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Ethnobotanical Studies of Kurram Agency, Pakistan Through Rural Community Participation

[1]Syed Shahinshah Gilani, [2]Syed Qamar Abbas, [3]Zabta Khan Shinwari, [1]Farrukh Hussain and [4]K. Nargis
[1]Centre of Biotechnology, University of Peshawar, Peshawar, Pakistan
[2]Irrigation and Power Department, Civil Secretariat, Peshawar, Pakistan
[3]CPC, COMSTECH, Islamabad, Pakistan
[4]Department of Human Nutrition, NWFP Agricultural University, Peshawar, Pakistan

Abstract: The project area, Koh–e–Sufaid Range, falls in the upper part of Kurram Agency, FATA Pakistan. The objectives of the study were to enlist plant species of the project area which have medicinal value; to know an indigenous knowledge of medicinal and other economically important plants of the area; to explore the possible channels of trading medicinal plants; and to study the impacts of plants on the socio-economic conditions of the local population and suggest practical measures for conservation of flora under stress. The sources of fuels in the study area are gas cylinders, fuelwood smuggled from Afghanistan, trees in arable land and forest trees. During winter, almost all the people in the project area use Afghan fuelwood. Average daily fuelwood consumption in the area was 60 kg/household/day while total fuelwood consumption in the project area per year was 111.1 Million-kg. Fifty four medicinal plants were locally used by the local community for different diseases. Based on the market survey of medicinal plants, traded medicinal plants of the area were *Morchella esculenta* (Korkichoke), *Artemisia brevifolia* (Tarkha) and *Teucrium stocksianum* (Mastyara). Their estimated annual consumption, according to the local traders and collectors was 2,40,200 kg.

Key words: Ethnobotany, Kurram agency, Koh–e–Sufaid, medicinal plants

Introduction

Kurram agency took its name from the river Kurram that passes through its entirety. The headquarters of the agency is Parachinar. The agency lies approximately between 33°-20′ to 34°-03′ north latitudes and 69°-50′ to 70°-45′ east longitudes in the western part of NWFP.

Kurram agency is bounded on the north and west by Afghanistan (the provinces of Ningarhar and Puktia respectively), on the east by Orakzai and Khyber Agencies, on the southeast by Hangu and on the south by North Waziristan.

The principal mountains range in the agency the Koh-e-Sufaid [Spinghar] with peak of Sikaram Sar 4,728 meters high forming a boundary and watershed with Afghanistan. It remains covered with snow throughout the year. The hills of the Mandher range raise gradually in the south of the Pewar Kotal till they drop to the south west corner of the plateau at Kharlachi, the point where Kurram river enters the valley. This range is not so high and is generally below 2,700 meters.

The climate is generally favourable to all kinds of living organisms. In January and February discomfort is experienced from snow, rain and cold weather and sometimes it is fogy. From mid June to mid August, the heat is moderate to make it somewhat pleasant. For rest of the year, the climate is in every way excellent.

The research area, Koh–e–Sufaid Range, falls in upper part of Kurram Agency and covers an area of 319 km^2 (Table 1). It starts from Pewar-Kotal up to Bughaki (Kirman area) and lies between 33°-53′ and 34°-03′ north latitudes and 69°-50′ and 70°-51′ east longitudes. Five project units, Pewar, Shalozan, Malana, Zeran and Kirman, were selected for conservation initiatives. These areas are contiguous and located at the foothills of Koh-e-Sufaid range. Pewar and Shalozan lie to the northwest of Parachinar at a distance of 27 km and 20 km respectively, Malana lies to the north of Parachinar at a distance of 3 km. Zeran and Kirman are situated to the north east of Parachinar at a distance of 5 km and 8 km respectively.

The area is enriched with abundant irrigation water and agriculture is well developed. People sell their agriculture products, especially fruits and vegetables to Islamabad and Punjab. Other major source of earning is the remittance.

There are 73 villages/ hamlets and 59,000 people living in the project area. Due to changing lifestyle, seasonal

Table 1: Research area unit wise distribution

Research area	Area (sq.km)
Pewar	74
Shalozan	81
Malana	46
Zeran	70
Kirman	48
Total	319

migration is no more existing in the project area. The people of Mullah Bagh and Upper Shalozan are permanent visitors of the Koh-e-Sufaid. They keep goats and sheep in large numbers. Agriculture is poorly developed mainly due to slopes; less arable land available and absence of irrigation water as these people have villages at higher altitudes. Zeran is the most populated area whereas Pewar is the smallest.

Following objectives were taken for the accomplishment of the basic theme of the study

To enlist plant species of the project area which have medicinal value
To know an indigenous knowledge of medicinal and other economically important plants of the area
To explore the possible channels of trading medicinal plants
To study the impacts of plants on the socio-economic conditions of the local population and suggest practical measures for conservation of flora under stress.

Hussain *et al.* (1996) reported 125 species with various uses from Dabargai hills Swat. Shinwari *et al.* (2000) while working on the medicinal plants of Pakistani Hindukush Himalayas, reported that 12% of the flora of Pakistan is used as medicinal plants and several of them are exported to various countries also. Shinwari *et al.* (2002) gave an account of more than 300 medicinal plants to be traded in Pakistani herbal markets. Gilani and Shinwari (2003a) compiled the review of Ethnobotanical literature of Pakistan. Shinwari *et al.* (2003) reported 275 medicinal plants and other useful from the District of Swat, which are locally used. Gilani and Khan (2003) reported 87 threatened plants from Swat, 23 from Buner and 31 species from Chitral.

Materials and Methods

All the relevant materials were thoroughly studied before going into the field. The questionnaires were designed for collection of ethnobotanical and socio-economic data of the project area.

The study was conducted in May 2002. Physical survey of the Koh-e-Sufaid range was conducted during which plants were collected, dried and pressed properly. Tags with local name were attached with each plant. All the specimens were submitted to the Ethnobotany project, WWF–P, Peshawar. The relevant information were collected through interviewing and filling questionnaires from shopkeepers, fuelwood sellers, medicinal plant collectors and venders but priority was given to old knowledgeable people who were the real users and had a lot of information about the plants and their traditional uses. The information were then compared with each other and people of other villages were told to share and add their experiences. In order to know about the traded medicinal plants, a market survey was also carried out.

Results and Discussions

The major forest types of the agency are Dry sub-Tropical forests, Dry Temperate forests and sub Alpine Scrub forests which reported by Shinwari and Gilani (2003a) from the Swat District also. The Dry sub-Tropical forests are found in the southern part while the other two types are found in the northern parts of the Project area. The dominant tree species are Fir (*Abies pindrow*) and Spruce (*Picea smithiana*) on the upper elevations while Oaks (*Quercus ilex*, *Quercus dilatata*) are on the low reaches of Koh-e-Sufaid. The major shrub type is *Juniperus Communis* which dominates sub-Alpine scrub forests of the range. *Betula utilis* is also found in the sub-Alpine region but occur sparcely.

The forests are under stress of deforestation due to domestic and commercial cutting for fuelwood and timber, grazing and other pressures (agricultural land expansion, forest fires, disease/pest attack, etc.) Gilani and Shinwari (2003b) also reported these reasons from the District of Swat. Khan *et al.* (2003) reported from the Gokand valley, District Buner that 90% of the population use wood as a source of fuel.

Livestock rearing plays an important role in the economy of the local communities. Rangelands are an important source for feeding their livestock. There is no proper management system for the use of rangelands and hence they graze their animals everywhere and all the times. As such, all the rangelands are heavily degraded. Grass species found are *Cenchrus cilliaris*, *Cynodon dactylon* (Kabal), *Chrysopogan aucheri* (Spinwakhei), *Themeda anathera* and *Cymbopogan spp* (Sargari).

The practices causing problems to the biodiversity are shown in Table 2. The people in the entire project area have reported US Bombing as a major cause of wildlife disturbance. Forests depletion and absence of community capacity to manage and develop their natural resources were also causes of biodiversity depletion.

Grazing is done in two areas i.e., plain and Community Jungle. The plain land near Parachinar is exclusively used for grazing throughout the year. The Community jungle is the joint property of all the tribes of the project area but usually there is a division of land and main bone of contention between FR Kurram and Kirman people.

The feeding calendar is diverse and season-dependent (Table 3). In Mullah Bagh, Upper Shalozan and high areas of Zeran villages, the intensity of grazing is a dominant feature. Hay is not a prominent fodder source and crop residue is mainly used as winter fodder. The quality of the feeding material is poor as there is no concept of proper animal feeding.

Table 2: Causes of losing bio-diversity of Koh–e–Sufaid Range

Practices	Degree of threat	How	Measures to protect bio-diversity
Grazing/Grass cutting	H	Livestock grazing in an area not having sufficient carrying capacity	Grazing and grass cutting activities must be done on rotational basis
Tree fodder	M	Excessive and unplanned use of tree fodder	Tree fodder must be used on sustainable basis
Forest fire	L	Valuable tree species are burnt	Fire, if necessary, should be burnt but needs to be carefully monitored
Cutting of trees as timber	M	Indiscriminate cutting of trees by illegal means	Bandaar system needs to be extended
Fuelwood collection	M	Ruthless cutting of trees by illegal means	Bandaar system needs to be extended
Medicinal plant Collection	M	Due to grass cutting and over Grazing, medicinal Plants are also cut down and the resource is shrinking	People need to be made aware of the importance and value of medicinal plants
Hunting/Poaching	M	Hunting is done but not on a big scale	Awareness needs to be enhanced
Bombing	L	Due to American bombardment (December, January 01-02) the habitats of wildlife species have been Disturbed	Bombardment must be stopped
Extraction of Marble	M	Disturb wildlife habitat	Afforestation in the area can reduce the noise level caused by mining
Extraction of coal	M	Disturb wildlife habitat	Afforestation in the area may reduce the noise level caused by mining

L: Low; M: Medium; H: High

Table 3: Feeding and fodder calendar

Practices	Months
Grazing in the forests	April to November
Grazing in village	December to March
Tree fodder	April to November
Fresh grasses	June, July, August
Hay	December to March
Agricultural residue (fresh)	September
Agricultural residue (dry)	November

Table 4: Average fuelwood consumed (kg/household/day)

Season	Morning	Day	Night	Total
Summer	12	14	14	40
Autumn	20	20	20	60
Winter	25	20	35	80
Average	19	18	23	60

The sources of fuels in the study area are gas cylinders, fuelwood smuggled from Afghanistan, trees in arable land and forest trees. During winter, almost all the people in the project area use Afghan fuelwood. The major use of the Afghan fuelwood is for the heating purposes and it is cheap as compared to local fuelwood. There are mostly fruit and fodder trees around arable land therefore the dependency of the people upon arable trees for fuelwood is very limited and occasional. Villages near the forests heavily depend on forests both for cooking as well as for heating. During the last ten years, the pressure on forest has decreased from the area away from the forests but due to increase in the population forests have suffered. Severe cold climate also contribute to the deteriorating condition of the local forests.

The food is cooked for three times in a day both in summer and winter. Bread is made in oven (Tandoor) whereas sausages are made on cooking stoves. Heating stoves are of traditional types consuming large quantity of firewood. The fireplace is traditional and used during nighttime as a meeting place for family and other matters. Average fuelwood consumption in the area was 60 kg/household/day (Table 4) while total fuelwood consumption in the project area per year is 111.1 Million-kg.

The local community has rights in the communal forests and they can easily get timber from the local forests (Table 5). The influence of Forest Department is negligible but Bandaar (Protective Forest Management by the local community) controls forests from depletion. However, there is a considerable reduction in the area of the forests due to firewood and growing demand of timber for upcoming generations. Forests in the surrounding areas have been lost and therefore people are buying Afghan timber.

Based on discussions, meetings and interviews with the community it was analyzed that maximum number of population involved in medicinal plant collection were children and livestock grazers while in Daradar (Kirman) most women were observed in helping their men in fuelwood collection and collect medicinal plants in their way. They collect those plants on occasional basis. The collected plants are sold in Parachinar Bazaar. The best possible season for plant collection is from June to the end of October. As the people collect those plants in minute quantity so resultantly the sale of the collected plants do not exceed from kilogram.

Details about the plants of the research area are given below.

Abies pindrow (Shandi Beejur) is used as timber. The large blocks of 2-3 ft are cut and their inner side is made hollow and opened from the two sides. This block is placed in the wall of a home, the other open side is towards outside the house. The wax is warmed and then its thin layer is pasted inside the block. The block is left for its fate whether the honeybees come to it or not. The honeybees make honey in it.

Adiantum capillus-veneris (Lailo Sanrai) the whole plant is used for skin allergies.

Arisaema jacquemontii (Korkamar) Chickens gain weight

Table 5: Timber usage

Available locally	Purchased from other	Price of timber Rs/cft	People involved
No purchase and sale of local timber	Purchase Afghan timber from dealers	Fir/Spruce: 130 Deodar: 400	Merchants bring it from FR-Kurram (Sewak, Angoori, Gandao), Afghanistan to Burki, Kharlachi, Teri Mengal and Parachinar

by eating its fruits. The rhizome is taken in a very small proportion and given with bread for rheumatism and paralysis.

Artemisia brevifolia (Syn: *A. maritima, A. kurramensis* (Tarkha)). The whole plant is dried and then it is beaten with a stick to remove leaves and inflorescence from the shoot. The leaves and inflorescence are then crushed to make powder of it. This powder is given to remove worms from the intestine i.e., anthelmintic. The leaves are alone crushed and then the powdered form is given with water for stomach problems. The stem is used for burning purposes.

Artemisia sp. (Durlang) The whole plant is used for jaundice.

Asphodelus tenuifolius (Paizakay) The bulbs are edible as salad.

***Berberis lycium* (Tor Azghay, Seer Azghay, Tarookay, Berberry):** The roots are crushed and then applied to heal external wounds. The roots are crushed, mixed with an egg and given to the internal wounds or it is boiled and the decoction is given to heal internal wounds. Red fruits are also edible.

***Bergenia ciliata* and *B. stracheyi* (Ghwayee Panri, Qamar Gul):** The roots are used as antirheumatic.

***Betula utilis* (Bruz):** The peeled off bark is placed in the Holy Quran for recitation purposes i.e., they use them as a book or page mark which they have recited the verses.

***Cedrus deodara* (Almanza):** Uncommon much in the area, it is smuggled from the Afghanistan for timber purposes.

***Citrulus colocynthis* (Pir Pandoo):** The fruit is used as antidiabetic. This plant grows in lower Kurram.

***Cymbopogon jwarancusa* (Yasab, Barwaza):** The people believe that their smoke removes evils form the home.

***Daphne mucronata* (Laighoonay):** Red fruits are edible.

***Fragaria saginoides* (Tapiyaka, Soopa):** Honey bee species.

***Fraxinus xanthoxyloides* (Seen Zalay):** The fruits are edible.

***Gagea elegans*:** Snow Cocks and Monal Pheasants use the plant as food.

***Gallium aparine* (Gaya):** Fodder species.

***Juniperus communis* (Wras, Oobakhta):** Local use not known.

***Malva neglecta* (Tookilai):** The leaves are used as vegetable and purgative.

***Mentha longifolia* (Welana):** Cure chest problem, the leaves are dried, crushed and mixed with oil. The paste is applied on the chest for cough.

***Morchella esculenta* (Karkichoke):** The mushroom is eaten for intestinal and gastric problems.It is sold at the price of Rs. 350-1000 per kg in wet form by the local collectors and at the price of Rs. 4000-6000 per kg in dried form.

***Oxalis corniculata* (Bibi Malga):** The leaves are used for curing kidney problems.

***Pedicularis sp.* (Ghojeer, Ghojar):** The flowers are poisonous to bees, cattle rarely eat it.

***Picea smithiana* (Bari Beejur):** Timber, fuelwood. The large blocks of 2-3 ft are cut and their inner side is made hollow and opened from the two sides. This block is placed in the wall of the home, the other open side is towards outside the house. The wax is warmed and then its thin layer is pasted inside the block. The block is left for its fate whether the honeybees come to it or not. The honeybees make honey in it.

***Podophyllum hexandrum* (Badrangai):** Fruits are edible.

***Punica granatum* (Rangotay):** It is wild edible pomegranate.

***Pyrus communis* (Arghinja):** The fruits are edible.

***Rabdosia sp.* (Kharpachay):** Honey bee species.

Resin (Nanjarra): Resin of *Pinus wallichiana, Abies pindrow or Picea smithiana* is applied on the skin where

the insect known as Ticks (locally it is known as Sheenai) is pierced into it. It is poisonous to them. The ticks when pierces into the skin, it moves towards inner side and the swelling occurs there, then it will be torn out from the skin by operation. The course of injections (also prescribed in dog bites) is also advised to the patient.

***Rhododendron arboreum* and *Rhododendron sp.*(Khakhoo):** Higly aromatic, people pluck their leaves, dry them and place in rooms for their sweet fragrance.

***Rubus fruticosus* (Manzakhka):** The fruits are edible.

***Rumex chalepensis* (Zamda):** Leaves are used as vegetable.

***Thymus linearis* (Pannay):** The leaves of *Viola* and *Thymus* are mixed with the sugar cane product (Gur) and crushed. The powdered form is given to cure flu. The whole plant is also used in spices (Musalahs), as a flavoring agent.

***Teucrium stocksianum* (Mastyara):** The leaves are crushed, and placed in water for 24 h, the extract is filtered through the fine clothe and is given to the patient as antipyretic. Leaves are also antidiabetic and insect killer due to its high aroma and also used in weight loss.

***Tulipa stellata* (Shondi Gul):** The flowers are ornamental.

***Urtica dioica* (Seza Oonkay):** Leaves are irritant. The crushed leaves are also applied on joints of bones to cure from rheumatism.

***Valeriana jatamansi* (Makhkak):** Flowers are aphrodisiac and tonic.

***Viburnum cotinifolium* (Spairchu):** The local use is not known.

***Viola biflora* (Bilamsha, Banafsha):** The flowers and leaves are boiled and its decoction is used for cough.

***Withania coagulans* (Khapianga, Sapianga):** It grows in the lower Kurram but local people use its fruits for gastric troubles.

***Zanthoxylum armatum* (Sheeshai, Jaur):** The branches are used in making baby carts for children.

Medicinal and other useful plants having unidentified Botanical Names: The following medicinal plants could not be identified because of their non-flowering season:

Amburtaak: It is tree and the fruits are edible.
Azghay: The plant is used as fuel wood.
Chontara: The whole plant is used as antipyretic.
Durshool: The leaves are crushed and applied to the rashes (Peep wala dana) on skin to remove pus.
Ghar Kachalu: The rhizome is highly poisonous.
Ghozhobi and Spaira Panri: The leaves of both the plants are mixed and crushed and applied to the external wounds.
Kamiya Buti: The leaves produce light in nights.
Kor Mewa: The rhizomes are used to increase milk production in cattle. It produces red flowers.
Mameera: The flowers are used for eye diseases.
Samaan: The plants are aromatic.
Shin Gulay: The plants are aromatic.
Sokrai: The reddish bark of the stem is edible.
Speena Ooli: It is shrubby in nature and its fruits are edible.

Traded Medicinal Plants of the project area: Market survey of the main city of Parachinar, Lalmay, Bughday and Pewar was conducted and the necessary information were recorded. Based on market survey it was identified that there was no trade of medicinal plants except *Morchella esculenta, Artemisia brevifolia* and *Teucrium stocksianum.* Their estimated annual consumption, according to the local traders and collectors was 240,200 kg (Table 6).
The Fig. 1 shows that maximum collected medicinal plant was *Teucrium stocksianum* followed by *Artemisia brevifolia* because of its occurrence in the adjacent fields which contribute a major factor in providing nutrients to those plants. The production of *Morchella esculenta* was very low due to the fact that it grows just after the rain or snowfall (Fig. 1 and 2).

- *Artemisia brevifolia* [syn: *A. maritima, A. kurramensis* (Tarkha (P)), Afsanteen (U))] traded from Lalmay and Bughday. It is anthelmintic in nature and was purchased by Kurram Chemicals Rawalpindi, in past. The price of dried and powdered form without stalks was Rs. 400-500 per mound two years ago. Its current price was Rs. 400 per mound in 2002.
- *Teucrium stocksianum* (Mastyara (P), Afsanteen (U)) was traded from Pewar area. It is insect repellent, antipyretic, blood purifier and cures heart diseases. In dried form with stalks its price is Rs. 100 per mound and in fresh form with stalks it is Rs. 40 per mound.
- *Morchella esculenta* (Karkichoke, Morell) is sold at the cost of Rs. 6000 per kg, depending on its demand and supply. It is traded to Peshawar market.

Due to buying of Tarkha and Mastyara at low cost by the medicinal plant traders, the local people do not grow them in their fields.

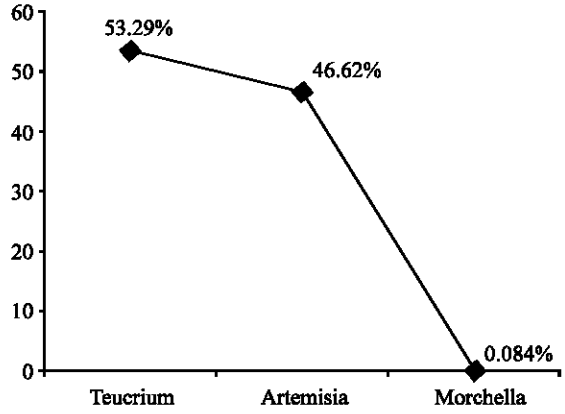

Fig. 1: Quantity-wise availability of medicinal piants (Hight % shows high quantity)

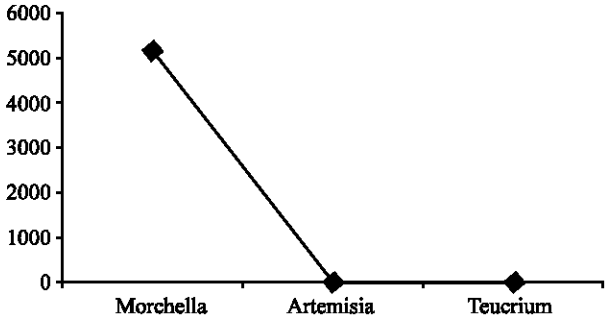

Fig. 2: Price-wise availability of medicinal plants (Rs./kg)

Medicinal plants collectors: In all of the five project areas the above mentioned three species were available but Shalozan and Pewar are famous for *Teucrium stocksianum.* There was one trader at Kirman road who purchased it from the locals, dried and finally carried it to Rawalpindi by trucks. The trader was not local and belonged to Bajaur Agency. Based on discussion with locals, it was concluded that season of *Artemisia brevifolia* start after *Teucrium stocksianum.* In each season seven and eight trucks of the mentioned medicinal plants were carried by the trader. One Truck constitute 100 sacks while one sacks contain 160 kg of these plants. In Afghanistan *Artemisia brevifolia* is found insufficiently as compared to *Teucrium stocksianum. Artemisia* of Afghanistan is of red color while that of Kurram is of green color. *Teucrium* of Afghanistan is larger than Kurram. About four trucks of *Teucrium stocksianum* while three of *Artemisia brevifolia* were brought from Afghanistan by Jagi tribe and sell to the mentioned trader. Majority collecrtors of these two species were men. Data analysis shows that about 64,000 kg of *Teucrium stocksianum,* while 50,000 kg of *Artemisia brevifolia* were carried in Pakistan through that route.

The Fig. 3 and 4 show that about two-third of the

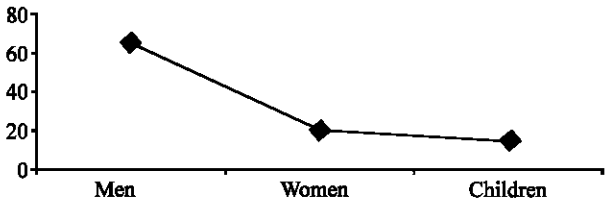

Fig. 3: Price-wise availability of medicinal plants (Rs./kg)

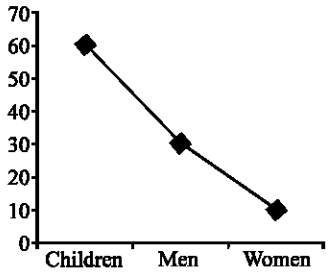

Fig. 4: Medicinal plant collectors of Moechella

medicinal plant collectors of *Artemisia brevifolia* and *Teucrium stocksianum* were men while about one-third were women and children. While Shinwari and Gilani (2003c) reported from the district of Swat that 90% of the medicinal plants collectors were either females or children. The high percentage of men in that practice was because of their dominant-farming attitude and resultantly the medicinal plants were collected adjacent to their lands.

In case of *Morchella esculenta* children of the project area collect it followed by men and then women. That expensive plant was mainly collected by the villagers living at the foothills of Koh-e-Sufaid Range. In Mulla Bagh, Sapar Kalay (Zeran), Bulbulak, Daradar, Kenaki, Uchadara, Raju mela in Bughaki (Kirman) the collection of that plant was practiced by the children in much more quantity as compared to the other project areas.

About two-third of the medicinal plant collectors of *Morchella esculenta* were children because most of the children were involved in the livestock rearing. They grazed their livestock in Koh-e-Sufaid Mountain range while in their way the mentioned expensive plant was also collected. About one-third of that plant collectors were male and most of them were shepreds and fuelwood collectors who also collect that plant when find. A minute proportion of that plant collectors were female because *Morchella esculenta* was mostly occurred in the areas which were out of their reach.

Medicinal plant venders: There were five vender's shops in Parachinar Bazaar involved in the trade of *Morchella Esculenta* while one whole sale shop was there at the Kirman road dealing with *Artemisia brevifolia* and *Teucrium stocksianum.*

Table 6: An estimated annual consumption of traded medicinal plants of the project area

No	Plant Name	Annual Consumption (kg)	Price/kg (Rs.)
1.	*Artemisia brevifolia* (Tarkha)	1,12,000	5-10
2.	*Teucrium stocksianum* (Mastyara)	1,28,000	1-2.5
3.	*Morchella esculenta* (Karkichoke)	200	4000-6000

Table 7: Purchase/sale, export and maximum availability of medicinal plants in the project area

S.No	Name of plant	Purchase rate Rs./Kg	Sale rate Rs./kg	Maximum availability	End point
1	*Artemisia brevifolia*	5	10	Lalmay, Bughday, Pewar	Rawalpindi
2	*Teucrium stocksianum*	1	2.5	Shalozan and Pewar	Rawalpindi
3	*Morchella esculenta*	4,000	6,000	Zeran and Kirman	Peshawar, Lahore, Karachi, France, Germany

Based on discussion with the local vender it was analyzed that in the last year export of *Morchella esculenta* from the Parachinar was 240 kg while in that year the figure decrease to 200 kg because of low availability. Venders were of the opinion that due to low rainfall its production has decreased. From Afghanistan *Morchella esculenata* is brought through its Khost Province entering in the Lower Kurram Agency by the route of Alizai.

The venders export *Morchela esculenta* to Nimak Mandi, Peshawar; Lahore and Karachi (Table 7). From there it is carried to Lahore and then Karachi. Finally that expensive plant is exported to France and Germany.

On the way the Forest dept. take Rs. 300/- for one crate (16 kg). Besides this, Rs. 100/- was also charged by each Levy check posts. An experienced local vender was interviewed who said that few years ago the Forest dept took Rs. 10,000/- for 320 kg of *Morchella esculenta*. He said that the price of four *Morchella esculenta* in London, France and Germany is 200 U.S $.

Processing of medicinal plants: There is no technical method used by the collectors for the processing of medicinal plants. However, they use local methods for drying, carrying and marketing of the plants. *Artemisia brevifolia* and *Teucrium stocksianum* are kept on a soft cloth for drying in the sun light. Further these are kept in a bag and brought by the collectors to the market. Often these two plant species are carried to the market in wet form and the trader dry it later on. *Morchella esculenta* is dried by entering thread inside it in the form of nacklace. After that it is brought to the market in polytene bag.

Trend of using medicinal plants: In the past people did that practice for domestic purpose and much of the people were of its users while contrary to this presently awareness regarding the uses of medicinal plants is reduced and it was shrinked to only commercial purpose. The reason given by locals for the decreasing trend of using medicinal plants against diseases is that the more effective allopathic drugs have replaced that centuries old traditional medicine.

The people did not have any problem in collecting those plants. Those living in the foothills of Koh-e-sufaid (specially Saper kalay, Mullabagh, Daradar, Uchadara and Arghanga sar) had more approach to *Morchella esculenta* because of its occurrence in those upper elevation. Other medicinal plants like *Artemisia brevifolia* and *Teucrium stocksianum* were mostly in the use of low lying areas of Koh-e-Sufaid Range.

Over grazing in area was severe, due to which the medicinal plants may be in threatened condition. The conservation of the medicinal plants and their trade on sustainable basis must be done.

The total species of medicinal plants are 54, of which, 13 couldn't be identified because of non-flowering season. Overgrazing in area was severe, due to which the medicinal plants were under severe threat.

The traded medicinal plants of the area are *Artemisia brevifolia*, *Teucrium stocksianum* and *Morchella esculenta*. The drug dealers pay them very little amount i.e., Rs. 5 per kg and Rs. 2.5 per kg for *Artemisia brevifolia* and *Teucrium stocksianum* respectively. *Morchella esculenta* is also traded from the area but its business is not too much developed as compared to District Swat where it is also exported abroad. Dealers in Kurram sell these plants at small scale and trade only to Peshawar. Their price was found to be low (Rs. 4000-6000/kg) as compared to Swat (Rs. 8000-10,000/kg). The community is ready to cultivate medicinal plants on commercial basis if a good market could be guaranteed.

Mining is also a great threat to the medicinal plants. In Marchok (Zeran) the marble excavating contractor is extracting marble from the area. He pays Rs. 200 per truck to the community.

As the flowering period of most of the plants start from mid of June but contrary to this most flowering plants were collected and identified their local names and uses. The area is rich in terms of biodiversity like flora, fauna and specially medicinal plants.

The rapid decline of medicinal plant resources due to their conventional use needs *ex–situ* and *in–situ* conservation, training of community regarding collection of medicinal plants and their marketing (Shinwari and Gilani, 2003b).

Recommendations: Based on the fieldwork, community' meeting and personal observation following

recommendations are given.

- To reduce the consumption of fuelwood in open fire places and to reduce fuel related diseases, especially of women, there is a need to introduce the fuel-efficient stoves.
- To reduce pressure on the natural forests, it is necessary to plant fast growing tree species on waste and marginal lands on partnership basis.
- The community is already managing their forest through Bandaar but to make the system more effective separate Conservation Committees needs to be established in each village and expand their writ to hunting and grazing.
  Needful training should be given to the members of the Conservation Committees regarding the natural resource conservation. By doing so they will be in position to convey messages to the general community about the importance of the natural resources.
- Since there is a lack of awareness regarding the natural resource conservation, an elaborative environmental awareness programs for various stakeholders needs to be arranged. This target can be achieved through arranging talks and meetings first with the educated people, notables and finally with general community. Nature clubs in different schools of the project area must be set up and quiz competition among the children must be held. Encourage the participants taking part in quiz competition by giving small gifts/awards. By doing so the new generation will become environment friendly.
- To conserve medicinal plants, pressure of overgrazing on area must be reduced to minimum. Local communities need to be involved in the conservation process of medicinal plants.
- Liaison between stakeholders and the local communities must be developed to promote trade of medicinal plants such as Tarkha (*Artemisia brevifolia*), Mastiyara (*Teucrium stocksianum*) and Karkichoke (*Morchella esculenta*) on sustainable basis.

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