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Evaluation of Informant Consensus Factor of Medicinal Plants Used in Shamozai Valley SWAT, KPK, Pakistan

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Abstract: *In the current study sixty one (61) plants were documented belonging to thirty eight (38) families used for curing twelve (12) different categories of human related ailments. There was countless agreement among the informers concerning medicinal uses of plants with Informants Consensus Factor (ICF) value ranging from 0.816 to 0.983, with an average value of 0.942. The study revealed that most of the informants agreed with application of Cannabis sativa to cure common pain (ICF 0.983) that showed the highest fidelity level (100%). The result also depicted that Cannabis sativa might be cast off for the improvement of new, cheap, effective, and eco-friendly herbal formulations for healthcare management.*

Keywords: *Evaluation; Medicinal uses; Consensus factor; Shamozai Valley; Swat; Pakistan*

Abbreviations: *ICF= Informants consensus factor, GIT= Gastro intestinal tract diseases and FL= Fidelity Level.*

1. INTRODUCTION

Plant-based remedies enjoy a reputable position today, particularly in the developing countries, where basic health facility is inadequate. Native medications which are more effective, safe and cheap are gaining fame among both rural and urban areas. Information from native traditional medicine or ethnic groups has played a crucial role in the finding of novel products from plants as chemotherapeutic agents [1]. The world health organization (WHO) has highlighted the importance of the traditional indigenous medicines, since a large majority of rural people in the developing countries still rely these medicines as the first protection in health care [2]. Pakistan is rich with a distinctive biodiversity, consisting of nine major ecological zones. Due to its pleasant climate, Pakistan is rich in medicinal floras which are distributed over a large area. Pakistan has about 6,000 species of natural plants of them about 400-600 are considered to be therapeutically important. In Pakistan, medicinal plants are mainly used by hakims. Unfortunately, very little devotion has been given to the ethno botanical feature of plants as hakims are only concerned with the floral and vegetative parts of medicinal plants without any concerned to their botanical characteristics, or distribution in the various ecological territories of Pakistan [3].

Plants have been cast-off since the beginning of human civilization for readymade food, medicines for numerous diseases, fodder/ forage for cattle, burning, flower for celebration, services to earn, honey collection, making agricultural tools, timber for construction and many other useful items [4]. Above 5000 plant species belonging to angiosperms are castoff worldwide for medicinal purposes. Medicinal plant products have been used successfully for various illnesses both externally and internally. Despite the increasing use of synthetic drugs, plants materials have persisted as the "treatment of choice" as they have no or fewer side effects [5]. Modern pharmacopeia still contains at least 25% drugs derived from plants [6] the sub –tropical areas of Pakistan are a diverse habitat for variation plant ,these areas lie in the Hindu Kush and lesser Himalayas [7]. The natural resources of Hindu Kush – Himalayas are deteriorating more rapidly than many other regions around the world.

The study of local uses of plants in Pakistan has been increasing at alarming rate during the last few years and has assisted the collection of an important knowledge. In Khyber Pakhtunkhwa (KP) of Pakistan [8]; [9]; [10]; [11]; [12]; [13]; [14]; [15]; [16]; [17] have compiled medicinal plants from various territories, but to our information no proper ethnobotanical study of medicinal plants used

locally for various ailiment in Shamozai valley, Swat, (KP) of Pakistan has been made. The objective of the current study was to enlist and compile the vast indigenous knowledge.

2. MATERIALS AND METHODS

2.1. Study Area

The current study was carried out in Shamozai valley adjoining border of districts Dir Lower and Swat, Khber Pakhtunkhwa, Northern Pakistan. It lies in Hindu Kush range at 34º 41' 03. 09" N latitude and 72° 07' 35.82" E longitude. It is situated at a distance of 35km away from Chakdara on the main Dir Swat road. The climate is cold in winter and warm in summer. The valley is populated with medicinal plants and the indigenous people mostly used them as a medication for various diseases. This remote area was selected to document the old traditional knowledge because in past there was a lack of medical facilities and mostly the people belongs to a poor families and can,t effort modern medication only Hakims and Pansaries uses different medicinal plants for curing different diseases.

Fig1. *Map of the study area*

2.2. Compilation of Data

The study area was thoroughly visited four times in different seasons of the year 2017. Voucher specimens for each species have been collected and processed using standard herbarium techniques [18]. The specimens were identified consulting different floras, viz: [19]. Voucher specimens were deposited at Herbarium University of Malakand. Ethno medicinal information's have been collected through Participatory Rural Appraisal (PRA), which is based on interaction with indigenous people and direct observation in the field [20]. The information's have been collected through semi-structured interviews with local inhabitants involved in the plants management [18]. A total of 200 residents have been interviewed during the field survey, information on uses of plants to cure different diseases of human being, parts used, have been collected. Based on the information's obtained from the informants and all the reported diseases have been classified into 12 categories.

The level of similarity among information delivered by various informants was calculated by using Informants' Consensus Factor, ICF [21] by using the following formula:

$$ICF = Nur - Nt / (Nur - 1)$$

Where, Nur = number of use reports from informants for a specific plant-use category; NT = number of taxa or species that are used for that plant use category for all informants.

ICF values range between 0 and 1, where '1' indicates the highest level of informant agreement. The fidelity level (FL), the percentage of informants claiming the use of a certain plant species for the same major purpose, was calculated for the most frequently reported diseases or ailments as: FL (%) = (Np / N) × 100 Where, Np = number of informants that claim a use of a plant species to treat a particular disease; N = number of informants that use the plants as a medicine to treat any given disease [18].

3. Results and Discussion

A total 61 plants belonging to 38 families have been listed for curing of 12 categories of ailments. Out of 52 formularies, 45 were of oral application and 7 of external applications. Among the noted taxa, herbs were characterized by (34) species followed by trees (19) and shrub (8) species. For each species botanical name, family, local name, ailments to be treated, and part(s) used were recorded (Table1). Use of plant parts as medicine among the informants demonstrates variations. Leaves were most commonly used part, followed by fruits, stem, whole plant, seed, bulb, bark, root, spike, latex, resin and gums (Table 1). Similar trend of harvesting leaves for medicinal use has also been reported from Lawachara National Park (Uddin et al., 2012). In the study area hazard to the species was marginal as leaves were the leading plant part used for medicinal purposes. It was detected that the collection of part of plant as medicinal part from the wild were not supportable. According to residents, this type of activity is done by the collectors related to illegal trade of medicinal plants. *Cannabis sativa* L is susceptible to this type of activity in the area.

ICF values were calculated to know the agreement among the informants for consumption of plants to treat certain disorder categories. The ICF values were presented in (Table 2). It was found that the ICF values vary from 0.816 to 0.983 with an average value of 0.942. Common cold & fever has the highest ICF value 0.983 with 188 use-reports for (4) species. The species accountable for high consensus was *Cannabis sativa* with 188 of 200 described events, linked by ineffectiveness cardiovascular diseases (ICF = 0.969; 100 use-reports, 3 species), hepatitis (ICF = 0.974; 40 use-reports, 2 species) and anti-helminthic (ICF= 0.974, 120 use reports, 4 species). Medicinal plants thought to be effective in treating specific disorder having high ICF values. The high ICF value for common cold & fever clearly indicated that this ailment is common in the area. High ICF values also showed that the species conventionally used to treat these ailments were worth searched for bioactive compounds. The least agreement (ICF=0.875 and ICF= 0.816) between the informants was observed for plants used to cure eye, ear, nose, mouth diseases and GIT diseases respectively. The low ICF value recorded in the area would be due to a lack of communication among people in different areas (Table 2).

Table1. *Documentation of medicinal plants with scientific name, local name, parts used, and ailments*

S.No	Botanical Name	Family	Local Name	Habit	Part Used	Ethnobotanical Uses
1	*Acacia nilotica* Lam.	Mimosaceae	Kikar	Tree	Bark	Anti-helminthic, for toothache, cough and cold.
2	*Ajuga bracteosa* Wall. Ex Benth.	Lamiaceae	Boteee	Herb	Leaves	Antidiabetic, for healing of external wounds and sore throat.
3	*Allium cepa* L.	Liliaceae	Piyaz	Herb	Leaves and bulb	For fever.
4	*Allium sativum* L.	Liliaceae	Oga	Herb	Bulb	Used for high blood pressure.
5	*Aloe vera* Auct. Non Mill.	Liliaceae	Kamal Panhra	Herb	Leaves	Abdominal pain, external wound healing.
6	*Artemisia scoparia* (Waldst.) et Kit.	Asteraceae	Jawkay	Herb	Stem	Stomachache, antihelmenthic, and also used for healing of wounds.
7	*Berberis lyceum* Royle.	Berberidaceae	Toor kwaray	Shrub	Root,fruit	Root used for internal wounds,antihepatitis, and mouth ulcers.
8	*Avena sativa* L.	Poaceae	Jamdarai	Herb	Spikes,stem	Used for gastro problems.
9	*Cannabis sativa* L.	Cannabinaceae	Bhang	Herb	Leaves	Used for colic pain and fever.
10	*Capsicum annum* L.	Solonaceae	Marchakai	Herb	Fruit	Digestion, used as an apetite causing agent. Used in heart attack. Aphrodisiac.
11	*Cedrus deodar* Roxb.	Pinaceae	Ranzra	Tree	Stem,bark,	Resin is used for skin infection.
12	*Chenopodium murale* L.	Chenopodiaceae	Kharawa	Herb	Whole plant	Whole plant is used for colic pain, for treatment of cough.
13	*Chenopodium ambrosioides* L.	Chenopodiaceae	Skha botay	Herb	Leaves	Used for piles. Antihelmentic.
14	*Chichorium intybus* L.	Asteracae	Han	Herb	Leaves	Leaves are used for renal disorders and also used for cleaning blood.
15	*Citrus aurentium* L.	Rutaceae	Naranj	Tree	Fruit,leaves	Leaves antidiabetic.

16	*Citrus medica* L.	Rutaceae	Nembu	Shrub	Fruit,leaves	Fruit is used in dry cough mixed with green tea also used for fever, help in digestion. fruit is used for culculi.
17	*Cucurbita maxima* L.	Cucurbitaceae	khog kado	Herb	Fruit,leaves	Fruit is edible,leaves are used as antihepatitis.
18	*Foeniculum vulgare* Mill.	Lamiaceae	Kagay velaney	Herb	seeds,leaves	Seed is used is a flavouring agent,Used for digestive disorders, prevent vomiting
19	*Equisitum arvense* L.	Equisitaceae	Bandakay	Herb	Leaves	Used is a source of vegetable (saag),used for gastric acidity.
20	*Diospyrus lotus* L.	Ebenaceae	Tor amlook	Tree	Fruit,stem,leaves	fruit is used for sore throat,wood is used as a fuel.
21	*Dodonea viscosa* (L.) Jacq.	Sapindaceae	Ghwaraskay	Shrub	Leaves, srem	Leaves used for healing of external burnt wounds.
22	*Eucalyptus lanceolata*	Myrtaceae	Lachi	Tree	Leaves ,stem	Boiled leaves extract is used for control of blood pressure
23	*Juglan regia* L.	Juglandaceae	Ghuz	Tree	Fruit, bark ,stem	bark is used for cleansing of teeth.bark extract is also used as antihelmentic. wood is used for furniture and timbers.
24	*Luffa actangula* (Roxb.) L.	Cucurbitaceae	Toray	Shrub	Fruit	antidiabetic
25	*Malva neglecta* Wallr.	Malvacae	Panerak	Herb	Leaves, ,root	root extract is used for kidney stones.
26	*Mentha longifolia* (L.) Huds.	Lamiaceae	Velanai	Herb	Leaves ,stem	Leaves used for colic pain, also used for digestive disorders, Antispasmodic, gunghre for digestion.dried leaves mixed with salt used for the relief of diarrhoea.
27	*Mentha arvensis* L.	Lamiaceae	Podina	Herb	Leaves	give relief in gastric disorders,also used in colic pain.
28	*Melia azedarach* L.	Meliaceae	Tora Bekanrha,(shanday)	Tree	Seeds,stem ,leaves	Antihelmentic,seed is used for infertility in sterile women
29	*Micromeria biflora* Benth.	Lamiaceae	shamakay	Herb	Leaves	used for cough and fever for children
30	*Narcissus tazetta* L.	Amaryllidaceae	Gul nargis	Herb	Whole plant	Healing of external wounds
31	*Nerium oleander* L.	Apocynaceae	Gandheray	Shrub	Whole plant	Ornamental,water extact is used for eye infections.
32	*Ocimum basilcum* L.	Lamiaceae	Kashmaly	Herb	Seed,leaves	Leaves extract used for ear pain,seed is used for stomach ache,ear ache and digestive disorders.
33	*Olea ferruginea* Royle.	Oleaceae	Khona	Tree	Fruit,leaves,stem	Leaves used for sore throat,mouth ulcers and sore.fruit is edible
34	*Oxalis corniculata* L.	Oxalidaceae	Manzakay tarookay	Herb	Leaves	Leaves used against ringworm
35	*Papaver somniferum* L.	Papaveraceae	Qash Qash	Herb	Seed,latex,	Used for the relief of diarrhoea,sedative ,analgesic,used for relief of cough and flu.latex is used for making opium.
36	*Pinus roxburghii* Sargent.	Pinaceae	Nakhtar	Tree	Seed,,resin, gums,stem	Resin is used antidiabetic,Seed is used as aphrodisiac, gum is used for back ache
37	*Pronus armeniaca* L.	Rosaceae	Khobany	Tree	Fruit,stem,leaves	Fruit is used for constipation
38	*Punica granatum* L.	Punicaceae	ananghoray	Tree	Fruit,stem	fruit is used in cough.wood is used as fuel. fruit is also used for inflammation of urine.
39	*Raphanus sativus* L.	Cruciferae	Molai	Herb	Whole plant	Stem is edible and used for hepatitis.leaves used as vegetable also used as fodder for cattles.
40	*Rubus fruticosus* Agg.	Rosaceae	Karwara	Shrub	Fruit,leaves	Fruit is edible.wood is used for fuel purpose.its branches used as thatching material in roofs.
41	*Salix babylonica* L.	Salicaceae	Walla	Tree	Leaves,bark	Leaves extracts are used for obesity.also used for blood pressure.wood is used for fuel purpose.also used as thatching material.
42	*Salvia moorcroftiana* Wall.	Rutaceae	Khardag	Tree	Leaves	Leaves are used for fracture pain.

43	*Solanum nigrum* Auct.	Solonaceae	Kachmacho	Herb	Leaves,fruit	Fruit is edible .fruit is also used as tumefacin.leaves are used as a source of vegetable.
44	Silybum marianum (L.) Gaertn.	Asteraceae	Wrejakay	Herb	Fruit	Fruit is edible.leaves used for hepatitis.
45	*Sonchus oleraceus* L.	Asteraceae	Showdapai	Herb	Whole pant	Plant is used as a fodder.also used for increasing milk production in cattles.
46	*Spinaceae oleraceae* L.	Brassicaceae	Palak	Herb	Whole plant	Leaves used as vegetable. Used for increasing blood.
47	*Tribulus terrestris* L.	Zygophyllaceae	Markondai	Herb	Seeds,	Seeds is used in hemorrhoids.
48	*Thuja orientalis* L.	Cupressaceae	Sarwa	Tree	fruit,seeds	Seed used for toothache
49	*Verbascum thapsus* L.	Scrophulariaceae	Khwarghwag	Herb	Leaves	Pain
50	*Vitix negundo* L.	Lamiaceae	Marvandai	Shrub	Leaves,stem	Stem used for gums dieases ,bad smell of mouth
51	*Teucrium stocksianum* Boiss	Lamiaceae	Spera botay	Herb	Leaves	Leaves used for mouth ulcer and,sore throat.
52	*Cotoneaster nummularia* Fischer & C. A. Meyer	Rosaceae	Mamanray	Shrub	Fruit, stem,	Fruit is edible and,stem is used for fuel purposes. Bulbs used in powdered form for infertility in women.
53	*Desmostachya bipinnata* (L.) Stapf		Dela	Herb		leaves used as fodder for cattles
54	*Plantago lanceolata* L.	Oleaceae	Ghwai jabai	Herb	Whole plant	Used in saag and also applied on external wounds.
55	*Tamarix aphyla* (L.) Karst.	Brassicaceae	Ghaz	Tree	Whole plant	Leaves used for infertility in women.
56	*Musa sapientum* L.	Asparagaceae	Keela	Tree	Leaves	Fruit is edible, flower in powder form mixed with honey used for asthma.
57	*Trifolium repens* L.	Musaceae	Shaftal	Herb	Whole plant	Used as fodder and vegetable.
58	*Tagetes minuta* L.	Papilionaceae	Hamesha	Shrub	Flower, fruit	Used for ornamental purpose.
59	*Cedrela serrata* Royle .	Asteraceae		Tree	Whole plant	Used for hemorrhoids and fever
60	*Zanthoxylum armatum* Dc.	Rutaceae	Dambara	Tree	Fruit, leaves	Fruit used for stomach disorders.and also used in chatni for taste.
61	*Zizyphus sativa* Gaertn.	Rhamnaceae	Markhanai	Tree	Fruit,leaves,stem	Leaves are used as antidiabetic

To find traditionally significant medicinal species in the society, Fidelity Level (FL) of plants has been predicted based on use reports which have been cited by 50 or more informants being used for a given illness. The FL values are shown in (Table 3). The investigation showed that the highest FL value was recorded for *Cannabis sativa* followed by *Aloe vera*, *Ajuga bracteosa*, *Artemisia scoparia*, *Capsicum annum* and *Narcissus tazetta*. The least FL values were found for *Chichorium intybus* and *Foeniculum vulgare*. FIC and FL result revealed that most commonly used species in the area is *Cannabis sativa* (ICF = 0.983) with 188 use-reports and FL value (94%). When choosing the most ideal species for each ailment category, we took the high Fidelity Level (%) in each category of ailment.

Table2. *Categories of disorders and informant consensus factor (ICF) for each grouping*

Diseases Category	Use report (Nur)	Taxa (Nt)	*ICF
Common cold & fever	188	4	0.983
Cardiovascular diseases	100	3	0.979
Hepatitis	40	2	0.974
Anti- helminthic	120	4	0.974
Common Pain	166	6	0.969
Renal+ Urinary disorder	60	3	0.966
Diabetics	150	7	0.959
Wound	90	6	0.943
Sexual diseases	35	3	0.941
Respiratory Diseases	25	3	0.916
Eye, Ear, Nose, Mouth diseases	25	4	0.875
GIT diseases	50	10	0.816

**ICF= Informants consensus factor, GIT= Gastro intestinal tract diseases*

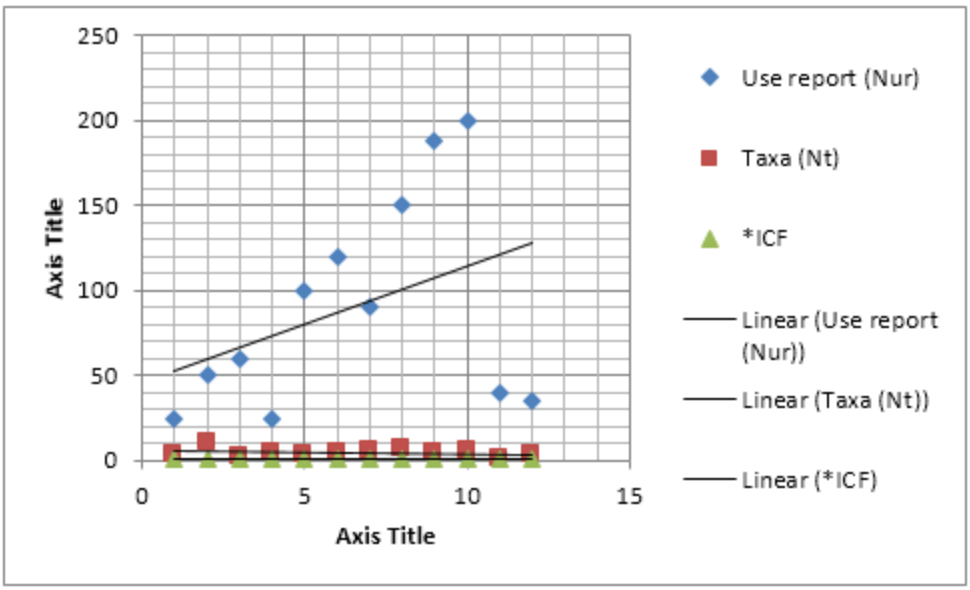

Fig2. *Categories of disorders and informant consensus factor (ICF) for each grouping*

Table3. *Utmost frequently used plants for various illness groups based on highest FL (%) in each disease category (Total informants = 200).*

Scientific Name	Disease Category	Use Report	Fidelity Level (%
Cannabis sativa L.	Common cold & fever	188	94
Aloe vera Auct. Non Mill.	Common Pain	166	83
Ajuga bracteosa Wall. Ex Benth.	Diabetics	150	75
Artemisia scoparia	Anti- helminthic	120	60
Capsicum annum L.	Cardiovascular diseases	100	50
Narcissus tazetta L.	Wound	90	45
Chichorium intybus L.	Renal+ Urinary disorder	60	30
Foeniculum vulgare Mill.	GIT diseases	50	25

4. Conclusion

The present work is the first attempt to document the ethno medicinal information on plants in the valley which offer better choice for the selection of broadly used medicinal plants looking for bioactive compounds to cure illnesses.

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