Padalia et al., **Afr J Tradit Complement Altern Med. (2015) 12(6):100-112**
http://dx.doi.org/10.4314/ajtcam.v12i6.10

HOW DOES TRADITIONAL HOME-GARDENS SUPPORT ETHNOMEDICINAL VALUES IN KUMAUN HIMALAYAN BHABHAR BELT, INDIA?

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Abstract

Background: Medicine is one of the four basic needs of human being fulfilled by the plant up to a large extent. Herbal remedies have been an integrated part of healing and are considered to be the oldest form of healthcare known to mankind on this earth.
Materials and methods: An ethno botanical survey has been conducted using semi structured interview schedule with the villagers, in agro forestry system to identify the traditionally used plants.
Results: A total of 60 medicinal plants belonging to the 33 families were found to be used for the treatment of diseases. Out of 33 families, Cucurbitaceae contributed maximum 06 genera followed by Poaceae, Brassicaceae, Solanaceae and Apiaceae. The documented plants were listed as 32 herbs, 06 shrubs, 15 trees and 07climbers. Different parts of investigated plants such as leaves (34%), fruits (19%), bark (only 2%) etc. were useful to cure the 10 different categories of ailments. In this study, about 70% of the medicines were prepared by fresh plant parts. The mode of application of herbal medicines was oral (53.33%), dermal (10%) and rest (36.66%) taken both by oral and dermal.
Conclusions: Indigenous people still believe in traditional system of medicine and prefer it in search of primary health care. Such plants may be used in the formulation of new drugs. The agroforestry system supports the ethno-botanical values in a very extensive way. It is one of the best known traditional practices to cure and prevent the diseases from the very beginning of civilization, other than to full fill the daily requirement of food, fodder and timber production. The remedies obtained from the agroforestry and home gardens system are comparatively cheaper, pure, have no side effects and easily available. Therefore, it deals with those communities whom have the limited access to mainstream medicine. Agroforestry provides the alternative source of remedies and growing space for medicinal plant. Hence, there is a great a need to cultivate and conserve such plants and at the same time, there is an immediate need of indigenous practices, knowledge of such plant resources, and documentation.

Key words: Medicinal plants, Ethno-botany, Diseases and prevention, Traditional medicine, Herbal remedies

Introduction

Hippocrates, the Father of Medicine, proclaimed, "Let food be thy medicine and medicine be thy food", almost 25 centuries ago. Ethno-botany is the study of the interaction between plants and people with a particular emphasis on traditional tribal cultures. According to the World Health Organization (WHO, 2001) about 65-80% of the world's population especially in the rural areas in developing countries depends essentially on plants for their primary healthcare due to poverty and lack of access to modern medicine (Awoyemi et al., 2012). Consequently, in India, a considerable part of this knowledge was formulated and documented into an organized system of medicine i.e. Ayurveda which dates back to the Vedic Age (4500-1200 BC). The earlier scripture Rig Veda mentioned 76 plants, the Yajur Veda 81, and the Athar Veda 289. Now, nearly 550 plant species are used commercially for medicinal uses of about 3000 known medicinal plants reported from India. Over 200 pharmaceutical industries are manufacturing more than 700 single and compound formulations based on classical Ayurvedic texts and experience based potent medicines (Bargali et al., 2002). These products are consumed not only in India but are also exported to other countries.

Agroforestry system is one of the best known traditional practices for livelihood, suitable land management and sustainable development (Kittur et al., 2013; Bargali et al., 2004; Bargali et al., 2009; Parihaar et al., 2015). In the present study, inhabitant prefers poly-cropping mixed with woody trees on the same piece of land. Integrated farming (agriculture system that integrates livestock and crop production) and orchardry (deliberately planting of trees that are maintained for fruits and nut production) were the most exploited pattern of agroforestry system of farming. In the traditional health care system, most of the medicinal plants were harvested and collected from the wild; but nowadays, the practices of ethno-botany is under threat due to heavy demand of these medicinal plants, less availability, growing human population, over exploitation, forest fire, increased urbanization and deforestation. Other than this, some highly valued medicinal plants come in the category of endangered or threatened species, therefore, the harvesting of these species from forest is illegal. At this time, domestic cultivation is an option to reduce the pressure on the wild and solve the problem of production to sustain the availability of medicinal plant. Cultivation of medicinal crops gives the opportunity to increase the quality production, genetic modification and control over the trade. Agriculture was sustainable in the studied villages. The local inhabitants practiced the artificial selection (desirable traits) and intercropping (growing two or more crops in a combination) to optimize the yield. Poultry farming is also gaining popularity as the source of income.

The medicinal plants of Uttarakhand state has been reported by many workers i.e., Sammant (1998), Joshi et al. (2012), Bargali et al. (2013) but the ethno-medicinal plants in traditional agroforestry and their indigenous uses has not been well explored. Traditional knowledge of medicinal plants and their uses by indigenous healers and drug development in the present are not only useful for conservation of cultural tradition and biodiversity but also for community health care and drug development in the local people (Emiru et al., 2011) and also provide employment to the villagers.

In Bhabhar belt of Kumaun Himalaya, medicinal plants have been used as traditional medicine to treat different human ailments. People who live in these areas have traditional knowledge on use of medicinal plant species. However, it is not widely used as it could be because the skills are fragile and no written document or easily forgettable as most of the medicinal plants are in the hands of a handful and kept as a secret (Fisseha, 2007). The environment is facing problems of resource depletion and loss of indigenous knowledge like other areas of the country. Thus, concerned ethnobotanical research plays an important role for conservation and sustainable utilization of these medicinal plants.

Therefore, the present study was conducted to assess, document the knowledge and use of medicinal plants regularly used by the traditional healers to treat different human ailments. The study also focuses on identifying the parts of plant used for medicinal purposes, their mode of preparation, ingredients added and doses of medicinal plants.

Methodology

Study Area

Location and Terrain

The Kumaun Himalaya, spread over a geographical area of 51125 km^2 (77034'to 81002' E longitude and 28043 to 31027' N latitude) comprises six districts of Uttarakhand State of India. The district has plain areas called the Terai and Bhabhar belt near the foothills of the mountains, towards the south, and shares boundary with Udham Singh Nagar district. In the present study, we selected the agroforestry systems including the home gardens of Nainital district, specifically in Haldwani and its adjoining areas, extending to the North-Eastern zone at $29^0$25' to $29^0$39'N latitude and $78^0$44' to $79^0$07'E longitude at the elevation of 424 m (1391 ft) situated in Bhabhar belt of Kumaun Himalaya,India.

The selected site (Figure 1) for ethno-medicinal investigation is one of the most productive section in foot hill region of Kumaun Himalayan and very rich in agriculture diversity. The major activities of the local people depend on agriculture and they do not have access to medical services.

Geography, Rivers and Rivulets

Nainital district is also called the Lake District of Uttarakhand due to the presence of many big and small lakes in the hills. The River Gaula, Koshi are the famous rivers of the district. Many small rivulets such as Bhakra, Dabka, Dhela and Baur also flow in the district. All the rivers flow from north to south.

Geographically, five kilometres north of Haldwani is Kathgodam, to the south lies Pantnagar. The Gaula River runs to the east and to the west into the fertile agricultural region of Lamachaur and Kaladhungi merging into the world-renowned Corbett National Park (Ramnagar).

Climate, Soil and Vegetation

The climate is monsoonal sub-tropical and is characterized by marked seasonality. The year can be divided into three seasons: rainy (July-September), winter (November-February) and summer (Mid-March-June). October constitutes the transitional month between rainy and winter seasons. The temperature speckled beyond 40^oC in summer to 5^oC with the dense fog in chilling winter season. Soil of the study area is very fertile, predominantly clay or sandy and complete mixture of the mineral particle or humus. The vegetation of the study site is dominated by *Shorea robusta* forest along with *Dalbergia sissoo, Grewia optiva, Tectona grandis, Adina cordifolia* and *Populus sp.* etc.

Economy Profile of the People

Agriculture is the main source of livelihood in the selected area of study. Well connected with the Indo-Gangetic plain by roads, rail and other option of transportation, Haldwani is an important commercial hub of agricultural product. It is home to one of the largest vegetable, fruit and food grain markets in Kumaun. The Gaula River is exploited for a large quantity of boulders, sand and gravels every year and forms an important revenue source for both the government and local business.

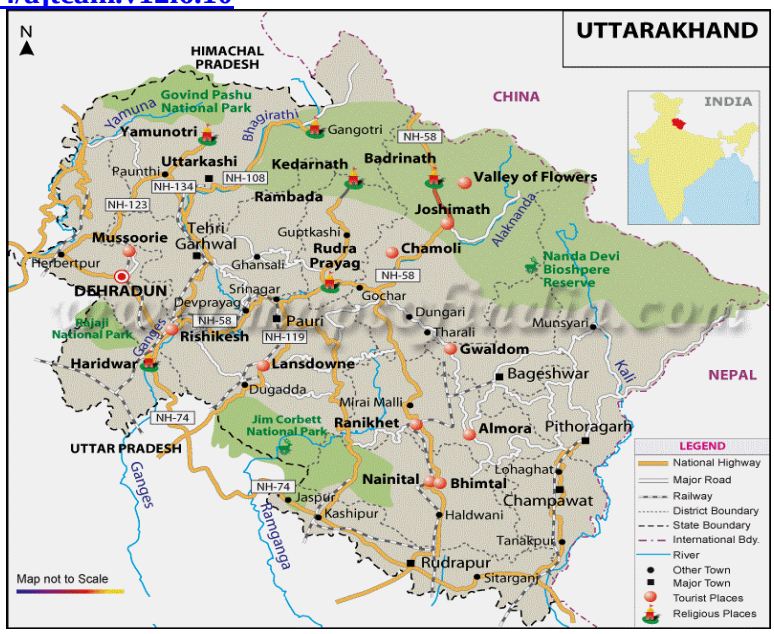
Materials and Methods

Ethno-botanical data was collected using semi-structured questionnaire (Bargali et al., 2007) during February 2014 to March 2014 by interviews and observations. The information about local name of the traditional medicinal plant, type (cultivated or wild), diseases treated, parts used, condition of plant used, route of administration of medicine and ingredients added were collected through formal discussions specially with the old age, adult members or head of the family. The data presented here are the outcome of a series of intensive and extensive exploration trips conducted in the study area (Bargali et al., 2002). Standard method of collection, preservation and maintenance of specimen in the herbarium were followed by Singh et al. (2008). Finally, the data were analysed using descriptive method.

Results and Discussion

As indicated in Table 1, a total of 60 medicinal plant species belonging to 33 families were collected and identified from the study area. Out of the 33 families, Cucurbitaceae contributed maximum 06 genera and followed by Poaceae, Brassicaceae, Solanaceae and Apiaceae with 04 genera in each. Liliaceae represented by 03 genera while Papilionaceae, Myrtaceae, Moraceae, Meliaceae, Chenopodiaceae, Malvaceae, Zingiberaceae and Asteraceae represent only 02 genera in each. Remaining families contributed solitary.

http://dx.doi.org/10.4314/ajtcam.v12i6.10



(Source: www.mapsofindia.com)

Figure 1: Showing the location of the study site in India, the red colour dot showing the location of the study site across the Uttarakhand State, India.

Table 1: List of medicinal plants used by traditional method for treating diseases

Botanical name	**Common/ local name**	**Family**	**Part(s) used**	**Habit**	**Ethno-botanical uses**	**Ingredient(s) add**	**Mode of preparation**	**Dosage***
Cereals and pulses								
Brassica campestris L.	Yellow sarson	Brassicaceae	Se, L	Herb/C, Dry/ Fresh	Seeds use as food preservative, appetizer, effective in rheumatism, pneumonia, muscular pain and toothache. Leaves enhance the secretion of gastric juice.	Mustered oil	Seeds paste, cooked leaves	250-300 gm leaves
Oryza sativa L.	Dhaan	Poaceae	G	Herb/C, Dry	Effective in diarrhoea, scanty urination, piles, bile disorder, laryngitis, gastric ulcer, hepatitis and nephritis.	Butter milk	Cooked rice	50-200 g
Phaseolus radiates (L.) R. Wilczek	Urad	Papilionaceae	G	Herb/C, Dry	Effective in nervous weakness, mild type of diabetes mellitus.	Germinating seeds: bitter gourd juice: honey	Crush Germinating seeds 25:bitter gourd juice 25: honey 5	10-12 g
Triticum aestivum L.	Gehu	Poaceae	G,Ys	Herb/C, Dry	Strengthen the nervous system, weakness due to pregnancy and lactation, effective in anemia, stomatitis and cirrhosis of liver.	Honey	Wheat flour, juice of young stem	100-200g
Zea mays L.	Makka	Poaceae	G, H	Herb/C, Dry	Decoction of young hairs effective in the treatment of cystitis and urinary infection. Cob useful in the gastric ulcer, roosted cob gives the strength and nutrition to the gums.	Water	15g hair : 200 ml water	250 ml
Fruits and Trees								
Artocarpus heterophyllus Lam.	Kathal	Moraceae	Fr, Se, Yl, Sa, Yr	Tree / C, Fresh	Decoction of young leaves effective in chest pain and diarrhoea. Sap of the plant cure swelling and blood boils. Decoction of young root effective in headache.	Honey	Boil 7-8 young leaves in water for	10-50ml

							30 mint in low heat	
Azadirachta indica A. Juss.	Neem	Meliaceae	Ap	Tree /W, Fresh and dry	Leaves are useful in skin and hair diseases, prevention from pimple and acne. Bark and young stem use as strengthening to gum and teeth, antiseptic & antiallergic.	None	Crushed 10-12 leaves with water.	Apply on the affected part
Carica papaya L.	Papita	Caricaceae	Fr, Sa, L	Tree / C, Fresh	Fruits are effective against dyspepsia, constipation, hyperacidity, heart burn and anorexia. Papaya milk effective in acne and pimple treatment, ringworm and eczema. Decoction of the leaves is helpful in the treatment of tonsillitis, ulcerative and gingivitis.	None	Direct eat the fruit	200-500g
Cinnamomum tamala Nees.	Tej Patta	Lauraceae	L, B	Tree/ C and W, Fresh and dry	Decoction of the dry leaves use to control high blood pressure. Young leaves enhance the digestive secretion.	Water	Boil 5-6 leaves with water at low heat	20-25ml
Citrus limon (L.) Burm.f.	Nimbu	Rutaceae	Fr, L	Small tree /C, Fresh	Lime juice is effective in indigestion, dysentery, piles, useful against the treatment of enlargement of spleen, influenza, constipation, bilious vomiting, burning of chest, enhance the immune power, bronchitis, pneumonia, cholera, hyperacidity, obesity, effective in beauty treatment, skin and hair diseases. Young leaves use as mouth freshener by chewing it, paste of leaves helpful in acne & pimple treatment.	Water, Honey, suger, Tumeric	Lemon juice mixed with 100 ml water and a teaspoon honey	100 ml
Ficus religiosa L.	Peepal	Moraceae	Ap	Tree/ W, Fresh and dry	Leaves are highly effective in treating heart disorders, control palpitation of heart and cardiac weakness. Bark useful in inflammations and glandular swelling of the neck. Its root bark is useful for stomatitis, ulcers and promotes granulations. The powdered fruit is taken for asthma. Its seeds have proved useful in urinary troubles.	None	-	-
Lycopersicon esculentum L.	Tamater	Solanaceae	Fr	Shrub/ C, Fresh	Tomato juice effective in morning sickness, biliousness, torpidity, indigestion, diarrhoea, burning in gastro-intestinal track. Pulp also used as beauty treatment of skin.	None	Extract the tomato juice from fresh tomato	200 ml
Mangifera indica L.	Aam	Anacardiaceae	Fr, Sa	Tree /C, Fresh	Fruit pulp is effective in bilious and gastro-intestinal diseases, dryness, itching and burning of eyes, rhinitis, bronchitis, tonsillitis, constipation, morning sickness, jaundice, gives elasticity to blood vessels, scurvy, enhance body resistance, effective in piles and cure against skin disease. Seeds use against tuberculosis, gingivitis and piles.	None	Direct eat the fruit	250-450g
Murraya koenigii (L.) Sprengel	Kadi patta	Rutaceae	L, R	Small tree/ C and W, Fresh and dry	Leaves are applied externally to bruises and eruption. The leaves and roots are cooling, anthelminthic, analgesic and cures piles, allays heat of the body, thirst, inflammation and itching. The juice of the root is good to reduce pains associated with kidney.	Water	Leaves paste	10g
Musa paradisiaca L.	Kela	Musaceae	Fr, F, L, Sa	Tree / C, Fresh	Effective in gastric ulcer, burning of rectum, piles, diarrhoea, typhoid, gastric, weakness, impotency and various skin diseases. Flowers useful against excessive menstruation, dysmenorrhoea and gonorrhea. Sap of stem effective in hysteria and lowering the alcoholic intoxication. Powder of leaves useful in	Milk, Honey	100 ml milk: 200 gm banana: 10 gm honey	250-500g

					hiccups and bronchitis.			
Phyllanthus emblica L.	Awla	Euphorbiaceae	Fr	Tree/ C and W, Fresh	Cure against scurvy, juice effective in conjunctivitis, glaucoma, influenza, asthma, cold, loss of hair, blood disorder, premature greying of hair, high blood pressure, mouth disease and good for the skin.	Honey	15 ml juice: 15 ml honey	20 ml
Psidium guajava L.	Amrud	Myrtaceae	Fr, L,B	Tree /C, Fresh	Palpitation of heart due to nervousness, weakness of heart, painful menstruation and enhance lactation. Decoction of young leaves cure against pyorrhoea and ulceration of the mouth. Bark use against dysentery, diarrhoea, indigestion and vomiting due to high acidity.	None	Direct eat the fruit	300-400 g
Punica granatum L	Anaar	Punicaceae	Fr	Tree /C, Fresh	Bilious vomiting, jaundice, hepatitis, morning sickness, hiccups, scanty urination due to hypertension, nephritis, enlargement of spleen, headache due to tension and nervousness, burning and itching of skin and palpitation of heart. Seeds cure against diarrhoea and indigestion. Dry peel of the fruit cure in bleeding from nose, lungs or from rectum.	Honey	20g juice :15g honey	50gm
Syzygium jambolanum (Syzy)	Jamun	Myrtaceae	Fr, Yl, B, Se	Tree /C, Fresh	Scanty urination, bleeding piles, burning of eyes, enhance the secretion of digestive juice and control the blood sugar. Decoction of young leaves effective in the dysentery and ovarian functional disorder. Fresh bark use in treatment of nose and lungs bleeding, dry seeds use as anti diabetics.	Honey, Water	10 gm powder mixed with equal amount of honey	20 g
Tamarindus indica L.	Emli	Caesalpiniaceae	Fr, Se	Tree / W, Fresh and dry	Lowering the effect of alcohol, pulp is effective in dysentery, diarrhoea, stomach pain, vomiting and jaundice. Seeds effective in sexual disorder (impotence).	Butter milk	5g: 200 ml	200 ml
Vitis vinifera L.	Angur	Vitaceae	Fr	Climber / C, Fresh	Efficient in gastric ulcer, rheumatism, anemia during pregnancy and lactation, tuberculosis, urinary calculi, scanty urination, hyperacidity in urine, indigestion, constipation and impotency.	None	Direct eat the fruit	250-300 g
Ziziphus jujuba Mill.	Ber	Rhamnaceae	Fr, L, B, Se	Tree /W, Fresh	Effective in the treatment of urinary calculi, diabetes, leucorrhoea, spermatorrhoea, mental retardation, weakness of memory, control excessive menstruation. Paste of leaves useful in beauty treatment of hair. Decoction of seed and bark helpful in constipation and rheumatism.	Lime juice	20 gm powered with 10 lm lime juice	20 g
Green and Leafy vegetables								
Amaranthus sp	Chaulai	Amaranthaceae	L	Herb/C , Fresh	In the treatment of malnutrition, hepatitis, anaemia, eye disorder, respiration disorder, cold and cough, gastric ulcer and effective in the spermatorrhoea.	Lime, honey	Juice of the leaves with 20gm honey	10 ml-50 ml
Benincasa hispida Thunb.	Petha	Cucurbitaceae	Fr	Climber /C, Fresh	Juice effective in bleeding tendency and haematuria. Pulp used in the treatment in anemia, excessive bold heat, weakness of heart and thinness of semen in males.	Lime juice	100 ml Juice: 5 ml lime juice	100 ml
Brassica oleracea L.	Patta gobhi	Brassicaceae	L	Multi layer herb/ C, Fresh	Juice is effective in bleeding form gum, gastric ulcers, viral hepatitis, palpitation of heart.	Honey	200 ml juice with 25 ml honey	250ml :10 g
Brassica oleracea botrytis	Fool gobhi	Brassicaceae	I	Herb / C, Fresh	Juice effective in gastric ulcer, bleeding from gums, night blindness, premature greying of hair and sterility.	Honey	25 ml juice: 5 ml honey	30 ml
Chenopodium album	Bathuwa	Chenopodiaceae	L, Se	Herb / C,	Gives strength to the nervous system, effective in constipation. Seeds use as the treatment of	Lime juice	50 ml juice: 5ml	50 ml

L.				Fresh	dropsy and involuntary dibbing of urine.		lime juice	
Cucumis sativus L.	Kakadi	Cucurbitaceae	Fr, Se	Climber/ C, Fresh	Useful in the treatment of scanty urination, cystitis, nephritis, toxemia of pregnancy, high blood pressure, biliousness, indigestion and good for beauty treatment. Seeds are also useful in the weakness of memory and nervous debility.	None	Directly eat	250-500g
Cucurbita maxima Duch.	Kaddu	Cucurbitaceae	Fr, Se	Climber/C, Fresh	Juice of the pumpkin is helpful in treatment of bleeding piles, enlargement of prostate and blood splitting. Seeds use against asthma, tuberculosis, cirrhosis of liver and weakness of memory.	Honey	100 ml pumpkin juice: 10 ml honey	30-40 ml
Hibiscus esculentus L.	Bhindi	Malvaceae	Fr, M, R	Shrub /C, Fresh	Mucilage is effective in dysentery, diarrhoea, stomachache, burning of throat, stomach, rectum and urinary passage. Fruit use as effective in leucorrhoea in females, thinness of semen.	None	Direct eat	100 ml-25g
Lagenaria vulgaris Ser.	Lauki	Cucurbitaceae	Fr	Climber / C, Fresh	Effective in the treatment of tuberculosis, gastric ulcer, jaundice, piles, diabetes, high blood pressure, congestive heart failure, insanity, burning in urinary passage due to high acidity of urine, constipation, burning of eyes and scalp.	None	Direct eat	500 g
Luffa cylindrical L.	Torai	Cucurbitaceae	Fr, Se, L, R	Climber /C, Fresh	Seeds effective in the amoebic dysentery. Decoction of leaves use as the treatment of eczema and piles as external ointment, root use as curing of diuretic and dropsy.	Butter milk	3g seeds : 100 ml butter milk	100 ml
Momordica charantia L.	Karela	Cucurbitaceae	Fr, L, R	Climber / C, Fresh	Decoction of its fruit helpful in diabetes mellitus, acne, pimple, skin disease, ring worm, itching, psoriasis and nervous system. Leaves use as the treatment of functional sterility in females and hemorrhoids. Roots use as to cure the rhinitis, throat hoarseness and hysteria.	Honey, lime juice	25 ml juice: 5 ml honey	25-50 ml
Solanum melongena L.	Bengan	Solanaceae	Fr, L	Shrub / C, Fresh	Pulp use as the treatment against torpidity of liver, enhance the secretion of the progesterone hormone, threatened abortion, sterility. Juice of leaves use as the treatment of congestion of lungs, bronchitis and whooping cough.	Butter milk	100g fruit pulp : 100 ml butter milk	100 ml
Spinacia oleracea L.	Palak	Chenopodiaceae	L	Herb/C, Fresh	Good to the eyes, nephritis, scanty urination, toxaemia of pregnancy and high blood pressure.	None	Directly eat	100-250 g
Trigonella foenumgraecum L.	Methi	Papilionaceae	L, Se	Herb / C, Fresh and dry	Effective in heart, liver and lungs disorders. Fresh leaves juice use in the treatment against diabetes, glandular swelling and increase immune power. Decoction of seeds use as the treatment of pneumonia, rheumatism anaemia and lumbago.	Honey, lime juice	Take 25 ml leaves juice: 5 ml honet: 5 ml lime juice	25ml
Roots, Rhizomes, tubers, spices and other plants								
Ageratum conyzoides L.	Bukila	Asteraceae	L and F	Herb/W Fresh and dry	Use as insecticide and nematicide.	None		-
Allium cepa L.	Piyaz	Liliaceae	S, L	Herb / C, Fresh	Effective in indigestion, food poisoning, dental caries, chronic dyspepsia, piles and beauty treatment of hair. Juice of onion is use as the treatment of epilepsy. Decoction of the leaves helpful in the scanty urination, cough, round worms and night blindness.	Vinegar honey, Water	Eat 15g crushed onion:3 ml vinegar	20 gm
Allium sativum L.	Lehsun	Liliaceae	L, Bu	Herb/C, Fresh	Antibacterial, effective in rheumatism, sciatica, intermittent fever, asthma, helpful in excretion of round and pin worms in children, whooping cough, pneumonia, nervous trembling of the	None	Consume directly	6-7 g

					hands, paralysis and impotency.			
Aloe barbadensis (L.) Burm.f.	Ghegwar	Liliaceae	S	Herb/C, Fresh	Effective moisturizer, cooling properties, good to skin disease, control the high blood pressure. Cure pimple and acne.	None	Apply leave juice directly on the skin	10-100 ml
Cannabis sativa L.	Bhaang	Cannabaceae	L, Se	Shrub/ W, Fresh	Cannabis has been used to reduce nausea, vomiting, treat pain and muscle spasticity.	None	Consume directly	-
Centella asiatica L.	Brahmi	Apiaceae	L	Herb / C and W, Fresh	Helpful in hysteria, rheumatic pain, premature greying and falling of hair, jaundice, piles, dyspepsia and hyperacidity in urine.	Water, oil	Take 15 ml leaves juice with 200 ml water	200ml
Colocasia esculenta (L.) Schott	Arbi	Araceae	Rh	Herb / C, Fresh	Gives strength to the nervous system, effective in scanty urination, thinness of semen.	None	Consumed directly	250 g
Coriandrum sativum L.	Dhaniya	Apiaceae	L, Se	Herb/C, Fresh and dry	Enhance the secretion of digestive enzymes, decoction of the green leaves good for the skin disease. Seeds are useful in the treatment against the indigestion, biliousness, flatulence, bronchitis, insomnia, high blood pressure and weakness of the memory.	Water, honey	Take 30 ml leave juice with 15 ml honey	50 ml
Curcuma longa L.	Haldi	Zingiberaceae	Rh	Herb/C, Dry	Carminative, antiseptic, anti-flatulent, blood purifier, effective in bronchitis, rhinitis, sore throat, diarrhoea, burning of rectum, chronic skin disease, scabies, ringworm, ulcer, cure boils and cut wounds, effective in itching, scabies and scorpion sting.	Milk, water	Take 3-5 gm powered rhizome with 200 ml warm milk	50 ml
Cymbopogon citratus (DC.) Stapf	Gavati chaha	Poaceae	L, O	Herb/C and W, Fresh and dry	Grass is used for culinary purposes, in tea and as a flavouring. Insects repelling such as whitefly. Its cultivation enables growing some vegetables (e.g. tomatoes and broccoli), without applying pesticides. Lemon grass oil, used as a pesticide and preservative. Helpful in relieving cough and nasal congestion.	None	Consumed directly	-
Daucus carota L.	Gajar	Apiaceae	R, L, Se	Herb /C, Fresh	Effective in the morning sickness, premature aging, nervous debility, weakness of memory, gastric ulcer and urinary calculi. Seeds use as the curing of indigestion, scanty urination and leucorrhoea in females. Juice of leaves effective in the enhancing of digestive system, burning sensation and beauty treatment.	Honey	Take 200 ml juice: 20 ml honey	200 ml
Foeniculum vulgare Mill.	Saunf	Apiaceae	L, Se	Herb/C, Fresh and dry	Main constituent of gripe water, effective in foul breath, constipation, nausea and vomiting, scanty urination, dysmenorrhoea, enhance the beauty of skin, cure acne and pimple, bronchitis, lung abscess and haemoptysis.	Water	Direct consume or take 15 ml leaves juice: 5 ml water	10-20g
Hibiscus rosa sinensis L.	Gurhal	Malvaceae	F	Shrub/ C and W, Fresh	Effective in the hair disease, give natural shine and nutrition to the hair.	Oil	5-6 flower boil with the coconut oil, apply on the hair roots	20-30ml
Mentha spicata L.	Pudina	Lamiaceae	Ap	Herb/ C and W, Fresh	Leaves decoction is given orally to cure throat infection and indigestion. Decoction of leaves with cinnamon is given orally to women for easy delivery.	Water, cinna-mon	Take 50 ml leave decoction : 2-5gm cinnamon	5-6 ml
Ocimum sanctum L.	Tulsi	Labiatae	Ap	Herb/C, Fresh	Tulsi posses wide range of therapeutic properties, commonly used to treatment coughs, colds, head and ear aches, rheumatism, arthritis	None	Consumed directly or apply the	5-6 g

				and dry	and skin diseases.		leaves paste on the affected area	
Oxalis corniculata L.	Katta-meetha	Geraniaceae	L	Herb/ W, Fresh	Effective in skin disease.	None	apply the leaves paste on the affected area	10-20g
Raphanus sativus L.	Muli	Brassicaceae	R, L, Se	Herb / C, Fresh	Effective in indigestion, dyspepsia, piles, jaundice, prolapsed of rectum, enlargement of liver and spleen treatment. Juice of the leaves use as cystitis, nephritis, hypertension and urinary calculi. Seeds are effective to overcome the impotency.	None	Consumed directly	150-200g
Rosa indica L.	Gulab	Rosaceae	F	Shrub / C and W, Fresh and dry	Main constituent of rose water which gives cooling to the burning eyes, decoction of the petals of the flower is an effective skin tonic, enhance skin beauty. 'Gulkand' prepared by the flower is good to digestion.	Water, suger	Apply the rose water in the affected area	_
Rumex patientia L.	Jangli palak	Polygonaceae	L	Herb/ W, Fresh	Leaves and roots use internally for treatment of viral infections, have astringent slightly purgative qualities.	None	Consumed the cooked leaves	10-12g
Solanum nigrum L.	Makoy	Solanaceae	Ap	Herb/ W, Fresh	Effective to reduce the muscles swelling and bone fracture.	Mustere d oil	25-30 gm leaves cooked with 10 gm mustered oil, tie on the affected part	50-100g
Solanum tuberosum L.	Aalu	Solanaceae	T, L	Herb /C, Fresh	Decoction of its fresh leaves help in the treatment of common cold and cough, sore throat and bronchitis. Curing properties against stomatitis, constipation, scanty urination, enhances breast milk.	Water and salt	Gargle with the decoction of leaves with water and salt	100 ml
Stellaria media (L.) Vill.	Winter weed	Caryophyllacea e	L	Herb/ W, Fresh	Often raw in salads. It has been used as a remedy to treat itchy skin conditions and pulmonary diseases also for bronchitis, rheumatic pains, arthritis, can be applied to cuts, burns and bruises.	None	Consumed directly, and apply the paste on the affected part	20-25g
Tagetes erecta L.	Genda	Asteraceae	L	Herb/C and W, Fresh	Effective in skin disease and earache.	None	Apply the paste on the affected part	2 ml
Zingiber officinale (Rosc.)	Adrak	Zingiberaceae	Rh	Herb/C , Fresh	Enhance the secretion of the digestive juice, effective in sensitivity of teeth, morning sickness, piles, whooping cough, influenza and cure against gastro-intestinal infection.	Lime juice, salt and honey	Take 3 ml juice with 3 ml honey and salt	3-5 ml

Ap= all parts, B= bark, Bu= Bulb, C= cultivated, F= Flower, Fr= Fruit, G= grain, H= hairs, I= Inflorescence, L= leaves, M= mucilage, O= Oil, R= root, Rh= rhizome, S= stem, Sa= sap, Se= seed, T= tuber, W= wild, YL= young leaves, Ys= young stem.
*The prescribed dosages are for the adults and its half quantity recommended for children.

The distribution of medicinal plant forms in the study is similar to the findings of Megersa et al. (2013), in which among all the recognized medicinal plants, herbs constituted the highest proportion, represented by 43.6% species while there were 27% tree species, 20.6% shrubs and lianas

contribute only 2%. In the present study, out of a total of 60 medicinal plants, highest number of plants belongs to herbs (53.33%) followed by trees (25%), climbers (11.66%) and shrubs (10%) (Figure 2)

In the home garden form of agroforestry system, a total of 32 herbs species (W= 06, C= 22, W-C= 04) belonging to 16 plant families were documented in this study. Out of these, 12 herbs were in three families (Poaceae, Brassicaceae and Apiaceae) followed by Liliaceae representing 3 herb species. Papilionaceae, Chenopodiaceae, Solanaceae, Zingiberaceae and Asteraceae contributed only two (2) genera each while remaining seven (7) families were represented by a single species (Table 2).

Shrubs species contributed 06 genera (W= 01, C= 03, W-C= 02) belonging to four (4) families. Malvaceae and Solanaceae add 2 genera in each while Cannabaceae and Rosaceae were represented by a genus each. .

A total of 15 tree species (W= 04, C= 08, W-C= 03) comes under 11 families out of which Myrtaceae, Moraceae and Rutaceae contributed 2 genera in each while the remaining represent single species. All the climber species belong to Cucurbitaceae family apart from *Vitis vinifera* which belongs to Vitaceae family. All the climber species were cultivated. In the present study, a total of 11 species (18.33%) were wild, 40 species (66.67%) cultivated and only 09 species (15%) were both wild and cultivated. Herbal remedies have been an integral part of healing and are considered to be the oldest form of healthcare known to mankind on this earth. These plant species were very useful in the treatment of various diseases. In the present study, those 60 medicinal plants species were treated around 10 different categories of human ailments (Figure 3) such as skin disease, heart diseases, sting of the poisonous insect or animal, common cold and fever, vomiting, anaemia, arthritis, bronchitis, diabetes, diarrhoea, dysentery, jaundice, leprosy etc.

Almost every plant parts were used for the medication either singly or in combination with other plants. Some of the medicinal plants were added with different ingredients. In this sequence Mesfin et al. (2013) reported in their study based on ethno-botanical use of traditional medicinal plants carried out in Northern Ethiopia in which about 61% of plants were not adding any ingredients while on the other hand, in the present study, around 29% (maximum) of plants do not add other ingredient to prevent or treat the diseases. The healers responded that lime juice, water, butter, oil, honey and sugar were some of the ingredients added to the medicinal plants in different modes of the preparation of medicine (Figure 4). From the present findings, about 70% medicines were prepared by the fresh form of plant or plant parts (i.e. decoction, extract) followed by both fresh-dry (21.66%) and dry (8.33%) (Figure 5) The plants which were used as a dry form of medicine were exclusively dried in shade, away from direct sunlight and stored in cool and dry place.

Table 2: List of the families and the belonging plants of the study area

S. N.	Families	No. of plants	Name of the plants
			HERBS SPECIES
1	Poaceae	04	*Triticum aestivum, Oryza sativa, Zea mays, Cymbopogon citratus*
2	Brassicaceae	04	*Brassica campestris, Brassica oleracea, Raphanus sativus, Brassica oleracea botrytis*
3	Apiaceae	04	*Daucus carota, Coriandrum sativum, Foeniculum vulgare, Centella asiatica*
4	Liliaceae	03	*Allium cepa, Aloe barbadensis, Allium sativum*
5	Papilionaceae	02	*Trigonella foenumgraecum, Phaseolusradiatus*
6	Chenopodiaceae	02	*Spinacia oleracea, Chenopodium album*
7	Solanaceae	02	*Solanum tuberosum, Solanum nigrum*
8	Zingiberaceae	02	*Zingiber officinale, Curcuma domestica*
9	Asteraceae	02	*Tagetes erecta, Ageratum conyzoides*
10	Amaranthaceae	01	*Amaranthus* sp
11	Araceae	01	*Colocasia esculenta*
12	Labiatae	01	*Ocimum sanctum*
13	Geraniaceae	01	*Oxalis corniculata*
14	Caryophyllaceae	01	*Stellaria media*
15	Lamiaceae	01	*Mentha spicata*
16	Polygonaceae	01	*Rumex patientia*
TOTAL	**32**		
			SHRUBS SPECIES
1	Solanaceae	02	*Solanum melongena, Lycopersicon esculentum*
2	Malvaceae	02	*Hibiscus esculentus, Hibiscus rosasinensis*
3	Cannabaceae	01	*Cannabis sativa*
4	Rosaceae	01	*Rosa indica*
TOTAL	**06**		
			TREES SPECIES
1	Myrtaceae	02	*Psidium guajava, Syzygium jambolanum*

2	Moraceae	02	*Artocarpus heterophyllus, Ficus religiosa*
3	Rutaceae	02	*Citrus limon, Murraya koenigii*
4	Punicaceae	01	*Punica granatum*
5	Anacardiaceae	01	*Mangifera indica*
6	Musaceae	01	*Musa paradisiacal*
7	Meliaceae	01	*Azadirachta indica,*
8	Caricaceae	01	*Carica papaya*
9	Rhamnaceae	01	*Ziziphus jujube*
10	Euphorbiaceae	01	*Phyllanthus emblica*
11	Lauraceae	01	*Cinnamomum tamala*

TOTAL 15

CLIMBER SPECIES

1	Cucurbitaceae	06	*Cucumis sativus, Cucurbita maxima, Momordica charantia, Luffa cylindrica, Benincasa hispida, Lagenaria vulgaris*
2	Vitaceae	01	*Vitis vinifera*

TOTAL 07

As figure 6 indicated, 32 species (53.33%) of the medicinal plants were taken by oral, 6 species (10%) were taken by dermal and the rest 22 species (36.66%) taken both by oral and dermal mode of application which was comparable with the previous findings of Mesfin et al. (2013). So, the present study showed majority of the medicinal formulations were administered orally in ailment categories other than dermatological. In dermatological problems, plants are administered topically as well as orally.

Figure 7 indicated that most utilized plant parts were leaves (34%) followed by fruits (19%) while the least used was bark (only 2%). A similar kind of study was conducted by Sharma et al. (2010) in Zangelanlo district, Northeast Iran in which among the medicinal plants parts; leaf (25%) was used in majority of cases. This was followed by fruits (19%), roots (15%), seeds (12%) and bark (2%). Plant parts used as medicine are collected by healer themselves from natural or wild sources. Various plant parts are collected in different seasons at different stages of maturity.

The rural/tribal people of the study area prefer traditional medicinal practice as compared to the modern medicinal system because they know more about the medicinal plants which are easily available in their local area - herbal formulations are comparatively cheaper and perceived to be free from side effects. It was also found that one species or sometimes more species were used for curing one or many diseases together. A total of 10 ailments were identified by informants revealing majority of the people preferred herbal system of treatments for curing common diseases while serious ailments like tuberculosis, cancer etc. were mostly treated through allopathic treatment (Phondani, 2011).

It was also examined during the formal discussion with the local community that the people prefer the allopathic treatment for instant relief while herbal remedies take time to come into action but on the other hand, it was experienced by them that allopathic treatment is expensive and have future side-effects while herbal treatment is much cheaper and has no side effects. Therefore, they prefer herbal remedies than the allopathic drug and only go through the modern medicine when the conditions become critical. It has also been observed that the knowledge about utilization of medicinal plant was generally accumulated by observation, experiences and transferred to the next generation by words of mouth. These local people have accumulated a rich knowledge on the use of various plants for treatment of various diseases. However, the younger generation under the influence of rapid socioeconomic growth has developed the tendency to over-exploit the economically important species (Bargali et al., 2003).On the other hand, the traditional healers have strong believe that if they disclose the secrecy about the medicinal properties of particular plant, all the medicinal potentialities of the plant will be lost and the remedy will not work properly.

An interesting fact also emerged from the present study. All the persons from different age groups, including infants and old, take the herbal remedy without side-effects. They do not have any kind of fear over taking such medicines, even though they knew that infants and old persons should take more care in the selection of medicine. This proves that herbal medicines are safer and free from side effects than the allopathic medicine. An indigenous knowledge on usages of medicinal plants is transmitted without any systematic process and the younger generation of the tribes are not interested in traditional healing system because it has no or very little scope for money, so they engage themselves in other occupations (Bussmann et al., 2000). Thus, it is certain that such knowledge is at the risk of disappearance in near future.

Recently, due to unplanned developmental programs, increasing modern healthcare facilities and impact of modern civilization in this area, natural resources as well as traditional knowledge and tribal cultures are depleting rapidly at an alarming rate. Therefore, it is urgent to explore and document this unique and indigenous traditional knowledge of the tribal community before it diminishes with the knowledgeable persons. Further documentation of indigenous and traditional knowledge is very important for future critical studies leading to sustainable utilization of natural resource and to face the challenges of bio-piracy and patenting indigenous and traditional knowledge by others (Singh et al., 2012).

Encouraging the community to grow different medicinal plants in their home gardens by mixing them with different crops and protecting the medicinal plants found in the wild is of principal importance. Such proven plant species may be used in the formulation of new drugs against different ailments. Hence, there is a great need to cultivate and conserve such plants and at the same time there is an immediate need of indigenous practices, knowledge of such plant resources and documentation. It is suggested that for a safe and effective use, the ethno-botany data should be subjected to a scientific and biochemical evaluation.

http://dx.doi.org/10.4314/ajtcam.v12i6.10

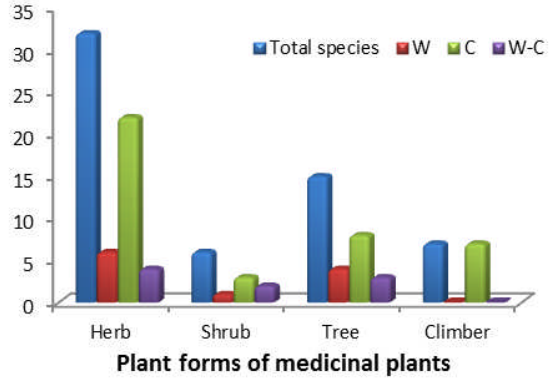


Figure 2: Plant forms of the medicinal plants.

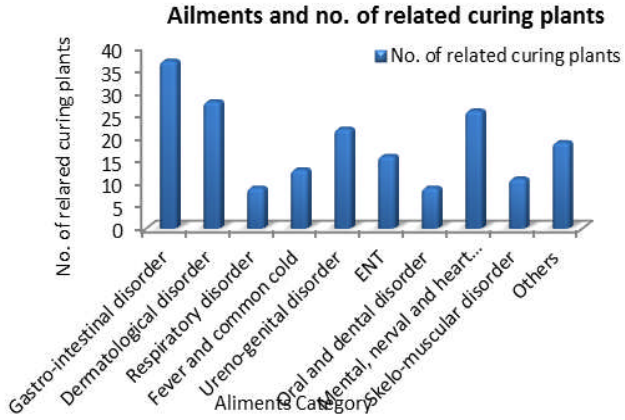


Figure 3: List of ailments category and the curing plant against related diseases.

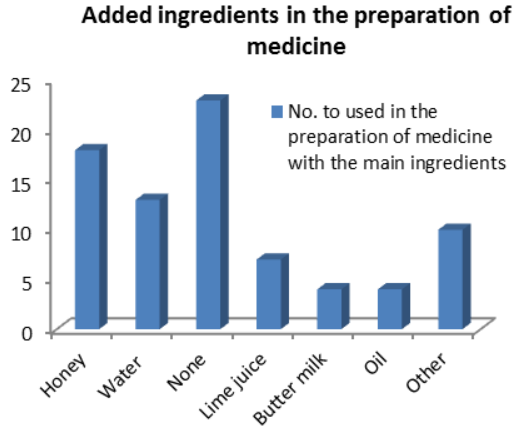


Figure 4: List of ingredient added

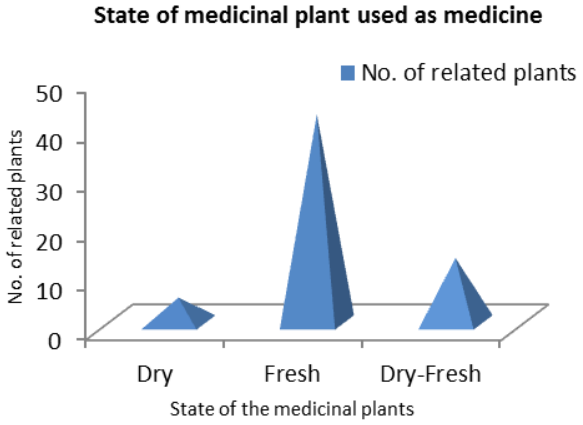


Figure 5: State of the medicinal plants used with the main medicinal plants to cure various diseases.

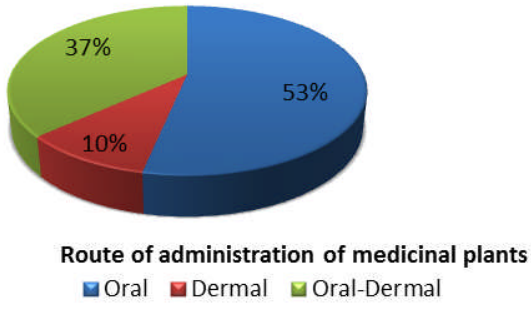


Figure 6: Route of administration of the medicinal plants.

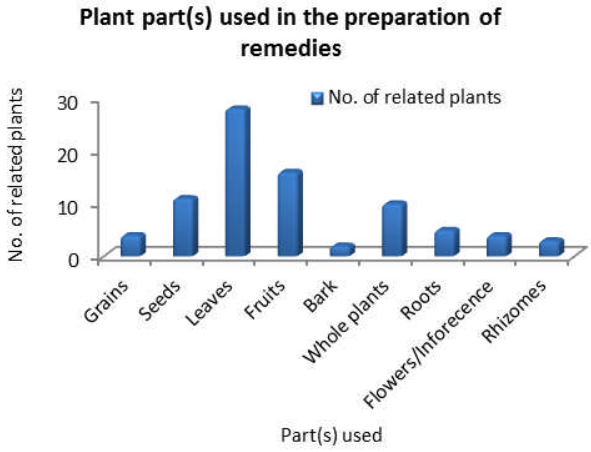


Figure 7: Plant part(s) used in the preparation of remedies in the study area.

Significance of the Study

We are living at the age of science where science and technology are supreme. Medical infrastructure is also highly developed. But despite this fact, the result that comes out from this ethno-botanical survey showed that indigenous medicine is preferred to the allopathic medicine in primary healthcare for the local people. It is simply called the 'medicine from the kitchen'. Thus, the usages of the plant and plants products should be encouraged and closing the gap between the social and medical sciences in order to reach a better understanding of the health need of the population, is much needed.

This study is therefore significant as traditional knowledge is still in practice and people take its profit in the same way as in the ancient days when the medical system was not as strong as it is presently. This system of indigenous knowledge and the practice close to the heart of the local communities and a large percentage of the rural communities depends on this acquaintance for primary health care. The community was not only exploring its benefits but also culturing this rich knowledge about plant and the plant products and transferring it to the next generation deliberately or unknowingly. It is an indigenous knowledge that is intimately linked to their custom and tradition.

Plant and plant's products have a great prospect in the field of drug development and pharmaceutical industries. For this purpose, scientific validation of the medicinal plants addressed by the local community/native people should be worked out by Research and Development to contribute their benefits scientifically and globally.

Therefore, the intervention of the local system as well as the encouragement of the state government, concerned institutes, capacity builders and other shareholders need to come up with enabling policies and to sustain this precious inhabitant knowledge of medicine for future generation (Lyngdoh, 2014).

Conclusion

The indigenous people in Bhabhar belt of Kumaun Himalaya are still deeply connected to their rich heritage of traditional medicine knowledge and try to preserve it. They still believe in herbal remedies. The ethno-medicinal survey of the study area indicates that currently, the local people use these plant species for their own consumption only and not for commercial purposes. Traditional healers have strong faith in ethno-medicines although they were less aware about the documentation and preservation of ethno-medicinal legends and medicinal plants.

It may therefore be concluded that a wise use of these plant species on a sustainable basis for folk medicines, agronomic and biochemical investigations are needed (Pant et al., 2008). Moreover, the documented medicinal plants can serve as a basis for future investigation of modern drug.

Acknowledgments

We are thankful to the Head, Department of Botany for providing necessary facilities to conduct this research work and the villagers for their support during the data collection. The first author (KP) is also thankful to University Grant Commission (Basic Science and Research) fellowship for the financial support. The study is partly supported by ICSSR (Project F.No.02/66/2014-15/RPR), New Delhi.

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