kunth.	Amaranthaceae	Taraka	Whole plant without spines	Blood clotting	The Leaves are crushed extract juice applied on wound for blood clotting.
16	<i>Anaphalis margaritaceae</i> L.	Plantigenaceae	Kuving	Whole plant	Diarrhea and dysentery	Leaves are cooked and used as sagg for the treatment of dysentery disease and 7 its Infusion is used to treat diarrhea. Apical meristem are kept in one glass of water for one night water mixed with grinded bark of <i>Berberis lyceum</i> make Solution locally called phutlarra used at night daily.
17	<i>Ailanthus altissima</i> (Mill) Swingle	Simarubaceae	Deerava	Apical meristem	Diabeties	Juice extract from young seed add with milk and sugar make juice taken at night for jaundice.
18	<i>Alnus nitida</i> Endl.	Betulaceae	Sharolii	young seeds	Jaundice	Oil extracted from seed used to remove dandruff in hair
19	<i>Brassica rapa</i> L.	Brassicaceae	Chahra	Oil of seed	Antidandruff	The root washed, dried, grinded with small amount of Sodium chloride used daily one spoon at night for stomachache.
20	<i>Borago officinalis</i> L.	Boraginaceae	Podeni	Root and leaves	Leaves used for fever and roots for stomach	The rhizome are dried, crushed into powder mixed in one glass of milk taken daily before breakfast for ulcer.
21	<i>Bergenia ciliata</i> (Haw) Sternb.	Saxifragaceae	But pave	Rhizome	Ulcer and dysentery	The juice obtained from rhizome is given in dysentery.
22	<i>Berberis lyceum</i> Royle	Berberidaceae	Sunmbal	Root, stem bark, fruit and branches.	Cancer, Wound healing, Edema formation,	<i>Berberis lycium</i> fruit are collected, crushed, squeezed, and filtered through cloth; the filtrate is dilute in water used

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					intestinal Colic and eye disease.	each morning before breakfast tea spoon also Effective as blood purifier and refrigerant. The dried roots are grinded into powder, mixed with water and take each night a teaspoon before breakfast for piles, jaundice cancer, piles, and eye diseases. Bark of roots are grinded and poured on wound for Healing. The bark are soaked in water for one weak and the water is used for fever, diuretic
23	<i>Berberis kunawurensis</i> Royle	Berberidaceae	Jangali sunmbal	Root bark	Diuretic and fever	The <i>chenopodium</i> plants are collected, cleaned, dried and grinded into powder the powder used twice in day for jaundice. Seed and leaves are collected dried and grinded taken with water in warm expulsion.
24	<i>Chenopodium album</i> L.	Chenopodiaceae	Bathwa	Bathwa,	Plants used as anthelmintic , the roots are used as Jaundice	The fresh rhizome is grinded mixed with sodium chloride and poured on infected teeth. Stem and leaves are crushed with small amount of water and then extract juice mixed with honey, flour and then Boiled locally called peeri then peeri is further dried in the presence of sun used with milk for treatment of these diseases.
25	<i>Cyperus rotundus</i> L.	Cyperaceae.	Della	Rhizome	Toothache	Rhizome are grinded and poured on wound for healing The unripe fruits of coriandrum and ginger are crushed and squeezed its extracts honey mixed with extracts and kept in a pot for a weak in open atmosphere, used one tea spoon thrice a day, effective for expulsion of gases, Mucous expulsion, itching, nervous disorders, measles diarrhea, cholera, and as a blood purifier .
26	<i>Conyza canadensis</i> L.	Asteraceae	Malochai	Vegetative parts	The plant is used as stimulant, diuretic, also used in diarrhea and dysentery	
27	<i>Chrysopogan aucheri</i> (Boiss.) Stapf.	Poaceae	Beknai boti	Rhizome	wound healing	
28	<i>Coriandrum sativum</i> L.	Apiaceae.	Dhania	Leaves, fruits.	Locally used as stomach tonic and digestive problems	
29	<i>Cannabis sativa</i> L.	Cannabinaceae.	Bhang	Leaves.	Leave is used in pregnant women after delivery to reduced enlargement of abdomen.	Collect the fresh leaves Grinded, extract its juice and poured on the small piece of cloths and kept it front of female Parts (vegyna) for one hour. it reduced the enlargement of abdomen.
30	<i>Capsella bursa-pastoris</i> Medic.	Brassicaceae		Whole plant	Wound healing, Heels cricks	Whole plant is crushed extract its fluids and poured on the wound for healing. Grinded the plants mixed with flour and dissolve with oil kept on fire When it became warm, mixed and poured on the effected heels for one hour. The young flowers dried in the presence sunlight then grinded into powder then powder mixed with wheat flour and water make roti in hinko locally called chodari roti used daily at night Arthritis.
31	<i>Canna indica</i> L.	Cannaceae	Choodri boti	Flower.	Arthritis	

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32	<i>Citrus sinensis</i> (L.) Osbeck	Rustaceae	Malta	Leaves.	Influenza	The juice which extract from leaves by the process of grinding make green tea used twice in day for influenza.
33	<i>Cedrus deodara</i> (Roxb. ex D. Don) G. Don.	Pinaceae	Diyar	Leaves.		Leaves are used as carminative, tonic, antispasmodic and valuable in asthma in bronchitis.
34	<i>Cichorium intybus</i> L.	Asteraceae	Kasni	Flower and root	Fever and weakness of Male sex organ	The root is boiled in water and make decoction is used before breakfast for the weakness of Male sex organ. The flower is dried and grind used before breakfast for fever.
35	<i>Convolvulus arvensis</i> L.	Convolvulaceae	Elri	Whole plant	As Anthalmanthic, stomach, diarrhea	Roots and leaves are crushed mixed with water and used in diarrhea, anthelminthic and stomachache.
36	<i>Capsicum annum</i> L	Solanaceae	Marchi	Pedicle.	Alzeihmer	Pedicle collected, dried, grinded into powder used daily before breakfast one spoon.
37	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Khabal	Whole plant	It is used in vomiting and diarrhea.	Whole plant is crushed extract juice mixed with water and take during vomiting and diarrhea. The juice from the plant is also given in dysentery.
38	<i>Centaurea benedicta</i> (L.) L.	Asteraceae	Doodi	roots		The roots are dried and grinded into powder used in morning for the weakness of male sex organ.
39	<i>Cirsium congestum</i> Fisch. And C.A. Meg-ex. DC.	Asteraceae	Kand boti	Root.		The roots are collected, clean and dried in the presence at Sunlight and grinded into powder and take one spoon at night to increasing the timing of man sex organ
40	<i>Cirsium acaule</i> (L.) A. A. Weber-ex wig	Asteraceae	Kandyarii	Root	Roots is tonic, Diuretic, Astringent and Antiphlogestic.	Roots is dried in the presences of sunlight and grinded into powder used at night for Tonic.
41	<i>debregeasia salicifolia</i> D.Don	Urticaceae	Chingal	Leave	Jaundice	Leaves are grinded, Extract juice then add water used one tea cup in morning for jaundice.
42	<i>Datura stramonium</i> L.	Solanaceae	Tatoora	Seeds and leave	Antispasmodic purposes and Diabetes	Seeds are grinded into powder used with milk at night one teaspoon daily for diabetes. Fresh leaves of Datura used with ghee to antispasmodic.
43	<i>Dodonaea viscosa</i> (L.) Jacq.	Sapindaceae	Sanatha	Leave	Burn, wounds and toothache	Extract juice from leaves and applied on burn and wound. The leaves are grinded with infected teeth.
44	<i>Duchesnea indica</i> (Andr) Focke.	Rosaceae	Mewa	Fruit	Kidney stone	The fruits collected, dried, crushed and mixed with grinded <i>Marcella esculenta</i> used with water twice in a day daily.
45	<i>Daphne mucronata</i> Royle.	Thymeleaceae	Kutay lal	Leave	Edema formation	Juice extracted from leaves and mixed with resin applied on edema formation.
46	<i>Diospyrus lotus</i> L.	Ebenaceae.	Amlook	Fruits	Constipation and influenza	Fruits are collected, Cleaned, dried and grinded into powder and taken before breakfast for constipation. Fresh fruits are taken for influenza thrice in a day.

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47	<i>Dryopteris serrato-dentata</i> (Bedd.) Hayatai.	Dryopteridaceae	Kunjii	Kunjii	Diarrhea and vomiting	Plants leaves are crushed, extract juice then used in diarrhea and vomiting.
48	<i>Erodium cicutarium</i> L.	Geraniaceae	Ratan jog	Root	Back bone pain	Root mixed with halwa is used
49	<i>Euphorbia prostrata</i> Aiton.	Euphorbiaceae	Tadri boti	Leave		The leaves are grinded then extracts its milky juice and then applied on taddar disease.
50	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Skha butay	Shoots	Skin infections	
51	<i>Epipactis helleborine</i> (L.) Crantz	Orchidaceae	Amm patreas	Shoot and leave		The leaves and shoots are dried in the presence of sun light. Then grinded into powder make decoction used at night to cure diarrhea.
52	<i>Eriobotrya japonica</i> (Thunb.) Lindle.	Rosaceae	Lokhat	Apical meristem	Diabetes	The leaves are boiled with in water for an hour its water used daily. (As we used simple water) for one weak.
53	<i>Euphorbia heliscopia</i> L.	Euphorbiaceae	Dhodai	Whole plant	Milky latex is applied to eruption	Seed are roasted and given in cholera. Milky latex is applied to eruption.
54	<i>Ficus palmata</i> L.	Moraceae	Bagar	Fruit		Dried fruit mixed with sugar and eaten after meal for indigestion and expulsion of gases.
55	<i>Foeniculum vulgare</i> Mill	Apiaceae	Saunf	Fruit leaves seeds	The juice of fruit is used to improve eyesight and oil is vermicide	The green leaves and branches are cleaned and eaten for abdominal problems and stomach burning.
56	<i>Geranium ocellatum</i> Camb.	Geraniaceae	Ratan jog jangali	Root	Roots used for Back bone pain	Roots are washed, dried in the presence of sun light Grinded, makes decoction drink before sleeping at night.
57	<i>Gerbera gossypina</i> (Royle) Beauverd	Asteraceae	Chitt boti	Leave	Jaundice and wound healing	The green leaves are crushed, extract juice mixed with grinded roots in powder form of <i>Malva neglecta</i> then mixed with Na cl makes in hinko called phakii used one teaspoon before breakfast with milk daily.
58	<i>Isodon rugosus</i> (Wall. ex Benth) Codd.	Lamiaceae	Chitt bota	Leave	Leaves used for Jaundice	The fresh leaves are crushed, grinded, extract juice add with milk and juice make locally called karra used at night before sleeping
59	<i>Juglans regia</i> L.	Juglandaceae	Khor	Leave	Toothache and abdomen warm	Bark of stem locally called dandasa used for toothache. Decoction of leaves are used for abdomen warm
60	<i>Eucalyptus citriodora</i> Hook.	Myrtaceae	Gond	Leave	Tooth ache	The leaves are grinded with infected teeth.
61	<i>Equisetum ramossissimum</i> Desf.	Equisetaceae	Bandakay	Shoot	Anti lice, Diuretic and Kidney stone	The juice extract from shoot are used as tonic, Anti lice, Anti acidic and Diuretic. Also used for kidney stone.
62	<i>Indigofera heterantha</i> Wall.ex Brand	Papilionaceae	Khanthi	Roots leaves	Wound and Jaundice	The roots collected, cleaned, kept in water for few days and used water daily before breakfast for jaundice.

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63	<i>Lactuca serriola</i> L.	Asteraceae	Hand	Leaf	Edema formation	The leaves crushed, extract its juice and poured on wound for healing. The Leaves are crushed extract its juice mixed with wheat Flour then heating and applied on edema formation.
64	<i>Mirabilis jalapa</i> L.	Nyctaginaceae	Dodli boti	Leaf	Constipation	Juice from fresh leaves are extracted, mixed with milk and used at night for constipation.
65	<i>Morus alba</i> L.	Moraceae	Chitta toot	Leaf	antihelminthic	Leaves are collected, dried, grinded and make Decoction used before breakfast.
66	<i>Morus nigra</i> L.	Moraceae	Kala toot	Fruit	Used as for cough and throat infection	The fresh fruit are collected extract its juice mixed with honey and used thrice in a day.
67	<i>Echinops echinatus</i> Dc.	Asteraceae	Kandara	Leaf	Jaundice	The leaves grinded and its juice used for jaundice.
68	<i>Hedera nepalensis</i> K-Koch.	Araliaceae.	Berrli	Leaf	Cough	Decoction of the leaves used for cough.
69	<i>Isodon coesta</i> L.	Lamiaceae	Pemar	Leaf	Fever	The leaves are dried crushed in to powder and used one spoon at night for fever.
70	<i>Lespedeza hirta</i> (L.) Hornem.	Fabaceae	Budii khantii	Leaf	Blood clotting	The leaves are crushed, extracts its juice and applied on wound for blood clotting
71	<i>Malva parviflora</i> Wall.	Malvaceae	Sonchal	Roots leave and flower	Hepatitis and Headache.	Leaves are boiled in water for 30 minute and water is used for hepatitis before breakfast daily one tea cup Hepatitis. Leaves and stem are dried, grinded into powder makes joshanda for Headache
72	<i>Mentha spicata</i> L.	Lamiaceae	Podena	Whole plant	Stomach pain and Vomating.	Decoction of leaves used for influenza, vomiting. Leaves and stem dried, grinded, and taken with water Small amount for stomach pain
73	<i>Marsilia quadrifolia</i> L.	Marsileaceae	Par boti	Whole plant	Diuretic and febrifuge	The juice which extract from whole plant and then add Water for clearance juice poured on sieve and used one tea cup before breakfast, to cure febrifuge.
74	<i>Mentha longifolia</i> L.	Lamiaceae	Jangali podena	Whole plant	Fever, Gas and vomiting	Decoction of shoot, leaves are used for fever, Gas and vomiting
75	<i>Melia azedarach</i> L.	Meliaceae	Batkalar	Apical meristem	Apical meristem used for Diabeties	The apical meristem boiled with water for one hour at low Temperature and used its water one tea cup before breakfast.
76	<i>Nasturtium officinale</i> L.	Alliaceae	Taremeera	Leaves and shoot	Medicinally used as diuretic and stomach problem	The leaves and shoots are dried, grinded into powder make Qava and used at night before sleeping for stone in bladder.
77	<i>Nerium oleander</i> L.	Apocynaceae		Roots, Leave and flower	Stone bladder	Decoction of leaves used for skin diseases the flower are dried in sun and smoked as anti asthmatic.
78	<i>Oxalis corniculata</i> L.	Oxalidaceae	Khat kurla	Whole plant	Jaundice, wound healing, stomach troubles and Dysentery problems.	Leaves are crushed and poured on wound for healing. The juice from the fresh plant is extracted, extract is mixed with water and sugar and this mixture is used for jaundice. The extraction of plant is also used dysentery problems.

SL	Botanical Name	Family	Local Name	Parts used	Action	Folk Recopies
79	<i>Prunus domestica</i> L.	Rosaceae	Allocha	Leave	Jaundice and pulmonary diseases.	The young leaves are collected, dried, grinded, mixed with grinded <i>Mentha longifolia</i> and make decoction used one tea cup daily at night for pulmonary diseases. The old leaves are crushed extract juice mixed with Water drink before breakfast jaundice.
80	<i>Platanus orientalis</i> L.	Platanaceae	Chennarr	Stem bark.	Diarrhea, Dysentery and toothache.	The bark is boiled in vinegar and then used in the treatment of Diarrhea, Dysentery and toothache.
81	<i>Polygonum bistorta</i> L.	Polygonaceae		Leaves and stem	Jaundice	The extract of leaves used for jaundice. The whole plant are dried and grinded into powder add desi gee and warm on fire foe five minutes
82	<i>Potentilla norvegica</i> L.	Rosaceae	Mehdi boti	Whole plant	Stomach acidity and jaundice	and clod then 85used one spoon before breakfast for stomach acidity. The fresh leaves and stem are crushed used to cure jaundice
83	<i>Pteris vittata</i> L.	Pteridaceae	Babozai	Leave and Rhizome	The rhizome are used for curing hysteria.	
84	<i>Pistacia integerrima</i> J.L. Stewart ex. Brandi	Anacardaceae	Kangar	Fruits	Kidney stone	The fruits are dried, grinded into powder and used in morning for kidney stone
85	<i>Polygonum polystachum</i> Wall.ex meisn	Polygonaceae.	Shakroo	Leaves	Roots used for Joints pain	The Leaves are cooked used as sagg for stomach problem. The rhizome are cut into small pieces mixed desi ghee and cooked for 30 minutes and used one teaspoon daily
86	<i>Podophyllum peltatum</i> L.	Berberidaceae	Soor ganda	Rhizome	Asthma	Resin extracted from stem are used as stimulant; Stomachache and as remedy for facial acnes, also used as diuretic and irritant.
87	<i>Pinus roxburghii</i> Sargent	Pinaceae	Cheer	Resin and cone	Stimulant, Diuretic and facial acnes	The capsules break make tea or decoction used one tea cup daily for Cough, Cold
88	<i>Papaver somniferum</i> L.	Papaveraceae	Khas khash	Whole capsule	Cold and Cough	The whole green plant are grinded, extract its juice and poured on the wound for healing.
89	<i>Polygonum avicular</i> L.	Polygonaceae	Rattro	Whole plant	Wound healing	
90	<i>Pinus wallichiana</i> A.B, Jackson	Pinaceae		Whole plant.	Medicinally used as diaphoretic, stimulant, in Asthma and cough. The resin is used in treatment of warts and facialace acne	The tops are cooked and are eaten by the people in urinary diseases. Infusion is used to treat inflammation of the pharynx.
91	<i>Prunus domestica</i> L.	Rosaceae.	Allocha	Leave	Jaundice and pulmonary diseases	The young leaves are collected, dried, grinded, mixed with grinded <i>Mentha longifolia</i> and make decoction used one tea cup daily at night for pulmonary diseases. The old leaves are crushed then extracts its juice mixed with water drink before breakfast for jaundice.

SL	Botanical Name	Family	Local Name	Parts used	Action	Folk Recopies
92	<i>Plantago major</i> L.	Plantagonaceae	3patroo	Whole plant.	Jaundice and wound healing.	The juice from the fresh plant is extracted, the extract is mixed with one cup of water and used before breakfast for jaundice. The fresh leaves are crushed and poured on wound.
93	<i>Quercus baloot</i> Griffth.	Fagaceae	Serai	Seeds	Seeds are used as diarrhea and astringent.	
94	<i>Robinia pseudoacacia</i> L.	Fabaceae	Keekar	Leave	Wound healing and back bone pain.	The leaves are crushed, extract its juice. That juice mixed with water poured on wound for healing.
95	<i>Ranunculus muricatus</i> L.	Ranunculaceae	Dami boti	Whole plant	Asthma	The whole plant collected, cleaned, dry and make decoction used for asthma.
96	<i>Ranunulus arvensis</i> L.	Ranunculaceae	Chaghch ejaket	Leave and root.	Wound healing	The leaves and fresh roots are crushed extract juice applied on wound for healing
97	<i>Rumex hastatus</i> D.Don.	Polygonaceae	Khatima l	Leaves and root	Jaundice	The leaves are rubbed on skin inflammation and Roots grinded its Juice used for jaundice.
98	<i>Rumex dentatus</i> L.	Polygonaceae	Hoola	Leave	Wound healing	The leaves are rubbed on skin against inflammation which caused by <i>Utrica dioca</i> . The juice of roots also used in wound healing.
99	<i>Ranunculus laetus</i> Wall. ex Hook f thoms.	Ranunculaceae	Bhangii boti	Leaves and root	Skin diseases and Blood clotting	The dried leaves are grinded and makes its decoction used at night for skin diseases. The fresh leaves by the process of grinding also used for blood clotting.
100	<i>Raphanus sativus</i> L.	Brassiceae	Moolii	Root	Digestion	The salad which made by Roots local people used in digestion
101	<i>Rosa indica</i> L.	Rosaceae	Rata gulab	Flower	Eye diseases	The flower crushed, extract its fluid used for eye diseases.
102	<i>Rheum australe</i> D.Don.	Polygonaceae	Chutyal	Whole plant	Rheumtism, arthritis, kidney stones and wound healing	Plant are cooked its solution used to treat the Rheumatism, Arthritis. Rhizome are dried in the presence of sunlight grinded into powder used daily teaspoon before breakfast with milk. The fresh rhizome are crushed, extract juice poured on wound for healing.
103	<i>Ricinus communis</i> L.	Euphorbiaceae	Gandi boti	Bark and roots	The roots of plant are collected, cleaned, dried, grinded and used thrice in a day. The bark of plant used for healing wound.	Fresh leaves crushed mixed with water and extract its Juice to treat external wound.
104	<i>Stellaria media</i> (L.) Vill.	Carophyllaceae	Bagu boti	Whole plant.	Skin itches	Decoction of the whole plant used to care itchy skin.
105	<i>Solanum nigrum</i> L.	Solanaceae	Kacha mach	Leave		The fresh leaves are crushed and extracts its juice poured on wound for blood clotting.
106	<i>Silybum marianum</i> (L) Scope.	Asteraceae	Kaund boti	Flower and seed	Tonic and expectorant	Seeds are grinded and used for increasing breast milk production.

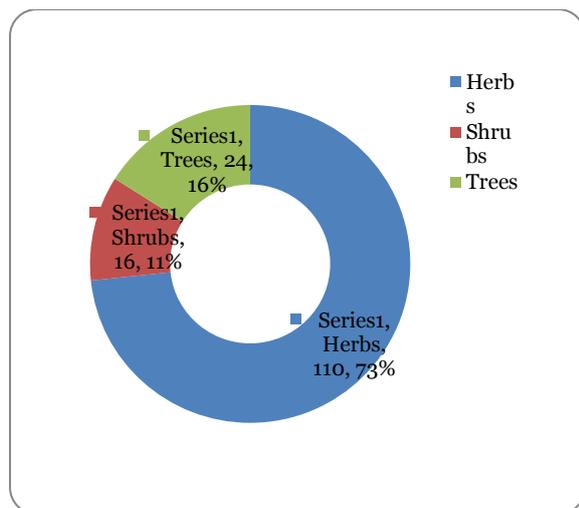
SL	Botanical Name	Family	Local Name	Parts used	Action	Folk Recopies
107	<i>Segetetia thea</i> (Osbeck) M.C. Jhonston	Rhamnaceae	Kandula	Leaf	Jaundice	The young leaves collected, crushed mixed with milk of Goat and extract juice used half tea cup daily before breakfast.
108	<i>Prunus armeniaca</i> L.	Rosaceae	Khubani hari	Fruit, seeds and leave	Blood clotting, improve our brain memory	Seeds are dried, grinded into powder used with milk at night daily.
109	<i>Prunus persica</i> (L) Batsch	Rosaceae	Aroo	Apical meristem	Pulmonary diseases	Leaves are grinded extracts juice poured on wound for Blood clotting.
110	<i>Pyrus communis</i> L.	Rosaceae	Nashpati	Fruit	Constipation	Apical meristem collected, dried, grinded into powder make decoction and used at night.
111	<i>Pyrus pashia</i> Ham. Ex D.Don.	Rosaceae	Batangii	Fruit	Abdomen pain and tonic	Ripen fruits are cuts into small pieces add sugar and milk makes milk shake used one glass at night.
112	<i>Plantago lanceolata</i> L.	Plantaginaceae	Chamch apatr	Leaf	Wound	Fruits are washed, Dried in the presence of sun light grinded Into powder and taken one teaspoon at night with water for abdominal pain.
113	<i>Paeonia emodi</i> Wall. Ex Hk.	Paeoniaceae	Mamekh	Root	Back bone and Epilepsy	The fresh leaves crushed and extract juice poured on wound. Dried rhizomes grinded into powder mixed with sugar then roasted in desi ghee used to treat Backache.
114	<i>Papaver somniferum</i> L.	Papaveraceae	Posat	Latex and Capsule	The latex used for bronchitis The capsule used for flu	Fruits are boiled in water make tea and take at night before sleeping to cure flu and cough.
115	<i>Psium sativum</i> L.	Paplionaceae	Bhandi	Legume	Arthritis	Legumes are cooked extracts its juice, juice mixed with Desi ghee then add sugar, flour wheat makes roti used at night for Arthrits.
116	<i>Portulaca oleracea</i> L.	Portulceae	Jamma mo boti	Shoot and leave	The young shoot used for leaver and leaves for kidney	
117	<i>Primula denticulate</i> Sm.	Primulaceae	2 patri	Rhizome	The rhizome used as antibacterial infection	The rhizome are crushed and mixed with grinded rhizome of <i>Rheum australe</i> mixed with water and heated for 30 minute stop heating and cool down then filtrate through sieve the filtrate add with sugar and used two cup twice in a day. Its good for jaundice and abdominal pain.
118	<i>Rubus niveus</i> Thanb-non Wall.	Rosaceae		Roots	Roots used for excessive menses	Roots are washed, dried in the presence of sun light grinded into powder and taken one teaspoon at night.
119	<i>Rubia tinctorum</i> L.	Rubiaceae		Whole plant	Diarrhea and dysentery	The Leaves are cooked and used as sagg for the treatment Of dysentery diseases and its Infusion is used to treat diarrhea.
120	<i>Solanum surattense</i> Burm.f	Solanaceae		Fruit	Anti-asthmatic, Anti-fungal	The young fruit crushed, extract juice and poured on fungal infection between hand and foot fingers.
121	<i>Sambucus wightiana</i> Wall-ex Wight	Caprifoliaceae	Jan	Flower	Flower used for	The young flower grinded extract

SL	Botanical Name	Family	Local Name	Parts used	Action	Folk Recopies
	and Aron		mera		fever	juice mixed with ghurr makes syrup used twice in day for fever
122	<i>Skimmia laureola</i> (DC.) Osbeck	Rutiaceae.	Nehraa	Leaf	Evils repel	The leaves used for its pleasant smell and the dried leaves burnt for evils repel.
123	<i>Sonchus asper</i> (L.) Hill.	Asteraceae	Hand	Young shoot, flower	Tonic, Diuretic, Jaundice and constipation	The plant decoction is used as tonic, diuretic, for jaundice and curing constipation. The leaves are first boiled and then water is removed away.
124	<i>Taraxicum officinale</i> Weber ex.Wigger.	Asteraceae	Hand	Roots and Leaf	Diabetes mellitus	These boiled leaves are cooked as meal. This cooked is eaten especially for Diabetes mellitus
125	<i>Thymus richardii</i> (Pers.) Kontze	Lamiaceae	Chekan boti	Whole plants	Backache and fever	The whole plants are dried and grinded into powder used for Backache and fever.
126	<i>Tulipa stellata</i> (Fries) Koch..	Liliaceae	Pangree	Root	Kidney stone	The roots are dried in the presence of sunlight and then dried used at night before sleeping for kidney stone.
127	<i>Triticum aestivum</i> L.	Poaceae	Karak	Seed	Diarrhea	The seeds are kept for one week in water and then grinded in machine extracts its white materials locally called Nashasta used in diarrhea
128	<i>Tagates minuta</i> L	Asteraceae.	Sat berga	Green leaf		Green leaf are collected, dried and makes decoction used for cough chest infection.
129	<i>Platycladus orientalis</i> (L.) Franco	Cupressaceae	Cheelai	Root bark and leaf	Leaves used for excessive menses, Root bark for burning	Leaves dried in the presence of sunlight then crushed into powder one teaspoon of grinded powder mixed with honey and desi ghee mixed these fluids in night before sleeping
130	<i>Trillium govanianum</i> Wall-ex.D.Don	Melanthiaceae.	Kagkhan	Roots.		
131	<i>Trifolium repens</i> L.	Papilionaceae	Shaftal	Leaves and flower	Wound healing and skin diseases	Crushed the fresh leaves and extract its juice poured on wond. Leaves are dried and green tea is made for cough and colds
132	<i>Utrica dioica</i> L.	Urticaceae	Keyri	Leaf	Wound healing	The green leaves collect with the help of gloves Keeps on fire for 5 minute then leaves crushed extract its juice apply on the wound twice in a day.
133	<i>Vicia faba</i> L.	Fabaceae	Jangali matter	Seeds	Menses and Skin Abrasion	The decoction of the leaves used in early menses. The poultice of plants applied to skin abrasion.
134	<i>Veronica polita</i> Fr.	Plantaginaceae	Akoor	Leaf and root		The leaves and roots are crushed and then kept in water for one night used its water daily in morning for Diabetes
135	<i>Veronica persica</i> Poir.	Plantaginaceae	Akoor	Whole plant	Leaves used for Diabetes	
136	<i>Viola ocellata</i> Torr,ala.gray.	Violaceae.		Whole plant.		
137	<i>Valeriana jatamansi</i> (Jones ex runb ) DC.	Velerianaceae	Mushak balla	Whole plant	Antispasmodic and pulmonary diseases	The leaves are kept for one night in water and used its water in morning for pulmonary diseases. The whole plants are used as antispasmodic
138	<i>Verbena officinalis</i> L.	Verbenaceae	Charoo	Leaves and Stem.	Jaundice	The leaves and stem collected, dried with the help of Sun light and crushed into powder make

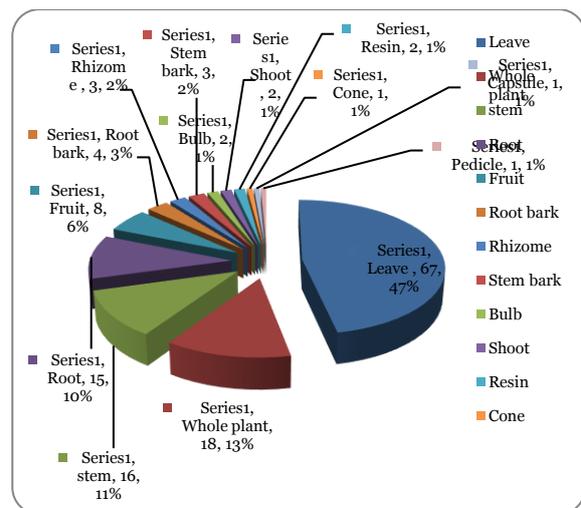
SL	Botanical Name	Family	Local Name	Parts used	Action	Folk Recopies
139	<i>Vitex negundo</i> L.	Verbenaceae	Marwandi	Leaf	Watering in mouth, leprosy	decoction used Before breakfast daily for one weak one cup. The young leaves are grinded, extract juice mixed with water and apply on effected side (leprosy). Leaves dried, crushed make decoction used before sleeping
140	<i>Vitis vinifera</i> L.	Vitaceae.	Angoor	Fruit.	For low blood pressure	The fruits are collected at least 1 kg grinded with the help of Grinder machine extract its fluid mixed with milk and daily.
141	<i>Verbascum thapsus</i> L.	Scrophulariaceae	Gadayan	Leaf	Wound healing	The leaves grinded extract fluid poured on the wound.
142	<i>Xanthium strumarium</i> L.	Asteraceae	Bandarboti (Whole plant.	Whole plant	Tonic, Cancer, diuretic, small pox, malaria fever	The root crushed in to powder used as tonic and to treat cancer. Fruit used as refrigerant, diuretic and Demulcent, leaf decoction is recommended in long Standing malarial fever.
143	<i>Zanthoxylum armatum</i> DC.	Rutiaceae	Timber	Stem and leave	Teeth pain , stomach pain	Stem cut with the help of knife used as brush with the help Sodium chloride for teeth pain.

**Table 2.** Some side effect and precaution observed by local informants.

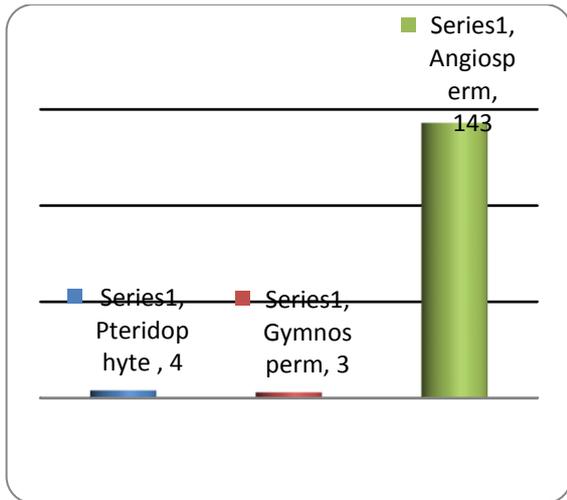
SL.	Botanical Name	Family	Side effect	Precautions
2	<i>Amaranthus viridis</i> Linn.	amaranthaceae	Not observed	Don't take warm thing.
3	<i>Ajuga integrifolia</i> Buch.-Ham.	lamiaceae	Rarely nausea	For sugar don't take sweets thing.
4	<i>Ajuga integrifolia</i> Buch.-Ham.	Plantigenaceae.	Not observed	Don't take warm thing. For diarrhea
5	<i>Astragalus mollissimus</i> Torr.	Fabaceae.	Not observed	Don't take warm thing.
6	<i>Erigeron canadensis</i> L.	Asteraceae.	Urine color change, nausea.	Not observed
7	<i>Diospyrus lotus</i> L.	Ebenaceae.	Gas produced	Not observed
8	<i>Malva neglecta</i> Wall.	Malvaceae.	Not observed	Used for hepatitis
9	<i>Oxalis corniculata</i> L.	Oxalidaceae.	Not observed	For jaundice only don't used any warm thing.
10	<i>Podophyllum peltatum</i> L.	Berberidaceae.	Sweeting.	Don't take cold thing.



**Fig. 1.** Contribution of Herbs, shrubs and trees.



**Fig. 2.** Parts of plants used as folk Medicines.



**Fig. 3.** Habit-wise classification of ethno medicinal flora of Hangrai.



**Fig. 4.** Some glimpses of study area.

**Discussion**

The traditional uses of Plants have a long historical background. Human beings had been using herbal medicines for treatment of various ailments since time immemorial. Nature has bestowed Pakistan with diverse climatic conditions which support rich floral diversity. The study area of “Hangrai” being the part of Northern Pakistan has great ethnomedicinal resources. Hangrai is a far flung area of district Mansehra. The area is deprived of modern health facilities and peoples are very much dependent on traditional herbal medication. The results revealed that peoples of Hangrai utilized 150 plants species of 135 genera belonging to 77 families for 28 different ailments.

Our findings are in close agreement with various other researchers conducted in different parts of Pakistan. Hamayun *et al.* (2003) reported that medicinal plants collected in District Buner (Pakistan) are used by the inhabitants to cure different diseases. Ajaib *et al.* (2014) documented ethnomedicinal uses of 93 herbaceous species belonging to 46 families of angiosperms from District Kotli, Azad Kashmir. Most of the herbs were used to treat a variety of ailments like diabetes, hypertension, jaundice, gonorrhoea, eczema and rheumatism. Similarly 56 medicinal plant species belonging to 36 families recognized ethnomedicinally from Poonch Valley, Azad Kashmir. These species were recorded for treatment of urinary tract infection, kidney stone, diarrhoea, respiratory disorder, asthma and rheumatic (Khan *et al.*, 2012). Whereas Adnan *et al.* (2014) enlisted 107 species of ethno medicinal plants from northwest Pakistan.

The current investigation showed that leaves are the most collected plant parts for medicinal purposes and Adnan *et al.* (2014) also found that the leaves of majority of the plant species are extensively used in the preparation of ethno medicines. Though over exploitation of leaves threaten the herbaceous medicinal flora especially slowly reproducing plants. However, medicinally significant shrubs and trees are not adversely affected by collection of the leaves. But digging out of the roots for medicinal purposes could be considered as potential harm for medicinal flora. Similar results were also reported (Tabuti *et al.* 2003; Hunde *et al.*, 2004).

Various methods of medicine preparations were apparent in this study. However, the most frequently used methods were aqueous extract followed by powdering as well as decoction. Similar methods were reported by Shinwari, (2002). The present investigation divulges that ethno medicinal knowledge is not confined to a single group but is found very rich in old age peoples. The females are more aware than the males because they are actually responsible for the looking after of their households. This indigenous wisdom has been attained by the continuous use of these plants at their home as well as by trial and error.

They exactly know how to use and which part of the plant can be used for that specific ailment. The findings of Khan *et al.* (2012) are also in close agreement with our findings.

The ethnomedicinal properties of some most cited plants of the study area as *Berberis lyceum* used medicinally for broken bones, cancer, dyspepsia and sexual vigor, while the rhizome is used for jaundice. Whereas the dried bark of *Berberis lyceum* is grinded to powder, mixed with Desi ghee (butter) and Gur (crude sugar) called Halwa. The Wound healing property of *Berberis lyceum* was also documented by Alam *et al.*, (2011) from Chagharzai valley, district Buner. Similarly the uses of *Allium sativum* and *Euphorbia helioscopia* are in accordance with study of Alam *et al.*, (2011). In current study, *Bergenia ciliata* reported for stomach ulcer, *Foeniculum vulgare* for improving eye sight and *Morus nigra* for tonsillitis and throat infection. Similar uses were documented by Ahmad, (2015). The ethno medicinal uses of *Paeonia emodi* are recorded for asthma whereas the study of Hamayun *et al.*, (2003) reported opposite results. This study reveals novel results of majority of ethno medicinal flora of Hangrai (Table-1). These novel ethnomedicinal applications of plants in this area are because the area is geographically isolated on west by River Kunhar and on East by Musa-Ka-Musallah and Allied mountains. The informants were mostly nomads and hailing from highly remote areas having unique ethnobotanical wisdom. Moreover the area is devoid of modern health facilities and the inhabitants exclusively rely on etnomedicines. Furthermore, the geographic barriers make the area culturally the most reserved one. The ruthless collection of local plants parts by indigenous inhabitant is leading flora towards danger of loss of many species. There is need that endangered or threatened species should be *in-situ* or *ex-situ* conservation is requirement and this study will be helpful in this context. The research will also be useful for drug discovery and development from these medicinal plants of the area.

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