



## RESEARCH PAPER

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## Ethnobotany of medicinal plants of Tehsil Kotli Sattian, District Rawalpindi

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### Abstract

In this study we aimed to explore the medicinal plants in Pakistan, the diversity of medicinal flora of Tehsil Kotli Sattian. On the bases out selected methodology it is concluded that the study area is rich with medicinal flora comprises of 62 plant species belonging to 37 families and 54 genera. It was observed that Rosaceae and Solanaceae are widely distributed families consists of 5 plant species. Leaves are the most extensively used part while decoction was the most common method of herbal preparation. The collected plant species are used by the local community for their primary health care needs indicated that plants have novel therapeutic potential against different ailments.

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## Introduction

Ethnobotany is generalized as the study of people and plants. It was coined in 1895 by American taxonomic botanist John W. Harshberger as the study of the utilitarian relationships between human beings and vegetation in their environment, including medicine uses (Harshberger, 1896). Ethnobotany basically accounts for the study of relationship between people and plants for their use as medicine, food clothing, fuel, shelter, and other household purpose (Balic , 1996).

Ethnobotany is multidisciplinary science that studies the relationship between a given society and its environment and in particular the plant world. They understand and collect the knowledge of valuable plants by the use of anthropological methods. The ethnobotanist aims to explore how these plants are used as food, shelter clothing and how medicinal use of such plants is linked to other characteristics of the plant species. (Joshi, 2002).

Ethnobotany Knowledge encompasses both wild and domesticated species and is rooted in observation relationship, needs and traditional ways of knowing. Such knowledge evolves over time and is therefore always changing and adding new discoveries, integrity and method. Importance of ethnobotany shows from the fact that it is important in applied conservation projects that take in account both social and environmental aspects i.e. both biodiversity and people (Terralingua, 2010).

The people living in remote area mostly rely on local resources in order to treat various health disorder (Abbasi *et al.*, 2013). Important feedback can be obtained from ethnobotanical information for public Health and environmental policies through the understanding of socio-cultural backgrounds and the analysis of ethnic-base strategies to combat diseases (Lemieux *et al.*, 2012).

### *Medicinal Plants*

Medicinal plants provide health promoting characteristics, temporary relief or symptomatic problems or have curative properties. Medicinal plants have been used for centuries in traditional

health care system and in various cultures around the world still depend on plants for their primary health care. Due to recent advancement in plants sciences, there has been tremendous increase in the use of plants base health product in developing as well as developed countries. Almost 70-80% people around the globe depend on medicinal plant for primary health care (Singh, 2002).

Medicinal plants are also source of income for millions of people. According to world health organization (WHO, 2002) in all region of the developing world, ethnomedicine has retained its reputation and its use is rapidly growing in the industrialised countries. In china traditional herbal remedies accounts for 30-50% of the total medicinal consumption. Use of herbal medicine for treating 60% of the children with malaria is common in Ghana, Nigeria and Zambia. Due to less side effects and economic value, people in developing countries like Indonesia (60%), Srilanka (65%), Nepal (75%), India (80%), Mynamar (85%) and Bangladesh (90%) have strong belief in this system of medicine. (Bhat *et al.*, 2003).

WHO estimated the present demand for ethnomedicinal plant is almost US\$14 Billion per year (Sharma, 2010). Annual demand for medicinal plant based raw material is growing at the rate of 15 to 25% and is expected to increase more than US\$ 5 trillion in 2050. An attempt is made by WHO to identify all medicinal plants used globally and listed more than 20,000 species. (Pandey *et al.*, 2008).

Due to primary source treatment against many diseases medicinal plants play a significant role in lives of its inhabitant. They serve as source of income for poor field workers and people associated with herbal product manufacturer. Most species of medicinal plant (about 70%) are uniregional and remaining are bi-regional or pluri-regional (Ali , 1986).

### *Medicinal Plants of Pakistan*

Pakistan has variety of climates, ecological zones and topographic regions that are gifted with a variety of medicinal plants (Hussain *et al.*, 2011) and even still desert part of Sindh provinces are said to unexplored

regarding the ethnomedicinal survey of medicinal plant. Moreover the indigenous knowledge of locals in this province is seriously depleted because of various conditions deforestation, famines long drought condition, migration of traditional healers and ignorance in the past regarding ethnobotanical documentation (Kadir *et al.*, 2012-13).

Rich floral diversity of Pakistan having 1572 genera and around 6000 wild plant species are most common in the Hindukush, Himalaya and Karakorum region (Tardio *et al.*, 2008). About 400-600 medicinal plant has been identified in Pakistan to be used in traditional health care system (Shinwari & Qaisar, 2011) this system is basically based on home based therapies. Few studies were carried out in Baluchistan by some scholars in the past as Shinwari and Malik (1989). Conducted research on ethnobotanical wealth of Dera Bughti area and ethnobotanical of Southern Baluchistan with particle reference to medicinal plants were investigated by Goodman and Ghafoor (1992).

Gathering and processing of medicinal plant for the preparation of herbal medicine is centuries old practice among local communities of Pakistan for both men and women. Rich floral biodiversity is found in northern part of Khyber pakhtunkhwa province and commercial extraction of medicine at plant began in this province some 50 years ago and continuous to this day (Ahmed *et al.*, 2014). The communities of rural area exploit plants for local use as well as sale outside their area. Almost 80% population of Pakistan is rural household where medicinal plants are easily available. Hockey (1958) reported that 84% of Pakistan population was dependent on traditional medicine for most of their medicinal use.

Dependence on medicinal plant in remote northern Pakistan is high but still no research has investigated specifically which plants are used. It has been noted in many area that the role medicinal plant play in the health care of isolated communities is still poorly understood (Bhattarai *et al.*, 2006). Since human civilization, medicinal plants have been used as

source of medicine (Hill, 1952). Due to unique photography and diverse climate conditions, Pakistan has great diversity of medicinal and aromatic plant (Bano *et al.*, 2014).

#### *Threats to Medicinal Plants*

The plant hotspots of Pakistan are spread over 13 natural regions from alpine pastures to mangrove forest. More than 10% of the flora is endangered (Shinwari *et al.*, 2002). The information is limited on the conservation status of native plant species however, there is a lot of controversy in the available data. Chaudhri and Qureshi (1991) reported 709 plants as threatened and endangered in Pakistan whereas Nasir (1991) reported 580 flowering plants. In contrast, more recently Ali and Qaiser (2010) reported only 21 flowering plants that are threatened in Pakistan. Alam and Ali (2009) revealed several threats to Pakistan's biodiversity including habitat loss, deforestation, grazing, invasive species, illegal trade, industrial pollution, growing demand for natural resources and the lack of adequate training. From Rawalpindi and adjoining areas, sporadic information is available on the flora of the study area. However, from the adjoining areas few studies were carried out (Stewart, 1957; Ahmad, 1964).

The economy of the area is primarily based on agriculture which is quite insufficient to support the existing population, consequently the subsistence economy prevails. This problem is the result of poor land capabilities, unfavourable climate, soil erosion, land sliding, land fragmentation and heavy pressure of cattle grazing and human population. A lack of clear custodianship, little understanding of sustainable management practices and knowledge of market requirements coupled with poor social status and economic opportunities for gatherers and inadequate institutional structures place natural habitats and populations of medicinal plants at risk. Currently there is little evidence for the conservation of indigenous medicinal herb species within the area. Biotic pressure from population growth and resulting domestic activities are placing some species under threat (Lange, 2002, Olsen and Larsen, 2003, Sher *et al.*, 2010).

Bano *et al.* (2014) also reported that human population growth, deforestation and over grazing problems in various parts of Swat District increase pressure on wild plant resources and this results in an alarming decrease in availability of certain important medicinal plants species. The continuous utilization of various plant parts especially roots and whole plant for the preparation of herbal medicine may be serious threats from conservation point of view (Flatie *et al.*, 2009). This practice puts a pressure on medicinal flora and perhaps this is the reason many valued medicinal plants are listed as threatened species. In a previously published report from Leepa Valley, Pakistan *Sussuria lappa* which is highly medicinal in its properties and have highest use value was declared as threatened species because the root of the plants are too much exploited in the preparation of herbal drugs (Mahmood *et al.*, 2012a). Besides these environmental consequences of deforestation, such a loss of plant and animal genetic resources impact these societies on a social and economic plane through their potentially adverse effects. Informants reported that natural regeneration of medicinal plants in the study area is under heavy pressure as a result of unauthorized collection, deforestation and overgrazing (Ahmad *et al.*, 2014c).

#### *District Rawalpindi Floral Wealth*

Rawalpindi is located in North West corner of Punjab. It lies between 33' and 34' north latitude and 72' and 74' east longitude. Rawalpindi shares boundaries with Jhelum district in south, with Hazara District in north, with Poonch in east and with Attock district in west. Total area of Rawalpindi is 2051 sq-miles but only 936 sq-miles are cultivated. The elevation rising from 1500' at Gujar Khan and 1750' at Rawalpindi to 7500' in the Hill station of Murree. The District comprises of six Tehsil namely Rawalpindi, Murree, Kahuta, Kallar Syadian, Gujar Khan and Taxila (Anon, 1998). Basically District Rawalpindi has Mediterranean type of flora. Due to long dry season, the flora of plain is distinctly arid numerous grasses are found but no less than 185 are collected so far (Stewart, 1957). Due to distinct geographical feature variety of flora in district Rawalpindi was documented by different researcher at different times.

Most common of them are tree *Acacia modesta*, *Olea cuspidata*, *Zizyphus* spp, Several *Grewia* spp, a *Rhammus* sp, *Calotropis*, *Peganum harmala* and *Elhretia aspera*. They also reported common shrubs *Dodonaea viscosa*, *Gymnosporia royleana*, *Adhatoda vasica*, *Otostegia limbata*, *Carissa opala*, the most common among is *Capparis deciduas*. Common wild willow *Salix acmophylla* and wild products of some plants include floral buds of *Bauhinia Varigata*, *Punica granatum*, fruit of *Capparis aphylla* and *Zizyphus nummularia* are also documented. Most valuable tree studied for furniture is *Dalbergia sisoo*. It is found in wild as well as in cultivated form (Shaheen *et al.*, 2014, Saqib *et al.*, 2014b, Satti, 2001, Ahmed *et al.*, 2013, Husain *et al.*, 2008).

#### *Tehsil Kotli Sattian*

Kotli Sattian is a subdivision of district Rawalpindi (Punjab). It is bounded on the west by the river Jhelum, on the north by the river Soan and ancient historical river of sub-continent and on the south by the Murree Sub division; a scenic hill station of Pakistan. It is also bounded on north by Kahuta Tehsil. Kotli Sattian touches the Kashmir territory on the east by bridging the river Jhelum. It is the next door neighbour of Islamabad the federal capital. The different areas of subdivision vary greatly from each other. It is spread over an area of 3045 sq km. The population of the villages comprising Kotli Sattian town (Tehsil) was 83,255 in 1981 while 1998 Census shows population 81,523. Due to its location at high altitude, climate usually remains pleasant from April to September while it becomes extreme cold from October to March. Snowfall usually happened from mid-December to February. The average annual temperature in Kotli Sattian is 21.9°C while annual rainfall is 976mm. Due to cool and humid condition for most of the year, the vegetation in the area comprises a variety of trees, herbs, shrubs and climber (Satti, 2001).

#### *Use of Medicinal Plants in Kotli Sattian*

There are diversity of Medicinal plant in Tehsil kotli sattian which are very beneficial for local community. Majority of local people are poor and modern health care facilities are inaccessible to them.

So these people rely on medicinal plants found in these areas. Herbal Preparation are used by people to treat minor Health problems and they all are well aware of the medicinal use of indigenous plants. Herbal medicine are prepared at home and doses are taken according to advise of the villages old people. Number of medicinal plants are used against single ailments e.g. Jaundice was reportedly treated by *Carissa opaca*, *Justicia adhatoda*, *Rhus coriaria*, *Taraxacum officinal* and *Caltropic procera* (Saqib *et al.*, 2014).

Few plants are investigated for pharmacological studies and proved effective against ailment Comelli *et al.* (2008) conducted a pharmacological research on *Cannabis Sativa* extract and found its potential effect against neuropathic pain along with the suggestion that it inhabit hepatic metabolism. Krishnamurthy *et al.* (2011) conducted a detail research on leaf extract of *Amaranthus viridis* and found it best for treatment of diabetics. Local people use herbal preparation as tooth brush eye and ear drops, Poultice/paste and oil. But it was observed that no hard and fast rule was obeyed for dosage of herbal preparation here (Mahmood *et al.*, 2012a).

The Tehsil Kotli Sattian has diverse flora and high ethnobotanical potential but due to harsh climatic conditions ,less research facilities and unawareness of local people about potential of these medicinal plants ,it is least to b researched. So, the present research was carried out to assess and document ethnobotanical knowledge of medicinal plants of Tehsil kotli sattian, District Rawalpindi.

The main objectives are

- To develop the inventory of Medicinal Plant of Tehsil Kotli Sattian
- To compile the base line data of Medicinal plant of Tehsil Kotli Sattian
- To document the indigenous recognition regarding the traditional use of medicinal plant
- Documentation of General Medicinal list of Tehsil Kotli Sattia
- Interview local communities of Tehsil Kotli Sattian about the ethnobotanical uses of medicinal plants

- To create awareness among people about local flora of Kotli Sattian



View of Tehsil Kotli Sattian, Floral Diversity of Kotli Sattian and Climatic Condition of Kotli.

## Materials and methods

### Description of Study Area

The study area is around three watersheds placed at north eastern of Kotli Sattian, it is located at north eastern portion of District Rawalpindi, the north eastern District of the Punjab. This region of the Pakistan has its significant values due to diverse biodiversity. It is surrounded by beautiful green hills. The study area is approximately between 73133' to 73127' east longitude and 33144' to 33154' north latitude and covers more than 180km of land. The river Jhelum is on the east, the Tehsil Murree is on the north-west and on the south side it is bounded by Kahuta Tehsil. It is also near Kashmir Territory by bridging the route of River Jhelum on the east side. Its name is derived from the mountain town of Kotli and Satti tribe. Common occupation of people of this area is agriculture. A large number of people choose to work in defence force since British colonial era. Main language spoken is Pothohari.(Satti,2001)

### Ethnobotanical Documentation

Ethnobotany study was conducted to compile the indigenous knowledge about the use of medicinal

plants for the treatment of ailments by local communities of Tehsil Kotli Sattian. For this purpose a field survey was conducted. During this survey, field trip of different villages of Kotli Sattian was carried out in order to compile ethnobotanical data about uses of medicinal plants.

#### Research Techniques

The method employed during the study was designed with main purpose for finding the precious wealth of local knowledge's on medicinal plant use so open ended approaches such as interview, questionnaire and group meetings were conducted for data collection following the protocol for ethnobotanical documentation field survey was carried out (Alexiades, 1996, Martin, 2004). Different techniques were used for conducting research in order to get information about indigenous use of medicinal plant of Tehsil Kotli Sattian. These are as follows.



**Map.** Map of study area

Sources: [www.rcci.org.pk/about-rawalpindi](http://www.rcci.org.pk/about-rawalpindi)

#### Plant Collection

A field survey was conducted to collect medicinal plants. Local persons helped in collection of plants. All types of plants (herb, shrubs and trees) were collected. After collecting the plants, the following steps were taken to preserve the plants.

1. The plants were tagged.
2. Then plants were wrapped in blotting paper and placed in polythene bags.
3. The plants were transported to plant sciences department, Quaid-e-Azam University, Islamabad, Pakistan.

4. Then plants were pressed dried mounted and accessed on herbarium sheets as per routine herbarium technique recommended by Jain and Rao (1977).

#### Plant Identification

The identification of plant samples were carried out by using flora of Pakistan (Ali and Nasir, 1989-91) while the documentation and preservation of voucher specimen was done in the herbarium of Pakistan, Quaid-e-Azam university, Islamabad.

#### Photography

During all field survey, trips and interviews, digital Camera (Model no Olympus OM-D E-M10 1442-2RK) was used to capture picture of medicinal plants and informants. Pictures were taken covering the whole habitat of medicinal plants. Some pictures were taken showing specific part of medicinal plant. Photography was also done during interview with herbalist and local community.

#### Data Analysis

Data documented during the ethnobotanical survey was entered on Microsoft excel database and analysed. Pie chart was made showing most use part, mode of utilization and no of families and genera of medicinal plant. Bar graph of most use top seven families were also made. Descriptive data was analysed through various indicis like Relative frequency citation (RFC), Use value (UV) and Use report (UR).

#### Relative Frequency Citation (RFC)

Relative Frequency Citation was determined by standard protocol described by (Vitalini *et al*, 2013), which is

$$RFC = FC/N \quad (0 < RFC < 1).$$

Where FC represent number of informants interviewed from given plant species while N is total number of informants.

#### Use Report (UR)

Use Report is use recorded for every species. UR showed the documented data of plant species used for curing various diseases (Phillips, 1994).

### Use Value

Use Value demonstrates the relative value of various plant species used in treatment of various diseases. UV was calculated by using the following formula (Phillips, 1994).

$$UV = U/n$$

Where U is the number of used reports for a given plant species while n is total number of informants interviewed for given plant species.

### Results

#### Ethno-Demographic Data of Tehsil Kotli Sattian

Demographic information was recorded through face to face interview. A total of 250 informants, there were 10 traditional healers and 190 were local people

of Tehsil Kotli Sattian. All informants were categorized into different demographic categories. Demographic data regarding age group, gender, education and experience was recorded carefully and presented in Table 1.

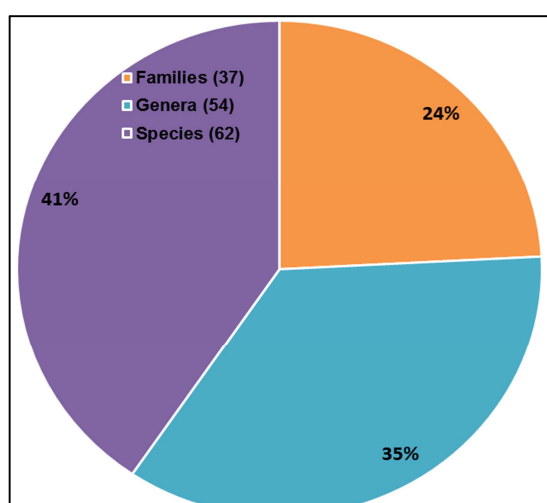
#### Medicinal Plants Diversity of Kotli Sattian

The present research was conducted to examine the diversity of medicinal flora of kotli sattian. A total of 62 plants species. belonging to 37 families and 54 genera were collected and identified (Fig. 1).

Dominant plants families (Fig. 4. 2) were *Rosaceae*, (5) *Solanaceae* (5), *Lamiaceae*(4), *Rutaceae* (3), *Moraceae* (3), *Asteraceae* (3) and *Oleaceae* (2).

**Table 1.** Demographic characteristics of informants (N=250) in Tehsil Kotli Sattian.

Sr No	Variables	Categories	No. of Persons	Percentage (%)
1	Informant Category	Traditinal health practitioners	10	4
		Local People	240	96
2	Gender	Male	190	76
		Female	60	24
3	Age	30-40 Years	50	20
		40-50 Years	40	16
		50-60 Years	100	40
		More than 60 Years	60	24
4	Educational Background	Illiterate	110	44
		Primary & Middle	60	24
		Secondary	30	12
		Under Graduate	40	16
		Graduate	10	4
5	Experience of Traditional Health practitioners	2-5 Years	2	20
		5-10 Years	3	30
		10-20 Years	2	20
		More than 20 Years	3	30



**Fig. 1.** Medicinal Plants Diversity of Kotli Sattian

### Results

There are a number of studies that were conducted in the remote areas of Pakistan but our studies provide additional information on ethnobotanically important species. In the recent years, efforts have been made to document the traditional knowledge about local medicinal flora. Ethnobotanical studies generally identify locally important plant species especially for the discovery of crude drugs. Ethnobotanical documentation of traditional knowledge has identified many important plant sources of modern day drugs. The ethnobotanical studies carried out so far had enclosed the entire association between people and plants but,

are mostly concentrated on the plants utilized in medication and foodstuff (Jain, 1965; Martin, 1995; Rao, 1981 and Bye, 1981).

The present research was conducted to examine the diversity of 62 medicinal flora of Kotli Sattian. Our results find supportive evidence from the study of Saqib *et al.* (2014) who reported 87 plants species that belongs to 55 families and 79 genera. It was found that Leguminosae and Poaceae are the dominant families that possess five and four species respectively. Likewise Shah (2001) listed about 58 species of medicinal plants from Ayubia National Park near Nathia Gali. Indigenous knowledge about the use of about 25 medicinal herbs from Kahuta, district Rawalpindi has been reported by Qureshi and Khan (2001). The results of our findings were also supported by Shinwari and Khan (2000) who reported the traditional utilization and conservation status of 160 plants form Margalla Hills National Park.

The results of wide spread use of decoction and infusion agree with the results of Gurdal and Kultur (2013) and Ahmad *et al.* (2014) who reported that decoction was the most commonly used preparation method followed by infusion. Herbal medicine even today plays an important role in rural areas and various locally produce drugs are still being used as household remedies for various diseases especially in these areas for different ailments (Qureshi & Ghufuran, 2005). The humankind has witnessed the increasing scientific and commercial curiosity in therapeutically plants chiefly due to their massive economic prospective and the prevalent intellectual adequacy of plant based products. Ethnobotanical information regarding curative plants and their uses by indigenous traditions is valuable not merely in the protection of conventional cultures and biodiversity, but also for community health care and drug development (Farnsworth, 1993).

Our findings depicted that leaves are mostly used plants parts which were justified by Mahmood *et al.* (2013) who investigated that leaves were most frequently used (38%) followed by seed (13%), whole plant (11%), flower (9%), fruit (8%), root and bark (6%).

Similarly Mahmood *et al.* (2012b) observed that common plant part used to make the herbal preparation was leaf (39%) followed by the root (19%), whole plant (12%), seed (9%), bark (7%), fruit (7%), flower (5%) and tuber (2%). The most commonly used plant parts in the traditional medicines are leaves, roots, tubers, seeds and fruits, as they retain rich amount of bioactive compounds as compared to other plants parts (Srithi *et al.*, 2009). The use of aerial parts and leaves in traditional medicines is safe and sustainable (Giday *et al.*, 2003). Whole plant is not preferred to use as a medicine because its removal will threaten the conservation of plant species. Compared with whole plants and roots, the use of leaves or aerial parts of plant is much better for sustainability of flora of medicinal plants (Ghimire *et al.*, 2008). It was also noted that the leaves are more accessible or available in nature and are relatively more abundant as compared to other plant parts which may explain why they are used while the frequent use of whole plant in the region may be that the area is mountainous and very less rain falls in the region, mostly plants are herbaceous and wild bushes, due to this the people collect the aerial parts of plants and use their decoction and infusion commonly (Neves *et al.*, 2009).

The herbaceous habit is not only dominant life form in our study but it is a common and widespread ecological phenomenon around the world (Ibrar *et al.*, 2007, Jan *et al.*, 2011). Ahmad *et al.* (2014a) reported that due to the herbaceous nature of most plants the local people in the Chail valley of Pakistan consumed either the leaves or whole plant. The results of our study also finds similar evidence from research work of Qureshi (2012) who investigated that whole plant and leaves are commonly used part in the area of Hingol National Park Baluchistan. For instance, the roots of *Astragalus psilocentros* are used to treat the flu and tooth aches (Hussain *et al.*, 2011). Powder made from the berries of *Juniperus communis* rubbed on rheumatic and painful swelling as well as burnt as incense in homes in Astor valley (Shinwari and Gilani, 2003).



The fruits of *Juniperus excelsa* are used to treat stomach ulcers and fever (Bibi *et al.*, 2014), but according to Awan *et al.* (2013) they are used for urinary tract problems. Indigenous community has a lot of trust for indigenous medicines, though the allopathic medicines are available, which are mostly unapproachable to the majority of population except in severe emergencies (El-Hilaly *et al.*, 2003). Shinwari *et al.* (2002) studied the current status of medicinal plants of Bar and Shinaki Valleys, Northern Area of Pakistan. They found that 22% of the plants were used by the locals for gastro-intestinal troubles, followed by 11% of plants used for bronchial and pulmonary ailments. The finding of the present study also agrees with that of Ahmad *et al.* (2014a) who documented that unsustainable medicinal plants collection and habitat loss have put the conservation status of medicinal plants at risk in Swat District. Measures and strategies should be developed by government to save medicinal plants from overexploitation.

Our results about high RFC value of studied medicinal plants correlates with Bibi *et al.* (2014). They also observed that high values of RFC shows that majority of informants agree that some of studied medicinal plant species are most popular plant species in Tehsil Kotli Sattian and are well known to maximum number of informants in area. Bibi *et al.* (2008) documented that Pakistan has a high diversity of plants that are being used by local communities for medicinal purposes. Proper usages of these plants are commonly practiced at the community and end-user level. However, there are many parts of the country which remain unexplored by ethnobotanists; there is no report available for the proper usage of plants. Mahmood *et al.* (2011b) reported that due to economic curbs, rapid population growth, limited health care facilities and unaffordable costs of allopathic medicines local people still prefer these indigenous medicines. Shinwari *et al.* (2003) surveyed the Astore valley and collected information on plant diversity, the potential income to local people from plant harvesting, and monitored the harvesting levels of medicinal plants. Of 34 medicinal plants, five were found to be endangered, 18 vulnerable, and 19 rare.

As a plant species is lost from a region, the information enclosed in it will also be slowly distorted and finally become lost forever. The documentation of indigenous knowledge and conservation of a plant species, both are basic burning issues (Cunningham, 1996).

### Conclusions

Present investigation documented the diversity of medicinal flora of Tehsil Kotli Sattian. On the bases of our findings, it is concluded from the present research work that the study area is rich with medicinal flora comprises of 62 plant species belonging to 37 families and 54 genera. It was observed that Rosaceae and Solanaceae are widely distributed families consists of 5 plant species. Leaves are the most extensively used part while decoction was the most common method of herbal preparation. The collected plant species are used by the local community for their primary health care needs indicated that plants have novel therapeutic potential against different ailments.

### Recommendations

From the current findings, the following recommendations should be allowed for further future studies:

1. Local inhabitant still relies on the use of indigenous plants for the treatment of chronic and drastic diseases. Therefore the natural flora of the area should be further explored for the identification and collection of wild medicinal plants.
2. The plant collected for medicinal purposes should be further evaluated for different biological and pharmacological activities including anticancer, anti-diabetic, analgesic, antiviral etc. Plant species should also be screened for the isolation and characterization of bioactive compounds responsible for these activities.
3. It may help in innovating herbal and nutraceutical laboratory's research and will create linkage between pharmaceutical industries and researchers.
4. Commercialization of such medicinal plant can help in the improvement of livelihood of local community. Introducing these herbal medicine can minimize the risk of using synthetic medicine.

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