Pak. J. Bot., Special Issue (S.I. Ali Festschrift) 42: 309-317, 2010.

GEOGRAPHICAL BARRIERS AND THEIR INFLUENCE ON INDIGINOUS KNOWLEDGE OF LOCAL FLORA

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Abstract

Isolation of adjoining human population due to geographical barriers, role of such berries in restriction of access to resources, dependence of such communities on the local flora and their ethnobotanic knowledge operate in a close interaction. The study is based on an interdisciplinary survey performed in two neighboring valleys of Western Himalayas. These valleys are similar in most of the features of terrain, with no passageway except at an altitude of ca. 5500 meters called "Shoontar Pass" with a very rare cross movement by local residents but some nomads with their herds usually cross it in spring and autumn. Although the floristic composition, natural resources and most of the climatic conditions were similar, however, the ethnobotanical data collected from both valleys exhibited manifest variation in traditional knowledge about use of local flora. Some of common plat species associated to the timberline vegetation were reported to possess very different ethnobotanic uses on both sides.

Floristic list is represented by a total of 207 species belonging to 138 genera of 42 Angiospermic families. *Asteraceae* is found to be the largest family having most of the useful plants, represented by 37 species. The second largest family is *Lamiaceae (Labiatae)* consisting about 17 species. The other families are represented by various number of species ranges from 1-16 species, used in various parts of study area. Ethnobotanical studies include 146 species belonging to 102 genera and 35 families.

Introduction

Himalayan tracts in Pakistan are recognized for their mountain grandeur, marvelous beauty, unique biodiversity and wonderful plant resources. The area also represent one of the most difficult terrains on earth, having several remote and unapproachable valleys. These valleys lead to very high mountain passes with infrequent crossing (Shinwari *et al.* 2000). Our study area is situated at the western boundary of Himalayan thrust that attain the highest average altitude within the Himalayas. The isolation of adjacent valleys becomes more recurrent in this region and therefore the human populations are found more frequently segregated. According to different survey reports, around 3000 plant species have been estimated from the Western Himalayan areas, while at least 5% species are reported as medicinal (UNDP/IUCN, 1999; Pei, 1992). Flora of Himalayas is

particularly rich on the southern parts due to the Monsoon rains from the Indian Ocean during summer and the northern parts are relatively dry with fairly low species diversity. The geographical barriers like mountains and rivers, usually reduce migration of both plant and animal species (Hayes, 2004) and so to create isolation in inhabiting human populations as well (Gascon, 2000; Dickore, 1995). Survey was Conducted in Western Himalayas from summer of 2004 to autumn of 2007. The study was aimed to the estimation of overall plant diversity, dependence of local populations on these resources and differences in utilization of indigenous plants. Both the studied valleys/areas are situated adjacent to each other, at the eastern side of one of the highest mountains of Himalayas, Mount Nanga Parbat (8126 meters asl.). The survey was designed to address the area separated by the south eastern ridges of this mountain, which are too high to offer a passageway. Northeastern valleys of this ride of mount Nanga Parbat comprises half of the study area in the form of two part of Astore District in Gilgit-Baltistan, namely Rattu & Guzair (near Sarwah). The Southeastern valleys made remaining half in the form of two villages of Neelum Valley of Muzaffarabad District Azad Jammu & Kashmir (Fig. 2).

Ethnobotany is perhaps most important method to study natural resource and their management by indigenous people. It enables us to work with local people to explore knowledge based on experiences of ages (Martin, 1995). Whilst the native herbs specially medicinal species even today plays an important role in the socioeconomic uplift of the rural areas and various locally produced drugs are still being used as household remedies for various diseases specially in these areas for different ailments (Qureshi and Ghufran, 2005). There is a great deal of traditional knowledge available in Himalayan indigenous people, specially in case of the populations living in small pockets in remote areas and valleys. Northern Areas is an administrative area/Province of Pakistan while the Neelum Valley is the north most part of the District Muzaffarabad, Azad Jammu & Kashmir. Both these areas fall in western Himalayas, the Astore valley is linked to the city of Rawalpindi by Karakorum highway (KKH) that runs along River Indus. While Neelum Valley is linked to the city of Muzaffarabad by a small road along River Neelum while several mule tracts and footpaths are present. Neelum Valley is about 175 km long. It runs parallel to Kaghan Valley of Hazara District. Towards northeast it is linked to Astor (Gilgit Agency) via Shounteast Astore –Astor, pass (Rattu and Astore Gali) situated at an elevation of 16500 feet. Small valleys, steep slopes and small terraces are common (Blatter, 1929). Winter lingers long in alpine zone of Neelum Valley. During winter snowfall ranges from 3-10 meters. Glaciers are common, but they are deteriorating rapidly.

Methodology

Fieldwork was under taken during summer of 2004 to autumn of 2007, while all sites were visited every year at least once. The study sites were visited at the beginning of the flowering season (April-June), during peak of the flowering season (July-August) and finally during fruiting months (September-October).

During fieldwork, along with plant sampling, drying, pressing and Preservation of Voucher specimens the field notes were also prepared. The complete set of the identified species was made to provide the biodiversity of the

local flora. The locals people herbalists and plant collectors were interviewed both formally and informally using open ended questionnaire. Important information concerning common uses, medicinal properties and field characteristics were also recorded. The collected plants were subsequently identified and deposited in the Herbarium, Quaid-i-Azam University (ISL).

Results and Discussion

Our study area includes 2 localities from District Astore and 2 from Neelum Valley District Muzzafarabad. Most of the people depend on agriculture, agro-forestry and mountain resources in both areas while the Neelam valley is relatively rich in biodiversity. Local people of old age informed that many of the barren mountains of Astore were covered with thick forests. Since people remained totally dependent upon these forests for firewood, construction and other utilities thus cutting of the forest has imposed a serious threat on the valuable plant species found in there along with threats of flooding, mudflow and sliding (Khan, 1996). There happens heavy economic losses from flooding and land sliding almost every year one such devastating flooding hit entire area in June-July 2005.

The present investigations reveled a marked difference in use of similar plant in different areas, while the species diversity in two different parts of the study area also seem to effect the relative dependence of people on one or the other group of plants. Based on the floristic assessment of the area for 207 different angiospermic species belonging to 138 genera of 42 families, the family *Asteraceae* seemed to be most dependable family for the natives. Though the indigenous uses vary vastly for the same species in different areas but this family remained the most abundant and important group of plants in the area, as *Asteraceae* (*Compositae)* is the largest family in Kashmir, Ladakh and Northern Areas of Pakistan (Stewart, 1972). Similarly in our study area the family *Asteraceae* is represented by 37 species. The next two families were *Lamiaceae* (*Labiatae*) and *Ranunculaceae* represented by 17 and 16 species respectively. The family *Rosaceae* and *Polygonaceae* are represented by 12 species each while *Papilionaceae* is represented by 10 species. The rest of the families are represented by less than 10 species. All the families were relatively more diverse and represented by more species in Neelum valley of Azad Jammu & Kashmir as compared to the adjoining Astore valley in Northern Areas of Pakistan. In the study area although the species were alike on both sides of the ecological barrier but the dissimilarity in their uses and the difference in species is represented in Table 1. The present investigation not only generate information regarding the floral diversity in the area but also about the availability, usage and importance of the indigenous medicinal, economical valued and wild food/fodder plant species of Western Himalayas. The floristic list showing the distribution of species is represented in Table 1. While Fig. 1 Shows the proportionate use of all economically important species found during the survey. Medicinal plants like *Valeriana jatamansi, Podophyllum hexandrum, Aconitum heterophyllum, Rheum emodi, Viola serpens, Bistorta amplexicaul* and *Picrorhiza kurrooa* are exclusively collected on seasonal basis, from different forests of study area but mostly the collection is more extensive at the Northern half of the study area around Astore valley in Northern Areas of Pakistan while in Kashmir area the collection is relatively un-common largely because of the easy

availability of medicinal species around the human settlements (Bukhari, 1996). The local people in Southern half of the study area do collect the medicinal plants but that is usually for the commercial purpose, and large quantity of the indigenous medicinal plants are exported to the bigger cities of Pakistan and abroad. On the other hand, the most of the collection done in Astore valley area is for the house hold purpose and at the most to be sold in the local market (Gascon, 2000; Hayes, 2004). Generally the Western Himalayan areas have been considered as having a good potential to provide large volumes of medicinal plants of economic importance. The Forest Department of Azad Jammu & Kashmir earned an average revenue of 1.54 million rupees annually from collection and sale of *Saussurea lappa* (synonym: *Saussurea caustus*) and other medicinal plants (Zaidi, 1998). Present investigations may help the documentation of medicinal and other useful plants, used traditionally against some different ailments and every day house hold. This also gives an idea about the difference in use of plants in different areas which may be due to of the following reasons local weather, availability, and accessibility of plants (teraine cordition) and preferences about inherited knowledge and cultural/ritual liking and disliking about different plants species.

Table 1. Species Distribution (presence/absence & useful or not used)

S.#	Name of Species	Family	RG	NR	RP	SA
1.	*Allium carolinianum* DC.	Alliaceae	-	-	+	+
2.	*A. fedtschenkoanum* Regel.		+	+	+	+
3.	*A. miserabile* Wend.		+	-	-	-
4.	*A. victorialis* L.		-	-	-	+
5.	*Angelica glauca* Edgew.	Apiaceae/ Umbelliferae	+	+	-	+
6.	*Bupleurum candolei* Wall. ex DC.		-	+	-	+
7.	*B. longicaule* Wall. ex DC.		+	+	+	+
8.	*Chaerophyllum villosum* Wall. ex DC.		+	-	-	+
9.	*Heracleum candcans* Wall. ex DC.		+	+	-	-
10.	*Pimpinella diversifolia* DC.		+	-	-	-
11.	*Pleurospermum candollei* (DC.) Clarke		+	-	-	+
12.	*Selinum filcifolium* (Edgew.) E. Nasir		+	+	-	+
13.	*Anaphalis contorta* (D. Don) Hook.f.	Asteraceae/ Compositae	+	+	-	+
14.	*Carduus edelbergii* Rech.f.		+	-	-	+
15.	*Centaurea iberica* Trevir ex Spreng.		+	+	-	-
16.	*Chrysanthemum pyrethroides* (Kar. & Kir.) B. Fedtsch.		-	-	-	+
17.	*Cirsium arvense* (L.) Scop.		+	+	+	+
18.	*Conyza Canadensis* (L.) Cronq.		-	+	-	-
19.	*C. japonica* (Thunb.) Lessing		-	-	-	+
20.	*C. stricta* Willd.		+	-	-	-
21.	*Cousinia minuta* Boiss.		+	+	-	-
22.	*Cremanthodium decaisne* Clarke		-	-	-	+
23.	*Crepis flexuosa* (DC.) Benth.		+	+	-	-
24.	*Dubyaea oligocephala* (Sch.-Bip.) Stebbins		-	-	-	+
25.	*Erigeron belloides* Benth. ex Clarke		+	+	+	+
26.	*Gerbera gossypina* (Royle) Beauv.		-	+	-	-
27.	*Iflago spicata* Forssk.		+	+	+	+
28.	*Inula obtusifolia* Kerner		-	+	-	-
29.	*I. royleana* C. B. Clarke		+	+	+	+
30.	*Jurinea ceratocarpa* (Decne.) Benth.		+	-	-	+
31.	*J. himalaica* R. R. Stewart		-	-	-	+

Table.1 (Cont'd).

32.	*Lactuca auriculata* Wall. ex DC.		+	+	-	-
33.	*L. dissecta* D. Don		+	+	-	-
34.	*L. sativa* L.		+	-	-	-
35.	*Launaea nudicaulis* Less.		+	+	+	+
36.	*Leontopodium himalayanum* DC.		-	+	-	-
37.	*Ligularia fischeri* (Ledeb.) Turcz.		+	+	-	-
38.	*Myriactis nepalensis* Less.		+	-	-	-
39.	*Saussurea albescens* (DC.) Sch.-Bip.		+	+	-	-
40.	*S. lappa* (Decne.) Sch.-Bip.		+	+	-	+
41.	*Senecio chrysanthemoides* DC.		+	+	-	-
42.	*S. graciflorus* DC.		+	+	-	-
43.	*S. nudicaulis* Ham. ex D. Don		+	+	-	-
44.	*Serratula pallida* DC.		-	+	+	+
45.	*Solidago virga-aurea* L.		+	-	-	-
46.	*Sonchus arvensis* L.		+	+	-	-
47.	*S. asper* (L.) Hill		+	-	-	-
48.	*Tanacetum dolichophyllum* (Kitam.) Kitam.		-	-	+	+
49.	*Taraxacum leucanthum* (Ledeb.) Ledeb.		+	+	-	+
50.	*Impatiens brachycentra* Kar. & Kir.	Balsaminaceae	-	+	-	+
51.	*I. meeboldii* Hook. f.		-	+	+	+
52.	*I. thomsonii* Hook. f.		+	+	-	-
53.	*Betula utilis* D. Don	Betulaceae	+	+	+	+
54.	*Arnebia benthamii* (Wall. ex G.Don) I. M. Johnston	Boraginaceae	+	+	+	+
55.	*A. euchroma* (Royle ex Benth.) I.M. Johnston		-	-	-	+
56.	*Cynoglossum lanceolatum* Forssk.		+	+	-	+
57.	*Heliotropium strigosum* Willd.		-	-	+	+
58.	*Lindelofia longiflora* (Benth.) Baillon		+	-	-	-
59.	*Onosma hispida* Wall. ex G. Don		-	-	+	+
60.	*Pseudomertensia echioides* (Benth.) Rield.		-	+	+	-
61.	*Arabidopsis himalaica* (Edgew.) Schulz	Brassicaceae	+	+	+	+
62.	*Capsella bursa-pastoris* (L.) Med.		+	+	-	-
63.	*Cardamine impatiens*L.		+	-	-	+
64.	*Chorispora sabulosa* Camb.		+	-	+	+
65.	*Erysimum hieracifolium* L.		-	+	-	-
66.	*Sisymbrium irio* L.		+	+	-	+
67.	*Campanula latifolia* L.	Campanulaceae	+	+	+	+
68.	*Codonopsis clematidea* (Schrenk) C. B. Clarke		+	-	-	+
69.	*C. rotundifolia* Benth.		+	+	-	+
70.	*Cannabis sativa* L.	Cannabinaceae	+	-	-	-
71.	*Cerastium fontanum* Baumg.	Caryophyllaceae	+	+	-	+
72.	*Dianthus barbatus* L.		-	+	-	+
73.	*Lychnis coronaria* (L.) Desr.		-	-	-	-
74.	*L. nutans* Benth.		+	+	-	-
75.	*Minuartia lineata* (C. A. Mey.) Bornm.		-	-	+	+
76.	*Myosoton aquaticum* (L.) Moench		-	+	-	+
77.	*Silene arenosa* C. Koch		-	+	+	+
78.	*S. vulgaris* (Moench) Garcke		+	+	+	+
79.	*Chenopodium album* L.	Chenopodiaceae	+	+	-	-
80.	*C. foliosum* (Moench) Aschers.		+	+	-	-
81.	*Convolvulus arvensis* L.	Convolvulaceae	+	-	-	-
82.	*Rhodiola himalensis (*D. Don) S. H. Fu	Crassulaceae	-	-	-	+
83.	*R. imbricata* Edgew.		-	-	+	+
84.	*Sedum ewersii* Ledeb.		+	+	+	+
85.	*Sempervivella mucronatum* (Edgew.) Berger		-	+	+	+

Table 1. (Cont'd).

86.	*Dipsacus inermis* Wall.	Dipsacaceae	+	-	-	+
87.	*Cassipoe fastigiata* (Wall.) D. Don	Ericaceae	-	-	+	+
88.	*Rhododendron anthopogon* D. Don		+	-	+	+
89.	*Euphorbia wallichii* Hook. f.	Euphorbiaceae	+	-	-	-
90.	*Corydalis diphylla* Wall.	Fumariaceae	-	+	-	-
91.	*C. falconeri* Hook. & Thoms.		-	-	+	+
92.	*C. govaniana* Wall.		-	+	+	+
93.	*Gentiana cachemirica* Decne	Gentianaceae	-	-	-	+
94.	*G. carinata* Griseb.		-	-	-	+
95.	*Swertia alata* (D. Don) C. B. Clarke		-	-	+	+
96.	*S. petiolata* D. Don		+	+	+	+
97.	*Geranium wallichianum* D. Don ex Sweet	Geraniaceae	-	+	-	+
98.	*Iris hookeriana* Foster	Iridaceae	+	+	+	+
99.	*I. kumaonensis* Wall. ex D. Don		-	-	-	-
100.	*Clinopodium umbrosum* (M. Bieb.) C. Koch	Lamiaceae	+	+	-	+
101.	*C. vulgare* L.		-	-	+	+
102.	*Isodon rugosus* (Wall. ex Benth.) Codd.		+	-	-	-
103.	*Lamium album* L.		-	+	+	+
104.	*L. amplexicuale* L.		+	+	-	-
105.	*Leonurus cardiaca* L.		-	-	-	+
106.	*Nepeta govaniana* (Wall. ex Benth.) Benth.		+	-	-	+
107.	*N. hindostana (*Roth) Haines		+	-	-	-
108	*N. laevigata* (D. Don) Hand.-Mazz.		-	-	+	+
109.	*N. podostachys* Benth.		+	-	-	-
110.	*N. satureoides* Boiss.		+	-	-	-
111.	*Origanum vulgare* L.		+	-	-	-
112.	*Phlomis bracteosa* Royle ex Benth.		+	+	+	+
113.	*Prunella vulgaris* L.		-	+	+	+
114.	*Salvia coccinea* Entlinger		+	-	-	-
115.	*S. plebeia* R. Br.		+	-	+	+
116.	*Thymus linearis* Benth.		+	+	+	+
117.	*Fritillaria roylei* Hook.	Liliaceae	+	-	-	+
118.	*Polygonatum verticillatum* (L.) All.		-	+	-	+
119.	*Trillium govanianum* Wall.ex Royle		-	-	+	+
120.	*Epilobium angustifolium*	Onagraceae	+	-	-	-
121.	*E. latifolium* L.		-	-	-	-
122.	*E. laxum* Royle		-	+	+	+
123.	*E. royleanum* Hausskn.		+	-	-	+
124.	*Dactylorrhiza hatagirea* (D. Don) Soo′	Orchidaceae	-	-	-	+
125	*Oxalis corniculata* L.	Oxalidaceae	+	+	-	-
126.	*Meconopsis latifolia* Prain	Papaveraceae	+	+	+	+
127.	*Astragalus amherstianus* Benth.	Papilionaceae	+	+	+	+
128.	*Cicer microphyllum* Benth.		+	-	+	+
129.	*Indigofera heterantha* Wall. ex Brandis		+	-	+	+
130.	*Lathyrus humilis* (Ser.) Fisch. ex Spreng.		-	-	-	+
131.	*Lespedeza juncea* Pers.		+	-	-	-
132.	*Lotus corniculatus* L.		-	-	-	+
133.	*Oxytropis cachemiriana* Camb.		+	+	-	-
134.	*Trifolium pratense* L.		+	+	+	+
135.	*T. repens* L.		-	+	-	-
136.	*Trigonella emodi* Benth.		-	-	+	+
137.	*Parnassia nubicola* Wall. ex Royle	Parnassiaceae	+	-	-	-
138.	*Phytolacca latbenia* (Moq.) Hans Walter	Phytolaccaceae	+	+	+	+
139.	*Plantago lanceolata* L.	Plantaginaceae	+	-	+	+
140.	*Phalaris minor* Retz.	Poaceae	-	-	-	+
141.	*Poa polycolea* Stapf		-	-	+	+
142.	*Podophyllum hexandrum*	Podophyllaceae	+	+	-	-

Table 1. (Cont'd).

143.	*Polemonium coeruleum* L.	Polemoniaceae	-	-	+	+
144.	*Fagopyrum cymosum* (Trevir) Meissn.	Polygonaceae	+	-	-	-
145.	*Oxyria digyna* (L.) Hill.		+	+	+	+
146.	*Bistorta affinis(* D. Don)Green		-	+	+	+
147.	*Aconogonon alpina. (Allioni)Hara*		+	-	+	+
148.	*B. amplexicaulis (*D. Don) Green		+	+	+	+
149.	*P. aviculare* L.		+	+	+	+
150.	*P. paronychioides* C. A. Meyer ex Hohn.		+	-	+	-
151.	Aconogonom*. rumicifolium* Royle ex Babington		+	+	+	+
152.	*P. viviparum* L.		+	+	+	+
153.	*Rheum webbianum* Royle		-	+	-	-
154.	*Rumex chelepensis* Miller		+	+	+	+
155.	*R. patientia* L.		-	-	-	+
156.	*Androsace rotundifolia* Hardew.	Primulaceae	+	+	+	+
157.	*Cortusa brotheri* Pax ex Lipsky		-	-	-	-
158.	*Primula denticulata* Smith		-	-	-	+
159.	*P. dutheiana* Balf. f. & Smith		-	+	-	+
160.	*P. elliptica* Royle		+	-	+	+
161.	*P. inayatii* Duthei		-	-	-	+
162.	*P. obtusifolia* Royle		-	+	-	+
163.	*P. rosea* Royle		+	+	+	+
164.	*Aconitum chasmanthum* Stapf ex Holmes	Ranunculaceae	+	+	+	+
165.	*A. heterophyllum* Wall. ex Royle		+	+	+	+
166.	*A. leave* Royle		-	+	-	+
167.	*Actaea spicata* L.		+	+	+	+
168.	*Anemone obtusifolia* D. Don		+	-	-	-
169.	*A. polyanthes* D. Don		-	-	+	+
170.	*A. tetrasepala* Royle		-	+	-	+
171.	*Aquilegia fragrans* Benth.		+	-	-	+
172.	*A. pubiflora* Wall ex Royle		-	+	+	+
173.	*Caltha plustris* L.		+	+	+	+
174.	*Delphinium pyramidale* Royle		+	-	-	-
175.	*Ranunculus hirtellus* D. Don		-	-	+	+
176.	*R. kohistanensis* R. A. Qureshi & M. N. Chaudhri		+	+	-	-
177.	*R. laetus* Wall. D. Don		+	+	-	+
178.	*Thalictrum minus* L.		-	+	-	+
179.	*Trollius acaulis* Lindl.		+	-	+	+
180.	*Cotoneater microphyllus* Wall. ex Lindl.	Rosaceae	-	+	+	+
181.	*Filipendula vestita* (Wall. ex G. Don) Maxim.		+	-	-	+
182.	*Fragaria nubicola* Lindl. ex Lacaita		+	+	+	+
183.	*Geum urbanum* L.		+	-	-	-
184.	*Potantilla argyrophylla* Wall. ex Lehm.		+	+	+	+
185.	*P. gelida* C. A. Mey.		-	+	-	-
186.	*P. nepalensis* Hook.		+	+	-	-
187.	*Rosa macrophylla* Lindl.		-	-	-	-
188.	*R. webbiana* Wall. ex Royle		+	+	+	+
189.	*Sibaldia cuneata* Kunze		+	-	+	+
190.	*Sorbaria tomentosa* (Lindl.) Rehder		-	-	+	-
191.	*Sorbus cuspidata* (Spach) Hedlund		+	+	-	+
192.	*Galium aparine* L.	Rubiaceae	+	+	-	+
193.	*G. tetraphyllum* Nazim & Ehrend.		-	+	-	-
194.	*Salix denticulata* N. J. Anders.	Salicaceae	-	-	-	-
195.	*Saxifraga brunonis* Wall. ex Seringe	Saxifragaceae	-	+	-	+
196.	*Pedicularis bicornuta* Klotzsch	Scrophulariaceae	+	+	+	+

Table 1. (Cont'd).

197. *P. longiflora* Rudolph		-	+	-	+
198. *P. pectinata* Wall. ex Benth.		+	+	-	-
199. *P. punctata* Decne.		+	+	-	-
200. *P. pyramidata* Royle		-	-	+	+
201. *Verbascum thapsus* L.		+	+	-	-
202. *Veronica mellissifolia* Desf. & Poir.		+	-	-	-
203. *Wulfenia amherstiana* Royle ex Benth.		+	+	-	-
204. *Viola biflora* L.	Violaceae	+	-	+	+
205. *V. canescens* Wall. ex Roxb.		+	+	-	-
206. *V. fedtschenkoana* W. Becker		-	-	+	+
207. *V. odorata* L.		-	+	-	+

Ratie Gali = RG
Noorie Narh = NR
Rattu Pastures = RP
Shounteast Astore = SA
+ represents useful/uses known & - uses unknown

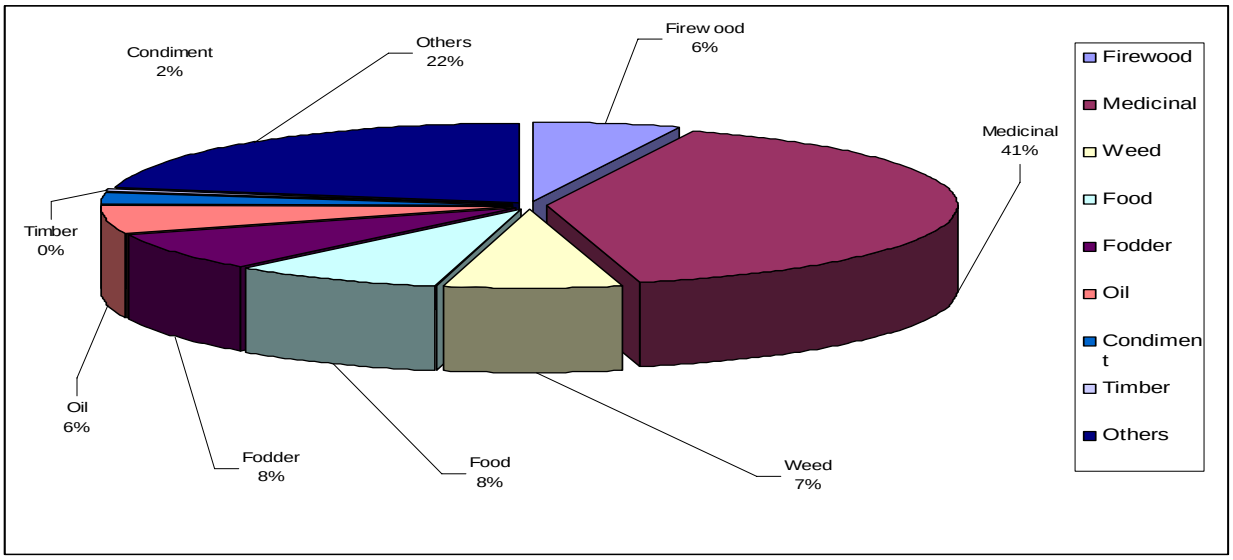

Fig. 1. Pie-Chart about indigenous uses of species which were reported

Total Families	= 35	Firewood	= FW	Oil	= OL
Total Genera	= 102	Medicinal	= MD	Condiments	= CND
Total Species	= 146	Weed	= WD	Timber	= TMB
Food	= FD	Others	= OT	Fodder	= FDR

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