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MEDICINAL PLANTS OF TURMIC VALLEY (CENTRAL KARAKORAM NATIONAL PARK), GILGIT-BALTISTAN, PAKISTAN

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ABSTRACT

This study was undertaken to enumerate the medicinal plants of the area, find out the conservation status, and record the folk knowledge from the inhabitants of Turmic Valley during 2011-2013. The valley is located in the Rondo division of the District Skardu on the Northeastern side of the Indus River. The detailed information about the local flora regarding medicinal uses was collected from the local herbal healers (*Hakeems*) and other knowledgeable people. Locally used herbs of the area prevent and cure the people from various diseases such as joint pains, bronchitis, flu and fever, lowering blood pressure, constipation, liver disorders, stomach and abdominal problems, etc. The most common medicinal herbs found in the region belong to the families Gentianaceae, Berberidaceae, Umbelliferae, Labiatae, Rosaceae, Compositae, Urticaceae, and Ranunculaceae. The inhabitants of the valley mostly use the 42 plant species for the treatment of different health problems. Forty-two species of plants (including 4 Gymnosperms, 1 monocotyledon, and 37 dicotyledons) and 35 types of diseases have been identified during the current study. *Thymus linearis*, *Rosa webbiana*, *Urtica dioica*, *Pleurospermum candollei*, *Berberis* spp., *Delphinium brononianum*, and *Mentha angustifolia* were the commonly used plant species in the valley. The collected baseline data of this study will be helpful for young researchers in the field of taxonomy, ethnobotany, pharmacology, organic chemistry, and particularly for biodiversity conservation. Over exploitation, habitat destruction, and over grazing are the major threats for the loss of the important flora of the area.

Keywords: Medicinal Plants, Turmic valley, Gilgit-Baltistan,

INTRODUCTION

The Rondo division is situated in the Karakoram Range between Gilgit and Skardu. Although the area is mountainous, the mountains are the main source of water and fodder for the livestock, and provide the basic necessities to the local people of the area. The Turmic valley is a beautiful valley of the Rondo division of the district Skardu (Baltistan region) that lies in the northeastern side of the River Indus about 100 km from Gilgit and 50 km from Skardu city between 35.40 ° N latitude and 75.13° E

longitude (Figure 1). The population of the valley is about 2000 households. The majority of the people are living in remote villages from 1600-5000 m, so they mostly depend upon plants of their surroundings to fulfill their needs. The climate varies from place to place due to the rough topography and elevation of the area. Due to great habitat diversity and altitudinal gradients, the area has diverse vegetation. Plants play an important role in curing public health and are helpful in developing the economy of the people. Therefore, establishment of the local names and indigenous uses of plants has

significant potential in societal benefits (Qamar et al., 2013; Bağcı, 2000). The baseline data collected through ethnobotanical studies is important for the conservation and sustainable utilization of the plant wealth of the area. The local people have no documentation or record of the knowledge, but it is transmitted from generation to generation (Lev and Amar, 2000). The 80% total human population of the world still depends upon traditional remedies (Azaizeh et al., 2003). Ethnobotany is the specific field of science which shows the relationship between humans and nature and provides the possibility to discover new medicines derived from plants (Heinrich, 2000). All over the world, the discovery of new medicine has the researcher taking interest in the traditional medicines which the people used from various plant species from their surroundings to cure different ailments (Ekici et al., 1998; Tuzlacı and Tolon, 2000; Dogan et al., 2004; Kultur, 2008; Koyuncu et al., 2009;; Tuzlacı et al., 2010; Bulut, 2011; Gunes, and Ozhatay, 2011).

Ethnobotanical studies have not been done in the study area, although the area is rich in cultural and floral diversity and the

people have great folk knowledge about their flora. They used different plants to solve their health problems. They mostly used alpine plant species for the treatment of diseases like fever, flu, cough or chest problems, constipation, skin diseases, stomach disorders, etc., but the floral diversity is threatened by climatic fluctuation and overexploitation of forest resources during the last two decades in all the areas of Gilgit –Baltistan (Khan and Khatoon, 2007), resulting in some important plant species like *Delphinium* and *Podophyllum* becoming rare in alpine and subalpine pastures. Therefore, the study was conducted to document the indigenous knowledge and to explore the important medicinal plants of the area. This study is mainly focused on wild plants which are collected for medical purposes by local people of the study area, and also the uses and local names of these plants. The local flora found in the area is the primary source of medicine for the treatment of various diseases. This paper reports the first ethnobotanical work regarding traditional medicine and their pharmaceutical importance in the Baltistan region. In this paper, ethnobotanical uses of 42 medicinally important plant species are documented.

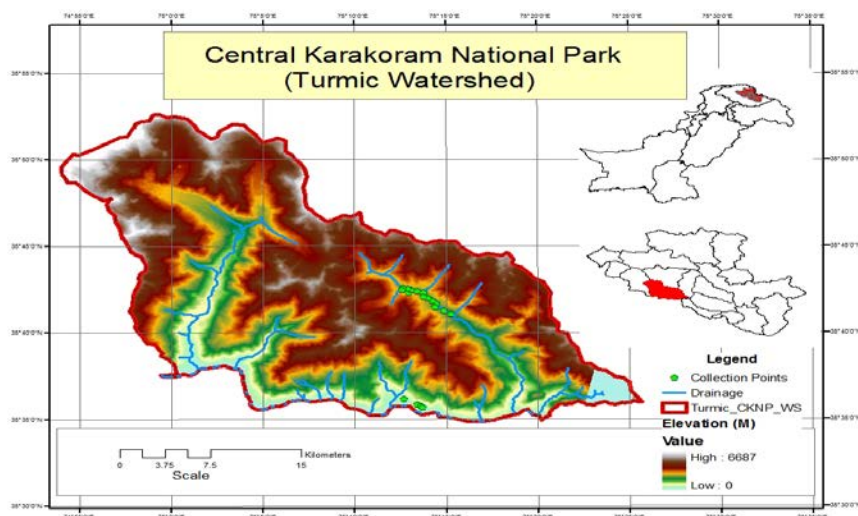


Figure 1: Showing the Turmic Valley watershed, CKNP Gilgit-Baltistan, Pakistan.

MATERIALS AND METHODS

The study was carried out during the springs of 2011-2013 from different localities and villages of the Turmic valley and identified with the help of the Flora of Pakistan (Nasir and Ali, 1970-89; Ali and Nasir, 1989-1991; Ali and Qaiser, 1993-2012). The collected specimens were properly pressed and dried in the field as well as in the Department of Biological Sciences. The collected voucher specimens were properly identified with the help of available literature, and deposited in the newly established herbarium of Karakoram International University. During the field visits, we collected the important information about the local flora like population size, abundance, distribution and medicinal uses, method of uses, local names, and common threats to the local flora. The majority of the population of the valley is illiterate; the information was collected through verbal interviews. The local informants were mostly shepherds, wood cutters, fodder collectors, medicinal plant collectors, and other common villagers who were interviewed to collect information on the medicinal uses of local plants. The Balti names, which were collected from the local people, vary from place to place. A global positioning system was used to record coordinates of the 50 different localities and their distribution map was designed using Arc GIS 9.3.

RESULT

The present study identified 42 species of local plants which are used by the local people to treat 35 types of diseases. The enumerated species are given in figure 2 and (4 Gymnosperms, 37 dicots, 1 monocot) belong to 37 genera (2 Gymnosperms, 34 dicots, 1 Monocot) and 27 different families (2 Gymnosperms, 24 Dicots, 1 Monocot).

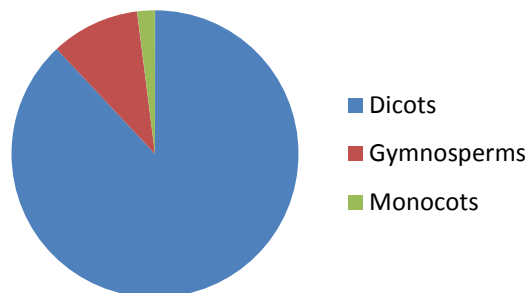


Figure 2: The percentage of the group wise distribution of the plants of Turmic Valley.

Our study reveals that the local people mostly used the Dicot flora from their surroundings as compared to Monocots and gymnosperms. Out of these 42 plants species, only one is cultivated (Dicot) and 41 are wild. This indicates that the people mostly used wild flora as compared to cultivated plant species and the trend of cultivation of medicinal plants is not common in the area. Due to the over-exploitation of the natural flora for local use and commercial sale, mostly alpine plants are under severe threats. Among the 42 plant species, 29 were herbs, 11 were shrubs, and 2 were trees. Herbs were the primary source of medicine in the study area (69%), followed by shrubs (26%) and trees (5%) shown in Figure 3.

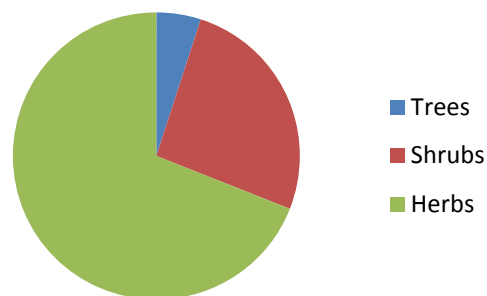


Figure 3: The percentage of the different life forms in the study area.

The proportion was similar to other studies on medicinal plants carried out in different parts of Himalayas (Shrestha and Dhillion, 2003; Uprety *et al.*, 2010) and western Nepal (Kunwar *et al.*, 2006). The fact that most of the medicinal plants are herbs could be because the study area is located in high elevation ranges where the diversity of herbaceous plants such as herbs is higher than that of shrubs and trees. The most important family was Compositae, which contains 7 species. This was followed by Labiatae and Polygonaceae, with 3 species, then by Gentianaceae, Rosaceae, Saxifragaceae, Papilionaceae, Berberidaceae, Ephedraceae, Cupresaceae and Umbelliferae (2 species each), and remaining families with one species (Figure 4).

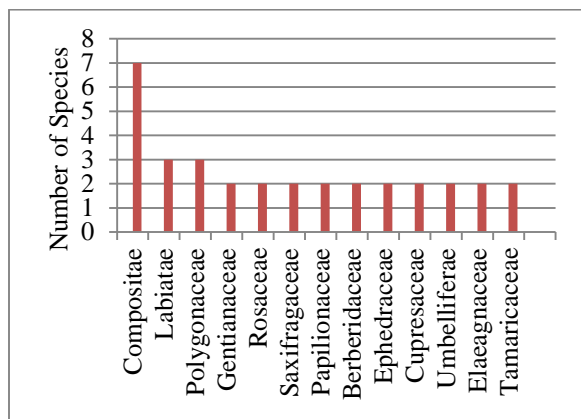


Figure 4: The Family wise distribution of plant species of the Valley.

The plant parts used widely to treat human and livestock health problems include root, stem, leaves, and seeds. The most commonly used plant parts for herbal preparations in the area were roots, seeds, and leaves. Such wide harvesting of roots and seeds, which are important for survival of plants, has a negative influence on the survival and continuity of useful medicinal plants and hence, affects the sustainable utilization of the plants. During field visits,

more than 35 different diseases were recorded as human health problems in the study area, but the collected data reveals that the local peoples mostly used these species for fever, cough, asthma, stomach and abdominal disorders, jaundice, rheumatism, joint pain, etc. Different parts of the plants included in the prescription are used in the form of powder, paste, juice, decoction, and eye drops. The presence of such a large number of medicinal plant species indicates (Table 1) that the area has a very high diversity of medicinal plant species and is a site for various indigenous knowledge researches. Medicines were prepared in the form of powder, decoction, paste, and juice. It was also observed that some plants were used in more than one form of preparation. They believe that the combination of several plant parts cures diseases rapidly. Generally, the fresh part of the plant is used for the preparation of medicine. When fresh plant parts are unavailable, dried parts are also used. The listed plants are grouped under monocots, gymnosperms, and Dicots families; genera and species within them are arranged alphabetically. Local names (in the Balti language) and uses are provided for each species.

DISCUSSION

During the current study, 42 species were enumerated, belonging to 37 genera in 27 families of vascular plants. The family, scientific name, local name, preparation, and methods of the medical plants usages are given in Table 1. Compositae was the family with the largest number of medicinal species (7), followed by Polygonaceae and Labiatae (3 spp. each), Umbelliferae, Saxifragaceae, Rosaceae, Papilionaceae, Gentianaceae, Berberidaceae, Ephedraceae, Cupresaceae, Tamaricaceae and Elaeagnaceae (2 spp. each) and the remaining families having (1 sp. each).

Table 1: List of Medicinal Plants; families, botanical names, vernacular name, voucher specimen number and their traditional uses, recorded from Turmic Valley.

No.	Families Name	Botanical Name	Vernacular Name	Voucher No.	Medicinal Uses
1.	Alliaceae	<i>Allium carolinianum</i> DC.	Not known	TK 58	The whole plant is commonly used as vegetable. The tuber of plant is used as tonic to strengthening the body
2.	Cupressaceae	<i>Juniperus communis</i> L.	Shukpa	TK 48	Decoction or in powder form berries are used for kidney problems especially for kidney stone and urinary tract infections
3.	Cupressaceae	<i>Juniperus excelsa</i> M. Bieb.	Shukpa	TK 17	Decoction or in powder form berries are used for kidney problems especially for kidney stone and urinary tract infections
4.	Ephedraceae	<i>Ephedra gerardiana</i> Wall. ex Stapf	Yalzeh/Burzehm	TK 18	Aerial parts are used for cough and asthma in the form of decoction. Some people also used for backache as well as other swellings particularly used after delivery.
5.	Ephedraceae	<i>Ephedra intermedia</i> Schrenk and Meyer	Yalzeh/Burzehm	TK 19	Aerial parts are used for cough and asthma after decoction. Some people also used for backache as well as other swellings particularly used after delivery.
6.	Berberidaceae	<i>Berberis orthobotrys</i> Bien. Ex Aitch. ssp. <i>Orthobotrys</i>	Istarboo	TK 27	Decoction of leaf, stem and root bark is used for jaundice problems, stomach problems and injuries.
7.	Berberidaceae	<i>Berberis pseudumbellata</i> Parker ssp. <i>Gilgitica</i> Jafri	Istarboo	TK 21	Decoction of leaf, stem and root bark is used for jaundice problems, stomach problems and injuries.
8.	Betulaceae	<i>Betula utilis</i> D.Don	Staqa	TK 44	The smolder of bark paper is applied for skin problems particularly for warts and skin allergies.
9.	Brassicaceae	<i>Descurainia sophia</i> (L.) Webb and Benth.	Halacho	TK 39	The seeds are used for chest complains throat problems, chest burning as well as for tonsils.
10.	Brassicaceae	<i>Sisymbrium brassiciforme</i> C. A. Mey.	Not known	TK 24	Fresh leaves are used as salad, and as a source of aphrodisiac and carminative.
11.	Capparidaceae	<i>Capparis spinosa</i> L.	Not known	TK 25	The bud, flowers and fruit after decoction used for the cough, flue and its related problem in winter seasons.
12.	Compositae	<i>Arctium lappa</i> L.	Not known	TK 26	Root powder is used for join pains.
13.	Compositae	<i>Artemisia brevifolia</i>	Bursay	TK 38	Areal parts are used for diabetes, fever, round warms and

		Wall. ex DC.			stomach problems
14.	Compositae	<i>Artemisia gmelini</i> Web. Ex Stechm.	Bursay	TK 28	Its areal parts are used for diabetes, fever, round worms and stomach problems
15.	Compositae	<i>Artemisia santolinifolia</i> Turcz. Ex Krasch.	Khubursay	TK 42	The areal parts powder is used for healing of external wound and injuries.
16.	Compositae	<i>Cousinia thomsonii</i> Clarke	Churcho	TK 37	The plant is edible and locally used for cancerous problems as well as for cough and asthma.
17.	Compositae	<i>Tanacetum falconeri</i> Hook. f.	Tialo	TK 28	Its leaf powder is useful for abdominal problems and the flowers are used for asthma blood pressure and jaundice problems.
18.	Compositae	<i>Taraxacum stenolepium</i> Hand.-Mazz.	Shantha	TK 40	The whole plant is used for liver problems, relief for tiredness' and join pains
19.	Elaeagnaceae	<i>Elaeagnus angustifolia</i> L. var. <i>angustifolia</i> L.	Not known	TK 36	Dry fruits are used for stomach problems and cough.
	Elaeagnaceae	<i>Hippophaer hamnoides</i> L. ssp. <i>turkestanica</i> . Rousi	Rayna	TK 23	Fresh and dry fruits are used for stomach problems and for anticancer.
20.	Gentianaceae	<i>Gentianodes tianschanica</i> (Rupr.exKusn.) Omer, Ali and Qaiser	Tikta	TK 66	Decoction as well as powder of the aerial part is used for Malaria Stomach disorders, liver problems, asthma and pneumonia
	Gentianaceae	<i>Swertia petiolata</i> D. Don	Chundal	TK 43	Its whole plant is used for liver problems, diabetes, stomach disorders, skin eruption, anti-lice and for easy delivery.
21.	Geraniaceae	<i>Geranium pratense</i> L. ssp. <i>stewartianum</i> var. <i>schimidii</i> Y.Nasir	Not known	TK 25	The whole plant is used for external and internal wound healing and some people used for male sexual problems particularly for stimulation.
22.	Labiatae	<i>Mentha longifolia</i> (L.) L.	Folling	TK 35	The areal parts of the plant are used for stomach problems, disturbed menstruation period cold cough, gastric troubles and fever.
23.	Labiatae	<i>Nepeta leucolaena</i> Benth. Ex Hook.f.	Azumal	TK 22	The aerial parts of plant is used for stomach problems and constipation
24.	Labiatae	<i>Thymus linearis</i> Benth.ssp. <i>linearis</i>	Tumburug	TK 47	Whole plant is used for cold cough, fever and indigestion
25.	Papilionaceae	<i>Trifolium pratense</i> L.	Bulboksook	TK 49	Whole plant is used for fever, cough and digestive

					problem.
26.	Plantaginaceae	<i>Plantago major</i> L.	Boqna	TK 45	Seeds are used for eye redness and removes thrust
27.	Polygonaceae	<i>Bistorta vivipara</i> (L.) S.F.Gray	Chapdeh	TK 56	The roots are used for inflammations and cancer problems.
28.	Polygonaceae	<i>Fagopyrum esculentum</i> Moench	Brau / Common Buck Wheat	TK 08	Flour is used for making bread. Young leaves are used as vegetable and as green fodder for livestock's. It is good honey plant and local people obtaining honey (Black Honey) from their flowers through honey bees, which is very useful for cancer and asthmatic, cough problems
29.	Polygonaceae	<i>Rheum spiciforme</i> Royle	Khakhhol	TK 51	Roots powder is used for stomach disorders, constipation, and acidity, liver problems particularly for hepatitis A, B, and C. The powder is also used externally for healing of wound.
30.	Ranunculaceae	<i>Delphinium brunonianum</i> Royle	Makhoting	TK 64	Its flower decoction is used for cough, chest problems, throat problems, piles and blood pressure.
31.	Rosaceae	<i>Rosa webbiana</i> Wall. Ex Royle	Siah	TK 52	Root bark decoction is used for blood purification as well as for mental relaxation, while stem bark is used for skin problems and blood pressure.
32.	Rosaceae	<i>Spiraea canescens</i> D.Don	Sehmenouk	TK 63	Its oil obtaining after burning the stem and branches is used for arthritis and joint pains.
33.	Rubiaceae	<i>Galium boreale</i> L.	Karazeh	TK 53	Used for eye inflammations
34.	Saxifragaceae	<i>Bergenia stracheyi</i> (Hook. f. and Thoms.) Engl.	Shapure	TK 60	Roots powder of the plant is used for healing of wounds, backache, stomach problems like ulcers chest problems cough and piles as well as diabetes.
35.	Saxifragaceae	<i>Saxifraga flagellaris</i> Willd. Ex Sternb ssp. <i>stenophylla</i> (Royle) Hulten.	Not known	TK 61	The silky roots like threat are used for hair elongation and dandruff.
36.	Scrophulariaceae	<i>Verbascum Thapsus</i> L.	Apo Tambaku	TK 46	The seeds of the plant are used for fever, swellings, and removal dead fetus during delivery.
37.	Solanaceae	<i>Physochlaina praealta</i> Hook.	Luntung	TK 05	Poisonous plant, leaves are used for antiseptic in cattle's sheds.
38.	Tamaricaceae	<i>Myricaria germanica</i> (L.) Desv. ssp. <i>Alopecuroides</i> (Omboh	TK 59	Leaves powder is applied for wound of livestock's by wolf bites.

		Schrenk) Kitamura			
39.	Tamaricaceae	<i>Tamaricaria elegans</i> (Royle) Qaiser and Ali	Omboh	TK 57	Leaves powder is applied for wound of livestock's by wolf bites.
40.	Umbelliferae	<i>Carumcarvi</i> L.	Kohyounth	TK 41	Seeds are used for cold fever, abdominal pains, flue and asthmatic problems
41.	Umbelliferae	<i>Pleurospermum candollei</i> (DC.) C.B.Clarke.	Shabdun	TK 55	Whole plant is commonly used for abdominal problems, stomach disorders, decrease cholesterol, blood pressure, heart problems and gastric troubles.
42.	Urticaceae	<i>Urtica dioica</i> L.	Not known	TK 63	The whole plant is used as vegetable and the roots of the plants are more effective for joints pain and its related troubles. In winter season root decoction ids mostly used for cold cough and heat up the body temperature.

Obviously, these eleven families which together represented 62.79% of the medicinal species were of great medicinal importance in the area. The remaining of 37.20% of species belongs to 16 families which were represented by 1 species each. These plants are mostly used for respiratory disorders, fever, abdominal disorders, cough, asthma, stomach and joint pain, etc. The present investigation has shown that the local peoples make use of a great range of plants from their environment. All the 42 species have one or more medicinal uses. *Carum carvi*, *Pleurospermum candollei*, *Rheum spiciforme*, *Delphinium brunonianum*, *Rosa webbiana*, *Spiraea canescens*, *Tanacetum falconerii*, *Urtica dioica*, *Bergenia stracheyi*, *Berberis spp.*, *Artemisia spp.* and *Gentianodes tianschanica* are commonly used for medicinal purposes by the local inhabitants of the valley. The highest number of species (30) representing 69.76% of total species were annual and perennial herbs, followed by shrubs (25.58%), and trees (4.65% respectively). Most of the species (26) were widely distributed in all ecological zones from the desert to alpine

region, while 9 species were found only in the alpine zone, 15 in the subalpine zone, and only 2 species were restricted to the desert zone. *Pleurospermum candollei*, *Rheum spiciforme*, *Delphinium brunonianum*, *Tanacetum falconerii*, *Gentianodes tianschanica*, *Allium carolinianum*, and *Saxifraga flagellaris*, were the species which are found only in the extreme alpine zone from 3700-4300m. These species were used by the people for different ailments and were exploited for commercial sale, also. These commercially exploited species had declined in their abundance during the last few decades. The drought resistant species like *Capparis spinosa* was found in the desert zone only. It is a Saharo-Sindian floristic element, reaching its distribution limit in the desert areas of Gilgit-Baltistan up to 1600 m from sea level. Remaining species were found from desert to alpine zone in the different habitats of the area. Knowledge of the uses of these plants probably will continue to dwindle because of the availability of modern medicines and other facilities. Despite the availability of wild medicinal plants, there is a significant reduction in their use. Of these

herbaceous plants identified as having some medicinal uses, about fifty percent are not used nowadays. These plants are mostly medicinal and edible, for which modern substitutes are now available. However, with the popularization of modern health care, the application of traditional herbs is gradually decreasing. Furthermore, due to urbanization, youngsters are more willing to work in cities than to stay in villages. As a result, a loss of the knowledge of medicinal plants is inevitable. We hope more people will engage in the study on the ethnobotany of Baltistan region so this cultural treasure will be well preserved before its disappearance. It was interesting to note that the informants exchanged information and ideas among themselves in the cases of chronic ailments. Such co-operative views and ideas will be helpful to document the local skills, and to involve their participation in local developmental programs and the conservation of biodiversity as well. By drying infusions or decoctions of these plants, local people use them during all the seasons of the year. Elder people have more information about herbs as compared to the younger ones. Herbal treatment has become a tradition for the residents of the study area. Steps should be taken immediately to document the traditional knowledge about medicinal plants and the floral wealth of the region.

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