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Ethno botanical studies of Tatta Pani Valley, Kotli, Azad Jammu and Kashmir (AJK) Pakistan

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Abstract
A comprehensive ethno botanical survey was conducted in valley Tatta Pani, Kotli Azad Jammu and Kashmir, during 2015-2016. The area is floristically very rich with dense vegetation cover. Semi-structured interviews and questionnaires were used to ethno botanical data from local inhabitants of Tatta Pani. A total number of 70 species belonging to 33 families were recorded. Of these 70 species 50 (71.42%) are medicinally important, followed by feed 25 (35.71%), fuel 17 (24.28%), marketing 15 (21.42%), timber wood 7 (10%), fencing/hedge 6 (8.57) and ornamental 5 (7.1%). The most frequently used plant part was leaf 48 (70%) followed by stem 39 (67.1%), fruit 23 (32.85%), seeds 17 (24.28%) and flower 7 (7.1%). Habit wise classification of the plant species of the study area revealed 27 (38.57%) trees followed by 26 (37.14%) herbaceous, 12 (17.14%) shrubs and 8 (11.42%) climbers. The community of the area depends on natural resources for firewood, feed, housing, timber and medicine due to lack of basic facilities. This is the first-ever exploration of the study area which will assist new researcher in future especially in the field of ecology and ethno botany.

Keywords: Ethno botanical uses, taxonomic databases, conservation status tatta pani, azad kashmir

1. Introduction
Ethnobotany is the study of the dynamic association among environment, humans and plants. In broad terms, ethnobotany is how people give names, recognize plants, use and organize traditional knowledge about plants [1]. People living near vegetation depend on them or their products to meet their needs, such as food, livestock, housing, wood, fuel, household appliances, farm tools, furniture, protecting fields from erosion, medicines, ornamental, fences, and religious uses [2]. Ethnobotany plays an important role in understanding the dynamic relationships between biological diversity and social and cultural systems [3]. Unfortunately, very little attention has been paid to the ethnobotanical aspects of plants as only hakims are associated with medicinal plants [4]. The country has about 6,000 species of wild plants of which about 400 to 600 are considered to be medicinally important. Ethnobotanists aims to document, describe and clarify complex relationships between cultures and plants. Ethnobotanical studies investigate the structural relationships between society and environment, using socio-anthropological methods and hence can be used as a useful tool to quantify ecosystem services [5]. Azad Kashmir in Pakistan is considered a biodiversity hotspot because of the diverse habitats of springs, streams, rivers, lakes, grasslands, roads and steep slopes, arable land, and wasteland. Especially in hilly areas like Kotli, a very high variety of economically important plants are found [6]. The area of Tatta Pani is less studied, and the current study was carried out to explore the indigenous knowledge of local vegetation, to create awareness among native people for sustainable usage of economically significant flora, and collect information about relationships between people and plants in the area.

2. Materials and methods
2.1 Study area
Tatta Pani is a valley of tehsil & District Kotli located 25km north of the city Kotli. Tatta Pani is a mountainous area that gradually climbs to the high mountainous area of Pooch, is very near to the Line of control (LOC) between AJK and Indian- occupied Kashmir. Its average elevation is 682-730 meters above sea level. It is located between the longitudes 33°50'06.51" to 33°61'412.6N° and between the latitudes 73°56'47.82" to 73°89'043.0°E. The average yearly precipitation is 1146.08 mm. July and August receive extreme rainfall (236.38 and 218.82mm respectively).

Higher moisture was found in January, August and December, while the minimum was noted in May, June & July (Figure1).

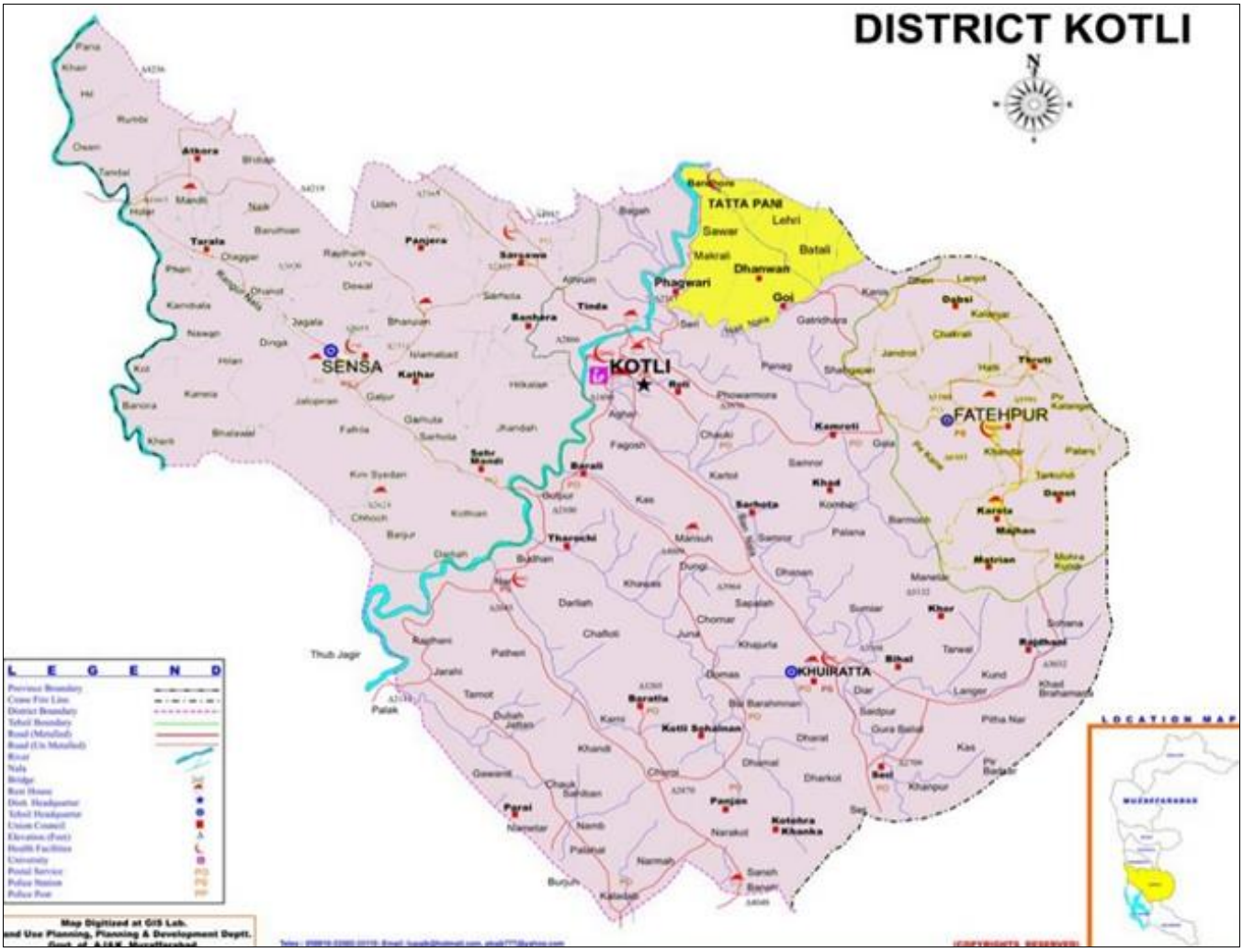

Fig 1: Map of the study area

2.2 Vegetation survey

Ethno botanical information was collected from local residents through semi-structured interviews and questionnaires including Local name, the part used, local uses, occurrence and marketing. About 100 people have been interviewed by different age groups. Plants are classified into various ethno botany classes FO: fodder species; ME: medicinal plants; O: ornamental plants; TW: timber wood production plants; H: hedge/fence plants; FU: fuel wood M: market value plants.

2.3 Plant collection and identification

Frequent field visit were carried out during 2015 and 2016 for the collection of plants specimen of study area. Plant species were collected, dry, poisoned, mounted on herbarium sheets and identified plant species with online databases followed by [7].

3. Results and discussion

Overall 70 plant species belonging to 33 families used for multipurpose by local peoples of the study area are documented. The detail list of collected plants species with their scientific name local name, part used, habit and ethnobotanical uses were listed below in Table 1. Most often used plant part are leaves 49 (70%) followed by stem 39 (67.1%), fruit 23 (32.85%), seed 17 (24.28%) and flower 7 (7.1%) (Figure 2 & 3). In the 33 families, Poaceae was the leading family with ten species which are widely used for cattle livestock, medicinal and human fodder. The other important families of the area were Moraceae with five species Myrtaceae, Mimosaceae, Amaranthaceae having three species each. Apiaceae Apocynaceae, Meliaceae, Alliaceae having two species each while the remaining families were represented by one species each (Table 2) of these 70 species 51 (71.42%) are used as a medicinal plants followed by fodder 25 (35.71%), fuel 17 (24.28%), market valued plants 15 (21.42%) timber wood 7(10%), fencing/hedge 6 (10%), and ornamental 5 (7.1%) were documented (Figure 2). The area of Tatta Pani is very rich and fertile with vegetation. A large number of people of the study area depend on natural plants for medicines, fruits, vegetables, fuel, furniture, fodder, roof thatching etc. The most dominant plants form in the study area contains 27(38.57%) tree followed by herbaceous 26 (37.14%) shrubs 12 (17.14%) and climbers 8 (11.42%) (Figure 3). A related pattern of vegetation form was reported by Ayyanar and Ignacimuthu they reported 54 ethno medicinally important plant species belonging to 26 families [8]. The most commonly used medicinal species in the study area include *Acacia modesta, Achyranthus aspera, Calotropis procera, Dalbergia sisso, Justicia adhatoda, Ipomoea carnea, Morus alba, Morus nigra, Ricinus communis, Taraxacum officinale, Ficus carica, Dodonaea viscosa, Melia azedarach, Cissus Carnosa, Eucalyptus citriodora* and *Eriobotrya japonica* to meet nearly every need of their lives (Table 4).Similar finding were reported by [9] they reported 74 plants from Sarban hills Abbottabad used against 56 various

diseases. Other important economics uses of study area is fodder, for this purpose 25 (35.71%) plants species were used,followed by fuel 17 (24.28%), this might be due to the reason that the main source of income of the local inhabitants is livestock rearing. Species used as fuel wood shows the weather of the area as well as flora which is of shrubby type, and at homes shrubs are mostly used for fire. Firewood is the prime reasons of forest damage of the flora of research area as here is no facility of natural gas so community of the study area depends on the plants for fuel purpose because people need fuel for cooking and heating. Our results are in agreement with the [10, 11] they described 76 medicinally important species of tehsil Shahkargar district Norawal used by local inhabitants.

The utilization of medicinal plants by residents, collectors and herbal drug suppliers was increasing with increasing demand of medical industry. This caused extreme decrease in the existence and products of medicinal plants. Browsing, soil erosion and deforestation were mostly responsible for reduction in the medicinal plant species. Hence it is vital to have conservation strategies for these medicinal plants [10]. The fuel shortage is the main threat to the flora of the area, during harsh and lengthy winter season large amount of wood is used as firewood. Maximum twenty one reported species are used as fuel forests, e.g. *Dalbergia sissoo, Pinus roxburghii, Dodonaea viscosa,* and, *Punica granatum* etc. Similar finding was reported from Margalla Hills National Park by [10, 11].

The current study of ethno botanical record reveals that the study area is under great biotic stress of overgrazing and deforestation. Woodland plants have been damaged due to poor management. Here is a dire need to save the resources of the area for sustainable use by the inhabitants. Conservation status *viz*., endangered critically endangered, vulnerable, least common were documented according to IUCN red list category. *Mallottus philippensis, Ajuga integrifoliaintegri folia, Ricinus commmunis* and *Zanthoxylum armatum* are critically endangered in whole district kotli ajk. Among these endangered species *Juglans regia*, *Olea ferruginae*, *Phyllanthus emblica* L are at high risk of being endangere [12] (Table 2). The existing research work of ethnobotanical plants empowers to draw assumptions about the impacts of their uses, near upcoming needs and preparation that must be completed for development and conservation. Peoples of the study area are illiterate don't know the worth of the medicinal plants therefore they are using these plants ruthlessly. Most people living in far flung areas depend on native vegetation.

Table 1: Lists of ethno botanically useful plants species of Tatta Pani Valley Azad. Kashmir

Botanical Name	Local name	Family	Ethnobotanical uses
Justica adhatoda L.	Bakhar	Acanthaceae	Me
Adiantum venustum D.Don.	Fern	Adiantaceae	Me
Aloe vera L.	Kanwar gandal	Agavaceae	Me
Achyranthus aspera L.	Poothakand	Amaranthaceae	Me
Amaranthus spinosa L.	Ganhaar	Amaranthaceae	Me, Fo, M
Amaranthus viridis L.	Ganhaari	Amaranthaceae	Me, Fo, M
Anethum graveolens L.	Soya	Apiaceae	Me, Fo, M
Coriandrum sativum L.	Dhanya	Apiaceae	Me, M
Magnifera indica L.	Aam	Anacardiaceae	Me
Carissa spinarum L	Granda	Apocynaceae	M
Nerium oleander L.	Gandeera		Me, M, Fu
Calotropis procera (Willd.)	Aak	Asclipiadaceae	Me, O, M
Taraxacum officinale Weber	Hand	Asteraceae	Me
Bombax ceiba L.	Sinmbal	Bombacaceae	M, Tw
Brassica compestris L.	Sarson	Brassicaceae	M, O
Lepidium pinnatifidum Laden.	Halian		M,Me
Raphanus sativus L.	Mooli		M, Fo
Opuntia dillenii Haw.	Thor	Cactaceae	Me, M
Bauhinia variegate L.	Kalyar	Caesalpinaceae	Me
Cassia fistula L.	Amaltas		Me, Fo, M
Luffa cylindrical L.	Kali toori	Cucurbitaceae	Me
Momordica balsamina L.	Jangali Karela	Cucurbitaceae	Me
Diplocyclos palmatus	Jangli kheera	Cucurbitaceae	Me
Cucurbita maxima	Kandola	Cucurbitaceae	Me, Fo
Euphorbia helioscopa L.	Doodal	Euphorbiaceae	Me, Fo
Phyllanthus emblica L.	Amla	Euphorbiaceae	Fu, Me
Ricinus communis L.	Hrnoli	Euphorbiaceae	Me
Dalbergia sisso	Tali	Fabaceae	Fu
Juglans regia L.	Akhrot	Juglandaceae	Me, Fo, Fu, O, M
Mentha longifolia L.	Chittapudina	Lamiaceae	Me, Fo, M
Allium cepa L.	Piyaz	Alliaceae	Me
Allium sativum L.	Thoom	Alliaceae	Me
Melia azzadirachta L.	Dreek	Meliaceae	Me, Fo, O
Cedrela toona Roxb.	Toon	Meliaceae	Tw
Acacia modesta Wall.	Pulai	Mimosaceae	Me, Fo, O, Tw, H
Acacia nilotica (L.) Willd.ex Del	Kikar	Mimosaceae	Me, Fu, H
Albizia labbek (L.) Benth.	Seree	Mimosaceae	Me, Fu, M
Brossonetia papyrifera Vent.	Jangali toot	Moraceae	Fu, Tw, Me
Ficus carica L.	Tosa	Moraceae	Me, Fu
Ficus palmate Forssk.	Phagwari	Moraceae	Me, Fu

Ficus religiosa L.	Pipal	Moraceae	Me, Fu
Morus nigra L.	Kala toot	Moraceae	Me, Fo, Fu
Morus alba L.	Safid toot	Moraceae	Me, Fo, Fu
Callistemon citrinus (Curt.) Stapf	Bottle Brush	Myrtaceae	Fo
Eucalyptus camaldulensis Dehnh.	Safida	Myrtaceae	Fu
Olea ferruginae Royle.	Kahoo	Myrtaceae	Me, Fo, Fu, Tw
Pinus roxburghii Sarg.	Cheer	Pinaceae	Fu, M, Tw, Me
Arundo donax L.	Naal	Poaceae	Fo, M
Chrysopogon serrulatus Trin.	Barri grass	Poaceae	Fo
Cynodon dactylon (L.) Pers.	Kabal	Poaceae	Fo, Me
Saccharum spontaneum L.	Kai	Poaceae	Fo
Sorghum bicolor L.	Jawar	Poaceae	Me, Fo
Sorghum helepense L.	Barugass	Poaceae	Fo
Zea mays L.	Makai	Poaceae	Fo
Poa annua L.	Gass	Poaceae	Fo
Triticumaestivum L.	Gandum, kanak	Poaceae	Fo, M
Penniesetum glaucum L.	Bajra	Poaceae	Fo
Rumex nepalensis Spreng.	Aliphir	Polygonaceae	Fo
Punica granatum L.	Daroona	Punicaceae	Me, M, Tw, H
Ziziphus mauritiana Lam.	Bairi	Rhamnaceae	Me, H
Ziziphus nummularia (Burm.f.) Wight & Arn	Jand	Rhamnaceae	Me, Fu, H
Eriobotrya japonica (Thumb.) Lindl.	Locat	Rosaceae	Me, Fu, M
Prunus armeniaca L.	Aari	Rosaceae	Me, F u
Prunus persica (L.) Bat Sch.	Arwara	Rosaceae	Fu
Pyrus pashia Ham. ex D.Don.	Tangi	Rosaceae	Fu, H
Rubus ellipticus Hook.f.	Akhra	Rosaceae	Me, H
Citrus limonum (L.) Burm.f.	Nimbo	Rutaceae	Me, M
Zanthoxylum armatum DC.	Timber	Rutaceae	Me, Fu, Tw
Dodonaea viscosa L.	Sanatha	Sapindaceae	Me, Fu
Solanum nigrum L.	Kachmach	Solanaceae	Me, O
Grewia tenax (Forssk.) Fiori	Taman	Tiliaceae	Me, Fo

Medicinal: Me, Fodder: FO, Fuel: Fu, Ornamental: O, Market: M, Timber wood: Tw, Fencing/Hedge; F/H.

Table 2: Family wise Distribution of medicinal plants species of valley Tatta Pani

Family	No of species	Family	No of species
Acanthaceae	1	Juglandaceae	1
Adiantaceae	1	Lamiaceae	1
Agavaceae	1	Mimosaceae	3
Amaranthaceae	3	Moraceae	5
Apiaceae	2	Myrtaceae	3
Anacardiaceae	1	Pinaceae	1
Apocynaceae	2	Poaceae	10
Asclepidiaceae	1	Polygonaceae	1
Astraceae Alliaceae	1 2	Punicaceae	1
Bombacaceae	1	Rhamnaceae	3
Brassicaceae	3	Rosaceae	3
Cactaceae	1	Rutaceae	2
Caesalpinaceae	2	Sapindaceae	1
Cucurbitaceae	4	Solanaceae	1
Euphorbiaceae	4	Tiliaceae	1
Fabaceae	1		

Table 3: Conservation status of ethno medicinal flora of Tatta Pani, district Kotli (Azad Jammu & Kashmir)

Conservation status	Plants species
Endangered	*Albizia labbek, Cissus carnosa, Dalbergia sisso, Juglans regia, Lepidium pinnatifidum, Olea ferruginaea,, Pinus roxburghii, unica granatum, Phyllanthus emblica, Grewia tenax.*
Critically endangered	*Ajuga integrifolia, Mallottus philippinensis Ricinus commmunis, Zanthoxylum armatum*
Vulnerable	*Acacia modesta, Arundo donax, Bombax ceiba, Ficus palmata, Mentha longifolia Nerium oleander, Zizipus nummularia*
Least concern or data deficient	*Achyranthus aspera, Bauhinia variegata, Cassia fistula, Calotropis procera, Cynodon dactylon, Justicia adhatoda, Mentha longifolia, Ricinus communis, Taraxacum officinale*

Table 4: Ethno botany of some local plants of Tatta Pani Valley

Family	Botanical Name	Local name	Habit	Part used	Ethno botanical uses
Acanthaceae	*Justica* adhatoda	Bakhar	Shrub	Leaves	Plant extract is used for bronchitis, asthma, jaundice and for skin diseases.
Adiantaceae	*Adiantum venustum*	Fern	Herb	Leaves, Roots	Fern plant is used for headache, cold and also used as antiviral an Antibacterial drug.
Agavaceae	*Aloe vera*	Kanwargandal	Herb	Leaves	Used to improve skin, prevent wrinkle, Lower blood sugar level, reduces constipation.
Amaranthaceae	*Achyranthus apera*	Poothakand	Herb	Leaves, stem, roots	Used for blood purification.
	Amaranthus pinosus	Ganhaari	Herb	Leaves, seeds	Used for treatment of internal bleeding diarrhea.
	Amaranthus viridis	Ganhaar	Herb	Leaves,seeds	Used as vegetables, saag. Grinded seed are mixed with rice water to control menstruation.
Apiaceae	*Anethum graveolens*	Soya	Herb	Leaves, fruits, seeds	Used in herbal medicine for treating stomach ache, carminative, leaves are used as celery.
	Coriandrum sativum	Dhanya	Herb	Leaves, seeds	Used as curry powder. Used as analgesic and carminative.
Anacardiaceae	*Magnifera indica*	Aam	Tree	Fruits	Decoction from kernel is used for treatment of diarrhea and hemorrhage.
Apocynaceae	Carissa spinarum.	Granda	Shrub	Leaves bark	Decoction from leaves and bark is used for breast cancer, headache, lowering blood presser and rheumatism.
	Nerium oleander.	Gandeera	Shrub	Stem, leaves fruits.	Plant is used as fuel, for treatment of asthma, epilepsy, wring worms, leprosy and malaria.
Asclepidiaceae	*Calotropis procera*	Aak	Shrub	Leaves bark stem.	Bark is used for digestive disorder, toothache, cramps and joint pains.
Alliaceae	*Allium cepa*	Piyaz	Herb	Leaves	Used as food salad and for reducing heart and cancer diseases.
	Allium sativum	Thoom	Herb	Leaves	Used as food used to prevent cardiovascular disorder.
Brassicaceae	*Brassica compestris*	Sarson	Herb	Leaves, stem, seed	Used as vegetable, oil extraction,
	Lepidum pinnatifidum	Halian	Herb	Leaves, seed	Used against asthma, digestive disorder.
	Raphanus sativus	Mooli	Herb	Leaves, stem	Used as vegetable and salad.
Cactaceae	*Opuntia dillenii*	Thohar	Herb	Leaves, fruit	Used for fencing and for treatment of diabetes and fire burns.
Caesalpinaceae	*Bauhinia variegate*	Kalyar	Tree	Flower, stem	Flower is used as vegetables and for treatment of skin diseases and leprosy.
	Cassia fistula	Amaltas	Tree	Stem, leaves, seed	Wood is used for fuel,.flowers are used for making gulkand.
Cucurbitaceae	*Luffa cylinderica*	Toori	Climber	Fruit	Used as vegetable.
	Momordica balsamina	Kareela	climber	Fruit	Used as vegetable.
	Diplocyclos palmatus	Jangli kheera	Climber	Fruit, seed	Extract used for headache and dysentery.
	Cucurbita maxima	Kandola	climber	Fruit, seed	Used as vegetable, used as tonic diuretic.
Euphorbiaceae	*Euphorbia helioscopa*	Doodal	Herb	Stem, leaves	Milky sap is used for wring worm.
	Phyllanthus emblica	Amla	Tree	Fruit, stem	Plant is used for fuel, used against diabetes and respiratory disorder.
	Ricinuscommmunis	Hrnoli	Shrub	Seed	Used as laxative, seed oil is used for liver disorder and inflammation.
	Mallottus philippinensis	Kambila	Tree	Leaves, stem	Used as fodder and fuel.
Fabaceae	*Dalbergia sisso*	Tali	Tree	Stem, leaves	Used for fuel and for making furniture.
Juglandaceae	*Juglans regia*	Akhrot	Tree	Leaves, fruit, stem.	Used for teeth cleaning, fruits are used against diabetes.
Lamiaceae	*Mentha longifolia*	Chittapudina	Herb	Leaves	Dried leaves are used for making tea used for digestive problems, used as flavoring in soup.
Meliaceae	*Melia azzadirachta*	Dreek	Tree	Leaves, seed	Fruit powered is used for skin diseases, wood is used as fuel.
	Cedrela toona	Toon	Tree	Leaves, stem	Used as fuel, skin diseases.
Mimosaceae	*Acacia modesta*	Pulai	Tree	Leaves, bark, stem	Wood is used as timber wood fuel, furniture and fencing leaves as fodder for cattle, twig is used for cleaning teeth
	Acacia nilotica	Kikar	Tree	Leaves flower	Flower provides nectar for honey bees, wood is used for fuel. Furniture and hedge
	Albizia labbek	Seree	Tree	Stem, seed	Wood is used for making furniture, photo frames and as fuel.
Moraceae	*Brossonetia papyrifera*	Jangali toot	Tree	Leaves stem, fruit	Leaves juice is used as laxative, it is poulticed into various skin disorder and bites. Wood is used for fuel. inner bark is used for paper and cloth

	Ficus carica	Tosa	Tree	Fruit, stem	Wood is used for fuel purpose. leaves roots and fruits are used for gastrointestinal, respiratory and cardiovascular disorders.
	Ficus palmate	Phagwari	Tree	Fruit, stem	Used to cure gastrointestinal disorder, ulcer, diabetes and fungal infections. Wood used for fuel.
	Ficus religiosa	Pipal	Tree	Stem, leaves	Wood used as fuel. Leaves bark and roots are used to cure asthma epilepsy and gastric problem.
	Morus nigra	Kala toot	Tree	Stem, leaves, fruit	Used as fodder, fruit is edible used as cooling agent, wood used as fuel and making furniture.
Myrtaceae	*Callistemon ctirinus*	Bottle Brush	Shrub	Flower, stem	Used as fuel and ornamental.
	Euclaptus camaldulensis	Goand/ safida	Tree	Stem	Used as fuel.
	Olea ferruginae	Kahoo	Tree	Seed, stem, leaves	Leaves extract are used for skin disease wood is used as fire wood.
Pinaceae	*Pinus roxburghii*	Cheer	Tree	Stem, seed	Used as fire wood, furniture.
Poaceae	*Chrysopogon serrulatus*	Bari grass		Leaves	Used as fodder for animals.
	Arundo donax.	Naal	shrub	Stem,	Stem is used for making pen for writing; whole plant is used for fuel.
	Cynodon dactylon	Kabal	Herb	Leaves	Used as fodder.
	Saccharum spontaneum	Kai	Herb	Leaves	Used as fodder.
	Sorghum bicolor	Bajra	Herb	Leaves	Used as fodder.
	Sorghum helepense	Baru gass	Herb	Leaves	Used as fodder.
	Zea mays	Makai	Herb	Stem, seed, leaves	Used as fodder.
	Poa annua	Gass	Herb	Stem	Used as fodder.
	Triticumaestivum	Gandum, kanak	Herb	Stem, seed, leaves	Used as fodder.
	Penniesetum glaucum	Bajra	Herb	Stem seed, leaves	Used as fodder.
Polygonaceae	*Rumex nepalensis*	Aliphir	Herb	Leaves	Used as fodder for animal, leaves are used in treatment of colic and headache.
Punicaceae	*Punica granatum*	Daroona	Tree	Fruit, stem	Used as hedge, foods, urinary infection, cough, skin disorder.
Rhamnaceae	*Ziziphus mauritiana*	Bairi	Tree	Fruit, stem, leaves	Used as food and fuel wood.
	Ziziphus nummularia	Jand	Shrub	Fruit, stem, leaves	Used as hedge, analgesic and ant inflammatory.
	Eriobotrya japonica	Locat	Tree	Leaves, fruit, stem.	Decoction of leaves is used against cough and mouth wash.
Rosaceae	*Prunus persica*	Rawara	Tree	Fruit, stem	Used against constipation, cough and asthma.
	Pyrus pashia	Tangi	Tree	Stem, leaves	Used as fuel and hedge.
	Rubus ellipticus	Akhra	Shrub	Fruit, leaves	Used against diarrhea and fever.
Rutaceae	*Citrus limonum*	Nimbo	Shrub	Fruit	Used as medicine for cold and flu also used as skin tonic.
	Zanthoxylum armatum	Timber	Shrub	Stem, fruit	Used as condiment, fuel, hedge.
Sapindaceae	*Dodonaea viscose*	Sanatha	Shrub	Stem, stem	Wood used as fuel and hedge.
Solanaceae	*Solanum nigrum.*	Kachmach	Herb	Leaves, stem, fruit	Used against dysentery and fever.
Tiliaceae	*Grewia tenax*	Taman	Tree	Stem, leaves	Used as fodder for goats

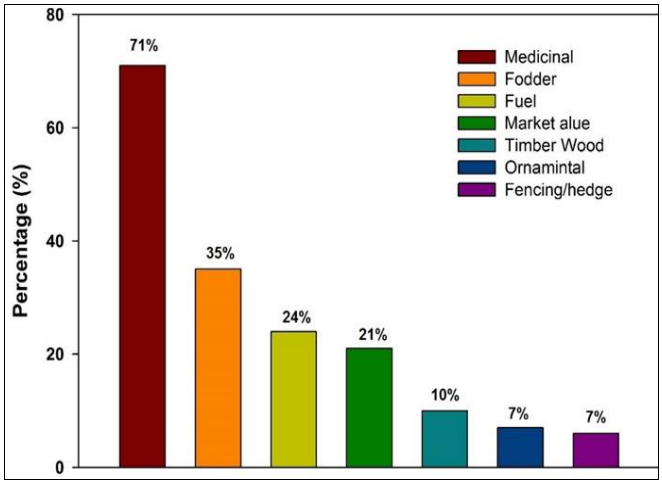

Fig 2: Percentage of Ethno botanical uses of different species of Tatta Pani

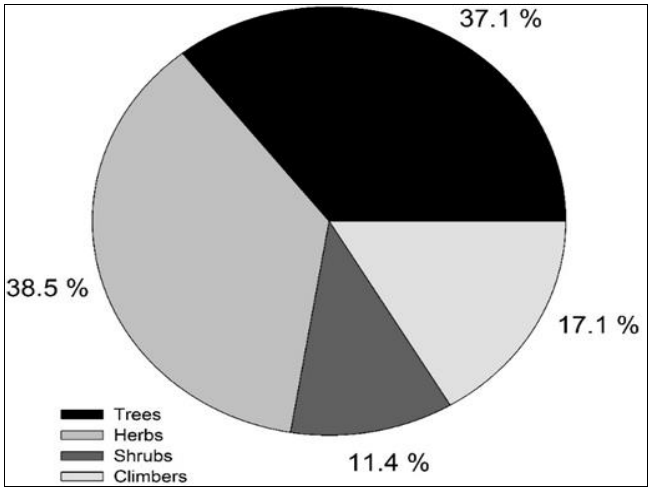

Fig 3: Life form of different ethno botanically used plants of Tatta Pani (AJK)

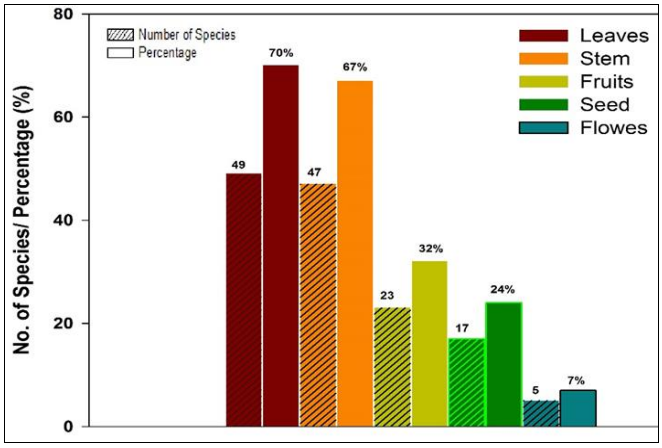

Fig 4: Graphical representation of different plant parts used in Tatta Pani (AJK)

Conclusion

The current study was planned keeping in view the supreme worth of the study area in perspective of its plant biodiversity. Plant assets of the area were unexplored ethno botanically. The study area harbors rich diversity in context with medicinal plants. A sum of 70 species belonging to 33 families was reported. The Poaceae was leading family followed by Moraceae Myrtaceae, Mimosaceae, and Amaranthaceae. The present investigation indicated that the local inhabitants of the study area use these documented medicinal plants for curing variety of diseases such as stomach pain, indigestion, body pain, backache, headache and rheumatism were cured by using the medicinal plant of the area. Over all the study area is rich in floral diversity however due to over populace, cleaning land for cultivation and development work led to the decline in plant diversity. There should be proper training of the local inhabitants of the area in this regard. Therefore there is a dire need to protect this phyto diversity hotspot for future generation.

Compliance with ethical standards

Conflict of interest: The authors declare that there is no conflict of interests regarding the publication of this paper.

Ethical approval

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