

*Full Length Research Paper*

# Ethnoecological appraisal of *Acacia modesta* Wall. common tree of dry ecosystem in Pakistan

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**Ethnoecological studies on *Acacia modesta* Wall. (Mimosaceae) growing wild in Dargai area of Malakand District (Pakistan), demonstrated a great demand due to the medicinal value of its flowers oil, gum, resins and sticks for honey bee. The plant as a whole is also valuable as fuel-wood and as construction material for income. Locally, common folk used it as fodder, timber, fencing, and household items and as a source of honey bee production. The tree was found to be abundant in some villages of Dargai area. The frequency being: 35% in Jaban, 15% in Kot, 25% in Mehrdi, 10% in Wartair, and 15% in Qaldara villages of Dargai. Interestingly, a great variation was noticed in the local selling prices of the gum which were also found higher in national as well as international markets. Ecological studies showed that *A. modesta* trees growing on all ranges of soils including: dry to wet, sandy to calcareous and acidic soils along with association of *Olea cuspidata*, *Ziziphus jujuba*, *Zizyphus nummularia*, and *Acacia arabica*. Phonological studies revealed all the three stages of trees from juvenile, young and rare older trees, in the region under study. Market survey and interviews with local collectors showed that Dargai was the major trade route for medicinal plants. In general, there are locally well known centers where *A. modesta* is growing in abundance. Dargai is believed to be a regional herbal medicines market route where the transportation of *A. modesta* gum and other herbals to other areas, have well been recorded. During the current study, it was observed that major plant collectors in the area were local women and children, however, many workers were Afghan refugees. Local men were cornered from open field work, perhaps due to safety reasons. Men participate in cutting of bigger plants whenever demand arises. There is a need that, along with conservation of valuable timber by participatory approach, *A. modesta* must also be included in these efforts to make its availability in long term for poor local collectors whose one the major source of income is from gum and fuel wood collection.**

**Key words:** *Acacia modesta* Wall. (Mimosaceae), Dargai, Malakand, Pakistan, useful plants for humans.

## INTRODUCTION

There is a growing interest in *Acacia modesta* Wall. (Mimosaceae) to include it under a developmental program for the sustainable cultivations and harvest scheme. The honey-bee keepers used the sticks of this popular medicinal and aromatic tree of Dargai. Various preparations of *A. modesta* are used in the local system of medicine for the treatment of numerous diseases

including skleto-muscular problems, to ease backache for women after delivery, and chronic stomach disorders, since time immemorial (Murad et al., 2011). The decoction legume and gum resin of *A. domestica* is used as a tonic and to cure dysentery. Branches are used as tooth-brush. In addition, this plant is used as an alternate source of interest for income and people utilize it as wood fuel, useful in construction work, as fodder, timber, fencing, and in keeping honey bees. It is interesting to notice, that in Darai area, *A. modesta* is common in certain parts and village while not in the other regions

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(Stewart, 1972; Sher et al., 2010; Hussain and Sher, 2005).

In the present study, the investigated area was located between 71 to 52° North longitude and 34 to 45° East latitude and stretches over an area of about 95,200 ha, out of which 60,030 (65%) is cultivated land in which 60% is grass land, about 5 is features land, and 35170 ha (35%) is non cultivated land, in which 25% is barren land, 5% range land (Figure 1).

The area is bordered in North by mountainous range of Swat, on the West by mountainous range of Bajur (or Mohmand Agency). In addition, to its North by Lower Dir, on the East side by Buner, South-East Mardan and South-West Charsada (Mohmand Agency). The area is mountainous and its altitudes range from 2,200 ft at Dargai to over 2,700 ft at Malakand area of the sub-division Batkhela.

Due to the geomorphologic vegetation, a variety of vegetation has been found in the area. The lower part (subtropical zone) is dominated by *A. modesta* (locally called Palosa), which show a very strong impact of overgrazing. Other indigenous trees in the area are *Olea cuspidata* (Khuna), *Ficus carica* (Inzer), *Morus alba* (Speen Toot), *Morus niger* (Toor toot) *Zizyphus jujuba* (Bera), *Acacia arabica* (Kiker), *Zizyphus nummularia* (Karkana) and *Delbergia sissoo* (Shawa, Sheshum). The upper part of the selected study area, is strongly representing the temperate zone, where *Pinus roxburgii* is common which covers all the hillsides at elevation above 2500 ft. However, other common plants are mainly *O. cuspidata* and *A. modesta* (Sher and Hussain, 2009). It was noticed that *A. modesta* was more in pressure of overgrazing and deforestation. Hence, some proposals and suggestions were made for the proper protection and management of ethnobotanical assets, wildlife and ecological prospects for generations to come (Sher et al., 2011).

As regards distribution and botanical characteristics of are concerned, *A. modesta* (Local name: Phulai, Palosa, common name: Hook thorn), is a member of Family Mimosaceae which is widely distributed throughout tropical or subtropical regions of the world. It is a medium sized tree with recurred prickles, leaves having 2 to 3 pairs of Pinnae and leaflets 3 to 5 pairs. Flower in auxiliary spikes. The flowering season is June and August, which are two times in a year. Fruit is Legume or Lomentum; seeds are exalbuminous; pollination is usually 'Entomophily' through the agency of insects (Sushila, 2011).

The literature review in general and the latest market study of medicinal plants of Malakand Division in particular revealed that there are certain species including *A. modesta* which have comparatively high market price and demand locally, nationally and internationally (Sher et al., 2011). Based on such high market value, *A. modesta* was selected for detailed study regarding its relative abundance, population status and

structural information about the knowledge of the local people about the target species, local name, uses, part used, marketing, distribution, availability and abundance were gathered from the local name, inhabitants generally the key information were elderly persons with the age group of about 50 to 70 year. The local people were asked about its abundance, distribution and population size that was judged by comparing with 30 to 40 years old record with current situation (Nasir and Ali, 1971 to 1995; Sher et al., 2011).

The species population size was categorized into absent, rare, very rare, occasional, frequent and dominant by using standard method of Haider et al. (2011) abundance scale. However, personal observation was also made in the field to note any pertinent event which could help gain better understanding of the presence, relative abundance based on the ecological characteristics of the species information and data on various aspects of the use and marketing of the targeted plant such as preparation, processing, traditional uses, marketing and distribution of harvest areas for the market were also gathered from the local experience persons through interview and discussions.

The specific objectives of the study were to: (1) identify the available ecological range, relative abundance and distribution of *A. modesta* in the study area; (2) determine the effect of ecological factors on the population size and structure of the target plant; (3) evaluate the impact of current harvest on the population status of targeted species in the study area; (4) assess the population dynamics in terms of regeneration, growth and phenological behaviors; (5) provide a checklist of plants to policy makers for plants conservation; and (6) assess the factors and reasons for the habitat loss.

As regards the importance and value of honey and honey bee is concerned, it is a popular trend among people to make observations and mark the plants important (Olsen and Larsen, 2003; Ozcan, 2005). In Dargai region, the following plants were found to be interesting for honey-bee: *A. modesta*, *Adhatoda vasica*, *Canabies Sativa*, *Cucurbita Maxima*, *Dicliptera roxburghiana*, *Helianthus annuus*, *Plectrunthus rugosus* and *Zizyphus sativa*, reported 18 fuel wood species from Dabargai hills, Swat (Hussain and Sher, 2005). Later, a list of the ethno-botanical information of 125 species of Dabargai Hills was published (Sher et al., 2004). Those researchers classified the plants as follows: as fodder (76 species), medicinal (19 species), fuel wood (18 species), timber wood (12 species), vegetable (11 species), fruit (13 species), mud supporter (6 species) and fence /hedges (4 species). It is worth mentioning that, Sher and Hussain (2009) discussed 57 plants species under 56 genera of District Buner with their families, local uses and botanical names. However, ethno-botanical information of Malam Jaba area (District Swat) were reported for varied purposes like medicinal importance, food value, tool making, fuel, timber wood, and threshing.

A comprehensive document comprising 300 medicinal plants was prepared by earlier researchers to facilitate the trade of medicinal plants in Pakistan (Rashid et al., 2011). Arshad and Akram (1999) also compiled a review of ethnobotanical literature of Pakistan. More interesting was the work done in the region, which we selected for the present study. A recent report explored traditional and folk use of medicinal plants by tribal communities of Hazar Nao forest, Dargai, Malakand, Pakistan (Murad et al., 2011).

It is interesting to notice that in the neighboring Swat district, 275 medicinal plants were in use (Sher et al., 2011). It was warranted that in Swat and neighboring regions, 87 medicinal plants were threatened plants.

## MATERIALS AND METHODS

A study of the population status of *A. modesta* was conducted during summer 2007 in different ecologically and economically important sites of the study area. Field visits were arranged thrice in a month. The field study was done from April to September 2007. Questionnaires were properly designed and used to collect proper information from each locality. Questionnaires are considered as a scientific procedure, commonly adopted to identify and document the traditional knowledge of local people and their immediate family about the collection, sale and processing of medicinal plants and their uses within the community. Information and data on various aspects of the plants such as traditional uses, collection method, time and marketing of species in the area are gathered from the local experienced persons through interviews and discussion. Data on the market value of the plants was collected from local collectors, shopkeepers (Export promotion Bureau Office, Malakand division). Plans were made for the phyto-sociological attributes (density, frequency and basal area), aspects and elevation of each stand to be recorded.

*A. modesta* was collected on the basis of their utility in the area. Local people including plant collectors and others on age group basis were interviewed for ethno botanical information on the study area. The timings for field worked were selected according to the growth and collection season of the plant. Population size and its distribution, history of settlement, major social groups or classes, productive activities etc. were also explore during the field study.

The data obtained on *A. modesta* were also studied and compared with 30 to 40 years previous record. The parameters included: the present population size and status of the target species. The trees are growing in sub-mountainous tract up to 1200 masl. Production starts after four or five years of age, yielding about 0.06 kg of gum per tree per year. The gum oozes spontaneously from the stem and main branches in October and November and collected by hand. A recent survey in the village of Sherawla (Haripur) found the number of *A. modesta* trees ranged between 2 and 200 per family with average of 69. The quantity of gum obtained from these trees ranges from 1 to 20 kg per household (average 11.2 kg), of which 15% is estimated to be consumed within the household. The major part of the gum is sold in the market with a normal price of about Rs.60 per kg, generating average revenue of Rs.571 per family (Production figures for the entire country are yet not available and need due attention).

At the present time, a number of barriers exist to the sustainable cultivation, gathering and use of *A. modesta* plants. These include lack of clear resource tenure and custodianships, little understanding of sustainable management parameters and knowledge of market requirements. These are coupled with inadequate institutional structures for the management of the dwindling medicinal

plant populations and dearth of techniques, skills and experience to promote their sustainable use. The present study was, therefore, initiated to investigate and describe the existing population structure, status, availability and distribution of selected plants; and to find out the effect of exposure altitude and vegetation on their population set up. Moreover, the impact of current harvest on the population size of the targeted plant is highly informative. Such investigations might lead to find improved strategies for the future management of species.

Uncontrolled exploitation, due to increasing population and its attendance pressure on resources and the new wave of emphasis on natural products is threatening most of the species investigated. In addition to these, the loss of habitats due to pollution and environmental degradation particularly in the study area; Dargai, and the whole Malakand Agency which harbors much of Malakandian's flourishing petroleum business further escalates the threats to these species.

## RESULTS AND DISCUSSION

The study indicated that some of the uses of the species have become unknown to most of the younger generation because the species in the area become scarce. The elders of the investigated area have rich knowledge about the ecology and other ethno-botanical values of *A. modesta*. Interviews and discussion with the local people of the study area provided considerable information on its value as medicine, fodder, fuel wood, timber wood, building materials, grazing land income and source of recreation to the local free of cost.

*A. modesta* is a valuable part of bioresources of the country and has been exploited commercially in tannin and Katha industry for decades. Besides its commercial importance, it is equally significant for the people particularly rural communities living in the vicinity of *A. modesta* forests as it is a subsidiary source of income to them. To a certain extent, these people are dependent on this plant to fulfill their day to day need of fuel, fodder, building material and others. This is the reason that like catechu, kiker gum has also become an integral part of socio-economic and cultural life of the people inhabiting the Malakand Agency.

### Current ethnobotanical values

The result of the present study revealed that *A. modesta* is a multipurpose plant in the investigated area. The popular uses of *A. modesta* are systematically arranged as follows:

a. Medicinal uses: The local people of the area used the extraction of leaves for earache and ear pampers. Similarly, the local people extract oil by heating green stem and branches, and then used this oil as painkiller particularly for the foot muscular pains. The most important product of *Acacia* (*A. modesta*) is the gum, which has much medicinal importance in traditional system of medicine. The powder gum is used as used to treat wounds and most commonly for backache. The

powder gum is cooked with Desi ghee (local made ghee), dates, almonds, coconuts and poppy seeds, which is locally called 'Parwada' eaten mostly by women after delivery. Tribal communities residing closer to the area under present investigation, such as the tribes of Hazar Nao Forest use this plant against skeletal and muscular disorders (Murad et al., 2011). For backache pains, especially facing women, the gum is crushed and mixed with wheat flour. The fried mixture in ghee is given with milk or warm water before breakfast for a month (Rashid et al., 2011).

The study also showed that the gum is used for the improvement of the semen quality, and to heal female uterine wounds. The gum is used as general body tonic and stimulant; ash is used in chew/snuff preparation. The sticks of *A. modesta* are used as tooth-brush called "miswak". It is a recent practice that *A. modesta* extracts are commercially used in the preparation of toothpastes and other products because they are rich of fluorides and calcium (It is officially approved by the Pakistan dental association). The second established use of *A. modesta* is done by the honey bee keepers who make use of it commercially.

b. Fodder: The trees are lopped heavily for their leaves used as fodder particularly for sheep and goats. Monkeys are found in those areas where there is thick growth of *A. modesta* particularly in the Wartair and Qaldara area because they feed on their twigs for food.

c. Timber: Because the wood of *A. modesta* is tough, bitter, and hard, therefore, it is commonly used in the formation of plough and other agricultural tools. It has been noted that the stem of the targeted species were commonly used at in the roof as a beam and in the frame of doors. Similarly, the powdered of *A. modesta* is also used in the formation of hardboard of ply.

d. Fuel-wood: Woody stem of *A. modesta* is tough and hard, therefore, it burns for longer duration of time and used accordingly. It is also misused by bricks formation industries as fuel. Some tobacco company uses it for repining of tobacco leaves, for burning purposes in rooms during winter season. Local folk also use it for cooking purposes in houses and in oven for bread formation.

e. Fencing: Cut branches are extensively used for fencing purpose by the farmers to protect agricultural fields and local grasslands from domestic livestock and wild animals.

f. Animals and animal products: Honey collected from wild bees live is an important source of nutrition and income for the forest dwellers in the country. Between 55 and 65 tones of honey are collected each year in the country from wild bee hives by approximately 15000 persons (Haider et al., 2011). *A. modesta* is one of the popular plants used by honey bee keepers.

g. Current harvest: The results of the current study revealed that the local people collected *A. modesta* by both busy and selective system of harvesting. They collected all younger and mature plants before seed

producing and maturing. The result also showed that the used of the fuel wood and timber wood are the major cause of its lower population existence in the present study area.

h. Building and furniture material: The wood is considered durable and widely used by the inhabitants for house building material as poles and to prepare furniture like bed poles, tables, etc.

i. House hold articles: Wood of *A. modesta* is strong, therefore, people prefer to use it to make various handles of cutters, knives, axe, saw, sickle, hammer, spade and combs.

### Ecological importance

In most parts of the present study area, *A. modesta* is the dominant tree growing in both plain and mountainous areas. The presence of rich ground vegetation beneath the company of the targeted tree during the spring and monsoon, its compatibility with its co-dominant *olea cuspidate* (Khuna) and precursor in succession (*Grewia asitica*) also promote other interaction. Little information and standing biomass establish a resource of fertility in the sandy soil deficient in organic matter and nutrients.

The density of the canopy not only protects the soil from wind erosion but also act as a windbreak. Locally, the shade of their tree is considered as having a cooling effect compared to that of *G. asitica* and *eucalyptus* species. *A. modesta* also provide a model shelter for the domestic animal and wild life (monkeys), in the heat and dust storms of the summer month the result also observed that it provided a habitat for a variety of birds (nesting), rodents (burrows), snakes and lizards (hallow stem) and mammals (thickets). The flower and fruit of the tree is also relished by a variety of insects, birds and rodents. The present study also showed that *A. modesta* is the best honey bee flora in the study area.

### Availability and distribution

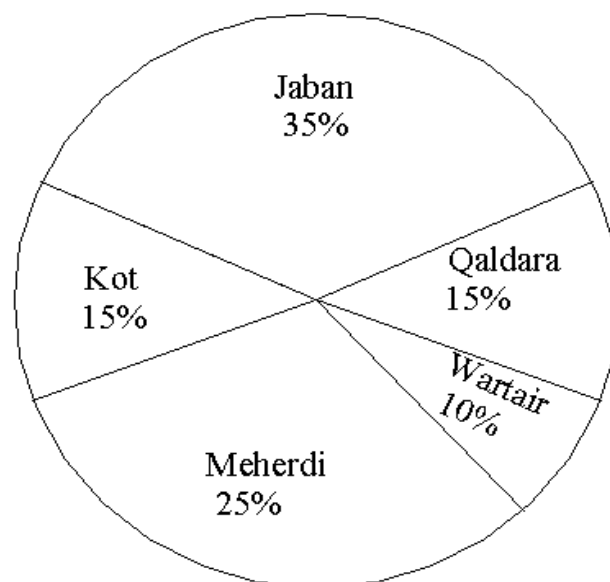
The result revealed that *A. modesta* were found in all the study sites of the investigated area that is, Jaban, Wartair, Qaldara, Meherdai and Kot. It is frequently available in Jaban valley and Meherdai, occasionally available in Qaldara, very rare in Wartair and Kot areas. The availability of *A. modesta* in different sites of the study area is depicted in Figure 2.

### Soil

The result of the present study showed that *A. modesta* grows at places with significant differences in soil characteristics. It occurs on dry, sandy soil, on rich and poor soils, on basic, calcareous and acidic soils.



**Figure 1.** Map of the study area (Tehsil Sam Rani Zai Dargai Distt; Malakand) (Source: Office of the Agriculture Officer at Dargai, Distt; Malakand).



**Figure 2.** Availability of *Acacia modesta* in the different sites of the study area.

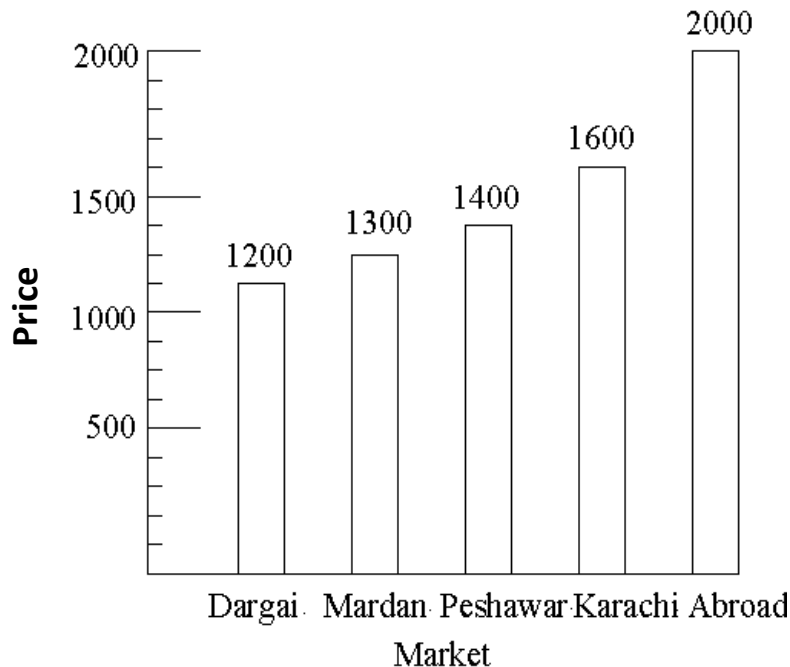


Figure 3. The value of gum in different markets.

Relatively large *A. modesta* sites are presently found in mountainous areas. It is also ground on calcareous soils (pH 6.0 to 6.8), but also on the sand stone and other more or less acidic soil.

#### Association with other plants

The present study of *A. modesta* in the investigated area revealed that *A. modesta* are found in most of the study sites. The data obtained in the areas under current study demonstrated that *A. modesta* was growing in close association with some other plants such as: *A. Arabica*, *O. cuspidate*, *Z. jujuba*, and *Z. nummularia*. However, it is also found in association with *Pinus roxburghii*, *Mallotus philippensis*, *Dalbergia sissoo*, *Zizyphus* and other plant species (Sher et al., 2005).

#### Phenology

The results of our present investigation revealed that rarely old plants of *A. modesta* were found (5 to 10%) in the studied area. The majority plants found were young (60 to 70%), juvenile (20 to 30%).

#### Phytogeography

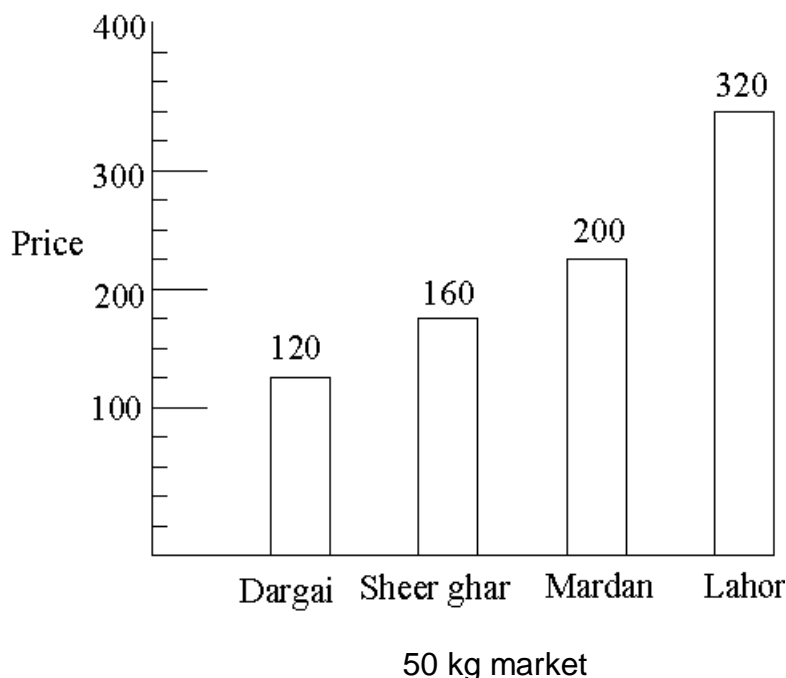
District Malakand consists of two subdivision that is, Dargai and Batkhela. Climatically, Tehsil Batkhela is

humid temperate while Tehsil Daragai is subtropical. The average precipitation is 600 to 800 mm. The area in Batkhela is almost hilly except Thana, Dehri, Alladand, Batkhela up to Totaken. Where major portion of Dargai Tehsil is under cultivation with negligible hilly area.

#### Market channels

The study shows that in Malakand Agency, Dargai is the main trade centre of *A. modesta*. The area supply considerable quantities of acacia gums to various national trading centers of Pakistan including Peshawar, Lahore, Karachi and also abroad. Similarly, the area also supplies its wood into the other parts of the province for the timber and furniture purposes. The values in different markets area are shown in following Figures 3 and 4 and in chart 1 for both gum and wood (Sher et al., 2011).

The present study evaluated that the price of the plants gradually increases from collector to local, national and international markets at each step in the chain (Figure 3). The price was lowest at the collectors level and increasing many fold from collectors to the national markets and abroad. However, while guessing at the increase of the price from the collector level and beyond, it may be kept in mind that considerable weight of the plant material is lost during drying, cleaning, processing, grading, packing etc. at each level when value is added to the material. This weight loss varies from species to species and the modes of processing for sale. One of the reasons for the low price at collector's level was their



**Figure 4.** The value of wood in different markets (Sher et al., 2011).

unawareness of the price of the plants in the trade markets.

### Collectors involved

The information at the local level had shown that in the study area children were the main collectors (50%), followed by women (30%), Afghan refugee men (15%) and local men (5%). It is generally observed that in the surveyed valley, the local agent (middleman) receives handsome returns. The local shopkeepers or other persons acting as agents of the traders of the regional herbal markets are the major buyers from the local collectors. It is also observed that the local wholesalers control prices information to the collectors which has enabled them to maintain high profits.

It has been found that traditional and homeopathic medicines are cheaper and often more accepted by large number of the people (Yazicioghe and Tuzlaci, 1996). In Pakistan, main source of medicinal plants is forest and rangeland. There are 50,000 registered hakims in Pakistan (Rashid et al., 2011; Haider et al., 2011). Malakand Agency has produced several hakims (local healers) famous not only locally but also the people from other parts of the country visit them. Many of them do not charge any thing for their service and treat the people free of cost.

In district Swat, the trade and collection of *A. modesta* are highly uncoordinated and vary from area to area and species to species. For obtaining plants from the study

area, the dealers from national markets send representatives to local dealers in District Malaknd and place their demand. The local dealers pass the message to their agents, that is, the local shopkeepers of the valley. These agents inform small shopkeepers and collectors. The collectors gather the species for the local shopkeepers and agents. The collectors are illiterate and do not negotiate for the price of the plant materials and gather sizeable quantities but do not receive reasonable returns. The dealers of District Malakand get the material from the agents when that is ready. In this way, the medicinal plants pass through three or four hands. Sometimes, daily wages of Rs. 100 to 150 per day given to labourers are employed by the local agents for plant collection but this is not usual.

There is ample evidence that increasing numbers of people across various parts of the world depend on traditional herbal remedies for their health care. The local uses of plants and products in health care are even much higher in particularly those areas with little or no access to modern health services (Sher et al., 2004).

The assessment of the biological values of the *A. modesta* clearly revealed that in the study area where it still survives, its attributes are not only social and economic interest but also of ecological importance. The livelihoods of many people in the study area depending upon on the gathering, processing and sales of *A. modesta*. This agree with the finding of Sher and Hussain (2009), who showed that about 5000 low income families in Malakand Division and Northern areas of Pakistan are involved in the collection and marketing of medicinal

plants including *A. modesta*. The present investigation shows that *A. modesta* which belongs to family *Mimosaceae* are only species found in Pakistan. Most of the local people use the different parts of *Acacia modesta* in traditional system as fodder for goats, roots for tooth bough, extraction of leaves for earache and ear pampers and oil as painkiller.

The gum is used as tonic and stimulant, when it is mixed with flour from poultice which is used to treat with wounds commonly for backache, etc. This shows that *A. modesta* have no single economically and medicinally uses but for multipurpose. People use plants in many ways such as medicinal, timber wood, fuel wood, food, fodder etc. (Joshi, 1982). So there is a great impact of human life on local vegetation as well as local vegetation influence human life (Balck, 1996; FAO, 1995). The people of Malakand area are mostly rural and illiterate. They cut forest and sell it as timber and fuel wood. They also use valuable timber wood for fuel wood requirements. The ever increasing population requires more food and as a result forests were burnt, cleared and replace with cultivations. In Malakand, forests of *A. modesta* Wall. *Aesculus indica* Wall ex.Camb., *Dodonea viscosa* (L.) Jacq., *Juglans regia* L., *Pinus roxburghii* Sergent, *Pinus wallichiana* A.B. Jackson, *Quercus dialatata* Lindley and *Quercus incana* Roxb., have been destroyed at alarming rate.

An awareness program in the area about the importance of indigenous flora, sustainable plants collection and conservation of medicinal plants will yield better results. The local community should be involved in conservation practices. Local staff, local stakeholders and plants collectors should be aware about the conservation of plant resources of the area (Goshi, 1997).

The present study revealed that the pattern and availability and distribution were found to be quite variable according to differences in grazing habitat loss and harvesting intensity. These factors have adversely affect the natural regeneration and have seriously decrease the availability of the species in the study area the population size of *A. modesta* near the residential area or plain area was highly threaten due to rapid destruction of habitat for agricultural purposes and expansion of settlement in the area.

Majority of the people living within and around the study area relies on the plant resources for centuries. Similarly, the unsustainable mode of harvesting and habitat loss has put the conservation status of *A. modesta* at risk in various parts of the Malakand Division. The present study therefore recommended that the conservation steps with the involvement of the local people should be taken to conserve and restore the degraded habitat of *A. modesta*.

The loss of biodiversity of decreases global stability and massive species loss would result in imbalance in ecosystem and lessen human survival. We are earth's

stewards and have a moral responsibility to care for our fellow creature or to put it in religious terms; we have a responsibility to take of the nature and environment around us. Conservation involves dealing with living plants weather growing in the wild or in cultivation and botanical gardens are by definition the institutions with more experience of how to raise plants, germinate their seeds, propagate them and maintain them alive and healthy. However, Ecoregions of Pakistan, Forestry in Pakistan and Wildlife of Pakistan are at initial but well on developing tract.

The results of the current work on *A. modesta*, added support to the future planning and orientation of different authorities to promote the management of different plants essential as fruits, food and feed, medicine, spices, and all blessed wild resources. The role of the local senior citizens with more information, and induction of young workers and learners are essential in the area. Although, it is often claimed that the plant collectors in a region have enough knowledge of their surrounding resources, but it is unfortunately not always true (Sushila et al., 2011). The local inhabitants were usually illiterate having little knowledge about the species and did know the proper time of collection to avoid loss.

### Ecologically operative problems

An ecologically operative problem of the area is severe grazing, browsing and trampling by domesticated livestock. It causes species not to reach its climax stage due to such hindrances. Such stresses are more important than edaphic factors in determining the community composition.

The important findings emerging from these studies as summarized by Sher et al. (2011): Trees in close proximity to agricultural crops depress the yield of the latter, the effects vary depending upon the species of trees and crops and farmers are prepared to plant trees which are fast growing and have a good market value.

Ethnobotanical information on medicinal plants and their uses by indigenous cultures is useful not only in the conservation of traditional cultures and biodiversity, but also for community health care and drug development. This information is utilized as a guide for drugs development under the assumption that a plant which has been used by indigenous people over a long period of time may have an allopathic application (Olsen and Larsen, 2003).

The present study also revealed that with the increase in elevation and remoteness of the area within the study area, of the involvement of children and women in the collection and dependence on medicinal plants increased. This agrees with the studies of Rashid et al. (2011) who reported that women and children usually gather medicinal plants as a part time business, in the northern areas of Pakistan. The present study, therefore, recommended that conservation measure with the



participation of local communities should be taken to conserve and restore the degraded habitat of the targeted plan. The foremost important thing is to increase awareness among the local inhabitants of the District Malakand, that they are the protectors of this vital indigenous plant, which can be exploited for several useful purposes.

At the present time, a number of barriers exist to the sustainable cultivation, gathering and use of *A. modesta*. These include lack of clear resource tenure and custodianships, little understanding of sustainable management parameters and knowledge of market requirements. These are coupled with inadequate institutional structures for the management of the dwindling medicinal plant populations and dearth of techniques, skills and experience to promote their sustainable use. The present study was, therefore, initiated to investigate and describe the existing population structure, status, availability and distribution of selected plants; and to find out the effect of exposure altitude and vegetation on their population set up. Moreover, the impact of current harvest on the population size of targeted plant was also determined. The findings might lead to locate ways and means to identify strategies to improve the management of the *A. modesta* populations of the study area.

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