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Quantitative Ethnobotanical Profile of Understory Vegetation in Acacia Modesta (Wall) Forests of Malakand Division, Pakistan

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Abstract: Floristically rich areas on the earth provide socioeconomic, ethnobotanical and ecologically stable ecosystems for the inhabitants of that area. Keeping in view the importance of regional flora, we surveyed the area for ethno-botanically important species during, 2014. Plant specimens were collected, identified and preserved at Herbarium, University of Malakand, Dir (lower), Pakistan, using as references, the collected specimens were interviewed from local people, using semi structured questionnaire. Results indicate that 32 ground species are used for seven ailments by the local people of the study area. Ailments with the highest FIC value (0.99) were Skeletomuscular and respiratory each. High specie fidelity (100%) was found for *Dodonea viscosa* and *Vitex negundo*. Maximum respondents agreed to use, *Dodonea viscosa* and *Vitex negundo* for the treatment of Skeletomuscular and respiratory diseases. Species such as *Vitex negundo*, *Dodonea viscosa*, *Zizypus nummularia* and *Mellotus philpineses* were ranked higher in terms of use. In the study area, some species, like *Vitex negundo*, *Dodonea viscosa*, *Zizypus nummularia* and *Mellotus philpineses*, were harvested regularly without conservation measure, which can be vanished in next few years. Further studies on active compounds of the regional plants are required.

Key words: Ground flora, fidelity, information censes factor, Malakand division, Pakistan

INTRODUCTION

Plants are used since ancient human civilizations for making food items, curing an ailment, forage for cattle, fuel-wood, decoration, construction purposes and collecting various timbered and non-timbered products (Ahmed *et al*., 2006). Total phanerogamous species recorded are 275,000 and different parts of these plants' species are used against various ailments by humans, especially caused by microbes (Prasad *et al*., 2013). Among all these, ethnobotanical uses are the most common, acting as important contribution to human health care (Nair *et al*., 2005; Kufer *et al*., 2005) and affecting economic status of remote distant areas (Barkatullah *et al*., 2009). Ethnobotanical studies are most often used in different regions of the world, due to their significant role in health care improvement (Sardar and Khan, 2009). Like other remote areas of the country, inhabitants of subtropical dry temperate ecosystems in mountainous regions of the Malakand division, ethnobotanical studies are in practice, providing an opportunity in studying local traditional knowledge and resource management (Barkatullah and Ibrar, 2011). Ethnobotanical studies not only document the traditional knowledge of medicinal plants but also help the ecologists, environmentalists, bio-conservationists, pharma-cologists, taxonomists, watersheds, wild life managers and foresters for their efforts in these areas. Malakand division is God gifted by a wealth of medicinal plants and their traditional knowledge. As human population of the study area are poor depending upon agriculture, services and environmental resources, therefore, local vegetation are the active resources for the socioeconomic development of the area and its people. Due to large dependence on local vegetation, these diverse floral ecosystems are facing severe biotic stress. Due to anthropogenic activities, natural disturbance and lack of management, these vegetation are on the threshold of extinction. According to Ibrar *et al.* (2007), a stable forest ecosystem should have a balance between biotic and abiotic components, maintaining genetic diversity of plants and animals with respect to their ecological needs. Present study would provide quantitative ethnobotanical profile, using traditional knowledge and folk uses of ground vegetation in *Acacia modesta* forests of Malakand division, Pakistan.

MATERIALS AND METHODS

Filed methods: A total of 125 respondents were interviewed through semi structured questionnaire, to collect ethnobotanical informations of regional flora, used

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by local inhabitants for curing various ailments, following the method, described by Cotton (1996). Selection criteria of the respondents was as follows: (1) They were living in the area for at leat 10 years and (2) Using regional flora for various ailments. Out of 125, we selected only 85 respondents (65 men and 20 women) on the basis of the information and key knowledge. Selected informants were local inhabitants, aged between 30-70 years. The information collected in local language, was local name of plant, its socioecnomic uses, the part used, disease treated, remedy preperation and dosage employed. Unidentified speies were collected, dried and preserved on standard herbarium sheet (Judd *et al*., 2002) for laboratory identifications. All voucher species were stored in Herbarium, Laboratory of Plant Ecology, University of Malakand, Dir (lower), Pakistan, for future references. Literature cited for unidentfied species was Flora of Pakistan (Nasir and Ali, 1972). Various diseases of human body systems were categorizd into seven groups cured by local inhabitants using local flora.

Data analysis: Information Consensus Factor (ICF) was employed for vegetation of the study area, used by local people. The ICF of a plant community indicates that how many plants are used for curing an ailment within a culture and thus help in plant selection for various pharmacological and phytochemical evaluation (Giday *et al*., 2007). The ICF values lie within 0.00 and 1.00. High ICF value indicates that a large number of plants are used by the majority of people for curing a specific ailment, while low ICF value means that, respondents disagree to cure a disease by this plant (Canales *et al*., 2005). In other words, information consistency of various respondents was calculated as ICF (Trotter and Logan, 1986), using the formula:

$$CF = \frac{Nur - Nt}{Nur - 1} \quad (1)$$

Where:

Nur = Number of responses, by each respondents for curing an ailment, using local plants

Nt = Number of plant species used

Fidelity Level (FL) was used to identify, which plant species are frequently used by majority of respondents in curing a disease. High FL value of a plant species designates popularity of that plant widely used by the people. The FL is used for the quantitative importance of a specie, used for a given purpose by the following formula (Friedman *et al*., 1986):

$$FL = \frac{Np}{N} \times 100 \quad (2)$$

Where:

Np = Number of respondents reported a plant species for a specific ailment

N = Number of respondents reported a plant species for any ailment

High fidelity level for large number of plants indicates their active biological role.

Direct Matrix Ranking (DMR) was used to measure quantitative socioeconomic usage of plant species on the basis of collected information from local people (Martin, 1995). Respondents were asked to give a use value, i.e., (0 = no use, 1 = less use, 3 = good to use, 4 = very good to use and 5 = best for use) to each studied specie. The given use values of each plant were added and ordered. Plants with first orders are commonly used for various domestic purposes than high order ranking.

RESULTS AND DISCUSSION

Reported informants: A total of 85 informants were interviewed through semi-structured questionnaire. Among these, 65 were men and 20 were women. 50% of them were above 60 years. Literacy level revealed that among the respondents, 60% were illetrated, 18% primary, 11% matric, 7% intermediate and 4% nonformally educated. Based on traditional medicinal knowledge, the males were highly informed than females. Among males, farmers (52%) were highly awared of traditional knowledge of medicinal plants followed by labourers (27%). Low traditional knowledge ratio in younger individulas is either lack of intrest or availibilty of modern health systems.

Reported medicinal flora: In the present study, 32 medicinal plants belonging to 21 angiosperm families were reported from dry temperate areas of Malakand division, Pakistan (Table 1). The study area provides a variety of microclimate and habitats, due to which floristically rich zonations are found like in other parts of the country. Due to present studies in hot summer, few species (32) were reported. Majority of the medicinal flora of the study area were occupied by herbs (67%) and shrubs (33%). Excessive use of these life-forms for various ailments indicates their high curing efficiency and easily availability near households and villages. Dominant floral families were *Asteraceae* (6 species) and *Poaceae* (3 species), other families were comprised of one species

Table 1: Reported medicinal flora and their calculated fidelity level for various observed ailments

Voucher No.	Specie code	Specie	System	NP	N	FL value
35861	Dv	*Dodonea viscosa*	Skeletomuscular	85	85	100
35862	Dm	*Daphene mucronata*	Circulatory system	57	67	85
35863	Cp	*Calotropis procera*	Respiratory system	78	82	95
35864	Gr	*Gymnosporia royaliana*	Nervous system	36	59	61
35865	Ol	*Otostegia limbata*	Sense organs	43	61	70
35866	VN	*Vitex negundo*	Digestive system	85	85	100
35867	Ja	*Justicia adhatoda*	Digestive system	68	77	88
35868	Zn	*Zyzipus nummularia*	Digestive system	59	81	73
35869	Mp	*Mellotus philipineses*	Digestive system	32	45	71
35870	No	*Nerium odorum*	Sense organs	41	56	73
35871	Go	*Grewia optivia*	Skeletomuscular	47	61	77
35872	Od	*Opuntia delaini*	Digestive system	56	73	77
35873	Da	*Datura alba*	Nervous system	53	83	64
35874	Av	*Amaranathus varidus*	Digestive system	78	84	93
35875	Aa	*Acyranthus aspera*	Digestive system	36	76	47
35876	Ab	*Ajuga bracteosa*	Circulatory system	82	84	98
35877	Co	*Carthamus occicantha*	Digestive system	62	85	73
35878	Cal	*Chenopodium album*	Digestive system	32	70	46
35879	Cs	*Canabas sativa*	Nervous system	81	85	95
35880	Cj	*Cymbpogon Jawarencosa*	Digestive system	58	71	82
35881	Cae	*Conyza aegyptica*	Digestive system	25	59	42
35882	Cc	*Cenchrus ciliarus*	Digestive system	15	37	41
35883	Eh	*Euphorbia hirta*	Digestive system	29	62	47
35884	Mt	*Malvastrum tricuspidatum*	Urinary system	12	38	32
35885	Pi	*Parthenium integrifolum*	Digestive system	34	56	61
35886	Sa	*Sonchus asper*	Circulatory system	27	59	46
35887	Sn	*Solanum nigrum*	Urinary system	75	85	88
35888	Sx	*Solanum xanthocarpum*	Circulatory system	66	81	81
35889	Sb	*Saccharum bengalenses*	Respiratory system	36	73	49
35890	Tm	*Taget minuta*	Sense organs	18	43	42
35891	Vt	*Verbuscum theopsus*	Respiratory system	55	77	71
35892	Xs	*Xanthum stromarium*	Circulatory system	11	53	21

each. High consumption rate of family *Asteraceae* and *Poaceae* indicate that they have more biologically active compounds in comparision to other families.

Reported disorders: Local communities of the study area use these 32 ethnobotanically important flora for curing various diseases and other domestic purposes. Diseases were grouped on the basis of their incident in different body sytems and thus seven major body system diseases were reported, i.e., skeletomuscular, circulatory, respiratory and nervous and so forth. Local communities use 14 plants for respiratory disorders, blood circulatory system disorders 5 plants and 2 each for respiratory, nervous and sense organs. Information consensus factor was higher (0.99) for skeletomuscular and respiratory systems disorders, while lowest (0.90) for urinary body system (Table 2). High degree of FIC value for a given disorder indicates the presence of these disorders in dry temperate regions of Malakand division, Pakistan, due to poor economy and harsh climatic conditions. High FL value for a particular plant species designates high popularity of that specie and extent of usage homogeneity among respondents. In the present study, fidelity level ranged from 21-100%. Species with the highest FL value includes *Dodonea viscosa* and *Vitex negundo* (Table 1). Nine species (*Dhapeno mucronata, Calotrops procera, Justicia adhatoda, Amaranthus varidus, Ajuga bractosa, Canaba sativa, Cymbpogon jawarencosa, Solanum nigrum* and *Solanum xanthocarpum*) were reported with FL value greater than 80%. These plants with high FL value are rich source of phytochemicals, acting as curing agents for various disorders. These species can be further evaluated for phytochemical screening.

Table 2: Information consensus factor of reported medicinal flora used against various human ailments

System	NUR	NT	FIC value
Skeletomuscular system	167	2	0.99
Circulatory system	196	5	0.98
Respiratory system	145	3	0.99
Nervous system	125	3	0.98
Sense organs	112	3	0.98
Digestive system	670	14	0.98
Urinary system	12	2	0.9

Multipurpose uses: Table 3 represents the DMR score of each species, indicating their multipurpose uses by local people. From the DMR score, it can be found that, which plant faces more stress in the study area. From Table 3, it

Table 3: DMR score of reported flora, based on utilization of the species in the study area

	Agricultural tool	Construction	Fodder	Fuel wood	Medicinal	Rank
Dv	1	3	0	4	4	2
Dm	1	2	0	4	3	4
Cp	0	0	2	3	4	5
Gr	0	0	0	2	3	9
Ol	0	0	0	2	3	9
V.N	3	4	1	4	4	1
Ja	0	0	0	3	3	8
Zn	0	1	4	4	3	2
Mp	2	1	1	4	3	3
No	0	0	0	2	3	9
Go	0	1	3	3	2	5
Od	0	0	1	0	2	11
Da	0	0	0	2	4	8
Av	0	0	3	0	4	7
Aa	0	0	2	1	3	8
Ab	0	0	1	0	4	9
Co	0	0	3	2	4	5
Cal	0	0	1	1	3	9
Cs	0	0	1	1	4	8
Cj	0	0	3	2	3	6
Cae	0	0	1	1	2	10
Cc	0	0	3	2	2	7
Eh	0	0	1	0	2	11
Mt	0	0	1	1	2	10
Pi	0	0	0	2	3	9
Sa	0	0	1	0	3	10
Sn	0	0	2	1	4	7
Sx	0	0	2	1	4	7
Sb	0	2	3	2	2	5
Tm	0	0	1	2	3	8
Vt	0	0	0	2	3	9
Xs	0	0	1	1	2	10
rank	5	4	3	2	1	

is clear that *Vitex negundo, Dodonea viscosa*, *Zizypus nummularia* and *Mellotus philpineses* were ranked higher (Fig. 1). These higher ranked species are basically woody shrubs and harvested for multipurpose by the local inhabitants unwisely. Among these multipurpose uses and threats construction of agricultural tools and homes, fodder for cattle, fuel wood and medicinal uses are common. Harvesting for medicinal purpose and fuel wood were common in late summer, which were to be used in cold winter. Thus proper conservation management is required to control decline of highly utilizing species.

Reported work includes scientific names, famlies, local names, parts used, ethnobotanical uses of wild flora of the dry temperate forests of Malakand division, Pakistan. The reported 32 species, belonging to 20 angiosperm families, were used for various human ailments, based on traditional folk knowledge. Quantitative analysis of semi-structured questionnaire reflects that majority of old-aged people (above 50 years), concerning with farming or labours, were ferquently awared about traditional uses and medicinal appliactions of the local flora. From reported studies, it was analysed that majority of the local flora (44% species) have curing potentail of various ailments of human digestive system, as also stated by Murad *et al.* (2011), followed by blood circulatory system (16% species). The excessive use of local flora for digestive system disorder in study area indicates various hygenic peculiarities. The inhabitants of the study area use a variety of herbs (62%), due to easy accessibility and high efficacy as compared to woody species (Singh *et al*., 2012). These herbacious vegetation are used throughout the world, for ethnobotanical uses (Tabuti *et al.,* 2003; Uniyal *et al.,* 2006). Dominant families were *Asteraceae* and *poaceae*, used in the study area, defining the presence of biologically well active compounds and their efficiency (Gazzaneo *et al*., 2005). In the present study, high Information Consensus Factor (ICF) was used to determine degree of homogenity among loacl inhabitants, while treating a disorder by a plant. The ICF helps in plant species with pharmacologically active compounds (Heinrich *et al*., 1998). High ICF values (0.99) were found for skeletomuscular and respiratory disorders, while lowest for urinary system.

Calculated fidelity level (FL%) indicates the use level and popularity of a plant specie in a culture and tradition. In this study, high (FL%) values were recorded for *Dodonea viscosa*, *Vitex negundo*, *Calotrops procera*,

Fig. 1(a-c): Multipurpose species (*Vitex negundo*, *Dodonea viscosa* and *Mellotus philpineses*) according to DMR score and ranking

Amaranthus varidus and *Canabas sativa*, ranging from 90-100%. High FL value, for the above-mentioned species, indicates their most common uses in the study area. Therfore, we suggest that species with high FL values could be analyzed pharmacologically. Results of the present study indicate that these species can not act as environmental friendly, nontoxic, highly effective, low cost folk medicines for improving healthcare of local people (Ghorbani, 2005; Khafagi and Dewedar, 2000). Further research studies are required in the field of preparation and use of herbal folk medicines.

CONCLUSION

High consumption of dominant families *Asteraceae* (6 species) and *Poaceae* (3 Species) indicate that they have more biologically active compounds, acting as curing agents for various disorders, which can be further evaluated for phytochemical screening. Furthermore, woody species (*Vitex negundo*, *Dodonea viscosa*, *Zizypus nummularia* and *Mellotus philpineses*) are harvested for multipurpose by the local inhabitants. It is concluded that the harvesting for medicinal purpose and fuel wood is common. Species (*Dodonea viscosa*, *Vitex negundo*, *Calotrops procera*, *Amaranthus varidus* and *Canabas sativa*) with high FL values could be analyzed pharmacologically.

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