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IMPORTANT MEDICINAL PLANTS OF CHITRAL GOL NATIONAL PARK (CGNP) PAKISTAN

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Abstract

National Parks are diverse habitat for different medicinal plants. So far 21 areas in Pakistan have been declared as National Parks (NP). The present investigations focus on the ethnobotanical study of important medicinal plants of Chitral Gol National Park. The local inhabitants including ethnic groups of Kalash living in the vicinity of the Park have always used the medicinal herbs for various ailments and are dependent on the plants in their surrounding for, food, shelter, health, medicine, fodder and various cultural purposes. A total of 31 trees, herbs and shrubs belonging to 21 families were recorded which are used as fuel, fence and as medicine by the local inhabitants. About 100 informants and local Hakims were interviewed in this regard. *Artemisia maritima*, *Artemisia brevifolia* and *Rosa webbiana* are dominant species suitable for harvesting, while *Ephedra gerardiana* and *Ferula narthex* are vulnerable to harvesting. The precious ethnobotanical knowledge is disappearing very fast, so this study could be helpful in conservation of ethnobotanical knowledge.

Introduction

Chitral Gol is the 5th order stream originating in the snow covered mountains of Gokshal-o-Tek, Gokshal and Dundinni, draining a valley laying in the west of Chitral town (Fig. 1) Chitral Gol National Park (CGNP) with an estimated area of 77.5 km^2 located on 35º50'N Latitude and 71º47'E Longitude. It is one of the alpine river catchments in the Hindukush Mountains with an elevation ranging from 1450 to 4979 m asl. The park area is out of the reach of Monsoon and receives 462 mm mean annual precipitation, principally in winter and spring (Khan *et al*., 2010). CGNP is a narrow valley with relatively steep, sharply defined ridges and slopes (Beg, 1974). There is an appreciable amount of winter snow and long dry summer leading to the dominance of drought resistant and cold tolerant vegetation inside and in surroundings of the park. The flora in general, is of Eastern Irano-Turanian type; however some Himalayan species also grow in suitable micro- habitats (Zarif, 2003, Inam-ur-Rahim, 2004). The park area was originally set aside as a royal hunting reserve during 1880's and during 1907. Goat grazing was banned by the ruler of Chitral in Gokhshal region of the park. Then it was proclaimed as a wildlife sanctuary in 1971 for five years by the then Commissioner of Malakand division after amalgamation of Ex-State in Pakistan. Chitral Gol was upgraded to the National Park (NP) status in October 1984. So, far 21 places have been declared as National Parks in Pakistan (IUCN 2004).

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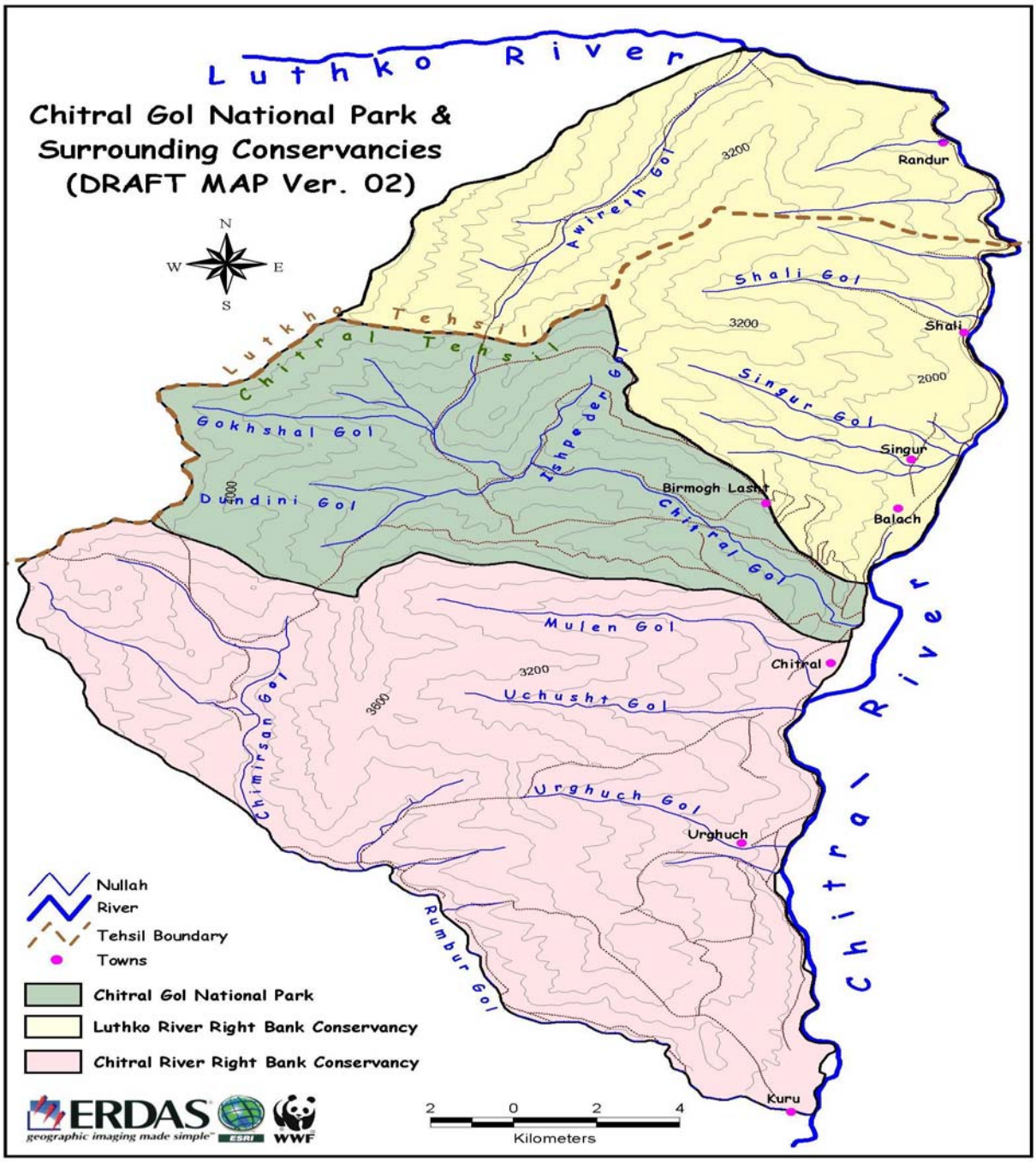

Fig. 1. CGNP& surrounding areas.

Pakistan has a total of 5521 species belonging to 1572 genera, which is mostly confined to the mountainous areas of the country (Ali, 2008; Ali & Qaiser, 1986). National parks provide a diverse habitat for different plants which are Ethno- medicinally important. A lot of papers have been published regarding the ethnobotanical importance of plants in different parts of Pakistan. However, little attention is paid to document the medicinal plants of National Parks in Pakistan. Shinwari & Khan, (2000) described 50 species of herbs and shrubs belonging to 27 families from Margala Hills National Park, Islamabad, as used by the local inhabitants living in the vicinity of the park for various ailments. Among these plants ten species are being sold in the local market while *Asparagus adscendens* Roxb, and *Viola canescens* Wall. ex Roxb, were reported vulnerable for harvesting. Similarly Zandial (1994) and Bukhari (1994) conducted Ethnobotanical studies in Machyara National Park (AJK). They presented the current

status of plant species and documented 104 important species of plants categorized into tree, shrub and herb species used ethnobotanically by the local people. Indigenous uses of some important Ethnomedicinal herbs of Ayubia National Park, Abbottabad is described by Gilani (2006) and reported 21 important herbs belonging to 19 families and concluded that *Podophyllum emodi* Wall. ex Royle and *Viola canescens* Wall. ex Roxb., are found vulnerable to harvesting.

Chitral Gol National Park has never been explored ethno-botanically in detail. However few studies were documented regarding the uses of medicinal plants in Chitral district, i.e. Hussain (2003) collected ethnobotanical information of fruit plants of Chitral and listed about 19 cultivated fruit plant species. Similarly Ahmed *et al*., (2006) conducted ethnobotanical studies on some medicinal plants of Booni valley, while Hussain *et al*., (2007) conducted an extensive survey on the medicinal plants of Mustuj valley and documented the uses of 111 plant species. Ajaz (2007) explored the non-timber forests produce of Kalasha valley and reported 27 marketable medicinal plants which can be utilize for poverty reduction, while an ethnobotanical studies with particular reference to medicinal plants in Chitral valley was given by Haidar and Qaiser (2009). Recently Khan *et al*., (2010) discussed the plants used as fuel, fence and their medicinal uses focusing in five major valleys including Bumburate, Rumbur, Birir, Shehekuh and Golin Gol Valley of District Chitral.

The present investigation regarding the indigenous uses of the medicinal plants in Chitral Gol National Park (CGNP) is therefore the first attempt and is important because this area has never been explored ethnobotanically and the information about the indigenous uses of medicinal plants which is vanishing rapidly. The urgent need for this kind of information is worthwhile because the vegetation in the Park is extensively impecunious due to biotic pressure which is an overriding factor in the study area. A number of nomads migrate in Gohkshal area of the park and is totally dependent on the forest for their fodder, fuel wood, fencing and other requirements.

The main objective of the present study is to document the indigenous knowledge of wild plants of Gol National Park Chitral and to provide scientific basis for further research.

Material and Methods

The present study was undertaken in nineteen major zones of Chitral Gol National Park, i.e., 1). Gohkshal Gol, 2). Dundini Gol, 3). Singur Gol, 4). Mulen Gol, 5). Shali Gol, 6). Bronshal, 7). Birmoghlasht, 8). Daleem, 9). Thoosi, 10). Miran, 11). 12). Zamrat, 13). Kasaweer, 14). Ishpeder, 15). Tonghongh, 16), Booster, 17). Sardoayeuch, 18). Zokhjal and 19). Utras. Regular visits were made, during 2009 to 2010 for the collection of relevant information. The general information about the area of Chitral Gol National Park was also collected before starting the research work on Medicinal Plants. Maps were obtained from PAMP Office Chitral and meetings were conduct with the park and wildlife authorities at Chitral.

The local name, traditional uses of plants with emphasis on medicinal uses were documented through an open ended questionnaire and interviews of the local elderly knowledgeable persons including local herbal practitioners (hakims), village conservation committees, wildlife field staff and plant collectors. According to Hussain *et al*., (2007) information was considered authentic when confirmed from at least 10 interviewees.

In the field, voucher specimens of difficult and unidentified plants as well as representative species were collected, pressed and have been deposited in the laboratory of Plant Ecology and Dendrochronology Federal Urdu University Herbarium. Field photographs were also taken for further confirmation of plant identification. All species were later identified with the help of numerous authorities and flora of Pakistan (Nasir & Ali, 1971-1995; Ali & Qaiser, 1995-2005; Ali & Qaiser, 1993-2009). The identification was confirmed at the herbarium, Department of Botany, University of Karachi.

Results

The study shows that a total of 31 species belonging to 21 families were recorded from the study area. Among these species 10 were trees, 7 shrubs and 13 were herbs. One species of mushroom was also obtained from the study area. The highest number of species were recorded of family Asteraceae (5 spp.) followed by Pinaceae (4 spp.) and Umbelliferae (3 spp.) respectively. Family Rosaceae and Cupressaceae exhibited two species each while, the remaining families had single species each. These species with their respective families and Ethnomedicinal uses are listed below and categorized into Trees, Shrubs, Herbs and Mushrooms.

A. Tree species

Cedrus deodara (Roxb. Ex Lamb.) G.Don
Family: Pinaceae
Local name: Deodar, Rough
Habitat: Wild large size evergreen tree
Part used: Branches, wood, leaves and cones
Local uses: Wood is used as timber wood, Branches and cones are used for fuel purposes. Oil extracted from freshly cut wood is used for various skin diseases.

Pinus gerardiana Wall. ex Lamb.
Family: Pinaceae
Local name: Chilghoza
Habitat: Wild large size evergreen tree
Part used: Branches, wood, leaves, seeds and cones
Local uses: Wood is used as timber and fuelwood. Branches are used as roof thatching materials in houses. Cones produce edible seeds called Chilgoza having a market value. The Seeds are commonly used as tonic, carminative, appetizer and aphrodisiac.

Pinus wallichiana A. B. Jackson
Family: Pinaceae
Local name: Choxeen
Habitat: Wild large size evergreen tree
Part used: Branches, wood, leaves and cones
Local uses: Wood is used as timber. Branches serve as roof thatching materials and fuel wood. Leaves are used for shading purposes in temporary huts.

Picea smithiana (Wall.) Boiss.
Family: Pinaceae
Local name: Patupar
Habitat: Wild large size evergreen tree
Part used: Branches, wood and cones
Local uses: Wood is used as timber. Branches are used as roof thatching materials. Cones are use as a fuel.

Juniperus excelsa M. Bieb.
Family: Cupressaceae
Local name: Saroz
Habitat: Wild medium size evergreen tree
Part used: Fruits, bark branches, Wood & leaves
Local uses: The aqueous extract from crushed fruits is anthelmintic. It is considered as one of the best timber woods of the area due to its durability. About 95% of the houses are constructed from its wood. It is also used in making beams, beam lets, pole and door fixtures. It is one of the best firewood of the area due to its high heat value and smokeless flames. Bark is used for thatching purpose. The trunk is used in making Bethalo.

Betula utilis D. Don
Family: Betulaceae
Local name: Bulee
Habitat: Wild /Cultivated large deciduous tree
Part used: Bark, branches, wood & leaves
Local uses: The waterproof thin papery bark was once used as paper for writing and as storage and wrapping material. The branches and stems serve as firewood and timber wood and in making agricultural tools. The leaves are used as fodder. Birch is generally the timberline tree that has also drastically reduced in population and form due to deforestation and overgrazing. It now mostly occurs as deformed shrub with open canopy.

Quercus baloot
Family: Fagaceae
Local name: Banj
Habitat: Wild /medium size evergreen tree
Part used: Seeds, wood & leaves
Local uses: Seeds are used by domestic animals. Wood is used as firewood and timber wood and for making agricultural tools. The leaves are used as fodder.

Juglans regia L.
Family: Juglandaceae
Local name: Birmogh
Habitat: Wild /Cultivated large deciduous tree
Part used: Nuts, bark, wood & leaves
Local uses: Its wood is used in furniture. The bark is used for cleaning teeth. The leaves are also used as lipsticks.

The nuts are considered very effective against teeth & Gum diseases. Pulverized walnut shell can be used for manufacture of decolorized charcoal and activated carbon. Plant contain alkaloids, barium as oxalic acid in fruit

Elaeagnus angustifolia L.
Family: Elaeagnaceae
Local name: Sinjoor
Habitat: Wild/Cultivated
Part used: Berries & gum, wood
Local uses: The fruit is collected and boiled in water for one hour and the juice is extracted by crashing the fruit through a cloth. The juice is stored in the bottles for the use against dyspepsia and blood purification. The gum of this tree locally called Luchak, it is ground and powdered, which is use as shampoo and hair tonic by girls and considered very effective for long and shiny hairs. Wood is used as timber and for fuel purposes.

Prunus dulcis (Mill.) D. A. Webb.
Family: Rosaceae
Local name: Kandu
Habitat: Wild
Part used: Kernel, gum & branches
Local uses: The kernel of wild almond is bitter and not edible, oil extracted from the kernel used for massaging and as hair oil and the gums are also used for similar purposes. The young branches are used for making baskets and agricultural tools. The tree also provides forage for honey bees.

B. Shrub species

Artemisia maritima L. ex Hook.f.
Family: Asteraceae
Local name: Bespuk
Habitat: Wild small size shrub
Part used: Leaves and Stems
Local uses: Plant decoction is used as antiseptic and anti-inflammatory and antimalarial. Leaves are utilized for cooling purposes. Plant powder is used for intestinal worms. The plant is also used as broom.

Artemisia brevifolia Wall. ex DC.
Family: Asteraceae
Local name: Droon
Habitat: Wild shrub
Part used: Whole plant.
Local uses: It is good firewood and fresh fodder plant. Leaves and inflorescence are ground to form powder which is used for gastric problems.

Artemisia parviflora Roxb. ex D. Don
Family: Asteraceae
Local name: Kharkalich

Habitat: Wild shrub
Part used: Seeds
Local uses: One teaspoonful of powdered seed is taken with a glass of water to cure abdominal pain.

Capparis spinosa L.
Family: Capparidaceae
Local name: Kaveer
Habitat: Wild shrub
Part used: Floral buds, fruits & Leaves
Local uses: The floral buds meshed with wheat flour are cooked to prepare Kaveerough, which is taken orally to cure typhoid fever. The aqueous extract from floral buds also cures typhoid. The leaves are used as fodder. The flesh fruits are applied as face cosmetics.

Rosa webbiana Wall ex Royle
Family: Rosaceae
Local name: Thorny
Habitat: Wild shrub
Part used: Branches, Leaves & fruits
Local uses: Stems and branches are mostly used as firewood and as fencing material around cattle sheds and fields. The leaves and fruits are used as fodder. Decoction is prepared from the fruits in boiled water and then strained overnight to treat asthma.

Tamarix dioica Roxb. ex Roth
Family: Tamaricaceae
Local name: Hinju
Habitat: Wild large size evergreen shrub
Part used: Branches, Wood & Leaves
Local uses: It is mostly used as firewood and in making agricultural tools and handle of axes. The dried leaves are good organic matter. Branches and stems are used in thatching of houses and cattle shelters.

Ephedra gerardiana Wall ex. Stapf.
Family: Ephedraceae
Local name: Somani
Habitat: Shrub
Part used: Fruit & Flower
Local uses: The young branches of *Ephedra gerardiana* are collected chopped and boiled in water and after by crashing the branches a radish brown juice is extracted. This is applied locally with aching backs.

C. Herb Species

Cannabis sativa L.
Family: Cannabaceae
Local name: Bong

Habitat: Wild herb
Part used: Seeds & leaves
Local uses: The leaves of *Cannabis sativa*, are collected, dried and ground. The powder is mixed with water and given twice a day to livestock to relieve abdominal pain.

Ferula narthex Boiss.
Family: Umbelliferae
Local name: Raw
Habitat: Wild perennial herb
Part used: Whole plant
Local uses: Leaves and young shoots are edible. Locally this species is used for cough, asthma, toothache, gastric problems and anti-constipation.

Peganum hermala L.
Family: Umbelliferae
Local name: Ispandur
Habitat: Wild herb
Part used: Fruits & seeds
Local uses: Dry fruit and seeds of *Peganum hermala* are burn and children and their cloths are fumigated with smoke in order to protect them from evil eyes.

Sisymbrium irio L.
Family: Brassicaceae
Local name: Khelikheli
Habitat: Wild /Cultivated herb
Part used: Seeds
Local uses: A past is made from the seeds of *Sisymbrium irio* and is applied to aching part of the body suffering from stabbing pain. The past is also mixed with soup and dishes against bloody stool and keep children body warm during winter.

Cichorium intybus L.
Family: Asteraceae
Local name: Kashti
Habitat: Perennial herb
Part used: Whole Plant
Local uses: The root of *Cichorium intybus* chopped and boiled in water. The decoction is used for typhoid and fever Chicory secretion is used to promote digestion.

Prangos pabularia Lindle.
Family: Umbelliferae
Local name: Muchain
Habitat: Wild herb
Part used: Leaves
Local uses: Fresh leaves of *Prangos pabularia* are crushed into a thick past, and this past is applied scorpion bites with ghee to relieve pain. The species is also utilized as fodder for livestock an ideal diet for Markhor.

Solanum nigrum Auct.
Family: Solanaceae
Local name: Pirmilik
Habitat: Wild herb
Part used: Ripen berries
Local uses: The juice of the ripen berries of *Solanum nigrum* are applied on the skin, to remove pimples.

Mentha arvensis L.
Family: Lamiaceae
Local name: Bhen
Habitat: Wild herb
Part used: Leaves, seed& root
Local uses: In early spring, the young leaves are collected and used as salad. Tea is made from the root and dry leaves.

Plantago major L.
Family: Plantaginaceae
Local name: Brono achar
Habitat: Wild herb
Part used: Leaves & seed
Local uses: Seeds are collected, cleaned, dried and stored. Whenever some one has got stabbing pains in the family, these seeds are fried with butter or apricot kernel oil and by additional of water and flour, a soup is made and is given to the patient before going to bed at night.

Ajuga bracteosa Wall. ex Benth.
Family: Labiatae
Local name: Boti
Habit: Perennial herb
Part used: Leaves
Local uses: Leaves are bitter in taste and used in fever. The young leaves are dried, powdered and eaten three times a day for throat infection and fever.

Anthemis cotula L.
Family: Asteraceae
Local name: Sherisht
Habit: Perennial herb
Part used: Inflorescence
Local uses: Flowers are boiled in water or tea and used for various gastrointestinal disorders like stomachache and gas trouble.

Chenopodium foliosum Asch.
Family: Chenopodiaceae
Habit: Annual herb
Local name: Pelili mrach
Part used: Ripe fruits

Local uses: The ripe fruits are eaten raw for its taste; they are also used for eye infection. Juice is extracted from the ripe and clean fruits and is applied for eye infections.

Urtica dioica L.
Family: Urticaceae
Habit: Perennial herb
Local name: Drozono
Part used: Whole plant
Local uses: Decoction of the plant is astringent and anthelmintic. Leaves cause severe irritation which can be soothed by rubbing leaves of *Rumex*. Young leaves are used as potherb.

D. Mushrooms

Morchella esculenta
Family: Helveliaceae
Local name: Quchi
Habitat: Mushroom of moist temperate habitat
Part used: Whole plant
Local uses: It is cooked as vegetables. It is also collected by the local people and sold in the local markets in good price.

Discussion

Chitral Gol National Park is famous for its rich biological diversity in Pakistan. Beside other natural resources, the area is also enriched with useful medicinal plants. However, these forests are facing severe anthropogenic interference and need to be protected and conserved by community participation. Local community should be actively involved creating awareness about the useful medicinal plants and their commercial value and community participation can be initiated. Medicinal plants are used in Pakistan not only by Tabibs and as household remedies but also by the pharmaceutical industries. The business of medicinal plants in Chitral is limited. Only a few species are marketed out of the district.

Some wild species like, *Ferula narthex* and *Paeonia emodi* in the park are endangered due to past over-harvesting by the local communities inhabiting nearby and also due to overgrazing by domestic animals.

Among the tree species *Cedrus deodara*, *Pinus gerardiana*, *Pinus wallichiana*, *Picea smithiana* and *Juniperus excelsa* are commercially important species found in the Park. *Cedrus deodara* has been declared as national symbol of Pakistan due to its graceful profile and termite resistant wood (Nasir & Ali, 1972). A large number of trees are lying dead due to some natural hazards in Gohkshal, and near Meran Rest House (Personal observations) and some trees were burnt for purpose of making charcoal.

Juniperus excelsa is also considered as one of the best timber wood of Chitral due to its durability. It is used in making beam, beamlets, poles and door fixtures (Hussain *et al*., 2007). It is one of the best fire woods and also serves as roof thatching material. Similarly, *Betula utilis* is abundant at high altitudes and is commonly the last tree species occurring at the timberline. Due to overgrazing and logging history in the past the density

of these species has drastically reduced in many places of the park and now they are found on steep rocky inaccessible slopes.

Another commercially important species *Pinus gerardiana* is found in the park with a high selling market price of about Rs. 2000-3000/ per kg in the local market. Number of cones on a tree generally increases with the increase in diameter. On the average, 50 cones/brach were found on a tree having a diameter 1.5m. For each meter increase in diameter, there was increase of at least 20 cones per tree. Most of the trees were having much lesser number of cones as these were removed for seed collection by the local inhabitants.

The seed crop of Chilgoza Pine is a very important commodity for local communities from a commercial viewpoint. Therefore, the trees having spreading crowns were more important even if gnarled and stunted. Such trees can bring higher return in terms of seed production than trees having crowns of narrow shape and straight stem.

According to Haidar & Qaiser (2009) the oil extracted from the kernels is valued highly for its stimulating and healing power. Therefore the local inhabitants of Chitral over harvested and in some cases removed all the cones. As a result, there is no natural regeneration of the species because the unsustainable practice of "Chilghoza" collection has drastically reduced its regeneration potential. Therefore it is recommended that this species should be regenerated and propagated through *in-situ* and *ex-situ* conservation. This plan can serve as a livelihood improvement of the community depending on the resources of the park.

Ephedra is a well known medicinal plant from time immemorial and Ephedrine is the main alkaloid which is a known remedy for asthma and some other diseases (Zaman *et al*., 1971). Similarly, *Ferula narthex* is also another important medicinal plant locally used for different ailments. Owing to the usefulness of the above two species the nomads are actively involved in the collection and marketing of these drug plants. These nomads being ignorant therefore uproot and over exploit these important medicinal plants. Consequently, these species are disappearing from the park and have become vulnerable in their natural habitats.

Artemisia is a large, diverse and economically important genus of the family Asteraceae. It has more then 500 species. Out of these 38 species are found in different parts of Pakistan which are popularly used among Pakistani people as food, ornaments, fumigants and medicines (Hayat *et al*., 2009). Chitral Gol National Park (CGNP) has a large area above *Quercus baloot* zone which is almost covered by *Artemisia* species. Tree species have been removed from these *Artemisia* steppes zone. The over dominance of the genus may be due to the allelopathic effect of the genus. This view is supported by the findings of Pareto (1985) and Tan *et al.* (1998), who stated that many species of genus *Artemisia* are economically important as medicines, food, forage, ornamental or soil stabilizers in disturb habitats, while some taxa are toxic or allergenic and some other are invasive weeds which render the harvest difficult. The other possible reason may be the steppe climate, moderate precipitation and excessive exposure to sunlight in the park. This view is strengthened by the statement of Erdtman (1969) and El-Moslimany (1990) who advocated *Artemisia* as an indictor of steppe climate and moderate precipitation. However, the species of *Artemisia* and *Rosa webbiana* are predominant and are suitable for harvesting in the park.

According to Aleem (1976) during summer, Markhor (*Capra falconeri*) consumed plants that include *Ephedra gerardiana*, *Rosa webbiana*, *Prunus amygdalis*, *and*

Artemisia species. Owing to natural grazing and unscientific practices would tend to diminish their frequency in the park and making the conservation difficult.

Being a remote area so far, no effective measures have yet been taken by the government agencies for the conservation of these medicinally important plants. Although it has been declared as a National Park but still parts of the Park are open for grazing of domestic animals which is a severe threat and great ecological setback to the natural plants of the Park. Therefore, it is strongly recommended to take initiatives for conservation of medicinally important plants of the park involving government agencies and local communities to obtain sustainable yield of the medicinally important plants.

Conclusions

1. The present study concluded that three species of *Artemisia* (*Artemisia maritima*, *Artemisia brevifolia* and *Artemisia parviflora*) and *Rosa webbiana* are predominant species of the Park and are amenable to harvesting.
2. *Ephedra gerardiana* and *Ferula* n*arthex* are vulnerable species which are overexploited by the nomads and local inhabitants living in the vicinity of the Park.
3. The local communities have a very rich knowledge on the use of different medicinal plants but majority of the people are illiterate and use unscientific methods for harvesting medicinal plants.
4. Such indigenous practices and knowledge of the people on the utilization of plant resources should be documented and preserved before they are eternally lost.

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