Investigation of Traditional Veterinary Phytomedicines Used in Deosai Plateau, Pakistan

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Abstract: In the present investigation, the traditional ethno veterinary knowledge is totally in the custody of elder members of the community. The young ones are unaware about such important practices. Previously no ethno veterinary study has been carried out from this study area. Therefore, present study has been designed to record the ethno botanical uses of indigenous plants Deosai Plateau, Pakistan. Total 59 people of different ages (38 Males and 21 females) were interviewed and information was collected through semi-structured questionnaires. The data obtained were quantitatively analyzed using Use Value (UVi) formula and Relative Citations Frequency (RFC$_s$). The collected specimens were pressed, dried, preserved, mounted on Herbarium sheets and after confirmed identification were submitted in the Herbarium, Department of Botany, Hazara University, Mansehra, Pakistan. The present findings revealed that thirteen medicinal plant species were recorded for their ethno veterinary uses. Belonging to nine families out of which 92% are herbs and 8% shrubs. Polygonaceae is the dominant family used in the treatment of different disease (23.07%) followed by lamiaceae and apiaceae. Majority of species were used in treatment of digestive disorder (9.4%), followed by diarrhea (7.5%), abdominal and dysentery (5.6%). Leaves and roots are the most frequently used parts in the treatment of various diseases (29%) each, followed by flower (18%). Medicinal plants most with used values were *Aconitum heterophyllum* Wall. ex Royle (0.84), *Rheum webbianum* Royle (0.80) and *Berberis orthobotrys* Bien. ex Aitch. (0.76) while most relative citations frequency was of *Rheum spiciforme* Royle (0.35), *Aconitum heterophyllum* Wall. ex Royle (0.27), *Berberis orthobotrys* Bien. ex Aitch. (0.27).

Key words: Ethno veterinary · Phytomedicine · Quantitative Analysis · Deosai · Pakistan

INTRODUCTION

Study Area (Deosai): Deosai is the beautiful plateau surrounded by peaks covered with snow and small valleys. The vast Deosai plateau up to the eye sight is full of lush green grass and variety of flowering plants. The scenery of Deosai depicts picture of heaven on the earth with its natural lakes, streams, rivers and glaciers which are infect most suitable and appropriate for the growth of flora and fauna moreover, along with its unique and attractive diversification in flowing plants, its geography is also worth mentioning. It is situated at the junction of Himalaya, Laddakh and Zanskar mountain ranges, these mountain ranges join together to form a vast alpine plateau. In between the two major world famous mountain ranges of the world i.e. Himalaya and

Karakorum, the plains of Deosai are located. No doubt the plateau is center of unique biodiversity located 20 km from south of skardu, a jeep able road passes across the plateau from Ali Malik Mar pass (4,000m) to chakor pass (4,200m) near sheosar lake and down to chillum village. The sky kissing mountains with the height of (5,000m) and mountain ranges with altitude of 3400m-4300m also enhances its beauty [1]. The climate of Deosai also contributes to its diversity, during winters the area receives heavy rainfall while, during summer it receives immense snowfall. This is further added by the coarse soil and abundances in water which is supporting and auxiliary for the flora. A wide diversity of fauna corresponds to the natural vegetation of the area. This includes hundreds of vertebrate and invertebrate species. The Flora of the region is very diverse, with a number of

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economically important species of wild plants, including Wild Cumin, Thyme, Pine, *Angelica*, *Artemisia*, *Arnebia*, *Colchicum*, *Saussurea*, *Aconitum*, *Ferula*, *Codonopsis*, *Valariana*, *Berberis* and hundreds of medicinal plants which are being used for the treatment of various diseases and for health care [2].

Livestock Diversity: The livestock is most important earning source of the ruler and mountainous region. The ruler population of the area is only depending on the livestock and their products e.g. milk, meat, wool, egg and fiber. The livestock's of the area is consisting of goats, yolk, cattle's, sheep and horses. Yolk is the well suited animal for the higher altitude, which is very common in the area [3]. Since the kettles are free for grazing in high pasture so the cross breeding between yolk and cattle commonly occurs. The cross breed animal is called zomo [4]. World's major livestock population is found in rural communities which have major dependencies on it for livelihood [5].

Ethno Veterinary Medicine (EVM): About 5,700 species of flowering plants have been reported from Pakistan and almost 400 of these are endemic species [6] and around 1,000 species of vascular plants are known to occur in northern mountain regions of Pakistan [2]. Most of the endemic plants are found in the northern and western mountains of Pakistan [7]. In Pakistan, the field of ethno botany is virgin and has been introduced recently but in recent years a lot of work has been done in this field by many researchers [8]. Peoples traditional knowledge (TK) pertaining to animal health care and production is known as ethno-veterinary medicine [9]. Ethno veterinary medicine (EVM) is the scientific term for traditional animal health care, provides low-cost alternatives to allopathic drugs. It is as old as the domestication of various livestock animal species. EVM covers people's knowledge, skills, methods, practices and beliefs about the care of their animals [10]. Research into ethno veterinary medicine is often undertaken as part of a community-based approach that serves to improve animal health and provide basic veterinary services in rural areas. In addition to its focus on botanicals, ethno veterinary medicine covers people's knowledge, skills, methods, practices and beliefs about the care of their animals. During recent years, there has been wide concern for collecting more ethno botanical information [11]. Some better work have been made to document the ethno medicinal knowledge regarding cure of animal diseases in India and other countries by McCorkle [12], Pande and Kumar [13], Catley and Mohammad [14], Goud and Pullaiah [15] and Kohler-Rollefson and Rathore [16] but in Pakistan very less attention has been given on documentation of plants used as ethno veterinary medicines and there is much need to document this knowledge. EVM traditional knowledge is present mostly in oral form, thus mainly undocumented which might be at risk of disappearing. Therefore the effort has been made to work on livestock health care management by documenting such important practices.

MATERIALS AND METHODS

Frequent field trips were under taken during 2008 to 2011 in the early, mid and last summer season of each year and collected plant specimens during their specific blooming season. Work plan was prepared and general information about the area, vegetation and cultural practices were collected before starting the field work. The project area was Dass Khirum, Chilim, Chota Deosai, Deosai plateau, sardar Kothiof District Astore, (Gilgit-Baltistan). During the whole period of the Research work ethno botanical information and traditional uses of plants were documented. The whole information were collected through interviewing and filling of questionnaires from local experts both men and women. Largely the information was given by local elders who were the real custodians and has a lot of information about the plants and their uses.

Fig. 1: Conducting interviews from the local inhabitants of study area.

Fig. 2: Some important medicinal plants of Deosai Plateau.

(A) *Aconitum hetrophylum*, (B) Aconite roots being sold in market at Gilgit, (C) *Berberis orthobotrys*, (D) Dried bark of *B. orthobotrys*, (E) *Bergenia stracheyi* (F) Rhizome and roots of *B. stracheyi*, (G) *Bistorta affinis*, (H) Dried flowers of *B. affinis*, (I) *Ferula narthex*, (J) Dried root of *F. narthex*, (K) *Hyocyamus niger*, (L) Seeds of *H. niger*, (M) *Primula rosea*, (N) *Pleurospermum candollei*, (O) *Phlomis bracteosa*, (P) Lichens used as substitute of *P. bracteosa* (Q) *Rheum webbiana*, (R) Root of *R. webbiana*, (S) *Rheum speciforma*, (T) Dried roots of *R. speciforma*, (U) *Thymus linearis*, (V) Dried leaves of *T. linearis*, (W) Medicinal plants sold in local market, (X) Traditional healer (Hakim) treating patient by using medicinal plants.

Necessary Equipments: The equipments used during the research work were, note book, map, pencils, plants pressers, blotting papers, polythene bags, knife, GPS and digital Camera.

Interviews: The inhabitants of the area were interviewed during the field work (Fig. 1). The qualitative data was obtained through Questionnaires regarding the plant resources and their utilization. The information about the utility of different plants, quantity of plants used, ratio of consumption, rate of availability, fuel wood and fodder sources, consumption, demand and priority of species were obtained.

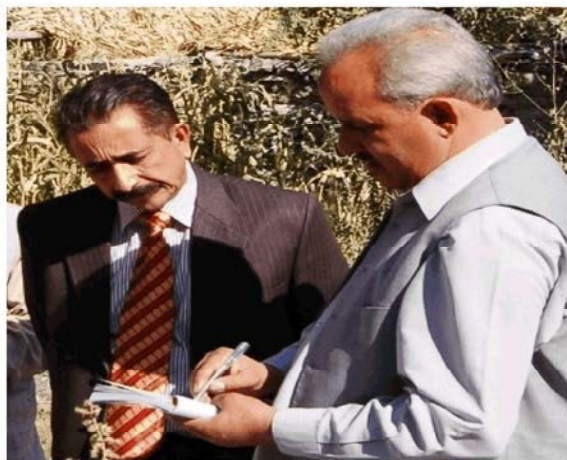Fig. 3: Collection of plant specimens from the study area.

Fig. 4: Recording related data in field note book.

Collection of Plant Specimens: The plants specimens along their photographs have been captured (Fig. 2). The specimens were properly tagged and field number was allotted to each specimen. Relevant data was recorded in field note book. The specimens were put in field press using blotting papers and newspapers. At herbarium, specimens were shifted to stationary herbarium. The blotting papers were changed regularly tilling specimen drying. The dried specimens were poisoned using Mercuric Chloride and Copper Sulphate solution. The specimens then mounted on standard size herbarium sheets.

Local names and uses of plants were given in the fields by local experts and the data were also collected from Hakeems, shepherds, farmers, local herbal practitioners and forest guards. Photographs of plants, habitat and other aspects were taken during study period.

Identification of Plants: The plants specimens were brought and properly identified with the help of available literature (Flora of Pakistan, Stewart [2], Ali and Nasir [17] and Ali and Qaisar [18] at AMHRWO Herbarium.

The identified and unknown plant specimens have been submitted at Hazara University Herbarium (HUP) for further identification.

Statistical Analysis: Data were tabulated in Microsoft Excel spreadsheets and analyzed using 2 quantitative ethno botanical methods: Relative Frequency Citations (RFCs and Use Value (Uv_i).

Use Value (Uv_i): The UV_i was calculated using the formula proposed by Phillips *et al*. [19]. UV_i the use value of a species for an informant, where U_i= No. of use reports cited by each informant for a given plant species. N_i = Total No. of informants interviewed for a given plant species.

To calculate the use value of a species for an informant;

$$UVi = \frac{\sum Ui}{N}$$

Relative Frequency of Citations (RFC$_s$): Relative Frequency of Citations was used to calculate the traditional value of each species by using the formula [20].

$$RFCs = \frac{FCs}{N}$$

Fc_s = No. of informants who mentioned the use of the species.
N = Total no. of informants of the study. (In this study, N = 59)

RESULTS AND DISCUSSIONS

Ethno-veterinary of Deosai Plateau: Total of 59 informants were interviewed, out of which 38 were males and 21 females. Three of them were above 80 (2 males, 1 female). However 14 informants were of 61 to 80 ages (9 males, 5 females), 24 informants ranged with the age of 41 to 60 out of which 16 were males and 8 females. Rest of the informants were of 21 to 40 (8 males, 3 females) and below 21 age (3 males, 4 females) (Table 1). All the informants were chosen from different fields of life like farmers, local practitioners / hakims, veterinary doctors, school teachers and pansaries.

Table 1: Showing knowledge of medicinal plants of different age group

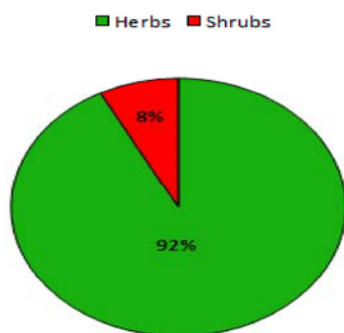| Age group	Male	Female	Total
1 to 20	3	4	7
21 to 40	8	3	11
41 to 60	16	8	24
61 to 80	9	5	14
Above 80	2	1	3
Total	38	21	59

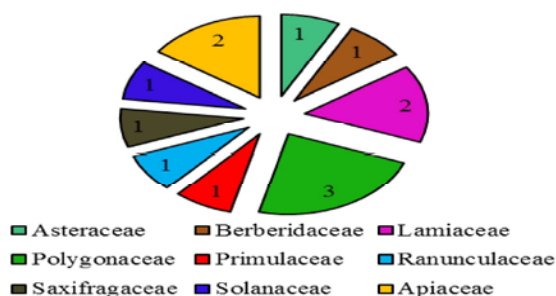Fig. 5: Graphical representation of plants growth form of Deosai.

Fig. 6: Taxonomic diversity of medicinal plant species of Deosai Plateau.

A total of 13 medicinal plant species are recorded for their ethno veterinary uses with folk recipes. Belonging to nine families out of which 92% are herbs and 8% shrubs while not even a single tree is recorded for ethno veterinary use in this study (Fig. 5), it might be due to dominance of herbs and their easy availability resulting from ubiquitous growth (Roadsides, gardens, farmland and in wild habitats) as it is geographic character of Alpine and Sub-alpines. At the time of surveys, same reason was also reported by the local inhabitants of these geographic regions about widespread use of herbs. Herbaceous plants can be easily handled in herbal preparation methods and extraction of bioactive compounds [21]. Ijaz *et al*. [22] in Abbotabad and Khan *et al*. [23] in Swat also found herbaceous life form the dominant. Due to high rate of wind velocity and other edaphic, physiographic and geographic factors in high altitudinal regions hindered tree growth so less percentage of tress are there. As for as field concerning *Aconitum heterophyllum* Wall. ex Royle, *Bistorta affinis* (D.Don) Greene and *Bergenia stracheyi* (Hook.f. & Thomson) Engl. are the most common species of the study area. Due to much importance in healthcare these medicinal plant species are decreasing day by day. Local

inhabitants are totally unaware about proper collection method which spontaneously affected the biodiversity. According to our observations there are no health services available for the local inhabitants due to which a big pressure is exerted on the biodiversity which results in declining of various plant species and they are leading towards threat. All these recipes are mostly prepared by local practitioners/ traditional healers and most of them are illiterate and with no experience as they are leading their forefathers footsteps.

Polygonaceae is the most dominant family used in curing various diseases (3spp, 23.07%). However polygonaceae was followed by lamiaceae and apiaceae (2 spp, 15.38% each), whereas all the remaining families are comprised of single species each (Fig. 6). Majority of species were used in treatment of digestive disorders (9.4%). In the study of Khattak *et al*. [24] 46 medicinal plant species are mentioned out of which 30.43% medicinal plant species were used to cure the stomach problems of domestic animals and birds. However digestive disorder is followed by diarrhea (7.5%), abdominal and dysentery (5.6%) each, while arthritis, backache, blood pressure, delivery wounds, diabetes, fever, ophthalmic diseases, respiratory problems, skin diseases and mouth infections were treated by two species each. The remaining various other diseases were treated by single species each (Fig. 7). Leaves and roots are the most frequently used parts in the treatment of various diseases (29%) each, followed by flower (18%), stem and seed (7%) each, whole plant (4%). While fruit and rhizome were medicinal plant parts treating less number of disease animals and human diseases (Fig. 8). Ijaz *et al*. [22] also mentioned leaves as the most widely used plant part as an ailment for different diseases. Detailed description of medicinal plants used in veterinary practices in alphabetical manner with vernacular, English and family names, its occurrence, part used in recipe and altitudinal is given in Table 2.

In this study, the used value of 13 medicinal plants ranges from 0.37 to 0.84 (Table 3). The medicinal plant species with greater use values given in Table 5 were *Aconitum heterophyllum* Wall. ex Royle (0.84) ranked 1st, *Rheum webbianum* Royle (0.80) 2nd and *Berberis orthobotrys* Bien. ex Aitch. (0.76) 3rd, while *Primula rosea* Royle was less used (0.37) by the local inhabitants among the collected medicinal. Greater used values of these mentioned medicinal plants might be due to their extensive distribution and local practitioners / traditional healers awareness which makes those plants as the first choice for treatment [25]. Khattak *et al*.
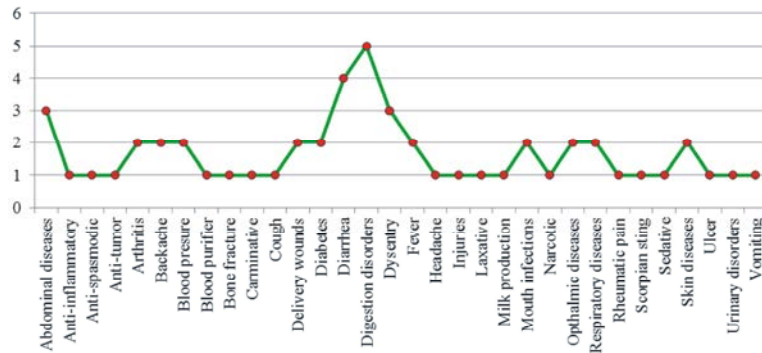
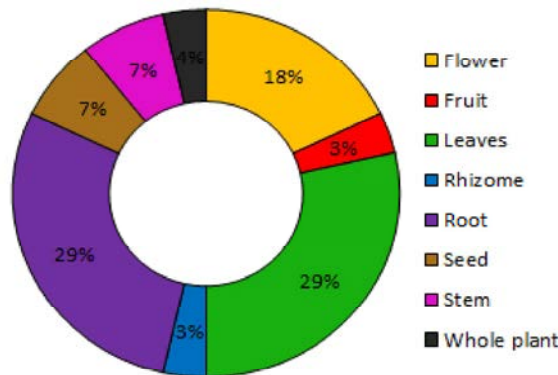Fig. 7: No. of medicinal plant species used for treatment of various diseases.

Fig. 8: Plant species parts used for preparation of herbal medicines.

Table 2: List of Medicinal Plants used in Veterinary diseases

Botanical Name	Vernacular name (Shina)	English name	Family name	Habit	Occurrence	Parts used	Altitudinal Range	Diseases cured
Aconitum heterophyllum Wall. ex Royle	Patris	Aconite	Ranunculaceae	Herb	Deosai, Burzil	R, Fl	2500-4200m	Periodic fever, digestion disorders, dysentery, abdominal diseases, diabetes, anti-dandruff
Berberis orthobotrys Bien. ex Aitch.	Ishkeen, Churkee	Barberry	Berberidaceae	Shrub	Deosai, Burzil, Chellum	L, Fr, R	1500-3000m	Anti-inflammatory, anti-diabetics, Anti-tumor, Injuries, bone fracture, delivery wounds, ophthalmic disease, dysentery
Bergenia stracheyi (Hook.f. & Thomson) Engl.	Sanspar	Heart-Leaved Bergenia	Saxifragaceae	Herb	Deosai plains, Burzill.	R, L	4000-4500	Headache, blood pressure, vomiting, arthritis, backache, delivery wounds, diarrhea and dysentery
Bistorta affinis (D.Don) Greene	Chomoi	Masloon	Polygonaceae	Herb	Deosai plain, Burzill.	L, Rh	2000-3000m	Diarrhea, backache, skin diseases, ulcer, rheumatic pains and arthritis
Ferula narthex Boiss.	Sup	Ferula	Apiaceae	Herb	Chillium	R, St	1800-3000 m	Respiratory disease, abdominal disease, scorpion sting, mouth infection, nerve tonic, digestion disorders and blood pressure
Hyoscyamus niger L.	Bazarbung	Henbane	Solanaceae	Herb	Deosai, Chillim	L, S	3000-4000m	Urinary diseases, abdominal disease, mouth infections, sedative, narcotic and anti-spasmodic, respiratory disorders
Primula rosea Royle	Meo	Prime Rose	Primulaceae	Herb	Deosai	Wp	2500-3800m	Ophthalmic disease
Phlomis bracteosa Royle ex Benth.	Cropo	Pholmis	Lamiaceae	Herb	Deosai.	L, R, Fl	2700-3000m	Fever and cough, skin diseases
Pleurospermum candollei Benth. ex C.B.Clarke	Shoogroon		Apiaceae	Herb	Deosai	L, R	2500-3000m	Diarrhea
Rheum webbianum Royle	Chontal	Rhubarb	Polygonaceae	Herb	Deosai	R, St, Fl	2800-3400m	Digestive problem, diarrhea, laxative
Rheum spiciforme Royle	Jarochuntal	Rhubarb	Polygonaceae	Herb	Deosai	R	2500-3000m	Digestive disorder, blood purifier and tonic for live stock
Silybum marianum (L.) Gaertn.	Shachoor-e-kono		Asteraceae	Herb	Deosai	S, L, Fl	500-5000m	Milk production
Thymus linearis Benth.	Tumuro	Wild thyme	Lamiaceae	Herb	Deosai	L, Fl	2800-3500m	Digestive disorder

Abbreviations for part used: Flower (Fl), Fruit (Fr), Leaves (L), Rhizome (Rh), Root (R), Seed (S), Stem (St) and Whole plant (Wp).

Fig. 9: Use Value and Relative Frequency Citations of medicinal plants for various diseases cited by the informants of Deosai.

Table 3: Quantitative analysis of the medicinal plants of Deousai Plateau

S.No	Species Name	Indices			Basic values		Ranking	
		U_i	N	FC_s	UV_i	RFC_s	UV_i	RFC_s
1	*Aconitum heterophyllum* Wall. ex Royle	16	19	16	0.84	0.27	1	2
2	*Berberis orthobotrys* Bien. ex Aitch.	16	21	16	0.76	0.27	3	2
3	*Bergenia stracheyi* (Hook.f. & Thomson) Engl.							
	13	18	13	0.72	0.22	5	4	
4	*Bistorta affinis* (D.Don) Greene	14	25	14	0.56	0.23	7	3
5	*Ferula narthex* Boiss.	11	22	11	0.50	0.18	10	6
6	*Hyoscyamus niger* L.	12	16	12	0.75	0.20	4	5
7	*Primula rosea* Royle	10	27	10	0.37	0.16	13	7
8	*Phlomis bracteosa* Royle ex Benth.	16	30	16	0.53	0.27	8	2
9	*Pleurospermum candollei* Benth. ex C. B. Clarke	9	17	9	0.52	0.15	9	8
10	*Rheum webbianum* Royle	16	20	16	0.80	0.27	2	2
11	*Rheum spiciforme* Royle	21	31	21	0.67	0.35	6	1
12	*Silybum marianum* (L.) Gaertn.	12	28	12	0.42	0.20	12	5
13	*Thymus linearis* Benth.	14	33	14	0.42	0.23	11	3

Key: U_i= No. of use reports cited by each informant for a given plant species. N_i= Total No. of informants interviewed for a given plant species. FC_s= No. of informants who suggested the use of a plant species for a particular disease I_u = Total No. of informants who mentioned the same plant for any disease. UV_i= Used Value index, RFC_s= Relative Citations frequency.

[24] reported *Olea ferruginea* Royle as the most widely used plant species in traditional veterinary medicines with a use value 0.81.

In this study, the relative citations frequency of 13 medicinal plants ranges from 0.15 to 0.35 (Table 3). The medicinal plant species with most relative citations frequency are *Rheum spiciforme* Royle (0.35) ranked 1st while *Aconitum heterophyllum* Wall. exRoyle, *Berberis orthobotrys* Bien. ex Aitch. And *Rheum webbianum* Royle ranked 2nd with similar relative citations frequency value (0.27). Whereas *Pleurospermum candollei* Benth. ex C.B. Clarke is ranked last with lowest relative citations

frequency (0.15) among the collected medicinal. Signorini *et al*. [26] reported that *Asparagus acutifolius* was the most used species (RFC = 0.71).

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