Ethno-veterinary practices of Poaceae taxa in Punjab, Pakistan

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Research

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Abstract

Background: Plant species of Poaceae family are not only used as fodder and forage but also contribute substantially in the treatment of various health disorders, particularly in livestock. Consequently, present study was aimed to document the therapeutic uses Poaceae taxa by the inhabitants of the Punjab Province to treat various veterinary health disorders.

Methods: Semi structured interviews, group discussion and field walks were conducted to collected data. Furthermore, quantitative indices includingcultural significance index (CSI), relative frequency of citations (RFC), fidelity level (FL), and relative popularity level (RPL) andJaccard Index (JI) were adopted for data analysis.

Results: Traditional uses of 149 plants belonging to 60 genera, 16 tribes of 5 sub families of Poaceae were recorded. Whole plant and leaves were the most consistent grazing parts with 40.94 and 29.53% contribution and decoction (35 reports) was the most preferred mode of administration. Majority of the plant species were employed to treat infectious diseases (25.93 %). and digestive disorders (14.10 %). *Triticum aestivum* depicted highest CSI, RFC and RPL levels at 8.00, 0.96, 1.00, respectively, followed by *Oryza sativa* and *Poa annua* . Likewise, *T. aestivum* and Saccharum spontaneum had 100 % FL and ROP. Jaccard index ranged from 12.25 to 0.37. Twelve plant species namely *Chrysopogon zizanioides* (anti-inflammatory), *Pennisetum lansatum* (improve bull fertility), *Cymbopogon citratus* (glandular secretion), *Sorghum saccharatum* and *Themeda triandra* (malaria), *Aristida funiculate* (anticancer) , *Koeleria argentia* (skin allergies), *Tetrapogon villosus* (antibacterial), *Cynodon radiates* (eyes infection), *Sporobolus nervosa* (Jaundice), *Enneapogon persicus* (antifungal), and *Panicum repens* (dysfunctional cattle organs) were reported for the first time with novelethnoveterinary uses.

Conclusion: Inhabitants of the study area had strong association with surrounding plant biodiversity and possess significant knowledge on therapeutic uses of grasses and other members of Poaceae to treat various health disorders in animals. Plant species with maximum cultural and medicinal values could be a potential source of novel drugs to cure health disorders in animals and human as well.

Background

Botanical taxa belonging to family Poaceaeare the most substantialcomponent of agriculture crops and livestock feed as well as the main sources of economy and revenue for the people of the rural areas around the globe [1]. Majority of the livestock depend on forage grasses and natural pastures. Native plant species of Poaceaeare cost-effective source of nutrients for livestock and contribute significantly to conserve the soil integrity, water supply and air quality [2]. The major constraints for improved productivity of livestock is the low quantity and quality of available forages during the dry season that cannot meet the nutrient requirements of grazing ruminants [3]. Rural populace usesgrasses as a source of feed for domesticated animals and as medicines to treat health disorders in cattle and human [4].

Many scientific attempts have been made to record ethnoveterinary data on medicinal plants in different part of the world like inKenya [5], Italy [6], Canada [7], South Africa [8], Pakistan [9], Brazil [10], Argentina [11], India [12], Nigeria [13], Spain [14] and Uganda [15] but grasses on the other hand are among least explored in the Poaceae family. In the past, gasses rich in nutritionwere preffered over those that have therapeutically important products [4]. Grasses are of particulary important in traditional health care system due to the presence of biological active compound like alkaloids, flavonoid and saponin [16]. Presence of alkaloids make them highly resistant again foreign microbes and flavonoid have been reported with anti-inflamatory, anticancer and antiviral activities and help animals to over come the oxidative cell damage [17]. Cynodon dactylon, Sacchrum spontaneum and Imperata cylindricaare reported effective in inflammatory and fungal diseases in animals [18]. Chloris barbatagrass is used as disinfectant [19], while Heteropogon contortus has anti-microbial, anti-carcinogenic, anti-inflammatory properties and increases milk production in livestock [20].

The local inhabitants of rural areas of Punjab widely use grasses for ethnoveterinary purposes. For example, Cynodan dactylon, Eleusine indica, Bromus japonicus, Phragmites australis, Eragrostis minor and Desmostachya bipinnata are reported to treat various stomach problems whereas Sorghum bicolor, Brachiaria ramose, Arundo donax, Chrysopogon zizanioides and Panicum antidotale are used to treat microbial infection in cattles [4]. Grasses provide livestock with food rich in nutrition especially in the dry winter season when other feed sources are not available [21]. Indigenous people with long histories of livestock rearing may have developed precious information about potential forage resources and they prefer to use grasses as fodder because they are highly plateable than other form of fodders [22]. Their platabilityalso depends on animal choice and may be linked with their seasonal availability and morphological and chemical nature of plant [23]. Animals generally prefer fresh foliage over dried because leaves of grasses are rich source of protein and cellulose and have low lignin than forbs and shrubs [24]. Grasses beside the nutritional and healthcare services also reduce the grazing pressure on other platable species and improve the productivity in livestock [25].

Though, different workers have reported the traditional uses of plant species from different areas of Punjab [26–34], but little is known about thetherapeutic potential of grasses and other members of family Poaceae [4], particularly for the treatment of various diseases in livestocks. Consequently, present studywas intended with the aim to document theethnomedicinal uses of plantspecies of Poaceae family from Punjab province of Pakistan, traditionally used to treat various health disorders in livestock and to explore the cultural significance of species and their popularity among different tribes on the basis of their usage in animal healthcare.

Materials And Methods

Study area

Punjab is the second largest province of Pakistan after Balochistan. It encompasses of 205,344 km^2 area, located between latitudes 27.42º and 34.02º N and longitudes 69.81º and 75.23º E at the north western edge of the geological Indian plate in South Asia [35]. Punjab is comprised of 36 districts which are

grouped into 5 agro-ecological zones [36] i.e. southern irrigated zone, arid desert zone, river zone, northern irrigated zone, thal sandy deserts zoneand baranizone are representative districts (Fig. 1). Northern irrigated zone and south desert zone are the two largest zone, with huge difference in cultural groups and ethnobotanical practices [4]. Majority of the area in Punjab consists of fertlile alluvial plain heavily irrigated with 5 rivers namely Jehlum, Ravi, Chenab and Sutlej. Spare deserts can be found in sourthern Punjab and Sulaiman Range. The variation in temperature and rainfall occurs all over the year. Soil is sandy, clay and loamy [37]. Most of the area experience foggy weather during winter and hot weather insummer. The average annual temperature ranges from − 2 °C to 45 °C. June is the hottestes and January is the coldest month of the year. Average annual rainfall of last five year is 479.8 mm. Nothern parts of the province receive reasonable amount of rainfall throught the year as compared to the sourthern part. Almost half of the rainfall occur during the month of July and Agust averaging about 255 mm.

Punjab is home to over half of the total population of Pakistan. The ethnic composition of the area is quite diverse comprising of different tribes and communities. Rana, Gujjar, Butt, Rayain are the major ethnic groups. Most of the people speak Punjab language followed by Saraiki and Pashto. Urdu and English languages are used in government offices.Compared to the other provinces, it has highest literacy rate. Punajb contributes major share in the economy of Pakistan in terms of GDP. The economy of the people in province is based on agriculture and wheat is the widely cultivated crop with significant production of rice, cotton, corn, sugarcane, pulses and jute. The major occupation of the rural communities is farming and they depend on agricultural means and livestock management to support livelihood.The inhabitants of the Punjab province have diverse traditional knowledge and practices because of linguistic and cultural variations. In agricultural lands like Punjab, grasses are preferred over other medicinal herbs and shrubs [4] because they are common, highly palatable and easy to process in order to cure livestock ailments [38].

Data collection

Data on ethnomedicinal application of Poaceae members to treat ethnoveterinary diseases were collected based on group discussion, semi-strcuture interviews and open and closed ended questionnaires during field visist in 2016-17, following the methods reported previously [39–41]. Prior to collect information, proper moral agreement was obtained from the head of local government and local informants. In total, 271 participants including both men and women, village leaders, shepherds, cattle holders who worked in local farms and some senior household animal owners were interviewed. Demographic information about the participants was gathered by adopting a method of [42]. Questionnaires were first developed in English, afterwards translated in local languastics i.e. Punjabi and Saraiki. Before conducting interviews, prior informed consents were also obtained from all the participants after briefing the objectives of the current study and no further ethical approval was required as there is lacking of explicit rules or regulations pertain to the practices of ethnomedicinal uses of plants or animals in Pakistan. However, Participants were allowed to discontinue the interviews at any time.

Collected plant specimen were identified with the help of different flora of Pakistan, whereas botanical and family names were furteh verified from literature [43], www.efloras.org/index.aspx and Kew grass data base (https://www.kew.org/data/grasses-db/index.htm). For voucher specimen satnadrd herbarium techniques as explained before [44, 45] were strictly followed. All plants were labelled and deposited in the herbarium at the Department of Botany, University of Gujarat, Punjab, Pakistan and the voucher specimens were preserved for record.

Cultural Significance Index (CSI)

The relationship between use reports of a given species and agreement among the informant knowledge was attributed through cultural significance index (CSI). It was calculated following a method of [46] using formula:

$$\mathrm{CSI} = \Sigma(\mathrm{i} \times \mathrm{e} \times \mathrm{c}) \times \mathrm{CF}$$

Where i is the management of species having considerable impact on community (a species cultivated, managed or operated by any mean is awarded score of 2 and the value 1 is awarded if species is yet free from any kind of manipulation), e is the use preference of informant for one plant species over another species for a specific purpose (value 2 is for preferred species and value 1 is for non-preferred species), c is use frequency of a plant species (value 2 is attributed to a high potential plant species being considerably used by informants and value 1 is awarded to a rarely cited species), correction factor (CF) is level of informant consensus which comes from species citation divided by the number of citations of the most mentioned species.

Relative frequency of citation (RFC)

RFC is to set up the priority order among the listed species and its value is depended on the numbers of participantswho have mentioned a particular species as a medicinal plant or good fodder indicating its significance. The RFC was estimated with the help of following equation following [47].

$$\mathrm{RFC} = \frac{\mathrm{FC}}{\mathrm{N}} \qquad (0 < \mathrm{RFC} < 1)$$

Where, FC is number of participants who stated a particular plant species as an excellent medicinal plant and N is the total number of participants included in the study.

Use Value (UV)

Use value (UV) was calculated by applying standard procedure reported previously [48].

$$\mathrm{UV} = \frac{\mathrm{U}}{\mathrm{n}}$$

Where U is total number of use reports mentioned by informants for a given plant and n is the total number of informants interviewed for a given plant species. UV close to 1 indicates many use reports for a given plant and its importance among informants.

Fidelity level (FL)

FL comes from the percentage of informant knowledge who report the uses of a plant species for an ailment and was determined using formula as reported previously by

$$\mathrm{FL}\ \% = \times \frac{Ip}{Iu} \times 100$$

Where, Ip is the number of participants who reported the use of a grass for specific purpose; and Iu is the sum of participants who claimed the use of a grass for any purpose. High level of FL reflects the high use of plant species in specific disease in the study area.

Relative popularity level (RPL)

Plant healing potential can't be differentiated when they show same fidelity level. In order to differentiate the healing potential of species with same FL values, relative popularity level is calculated, which is the ratio between ailments cured by a specific plant and total number of informants who reporting that disease. Base of RPL, plant species are divided into popular and non-popular groups. Popular speciesare those reported by more than half number of informants or above and rest of the species are declared as non-popular. For popular plant species RPL was arbitrarily selected equal to 1 that represents the complete popularity of a species for the cure of ailments and 0 value represents that no ailment was treated by this species [36]

Rank order priority (ROP)

Plant species having different FL and RPL values were attributed with correction factor (ROP) to rank properly the reported species. The ROP was calculated by multiplying FL and RPL values as elucidated earlier

$$\mathrm{ROP} = \mathrm{FL} \times \mathrm{RPL}$$

Jaccard Index (JI)

The data presented in our study was compared with already published data in the adjacent areas of Himalayan territory using Jaccard index by appraising percentage of reported species and their medicinal uses

$$\mathrm{JI} = \frac{\mathrm{cx100}}{\mathrm{a} + \mathrm{b} - \mathrm{c}}$$

Where, a represent the number of plants in an area A, b is number of plants in area B and c is number of plants common to area A and B.

Results And Discussion

Demographic features

Data were collected from 271 informants (Table 1) of ages between 20 to 80 years old including female and male nomads (5.90 and 23.62%), female and male farm cattle holders (7.75 and 18.08%), and female and male domestic cattle holders (24.72 and 19.93%). About, 18.08% informants were illiterate while others were educated up to master and PhD levels. The level of indigenous knowledge on medicinal uses of the plant species of family Poaceae was more prevent in illiterate (around 80%) and less educated people and rest of informations were shared by the educated informants but well educated informants were less conversant on the ethnomedicinal uses of plant species, particularly of Poacease taxa. High level of exposure to modernization and dependence of allopathis medicines could be the reason behind this, which have already been reported [49, 50]. Though, previous studies were focused on a single community having one ethic group and same culture [51], but in the last few decades ethnobiologists are more interested in cross cultural variation of traditional knowledge of different communities and ethnic groups [52]. Because of this, we also collected data on ethno-veterinary uses of poaceae taxa from different ethnic groups i.e. Punjabi, Gujjar, Butt, Khawaja, Arayeen, and Rana. These groups have diverse culture and speak didderentlanguistics(Fig. 2) such as Urdu, Punjabi, Saraiki, Pothare, Balochi, Pashto, Mewatti, Kashmiri, Hindku, and English (25.46, 17.34, 16.24, 8.86, 7.75, 6.64, 5.54, 4.80, 4.06 and 3.32%, respectively).

Table 1
Demographic informants of informants

Variable	Demographic catagories	Numbers	Percentage
Gender	Male	104	38.37
	Female	167	61.62
Age	< 20 years	31	11.43
	21–40 years	73	26.93
	41–60 years	119	43.91
	61–80 years	48	17.71
Occupation	Nomads	80	29.52
	Farm cattle holders	70	25.83
	Domestic cattle holders	121	44.64
Education levels	Illiterate	49	18.08
	Primary	77	28.41
	Middle	53	19.56
	Intermediate	37	13.65
	Graduate	28	10.33
	Master	16	5.900
	M.Phil	9	3.320
	Ph.D	2	0.740

Taxonomic description of plant species

In total, 149 plant species of family Poaceae, belonging to 18 tribes were documented, which are used to treat various veterinary health disorders classified in to 12 major disease catagories. Of these, 56% were of perennial nature and rest of the 46% were annual herbs (Table 2).

Table 2

Ethno-veterinary uses of poaceae taxa in the Punjab province, Pakistan.

Tribe	S. #	Binomial name	Local name	Life trend	Part Used	Preparation	Ethno veterinary uses	FC (n)	RFC
Andropogoneae	1.	Apluda mutica L. UOG-110	Tachuli	Perennial	Aerial	Extract	Stomachache	47	0.17
	2.	Bothriochloa bladhii (Retz.) S.T. Blake UOG-111	Palvan	Perennial	Aerial	Decoction	Indigestion	220	0.81
	3.	Chrysopogon aucheri (Boiss.) Stapf UOG-117	Khar, Beerankha	Perennial	Leaves	Paste	Digestive disorders, improve fertility in bull	70	0.26
	4.	Chrysopogon serrulatus Trin. UOG-118	Chita Gha	Perennial	Leaves	Fodder	Antifungal & tonic	86	0.32
	5.	Chrysopogon zizanioides (L.) Roberty UOG-122	Vetiver, Khuss	Perennial	Leaves	Fodder	Antibacterial, anti-inflammatory	111	0.41
	6.	Cymbopogon citratus DC. ex Nees UOG-131	Lemon ghaas	Perennial	Leaves, seed	Herbal tea	Headaches, tonic body, nervous system, stimulate glandular secretions	175	0.65
	7.	Cymbopogon commutatus (stend) Stapf. UOG-133	Lemon grass	Perennial	Whole	Extract	Indigestion, gastro enteritis	88	0.32
	8.	Cymbopogon jwarancusa (Jones.) Schult UOG-134	Khavi, Kittran	Perennial	Whole	Decoction	Typhoid fever, reproductive disorders	168	0.62
	9.	Cymbopogon martini (Roxb.) J. F. Watson UOG-140	Rauns	Perennial	Whole	Oil	Cough, fever, phlegmatic pains	53	0.20
	10.	Dichanthium annulatum (Forssk.) Stapf UOG-141	Murgha, Dab Ghaah	Perennial	Whole	Paste	Indigestion	251	0.93
	11.	Dicanthium foveolatum (Del.) Roberty UOG-145	Humre	Perennial	Whole	Smoke	Smoke of plant is supposed useful to treat measles, bone healing	98	0.36
	12.	Eulaliopsis binata (Retz) C.E.Hubbard UOG-147	Sabai grass	Perennial	Stem	Decoction	Respiratory infections, fever, infectious, phlegmatic pains	96	0.35
	13.	Heteropogon contortus (L.) P Beauv. ex. Roem & Schult UOG-151	Kana	Perennial	Leaves	Extract, Paste	Leucorrhoea, digestive disorders, anemia, typhoid	172	0.63
	14.	Imperata cylindrica (L.) Raeuschel UOG-155	Siru	Perennial	Leaves	Paste	Astringent, febrifuge, antibacterial	183	0.68
	15.	Saccharum arundinaceum Retz. UOG-158	Sarkanda	Perennial	Leave	Juice	Diuretic, refrigerant, diaphoretic, urinary complaints, blood pressure	202	0.75
	16.	Saccharum bengalense Retz. UOG-161	Kana, Sarkanda	Perennial	Leaves	Juice	Oral infections dyspepsia, fever, constipation, hepatitis	233	0.86

FC: Frequency of citations Uv: Use value CSI: Cultural significant index

Tribe	S. #	Binomial name	Local name	Life trend	Part Used	Preparation	Ethno veterinary uses	FC (n)	RFC
	17.	Saccharum spontaneum L UOG-165	Kaa, Kahi	Perennial	Leaves, Root	Juice	Relieve in inflammation, urinary problems, treatment of abdominal pain, improvement of appetite	116	0.43
	18.	Saccharum ravennae L. UOG-167		Perennial	Aerial	Decoction	Typhoid, improvement of appetite, phlegmatic pains	145	0.54
	19.	Saccharum officinarum Roem. & Schult. UOG-169	Gana	Perennial	Aerial	Juice	Improvement of appetite, diuretic, digestive disorders	233	0.86
	20.	Sorghum bicolor (L.) Moench UOG-172	Jowar, milo	Perennial	Aerial	Fodder, Extract	Digestive problems	223	0.82
	21.	Sorghum saccharatum (L.) Moench UOG-175	Milo	Annual	Aerial	Extract	Diuretic, demulcent, serious abdominal pain, piles, malaria	178	0.66
	22.	Sorghum halepense (L.) Pers. UOG-177	Baru	Perennial	Root, Whole	Fodder, Extract	Infectious diseases	219	0.81
	23.	Themeda anathera (Nees) Hack UOG-179	Loonder, Lunji	Perennial	Leaves	Fodder, juice	Body cooling, depression, nervous exhaustion, shingles, herpes, refrigerant	89	0.33
	24.	Themeda triandra Forsk. UOG-181	Ghaa	Perennial	Leaves	Fodder	Anti-allergic, piles, malaria	134	0.49
	25.	Vetiveria zizanioides (L.) Nash UOG-183	Vetiver	Perennial	Leaves, Seed	Decoction	Stomach problem, antiseptic, anti-inflammatory, demulcent	144	0.53
	26.	Zea mays L. UOG-186	Makai	Annual	Aerial	Paste, Extract	Detoxifier, nerve tonic, antiseptic	221	0.82
Aristideae	27.	Aristida adscensionis L. UOG-188	LumbGaah,	Annual	Aerial	Paster	Skin disorders	143	0.53
	28.	Aristida cyanatha Nees ex Steud. UOG-191	JangliGha	Annual	Aerial	Powder	Diuretic, anti-septic, anti-inflammatory, demulcent	99	0.37
	29.	Aristida funiculata Trin. & Rupr. UOG-212	Lumb	Annual	Leaves	Extract	Hypertension, hysteria, premature ejaculation, cure cancer, anti-fungal	55	0.20
	30.	Aristida hystricula (Edgew) UOG-216	Lumb	Annual	Aerial	Extract	Diuretic, antiseptic, blood pressure, fever, to treat dysfunctional organs of cattle, clear menstrual discharge	156	0.58
	31.	Aristida mutabilis Trin. & Rupr. UOG-219	Lumb	Annual	Leaves	Decoction,Extract	Stomach problem, antiseptic, anti-inflammatory, piles	51	0.19

FC: Frequency of citations Uv: Use value CSI: Cultural significant index

Tribe	S. #	Binomial name	Local name	Life trend	Part Used	Preparation	Ethno veterinary uses	FC (n)	RFC
	32.	Stipagrostis plumosa (L.) Munro. ex T. Anders UOG-233	Lumb, Chita gah	Annual	Whole	Fodder	Anticancer, sexual disorder	161	0.59
Arundineae	33.	Arundo donax L. UOG-236	Nara bans, Nal, Narki	Perennial	Leaves & stem	Decoction	blood pressure, fever, dysfunctional organs of cattle	225	0.83
	34.	Phragmites australis (Cav.) Trin. ex Steud. UOG-238	Dila, Babyoon	Perennial	Leaves, Root	Fodder, Powder	Digestive disorders, vomiting, bronchitis, cholera, diarrhea, cough, urinary tract infections	48	0.18
	35.	Phragmites karka (Retz.) Trin. ex Steud. UOG-240	Narr	Perennial	Leaves	Fodder, Extract	Cardiac problem, antiemetic, detoxifier, shingles	159	0.59
Aveneae	36.	Avena fatua L. UOG-243	Jangli Jai	Annual	Whole	Fodder	Stomach problem, cooling, styptic depression, nervous exhaustion, piles,	149	0.55
	37.	Agrostis gigantea Roth. UOG-245	Lamba gaah	Perennial	Leaves	Fodder	Anti-allergic, shingles, herpes	87	0.32
	38.	Agrostis viridis Gouan UOG-247	Forssk.	Perennial	Leaves	Decoction	Detoxifier, diaphoretic, diuretic, Hysteria	107	0.39
	39.	Avena sativa L. UOG-260	Jai, Wild Oats	Perennial	Aerial	Fodder	Detoxifier, piles, refrigerant, demulcent	239	0.92
	40.	Avena sterilis (Dur.) Gill & Magne UOG-262	Crazy oat	Annual	Aerial	Fodder	Diarrhea, dyspepsia, gastrointestinal disease, depression, herpes, hysteria	39	0.14
	41.	Koeleria argentia Griseb. UOG-264	Koeleria	Perennial	Leaves	Decoction	Treat sores and skin problems, anti-inflammatory	79	0.29
	42.	Phalaris minor Retz. UOG-266	Dum bisitti	Annual	Leaves	Decoction	Animal cough, depression, diaphoretic	176	0.65
	43.	Polypogon monspeliensis (L.) Desf. UOG-268	Malhar, Dumbi citi	Annual	Aerial	Fodder	Cardiac disorders	97	0.36
	44.	Trisetum clarkei (Hook. f.) R. R. Stewart UOG_271		Perennial	Leaves	Extract	Relieve in inflammation, urinary problems, laxative	55	0.20
	45.	Polypogon fugax Nees ex Steud UOG-274	Beard grass	Annual	Stem	Juice, decoction	Improvement of appetite, diuretic, anti-inflammatory	45	0.17
Bromeae	46.	Bromus catharticus Vahl UOG-277	Rescue grass	Annual	Leaves	Fodder	Improvement of appetite, diuretic, digestive disorders, cooling effect, anemia	70	0.26
Bambuseae	47.	Bambusa aglaucescens (Willd.) Sieb. UOG-279	Bans	Perennial	Aerial	Paste, Extract	Help to cure wounds, anemia, constipation, anti-allergic	183	0.68

FC: Frequency of citations Uv: Use value CSI: Cultural significant index

Tribe	S. #	Binomial name	Local name	Life trend	Part Used	Preparation	Ethno veterinary uses	FC (n)	RFC
Bromeae	48.	Bromus japonicas Thunb. UOG-281	Joukai, Silai ghass	Perennial	Aerial	Fodder	Treat constipation, anti-toxin, relieve in inflammation	82	0.30
	49.	Bromus pectinatus Thunb. UOG-286	Chess grasses	Annual	Aerial	Fodder	Infusions used to normalize, increased heart palpitations	67	0.25
	50.	Bromus sericeus Drobov UOG-289	Brome Grass	Perennial	Leaves	Fodder	To treat dysfunctional organs of cattle, diarrhea, anti-allergic	113	0.42
Chlorideae	51.	Tetrapogon cenchriformis (A. Rich.) Clayton UOG-292		Annual	Leaves	Fodder	Diarrhea, dyspepsia, antiseptic & tonic, piles, anti-allergic	77	0.28
	52.	Tetrapogon tenellus (Roxb.) Chiov. UOG-294	Dumbi seeti	Annual	Leaves, Root	Fodder	Antibacterial, antifungal, diarrhea, dyspepsia, shingles	144	0.53
	53.	Tetrapogon villosus Desf. Fl. Atlant. UOG-297	Sager	Perennial	Aerial	Powder, fodder	Treatment of abdominal pain, anti-bacterial	43	0.16
Cynodonteae	54.	Chloris gayana Kunth UOG-301		Perennial	Leaves	Decoction	Treat constipation, diarrhea, anti-allergic, heart palpitations	129	0.48
	55.	Chloris barbata Sw. UOG-305	Jungle boti	Perennial	Aerial	Decoction	Diarrhea, dyspepsia, anti-inflammatory, styptic	228	0.84
	56.	Chloris dolicostachya Lag. UOG-307		Perennial	Aerial	Extract	Diabetic, diuretic, laxative, cough	137	0.51
	57.	Chloris virgata Sw. UOG-308	Boti	Perennial	Leaves	Paster, decoction	Diabetic,, fracture, menstrual discharge, dysfunctional organs	211	0.78
	58.	Cynodon dactylon (L.) Pers. UOG-309	Khabbal, Tala	Perennial	Leaves	Paste, juice	Eye pain, skins injuries or cutting, anti-inflammatory, anemia, dysentery, heal bone fracture	249	0.92
	59.	Cynodon radiates Roth. UOG-312	Talar	Perennial	Whole	Decoction	eyeache, relieve the eye pain, anti-inflammatory, haemostatic	105	0.39
Danthonieae	60.	Schismus arabicus Nees UOG-315	Saryalaghas	Perennial	Whole	Fodder, juice	Diuretic, laxative, cough ,anti-toxin, demulcent	216	0.80
Eragrostideae	61.	Acrachne racemosa (Heyne ex Roth) Ohwi UOG-318	Chinki	Annual	Whole	Fodder, paste	Skins injuries or cutting, controls dysentery, treat wounds, kidney problems, bronchial disorders	132	0.41

FC: Frequency of citations Uv: Use value CSI: Cultural significant index

Tribe	S. #	Binomial name	Local name	Life trend	Part Used	Preparation	Ethno veterinary uses	FC (n)	RFC
	62.	Aeluropus lagopoides (L.) Trin .ex. Thw UOG-320	Kalar ghaa	Perennial	Whole	Fodder, juice	Haemostatic, antibiotic, anti-inflammatory, phlegmatic pains, relieve in inflammation	71	0.26
	63.	Dactyloctenium aristatum Link, Hort. Berol. UOG-332	Madhana ghaa	Annual	Leaves	Decoction	Laxative, cough, haemostatic, anti-allergic, herpes	46	0.17
	64.	Dactyloctenium aegyptium (L.) Wild. UOG-338	Koora, Madanah,	Annual	Whole	Decoction	Abdominal pains, malaria, haemostatic, anti-allergic, demulcent, detoxifier	178	0.66
	65.	Dactyloctenium scindicum Boiss. UOG-342	Dela	Perennial	Whole	Paste, fodder	Dysentery, jaundice, digestive disorders, anti-inflammatory	98	0.36
	66.	Desmostachya bipinnata L. Stapf UOG-344	Kusa, Dab	Perennial	Aerial	Decoction	Digestive disorders, diuretic, anti-amenorrhea	196	0.72
	67.	Eragrostis tenella L. UOG-349	Love grass	Annual	Whole	Fodder, juice	Treatment of abdominal pain, kidney problems, clear menstrual discharge	205	0.76
	68.	Eragrostis atrovirens (Desf.) Trin. ex Steud. UOG-355	Thalia Grass	Perennial	Whole	Fodder, paste	Malaria, jaundice, anemia, dysentery, toothache	81	0.30
	69.	Eragrostis barrelieri Dav. UOG-368	Makni	Annual	Whole	Fodder	Diuretic, constipation	127	0.47
	70.	Eragrostis ciliaris (L.) R. Br UOG-369	Makni	Annual	Whole	Fodder, Extract	Cure digestive disorders, astringent, detoxifier	224	0.86
	71.	Eragrostis cilianensis Lut. ex F.T. Hubbard UOG-373	Stink grass	Annual	Whole	Fodder, juice	Digestive disorders, malaria, anti-allergic, herpes	148	0.55
	72.	Eragrostis japonica (Thunb.) Trin. UOG-376	Pan ghas	Annual	Leaves	Paste, fodder	Treat wounds, diuretic, anti-inflammatory	48	0.18
	73.	Eragrostis pectinacea. (Michx.) Nees ex Steud. UOG-377	Tufted grass	Annual	Whole	fodder	Urinary problems, laxative, gastrointestinal disease	139	0.51
	74.	Eragrostis minor Host. UOG-379	Choti ghas	Annual	Whole	fodder	Digestive disorders, anti-inflammatory, demulcent	219	0.81
	75.	Eragrostis pilosa (L.) P. Beauve UOG-383	Nika sanwak	Annual	Whole	Paste, decoction	Dysentery, toothache	52	0.19
	76.	Eragrostis papposa (Roem & Schult.) Stued. UOG-386	Ghaa	Perennial	Aerial	Fodder	Controls itching, diuretic, constipation, jaundice, styptic	147	0.57
	77.	Leptochloa panicea (Retz.) Ohwi UOG-388	Paja	Annual	Whole	Fodder	Blood pressure, diuretic, constipation, anti-inflammatory	39	0.14

FC: Frequency of citations Uv: Use value CSI: Cultural significant index

Tribe	S. #	Binomial name	Local name	Life trend	Part Used	Preparation	Ethno veterinary uses	FC (n)	RFC
	78.	Leptochloa chinensis (L.) Nees UOG-390	Naru	Annual	Whole	Fodder	Diuretic, digestive disorders, sore, anti-allergic, homeostatic	67	0.25
	79.	Eleusine indica (L.) Gaertn UOG-394	Chezi, UntKatara	Annual	Aerial	Grain flour	Abdominal pain	143	0.53
	80.	Sporobolus arabicus Boiss. UOG-398	-	Perennial	Whole	Fodder	Controls itching, treatment of abdominal pain, herpes, to treat dysfunctional organs	46	0.17
Paniceae	81.	Sporobolus nervosa (Hocshsst.) UOG-401	Lambi ghaa	Perennial	Aerial	Fodder	Malaria, jaundice, anemia, dysentery, toothache	145	0.54
Eragrostideae	82.	Dactyloctenium aristatum Link, Hort. Berol. UOG-403	chhaibbnrr	Perennial	Whole	Decoction	Diuretic, constipation	231	0.85
	83.	Dactyloctinium scindicum Boiss UOG-406	Crow foot grass	Perennial	Whole	Fodder, paste, decoction	Cure digestive disorders, astringent, wounds treatment	189	0.70
Hainardeae	84.	Parapholis strigosa (Dum.) C. E. Hubbard UOG-408	Tooti ghas	Perennial	Whole	fodder	Leucorrhoea, digestive disorders, malaria, anti-allergic, relieve in inflammation	43	0.16
Oryzeae	85.	Oryza sativa L. UOG-409	Chawal	Annual	Aerial	Paste, decoction	Diarrhea, wound healing	255	0.94
Pappophoreae	86.	Enneapogon shimpranus (Hochst. ex A. Rich) Renvoize UOG-412	Jeo	Perennial	Whole	Fodder, Paste	Disinfectant, digestive disorders, anti-allergic	69	0.25
	87.	Enneapogon persicus Boiss. UOG-416	Jiu, Sabri	Perennial	Whole	Fodder	Improves digestion, laxatives, anti-fungal, controls itching	46	0.17
	88.	Enneapogon desvauxii P. Beauv. UOG-418	Dhui	Annual	Leaves, Seed	Fodder	Digestive disorders, malaria	56	0.21
Paniceae	89.	Digitaria nodosa Parl. UOG-421	Swank	Perennial	Whole	Fodder	Digestive disorders, malaria, laxatives, anti-bacterial	201	0.74
	90.	Brachiaria distachya (L.) Stapf. UOG-423	Jangli ghas	Annual	Whole	Fodder, juice	Jaundice, anti-allergic, detoxifier, clear menstrual discharge, General weakness	151	0.56
	91.	Brachiaria deflexa (Schumach.) C.E.Hubbard ex Robyns UOG-427	Moti ghas	Annual	Whole	Fodder, powder	Kidney problems, anti-inflammatory, styptic, demulcent, herpes	169	0.62
	92.	Brachiaria mutica (Forssk.) Stapf. UOG-429	Bubbr Kha	Annual	Leaves	Fodder, Extract	Toothache, sore, anti-inflammatory, controls itching	142	0.52

FC: Frequency of citations Uv: Use value CSI: Cultural significant index

Tribe	S. #	Binomial name	Local name	Life trend	Part Used	Preparation	Ethno veterinary uses	FC (n)	RFC
	93.	Brachiaria eruciformis Grisev. UOG-433	Sawari, Jhanda	Annual	Whole	Juice, paste	Leaves work as antiseptic, relieve in inflammation	159	0.59
	94.	Brachiaria reptans (L.) Gardner & Hubbard UOG-437	Hausa, Sair	Annual	Stem	Juice	Leaves juice helps to cure anemia, laxatives, diuretic	184	0.68
	95.	Brachiaria ovalis Stapf UOG-439	Ghaah	Perennial	Leaves	Juice	Anti-inflammatory	148	0.55
	96.	Cenchrus biflorus Roxb. UOG-441	Bhurat	Annual	Aerial	Extract	Urinary problems	163	0.60
	97.	Cenchrus ciliaris L. UOG-444	Dhaman	Perennial	Aerial	Juice, Extract	Urinary disorders	238	0.69
	98.	Cenchrus prieurii (Kunth.) A Marie UOG-448	Dhaman	Annual	Leaves	Juice	Digestive disorders, anemia, toothache, sore, general weakness	173	0.64
	99.	Cenchrus pennisetiformis Steud. UOG-454	Bara Dhaman	Annual	Whole	Paste, powder	Kidney problems, digestive disorders, herpes	186	0.69
	100.	Cenchrus setigerus Vahl. UOG-458	Kala dhaman, Talra	Perennial	Aerial	Extract, powder	Disinfectant, kidney pain, sore, wound, phlegmatic pains	135	0.50
	101.	Digitaria arvensis L. UOG-459	Tera	Perennial	Leaves	Fodder	Kidney problems, digestive disorders, anti-allergic	52	0.19
	102.	Digitaria ciliaris (Retz.) Koeler UOG-462	Shamokha, Tandla	Annual	Whole	Fodder	Diuretic, aphrodisiac, digestive disorders, anti-fungal	147	0.54
	103.	Digitaria longiflora (Retz.) Pers. UOG-465	Deeta, Indian Crab Grass	Annual	Whole	Fodder	Diuretic, kidney pain, general weakness, stimulant, cure wounds, styptic	88	0.32
	104.	Digitaria stricta R Rotch ex Roem. UOG-468	Meru	Perennial	Leaves	Fodder	Treat Tumors, diuretic, Emollient,malaria, digestive disorders, Anti-allergic	221	0.82
	105.	Digitaria radicosa (Presl) Miq. UOG-477	Trilling Crab Grass	Perennial	Whole	Fodder	, Leucorrhoea, digestive disorders, kidney pain, tonic	67	0.25
	106.	Digitaria sanguinalis (L.) scop. UOG-485	GhandhalaGhaa	Annual	Whole	Fodder	Antiseptic, stimulant, treat tumors, kidney pain, sore	173	0.64
	107.	Digitaria setigera Roth ex. Roem. & Schult. UOG-489	Ungli Gha, Fonio	Perennial	Whole	Fodder	Laxatives, diuretic, malaria, tonic, refrigerant, clear menstrual discharge	232	0.86
	108.	Digitaria violascens Link, Hort. UOG-490	Violet Crab Grass	Perennial	Leaves, Root	Fodder	Stimulant, treat tumors, diuretic, anti-bacterial, herpes	51	0.19

FC: Frequency of citations Uv: Use value CSI: Cultural significant index

Tribe	S. #	Binomial name	Local name	Life trend	Part Used	Preparation	Ethno veterinary uses	FC (n)	RFC
	109.	Echinochloa colona (L.) Link UOG-493	Jungli chowol, Sanawakri	Annual	Whole	Paste	Digestive disorders, general weakness, constipation, phlegmatic pains	182	0.67
	110.	Echinochloa crus-galli (L.) P. Beauv. UOG-495	Sanwak	Annual	Whole	Juice	Digestive disorders, demulcent	98	0.36
	111.	Ochthochloa mpressa (Forssk.) Hilu UOG-497	Phalwan, Gandeel, Jut Madhaana	Perennial	Aerial	Grains, raw material	Kidney pain, anti-allergic, clear menstrual discharge	152	0.56
	112.	Panicum antidotale Retz. UOG-499	Gharam, Morrot	Perennial	Whole	Decoction, Juice	Anti-bacterial	191	0.70
	113.	Panicum atrosanguineum Hochst. Ex A. Rich UOG-500	Moti Gha	Perennial	Seed	Decoction	For fever, diuretic, tonic, laxative, wounds treatment, gastrointestinal disease	43	0.26
	114.	Panicum maximum Jacq. UOG-501	Bansi Gha	Perennial	Whole	Paste, Decoction	Digestive disorders, diuretic, tonic, malaria, emollient	139	0.51
	115.	Panicum turgidum Forssk UOG-505	Bansi	Perennial	Whole	Paste	diuretic, febrifuge, tonic, Skin disorders, anti-allergic	81	0.30
	116.	Panicum psilopodium Trin. UOG-507	Cheena	Perennial	Leaves	Juice, Paste	Diuretic, laxative, cure cancer, gastrointestinal diseases	104	0.38
	117.	Paspalidium distichum L. UOG-511`	Knot grass	Perennial	Whole	Fodder, Juice	Diuretic, laxative, anti-bacterial, to treat dysfunctional organs, general weakness	93	0.34
	118.	Paspalidium flavidum (Retz.) A. Camus UOG-513	Gandh ghas	Perennial	Leaves	Powder	Urinary problems, laxative, anti-allergic, demulcent	86	0.32
	119.	Paspalidium punctatum (Burm.) A. UOG-524	Nseila	Perennial	Whole	Paste, decoction	Kidney problems, diuretic, oral infections, anti-bacterial	41	0.15
	120.	Paspalum paspaloides (Michx.) Scribner. UOG-533	Maro	Perennial	Leaves	Juice	Digestive disorders, antibiotic	84	0.31
	121.	Panicum repens L. UOG-539	Goli gha	Perennial	Whole	Juice	Digestive disorders, wounds treatment, emollient, to treat dysfunctional organs	213	0.39
	122.	Pennisetum divisum (J. Gmel.).Henrard UOG-542	Morrot, Awansi grass	Perennial	Leaves	Decoction	Urinary problems, anti-inflammatory, oral infections	94	0.35
	123.	Pennisetum glaucum (L.) R.Br. UOG-546	Bhaajhri	Perennial	Whole	Tea, Extract	Digestive disorders, jaundice, antibiotic, wounds treatment	100	0.37

FC: Frequency of citations Uv: Use value CSI: Cultural significant index

Tribe	S. #	Binomial name	Local name	Life trend	Part Used	Preparation	Ethno veterinary uses	FC (n)	RFC
	124.	Pennisetum americanum (L.) Leeke UOG-555	Bajra	Perennial	Leaves, Root	Decoction, juice	Digestive disorders, jaundice, detoxifier	38	0.14
	125.	Pennisetum orientale Rich UOG-566	Haathi ghaa	Perennial	Whole	Decoction	Relieve in inflammation	211	0.78
	126.	Sporobolus iocladus (Nees. ex. Trin.) Nees. UOG-567	Swag	Perennial	Leaves, Root	Fodder	Remove debris from wounded area, anti-allergic, general weakness	90	0.33
	127.	Paspalum dilatatum Poir. UOG-577	Batto	Perennial	Leaves	Juice	Laxative, gastrointestinal disease, oral infections	36	0.13
	128.	Setaria glauca (L.) P. Beauv UOG-578	Ban Kangni	Annual	Whole	Extract	Leucorrhoea, anemia, skin disorders, digestive disorders	228	0.84
	129.	Setaria intermedia Roem. & Schult. UOG-584	Chirchira	Annual	Whole	Powder, juice	Diabetes, gastrointestinal disease, oral infections	220	0.81
	130.	Setaria italic (L.) P.Beauv. UOG-587	Kangni	Annual	Leaves	Decoction, Extract	Urinary problem, anti-bacterial, relieve in inflammation	97	0.36
	131.	Setaria pumila (Poir) Roem. & Schult. UOG-589	Ban kangni	Annual	Aerial	Extract	Oral infections, general weakness	189	0.70
	132.	Setaria verticillata (L.) P. Beauv. UOG-590	Barchittas	Annual	Leaves	Grains	Indigestion demulcent	167	0.62
	133.	Setaria viridis (L.) P. Beauv. UOG-593	Kangni	Annual	Leaves, Stem	Grains	Urinary problems, febrifuge and tonic.	241	0.89
	134.	Brachiaria prostrata Grisev. UOG-596	Common Sandbur	Annual	Leaves	Juice	Headaches, tonic body, nervous system	231	0.85
	135.	Brachiaria ramose (L.) Stapf UOG-600	Brown top Millet	Perennial	Leaves	Juice	Infectious diseases, indigestion, laxative, anti-allergic	201	0.74
	136.	Pennisetum lansatum Klotzsch. UOG-605	Awansi grass	Annual	Whole	Fodder	Diuretic, improve fertility in bull, oral infections	160	0.59
	137.	Urochloa panicoides P. Beauv. UOG-611	Harat	Annual	Leaves	Smoke	Smoke of plant is supposed useful to treat measles, febrifuge, sore	143	0.53
	138.	Urochloa setigera (Retz.) Stapf. UOG-615	Jhun	Annual	Whole	Decoction	Patient of typhoid fever, sore, diabetes, demulcent	233	0.86
Poeae	139.	Dactylis glomerata L. UOG-621	Gadu	Perennial	Leaves	Extract	Diuretic, sore, herpes	101	0.37
	140.	Lolium temulentum L. UOG-625	Cockle	Perennial	Leaves	Grains	Nervous disorders, to treat dysfunctional organs	35	0.13

FC: Frequency of citations Uv: Use value CSI: Cultural significant index

Tribe	S. #	Binomial name	Local name	Life trend	Part Used	Preparation	Ethno veterinary uses	FC (n)	RFC
	141.	Lolium persicum Boiss. & Hohen. ex Boiss UOG-631	Bera ghas	Annual	Leaves	Grains	Respiratory infections, fever, diabetes, to treat dysfunctional organs, improve fertility in bull, general weakness	119	0.44
	142.	Poa annua L. UOG-633	Blue Grass, Jaie	Annual	Whole	Fodder, decoction	Gastrointestinal disease	251	0.93
	143.	Poa infirma Kunth. UOG-637	Wakh, Kandail	Annual	Whole	Decoction, juice	Digestive disorders, jaundice, diabetes, anti-fungal	249	0.92
Triticeae	144.	Hordeum vulgare L. UOG-645	Jao	Annual	Leaves, Seed	Paste, powder	Leucorrhoea, anemia, skin cleaner, diabetes, herpes	107	0.39
	145.	Triticum aestivum L. UOG-648	Kanak, Gandum	Annual	Whole	Paste	Anti-cancerous,, gastrointestinal disease	261	0.96
Zoysieae	146.	Leptothrium senegalense (Kunth) W. D Clayton UOG-650	Madhani	Annual	Whole	Juice, powder	Cure cancer, laxative, anti-inflammatory, anti-allergic	154	0.57
	147.	Tragus berteronianus Schult. UOG-655		Annual	Leaves	Decoction	Digestive disorders, nervous disorders, anti-bacterial	65	0.24
	148.	Tragus racemosus (L.) UOG-666	Swanri	Annual	Whole	Decoction	Digestive disorders, laxative, cure cancer, anti-allergic	54	0.20
	149.	Tragus roxburghii Kew Bull. UOG-786	Bur grah	Annual	Whole	Juice	Laxative, gastrointestinal disease, diabetes, Cure cancer, anti-bacterial	83	0.31

FC: Frequency of citations Uv: Use value CSI: Cultural significant index

Plant part (s) used

As depicted in Fig. 3, about 41% recepies were based on whole plant, followed by leaves, aerial parts and stem (29.53, 20.13 and 5.370%, respectively). As majority of the Poaceae taxa are small annual herbs with shallow roots, therefore they are easy to pull out as a whole plant and utilized to treat various diseases [4]. Likwiese, leaves are also easy to collect, rich in health beneficial secondary metabolites that contribute significantly in the treatment and prevention of health disorders [49, 53, 54].Leaves have also been reported previously as one of the most consistently used plant part for grazing and medicinal purposes [26, 36, 54].

Method of preparation and administration

As mentioned in Fig. 4, decoction was the common method of herbal preparation with 35 reports, followed by juice (31 reports), paste (26 reports), extract (24 reports), powder (10 reports), grains (5 reports), smoke (2 reports) and herbal tea, oil and raw material (1 report each). Crude preparation of decoction by boiling the plant parts in water for the treatment of various ailment is a common practice among the ethnic communities of in Punjab. The powder is prepeared by grinding the shade dried plant parts and paste is made from crushing the fresh or dried plant parts with water or oil [34].Mode of administration falls into two main categories viz. oral and topical. Herbal preparations used to treat internal diseases i.e. gastrointestinal disorders, fever, pain etc. are usually administrated orally, while for joint pain, skin infections topical method is common. Most of the plants were given orally as fodder (59 reports) without processing them in crude preparation.Offering plant as fodder to animals is the best way to treat a specific disease without having side effects. Interestingly, there is a significant trend of multi-plant formulation devised by semiprofessional herbalists and traditional practitioners. In that case, powder of more than one plants/plant part is orally administered with water known as “Phakki”. There are certain cases with such recipes where overdose and malpractice resulted in adverse drug reactions.

Ethno-veterinary uses of Poaceae taxa

In Pakistan, ethno-veterinary studies are an important source of indigenous information associated with animal healthcare system. The present study is a continuance of earlier explorations for the improvement of records on the ethno-veterinary medication in Pakistan. In Pakistan, many documentations of ethno-veterinary knowledge have been develop so far [9], [60], [77–99] but unfortunately grasses are totally neglect part. Many researchers carried out ethno-veterinary investigations in other parts of the world, for example Africa, Orma land- Kenya [100], Nigeria [101], Zimbabwe [102], India [103], China [104], Netherlands [105], America [106], Canada [7] and Brazil [107]. Besides these studies, literature on Poaceae members used in ethno-veterinary practices is still missing in Pakistan. Therefore, this paper contains an important information of biological resources used in ethnomedicines (EM) and ethnoveterinary practices (EVPs) in Punjab, Pakistan.

Ethno-veterinary implies all traditional methods used to treat common diseases in livestocks [55]. Nutritional value and pharmaceutical properties of Poacea taxa make them an ideal candidate among indigenous communities to cure and feed the domestic cattle [4]. Inhabitants of the study area use 149 plant speices to treat various health disorders in cattle, which were grouped into 12 major disease categories (Tables 2). As shown in Fig. 5, maximum number of use reports of plants were documented for infectious diseases (25.93%), followed by digestive disorders (14.10%), internal causes (13.90%), skin diseases (11.41%), cardiac disrders (8.50%), kidney problems (7.88%),reproductive diseases (5.60%), nervous problems (4.35%), musculoskeletal diseases (4.14%), respiratory infections (1.65%),injuries (1.45%), and cancer (1.03%).

Eulaliopsis binata, Saccharum bengalense, Sorghum halepense, Phragmites australis, Paspalidium punctatum, Pennisetum divisum, Paspalum dilatatum, Setaria intermedia, Brachiaria ramose and Pennisetum lansatum were mainly used to cure infectious diseases in livestock. Most of the skin disorders were cured by Aristida adscensionis, Koeleria argentia, Cynodon dactylon, Acrachne racemose, Panicum turgidum, Setaria glauca and Hordeum vulgare. In previous studies, Brachiaria ramose and Sorghum bicolor have been reported to treat microbial infections [56], and Sorghum halepense for infectious diseases in livestock [57].

Chrysopogon aucheri, Saccharum officinarum, Phragmites australis, Dactyloctenium scindicum, Desmostachya bipinnata, Eragrostis ciliaris, Eragrostis cilianensis, Eragrostis minor, Leptochloa chinensis, Parapholis strigosa, Cenchrus prieurii, Echinochloa colona, Echinochloa crus-galli, Paspalum paspaloides, Panicum repens, Pennisetum glaucum, Pennisetum typhoidum, Tragus berteronianus and Tragus racemosus were used to treat digestive diseases.These findings were compatible with other studies conducted in Pakistan succ as Desmostachya bipinnata, Eleusine indica, Eragrostis minor have already been reported to treat digestive disorders [4]. Likewise, Arundo donax, Cynodon dactylon and Dichanthium annulatum have been reported to cure gastrointestinal problems in animals [58–60]. Eleusine indica is used to cure abdominal pain in Punjab, whereas in previous study this plant has been reported as anti-helminthic, febrifuge and to treat cancer [61].

Cardiovescular diseases were treated with Phragmites karka and Polypogon monspeliensis. Acrachne racemosa, Eragrostis tenella, Brachiaria deflexa and Cenchrus pennisetiformis were used for kidney disorders, whereas Cymbopogon jwarancusa was used to cure reproductive diseases in livestock. Eulaliopsis binata and Lolium persicum were used to treat respiratory diseases. Cymbopagon citratus, Cymbopogon citratus, Avena fatua, Brachiaria prostrata, Lolium temulentum and Tragus berteronianus were used for nervous disorders. Cymbopogon citratus is used to cure nervous disorders and to stimulate glandular secretions but it has been reported as anti-bacterial, anti-fungal and anti-infamatory agent also [62]. Aristida funiculata, Stipagrostis plumose, Panicum psilopodium, Triticum aestivum, Leptothriumse negalense, Tragus racemosus and Tragus roxburghii were used in cancer.

We reported that Dactyloctenium aegyptium as detoxifier and antiallergic plant but according to [63] this plant has anti-inflammatory, anti-cancer, anti-microbial properties and is widely used to treat small pox and ulcer in children. Leucorrhoea, anemia, skin cleaner, diabetes and herpes are treated with Hordium vulgare in different parts of Punjab. Its stem is grinding and mixed with water in order to gain the weight in Hawassa Zuria District, Sidama zone, Southern Ethiopia [64].This plant is also used to treatfever in some parts of India while in Salt Range of Pakistan, flour made from this plant is used to cure jaundice [65, 66]. Desmostachya bipinnata is diuretic, anti-amenorrhea and is used to treat manydigestive disorders. [67] documented that powder made from the roots of this plant is used to cure rheumatism in Soon Valley of Pakistan while root infusion of the same plant is used to treat is urinary infections and whole plant is taken orally to treat dysentery [68]

Vetiveria zizanoidesis is antiseptic, demulcent and anti-inflammatory. It is rich in aroma which is used to treat stomach disorders and inflammation [69]. Paste made from the leaves of Cynodon dactylon effective against skin injuries while juice of the plant is used in healing bone fractures. According to [66], root decoction of Cynodan dactylon is given to cattle having repiratory problem.Decoction made from Sorghum bicolor is given to the children in case of typhoid and water extracted from the plant is used to bath the babies [70]. Themeda anathera is refrigerant and juice extracted from leaves is used to reduce depression. However, decoction made from the leaves is also used as blood purifier [71]. Desmostachya bipinnata is anti-amenorrhea and diuretic. Decoction made from the leaves is given to asthma patient to relieve from pain [72]. Decoction made from the whole plant of Cymbopogon jwarancusa is used in typhoid fever. Other documented ethnomedicinal uses are; abdominal pain, tumor and unconsciousness [73]. Eleusine indica is used in abdominal pain which is in line with the study of [7], who reported that grain flour made from the aerial parts of the same plant is used to treat digestive problems. Apluda mutica is used to get relieve from stomach pain while [74] reported that paste made from this plant is also used to cure fungal diseases in livestock. [38] describe that besides imporving digestion, Bothriochloa bladhii is also used as stored food and fodder for both livestock and wild ruminants. Extract made from aerial parts of Zea mays is detoxifier, nerve tonic and antiseptic. [56] reported that seedsof the same plant are mixed with oil to manage tick infection in livestock. Paste made from leaves of Imperata cylindrica is given to cattle in order to control microbial infections. [75] reported that this plant possess antioxidant, neuroprotective and anticer properties. Juice extracted from leaves and roots of Saccharum spontaneum improves appetite and gives relieve in inflammation, urinary problems and abdominal pain. According to [60], stem of this plant is chewed to relieve stromach pain. Whole plant of Dichanthium annulatum is used in indigestion but [76] also reported that whole plant is also used in dysentery and menorrhagia.

Cultural significance index (CSI)

Cultural significance index was used to calculate the importance of individual plant used by indigenous people.In CSI, the recognition or reputation of species is linked to its functions to the people and are considered auxiliary element in the cultural recognition of a plant [108, 109]. It was observed that cultural importance of each species varies between local communities. This difference is influenced by level of knowledge, the particular cultural settings and the local conditionsIn the present study, CSI values varied from 0.13 to 8.00 which was markedly affected by the preference, manangement and frequency of use by the local inhibitants (Table 2).

The highest CSI value was obtained byTriticum aestivum (8.00), which is extensively used in anticancerous and gastrointestinal disorders in livestocks.The other 6 species and their respective CSI are Oryza sativa (0.81), Poa annua (7.69), Cynodon dactylon (7.34), Avena sativa (7.33), Saccharum officinarum (7.14) and Zea mays (6.77). These species were highly cited and preferentially used by the informants to be used in theurapeticand other purposes but also cultivated and used different kind of management tools. The preference and frequency of use and quality of medicinal use are the factors that determine the cultural importance of plants. The high CSI values of plant species also reflect the fact that more a species is available to the users of a community for medicinal purpose, it become more important. For instance, Triticum aestivumis well known herb which is mentioned in Ayurveda herbal system. It has been used in a large number of dietary supplements and is extreamly valuable for treating various ailments such as kidney malfunctioning, immune modulator, joint sweeling and bacterial infecton [110]. The documented species with high cultural significance are not only important for ethnic groups of Punjab but also for the other ethnic group of the world. Further, these species have accumulated a lot of traditional knowledge that has been transmitted direct experience over the time in next generations. Grasses represented with lowest CSI values were, Lolium temulentum (0.13), Paspalum dilatatum (0.14), Pennisetum typhoidum (0.15), Paspalidium punctatum (0.15), Avena sterilis (0.15), Panicum atrosanguineum (0.16), Parapholis strigosa (0.16), Tetrapogon villosus (0.16), Enneapogon persicus (0.17), Sporobolus arabicus (0.17), Dactyloctenium aristatum (0.17), Polypogon fugax (0.17), and Apluda mutica (0.18). The results obtained in our study are in agreement with the studies conducted by other researchers [111], who observed that plants which are not easily availability touser community for the disease managementarelesssignificant and usually havelower CSI value. However [112] proposed a weak correlation between use and availability of plants and suggested that species with greater cultural significance have a tendency tobecome vulnerable or rare locally.

Relative frequency of citations (RFC)

Relative frequency of citations reveals the importance of each grassamong indigenous communities of Province Punjabin ethno-veterinary medicines and primary health care of animals to make them healthy and productive. It is calculated from the citation frequency of informants claiming the use of a plant species divided by the total number of informant who participated in the survey to share their indigenous knowledge [5]. In our work, RFC ranges 0.96 to 0.14 (Table 2).

Maximum RFC values was obtained by Triticum aestivum (0.96).The other high citationspecies and their respective values are Oryza sativa (0.94), Poa annua (0.92), Dichanthium annulatum (0.92), Cynodon dactylon (0.91), Poa infirma (0.91) and Avena sativa (0.91), Setaria viridis (0.88), Saccharum officinarum (0.85), Saccharum bengalense (0.85), Urochloa setigera (0.85), Digitaria setigera (0.85) and Brachiaria prostrata (0.85), Chloris barbata (0.84), Setaria glauca (0.84), Sorghum bicolor (0.82), Zea mays (0.81), Setaria intermedia (0.81), Sorghum halepense (0.80), and Eragrostis minor (0.80).These species narrate the fact that these plants were known to local culture for a long period of time. It is noteworthy that majority of the people in different regions of the Punjab were not fully aware of the medicinal potential of the plants of Poaceae. The poor educational background is the major reason that directly affects the learning system in this concern. The study is in agreement with [113]. Relative frequency of citation highlighted the importance of individual species among local communities based on the number of uses [114].It has been suggested [55] that plants with high RFC values should be involved in biological, phytochemical and pharmacological studies for further investigation of drug development. Such kind of plants must be conserved on priority basis due to the threat of over exploitation and extensive use of these plants in community [19]. Values of RFC are very dynamic as it changes with area to area and depends on the folk knowledge of the native people. It is well known that species with low RFC values are not unavoidably insignificant [115]. Their low value may represent the low knowledge of the local people in particular the younger ones who are not aware of the uses of these species.

Plants with high RFC values depicted their dominancy in the study area and indigenous people had more familiarity with this group. These plants were preferred over others because of their availability and positive role in traditional health system. The results are in line with the “appearance hypothesis” [57], which explains that local people have greater knowledge of ethnomedicinal use on plants which are more common in an area. Futher, common plants would allow local peopleto gain more experience of their properties and consequently would have a greater probabilityof being introduced into the local culture [55].

Use Value (UV)

UV index was used to evaluate the importance of plant species among the indigenous communities [116]. UV value ranged from0.02 to 0.93 (Table 2). The most commonly used medicinal plants in livestock diseases were, Triticum aestivum (0.93), Sorghum bicolor (0.91), Cymbopogon citratus (0.89), Avena sativa (0.86) Poa annua (0.86), Hordeum vulgare (0.83), and Cymbopogon martini (0.81) and Saccharum spontaneum (0.80). The high use value of the species show their importance in the traditional medicine system [117]. The high use value of medicinal plants can be attributed with the fact that they are the first choice of the traditional healers for the treatment of ailments and local inhabitants are well aware off these plants [57], [118]. Species with low use value were, Chloris dolicostachya (0.02), Enneapogon persicus (0.04), Panicum repens (0.05), Pennisetum lansatum (0.06) and Tragus racemosus (0.06).This might be due to their less availability but they are not necessarily less effective [57]. These plants can be employed inthe development of human pharmaceuticals [119].

Correlation among used indices

The relationship among ethnobotanical indices i.e.CSI, RFC and UV. is given in Fig. 6. A strong positive correlation was present between CSI and RFC (r^2 = 0.60), followed by CSI and UV (r^2 = 0.52) while between RFC and UV a relatively weak positive correlation was recorded (r^2 = 0.25). About 60% of the values of CSI and RFC and52% of the CSI and UV values fall in the same region, representing high association among these indices whereas, only 25% values of RFC and UV showed weak correlation between these two indice.

Fidelity level

Fidelity level of 24 most important species ranged from 14.3 to 100% (Table 3). In general, the highest fidelity level of a species highlighted the existence of a particular disease in the study area and utilization of plant species by the local people in order to treat it [93, 94]. Triticum aestivum and Saccharum spontaneum showed 100% fidelity level for anticancer and urinary pain. Other species with high FL values were; Cymbopogon jwarancusa (Typhoid fever), Vetiveria zizanioides (Stomach pain), Saccharum officinarum (Digestive disorders), Tetrapogon tenellus (Antimicrobial), Desmostachya bipinnata (Digestive problems), Saccharum bengalense (Oral infections), Eragrostis minor (Anti-inflammatory), Oryza sativa (Wound healing), Dactyloctenium aegyptium (Jaundice), Phalaris minor (Cough) and Chloris virgate (Bone fracture) with 98, 94, 84, 80, 78, 76, 75, 74, 71, 71 and 70%, respectively. Use of plants by human beings for animal health care is an old practice. These species are not only used for feeding livestock instead these are an important and cheap source of medicine for cattle to treat multiple health issues [120]. The traditional ethno-veterinary system has played a significant role in animal production especially in the rural areas where livestock diseases are locally treated [121, 122].

Table 3
Highly utilized plant species with FL, RPL and ROP

S. No.	Species name	I_u	NA	Major ailments	I_p	FL	RPL	ROP
1.	Triticum aestivum	84	3	Anticancer	84	100	1	100
2.	Saccharum officinarum	90	3	Digestive disorders	76	84	1	84
3.	Sorghum halepense	80	4	Infectious diseases	55	69	1	69
4.	Cymbopogon jwarancusa	84	4	Typhoid fever	82	98	1	98
5	Saccharum bengalense	71	7	Oral disorders	54	76	1	76
6.	Saccharum spontaneum	71	4	Urinary pain	71	100	1	100
7.	Oryza sativa	68	3	Diarrhea	50	74	1	74
8.	Vetiveria zizanioides	65	3	Stomach pain	61	94	1	94
9.	Arundo donax	62	5	Blood pressure	37	60	0.98	58
10.	Bambusa glaucescens	57	4	Allergies	30	53	0.92	48
11.	Phragmites karka	53	2	Nervous problems	25	47	0.86	41
12.	Imperata cylindrica	51	6	Piles	25	49	0.86	42
13.	Cynodon dactylon	42	8	Anemia	24	57	0.79	45
14.	Setaria pumila	34	2	Oral infection	21	62	0.74	46
15.	Bromus japonicus	29	2	Constipation	17	59	0.74	43
16.	Sporobolus ioclados	29	5	Liver disorder	14	48	0.66	32
17.	Octhochloa compressa	21	4	Kidney pain	14	67	0.58	39
18.	Panicum antidotale	19	2	Antibacterial	10	53	0.53	28
19.	Phalaris minor	14	1	Cough	10	71	0.5	36
20.	Dactyloctenium aegyptium	14	4	Jaundice	10	71	0.45	32
21.	Tetrapogon tenellus	10	4	Antimicrobial	8	80	0.45	36
22.	Chloris virgata	10	2	Bon fracture	7	70	0.41	29
23.	Desmostachya bipinnata	9	4	Digestive problems	7	78	0.36	28
24.	Eragrostis minor	8	2	Anti-inflammatory	6	75	0.29	22

Legends: Iu: Sum of participants who claimed the use of a grass for any purpose NA: Number of ailments treated Ip: Number of participants who reported the use of a grass for specific purpose FL: Fidelity level RPL: Relative popularity level ROP: Rank order priority.

Relative popularity of species

One hundred and forty-ninespecieswere mentioned by 271 informants, interviewed during this study for different kind of diseases. Of these, 125 specieswere reported by fewer than 8 informants and therefore were excluded for further discussion. The rest of the 24 specieswere reported by more than 7 informants are presented in Table 3. For speciescited by 8 to 62 informants, the number of uses per species increased progressively (Fig. 7) with increase in the number of informants interviewed showing positive correlation (r, 0.14, coefficient of variation, 0.46). Conversely, speciesmentioned by more than 65 informants, the average number of uses per speciesdid not increased with increasing number of informants. About sixteen plant species mentioned by 62 informants were grouped as unpopular whereas, eight species reported by 65 or more informants were classified as popular.

Specieswith high popularity level (1.0 RPL) were; Triticum aestivum, Saccharum officinarum, Sorghum helepense; Cymbopogon jwarancusa, Saccharum bengalense, Saccharum spontaneum, Oryza sativa and Vetiveria zizanioides. The healing potential of each species may vary and is expressed by its FL value [36]. Rank order priority index can be used as correction factor to rank plants properly with different fidelity level [48]. Out of 24 species only 9 attained 50% or above ROP values. This can be attributed to the decreasing popularity of herbal medicines in the study area. Triticum aestivum and Saccharum spontaneum were reported with highest ROP value (100%), trailed by Cymbopogon jwarancusa (98%), Vetiveria zizanioides (94%), Saccharum officinarum (84%), Saccharum bengalense (76%), Oryza sativa (74%), Sorghum halepense (69%) and Arundo donax (58%). Rest of the specieswere presented by less than 50% of ROP values. The high popularity of these speciescan be attributed to their high nutritional values [4] and may be linked to the fact that local farmers are well aware of these speciesand they frequently used them for the treatment of various ailments in the livestock. This is an agreement with similar findings of previously reported studies conducted in same province (Punjab) [4, 36]. Our study is also consistent with the findings of on the status of healing potential of medicinal plants in Palestinian area [48] and medicinal plants among Bedouins communities in Negev desert [46].

Jaccard Index (JI)

Novelty index was done (Table 4) in order to compare the reported taxa with the other studies conducted in different parts of same province (Punjab), other provinceof Pakistan andin neighbouring countries like India, Bangladesh and Nepal.Ethobotanical information may have cultural differences and different origin among rural populations as this knowledge greatly varied from region to region [52, 54]. Therefore, a comprehensive research with highunderstandingof ethnobotanical folk knowledge is mandatory for better judgement [123], and exploration of traditional knowledge in order to find novelty in work and possible drug discovery [98, 124]. Jaccard index in our study ranged from 12.2 to 0.37. Within Pakistan, highest Jaccard index (12.2) was found with previous report from Hafizabad Punjab, Pakistan [4], followed by the study conducted by [125], from district Layyah, Punjab, Pakistan (5.61), [57] from Swat KPK, Pakistan (3.70), [126] from Gujrat, Pakistan (3.63) and [4] from Central Punjab, Pakistan (3.63).Outside the Pakistan, maximum Jaccard index was found with the study conducted by [70] from Ogun State, Nigeria (1.99), [127] from Terai Forest, Western Nepal (1.97) and [128] from tropical regions of Nigeria (1.73). Within Pakistan, the lowest Jaccard index was recorded from [21] from Quetta-BalochistanPakistan (0.36), [57] from Hungu, Pakistan (0.46) and [50] from Mohmand Agency, FATA, Pakistan (0.47). In the world, the lowest novelty index was recorded for [129] from Eastern Amazon, Brazil (0.49), [130] from Tamil Nadu India (0.50), [131] from Baitadi&Darchula, Nepal (0.50) and [54] from Bandarban, Bangladesh (0.60).

Table 4
Comparison between present and previous studies at neighboring, regional, and global level as performed by Jaccard Index (JI)

S.N.	Study area	Journal name	Ref.	TRS	CPBA	PPAA	PPSA	PSU	PDU	% SU	% DU	JI
1	A: Bandarban, Bangladesh	Front. Pharmacol.	[127]	159	1	9	147	0	1	0	0.06	0.64
2	B: Lakki Marwat KPK, Pakistan	J. Ethnopharmacol.	[132]	62	3	59	146	1	2	0.16	0.32	1.48
3	A: Nigeria	J. Ethnopharmacol.	[131]	93	4	89	145	3	1	0.32	0.1	1.73
4	B: Ratwal, District Attock, Paksitan	Pak. J. Bot.	[62]	43	1	42	148	0	1	0	0.23	0.52
5	B: District Peshawar, KPK, Pakistan	Pak. J. Bot.	[91]	83	8	75	141	5	3	0.6	0.36	3.70
6	B: Karak, KPK, Pakistan	J. Ethnopharmacol.	[145]	46	3	43	146	3	0	0.65	0	1.61
7	B: Hangu, KPK, Pakistan	Evid Based Comp. Alt. Med.	[132]	67	1	66	148	0	1	0	0.14	0.46
8	C: Talagang, Punjab, Pakistan	Braz. J. Pharmacol.	[70]	101	3	98	146	1	2	0.09	0.19	1.24
9	A: Ogun State, Nigeria	Amer. J. Plant Sci.	[129]	63	4	59	145	1	3	0.15	0.19	1.99
10	A: Tamil Nadu, India	Braz. J. Pharmacol.	[134]	54	1	53	148	1	0	0.18	0	0.50
11	A: Eastern Amazon, Brazil	J. Ethnopharmacol.	[133]	56	1	55	148	0	1	0	0.17	0.49
12	B: Tehsil Kabal, KPK, Pakistan	J. Bot	[146]	138	3	135	146	1	2	0.07	0.14	1.07
13	Gujrat, Punjab, Pakistan	Ethnobotanical Leaflets	[70]	88	8	80	141	7	1	0.79	0.11	3.63
14	C: Hafizabad, Punjab, Pakistan	Plosone	[71]	85	8	87	141	6	2	0.7	0.23	3.63
15	A: Western Himalaya, India	J. Ethnobiol Ethnomed.	[147]	78	2	76	147	1	1	0.12	0.12	0.90
16	B: Abbottabad, Pakistan	J. Ethnopharmacol.	[18]	120	1	119	148	0	1	0	0.08	0.37
17	A: Guimaras Island, Philippines	J. Ethnopharmacol.	[33]	142	4	138	145	1	3	0.07	0.21	1.45
18	A: Switzerland	J. Ethnobiol Ethnomed.	[148]	22	1	21	148	1	0	0.45	0	0.60
19	B: Mohmand Agency, FATA, Pakistan	J. Ethnobiol Ethnomed.	[60]	64	1	63	148	1	0	0.15	0	0.47
20	Uige, Northern Angola	J. Ethnobiol Ethnomed.	[144]	122	3	118	146	0	3	0	0.24	1.14
21	A: Baitadi & Darchula, Nepal	J. Ethnobiol Ethnomed.	[135]	53	1	52	148	0	1	0	0.18	0.50
22	C: Central Punjab, Pakistan	J. Ethnobiol Ethnomed	[4]	53	53	0	96	38	13	0.71	0.24	12.25
23	C: Layyah, Punjab, Pakisstan	Ind. Res. J. Pharm. Sci.	[128]	78	11	69	138	7	2	0.89	0.25	5.61
24	C: Toba Tek Singh, Punjab, Pakistan	Ind. Res. J. Pharm. Sci.	[143]	17	4	13	145	0	4	0	0.23	2.59
25	A: Terai Forest, Western Nepal	J. Ethnobiol. Ethnomed.	[130]	66	4	62	145	2	0	0.3	0	1.97

A: International, B: National, C: Provisional, Ref. References, TRP: Total reported species, CPBA: Common plants of both areas, PPAA: Plants only present in the aligned area. PPSA: Plants only present in the study area, PSU: Plants with similar uses, PDU: Plants with different uses,

In the current study, percentage of similar usesranged from 0.89 to 0.00 and dissimilar uses percentage ranged from 0.36 to 0.00 (Table 4).The highest level of similar plant uses (0.89) were matched with the study conducted by [125], from district Layyah, Punjab, Pakistan, followed by the [126] from Gujrat, Pakistan (0.79), [4] from Central Punjab, Pakistan (0.71), and [36] from Hafizabad, Punjab, Pakistan (0.70). All these studies were conducted from different parts of same province (Punjab). The highest percentage of dissimilarities of plant uses was matched (0.36) with [117] from Peshawar KPK, Pakistan, trailed by (0.32), [54] from Lakki Marwat, KPK, Pakistan.

The high degree of similar type of plant uses may indicate same cultural practices among communities and similar type of vegetation may reflect same type of floral diversity and climate in those areas [41]. It has been recorded that neighbouring indigenous communities share more common traditional practice of plants as medicines in order to cure various ailments and this is because of more social trade and sharing of ethnomedicinal knowledge among native groups [132, 133]. In contrast, a low similarity index indicates less sharing of medicinal knowledge and low social interaction that could have been happened in the past bringing more difference in ethnobotanical practices [50]. Geological isolation of ethnic groups and plants resulted a significant change in vegetation structure and therapeutic uses of indigenous plants and this may be a reason for loss of ethnobotanical information [44]. A low degree of similarity index of our study with other studies conducted in same province or in other parts of Pakistan indicated that either a little attention has been paid towards grasses in these studies and zero (0) percent similarity index show that grasses were totally ignored. Therefore, this is the first comprehensive report on ethno-veterinary knowledge of indigenous grasses of whole province of Punjab.

Similarities and differences in ethnobotanical use of plant species were compared with studies conducted within and outside the Pakistan. The maximum diversity in ethnobotanical uses of plants was found with the study of [4] from Central Punjab, Pakistan (13 uses) and data is presented in Table 5. It was trailed by other studies conducted in surrounding areas; [118] from Toba Tek Singh, Punjab, Pakistan (13 uses), [134] from Peshawar, Pakistan (3 uses), and [135] from Uige, Northern Angola (3 uses) and [136] from Guimaras Island, Philippines (3 uses). In rest of the studies, diversity in therapeutic uses of medicinal plants was found 1 to 2 or 0. The maximum similarity in ethnobotanical uses was found in [4] from Central Punjab, Pakistan (38 uses), followed by [125] from Layyah, Punjab Paksitan (7 uses), [126] from Gujrat, Punjab, Pakistan (7 uses) and [36] from Hafizabad, Punjab, Paksitan (6 uses).

Table 5
Diversity in uses of medicinal plants used by the communities across the globe.

Sr.#	Work done previously	Location	Common uses	Diverse uses
1.	[4]	Central Punjab, Pakistan	38	13
2.	[128]	Layyah, Punjab, Pakistan	7	2
3.	[71]	Hafizabad, Punjab, Pakistan	6	2
4.	[34]	Gujrat, Punjab, Pakistan	7	1
5.	[91]	District Peshawar, KPK, Pakistan	5	3
6.	[143]	Toba Tek Singh, Punjab, Pakistan	0	4
7.	[33]	Guimaras Island, Philippines	1	3
8.	[70]	Talagang, Punjab, Pakistan	1	2
9.	[144]	Uige, Northern Angola	0	3
10.	[129]	Ogun State, Nigeria	1	2
11.	[134]	Tamil Nadu, India	1	0
12.	[146]	Tehsil Kabal, KPK, Pakistan	1	2
13.	[145]	Karak, KPK, Pakistan	3	0
14.	[131]	Nigeria	3	1
15.	[132]	Lakki Marwat KPK, Pakistan	1	2
16.	[127]	Bandarban, Bangladesh	0	1
17.	[62]	Ratwal, District Attock, Paksitan	0	1
18.	[132]	Hangu, KPK, Pakistan	0	1
19.	[133]	Eastern Amazon, Brazil	1	0
20.	[147]	Western Himalaya, India	1	1
21.	[18]	Abbottabad, Pakistan	0	1
22.	[148]	Switzerland	1	0
23.	[60]	Mohmand Agency, FATA, Pakistan	1	0
24.	[135]	Baitadi & Darchula, Nepal	0	1
25.	[130]	Terai Forest, Western Nepal	2	0

Novelty in ethno-veterinary uses

Therapeutic uses of plant species of family Poaceae were compared with previous reports from different parts of the Pakistan and with other studies conducted in the neighbouring areas including India, Bangladesh and Nepal to find out the novelity index. The data showed significant differences in the usage plant species and their parts used to treat helath disorders in animals. Out of 149 species, ethnomedicinal uses of 12 plant species such as Chrysopogon zizanioides (anti-inflammatory), Pennisetum lansatum (improve bull fertility), Cymbopogon citratus (glandular secretion), Sorghum saccharatum and Themeda triandra (malaria), Aristida funiculate (anticancer), Koeleria argentia (skin allergies), Tetrapogon villosus (antibacterial), Cynodon radiates (eyes infection), Sporobolus nervosa (Jaundice), Enneapogon persicus (antifungal), and Panicum repens (dysfunctional cattle organs) have rarely been repprted so far from this region and rest of the world. It is noteworthy that majority of these plants have not been explored pharmacologically. Therefore, could be used for indepthphytochemical screening and bioactivity assays in order to validate their traditional uses. Moreover, less familiar Poa annua, Dichanthium annulatum, Poa infirma, Setaria viridis, Saccharum bengalense, Urochloa setigera, Digitaria setigera, Brachiaria prostrata, Chloris barbata, Setaria glauca, Setaria intermedia and Eragrostis minor with high citations should also be investigated in detail.

Conclusion

Present stuy is the first comprehensive report emphasis on the application of Poaceae taxa in ethno-veterinary health disorders. A total of 149 species were reported with therapeutic uses that represent new bioresources for pharmacological studies and drugs discovery. Our study revealed that ethnobotanical knowledge of Poaceae taxa is less prevailing in the rural areas of Punjab compared to other medicinal plants. Therefore, ethnomedicinal application of the members of this family should be reportedfrom other parts of the country, which will be helpful in conserving precious medicinal plant knowledge and itsapplication in novel drug discovery.

Declarations

Ethics approval and consent to participate

Before conducting interviews, prior informed consent was obtained from all participants. The study was carried out according to the set rules and recommendations of the Code of Ethics of the International Society of Ethnobiology. No further ethics approval was required.

Consent for publication

This manuscript does not contain any individual person's data and further consent for publication is not required.

Competing interest

The authors declare that they have no competing interest.

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Authors' contribution

Khizar Hayat Bhatti and Muhammad Shoaib Amjad: Conceptualization, Methodology; **Muhammad Majeed:** Data curation, Writing-Original Draft Preparation, **Audil Rashid:** Identification; **Arshad Mehmood Abbasi and Khawaja Shafique Ahmad:** Supervision, Resources; **Fahim Nawaz:** Writing- Reviewing and Editing; **Ansar Mehmood:** Validation, Visualization; **Majid Mahmood:** Software, Formal Analysis

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Figures

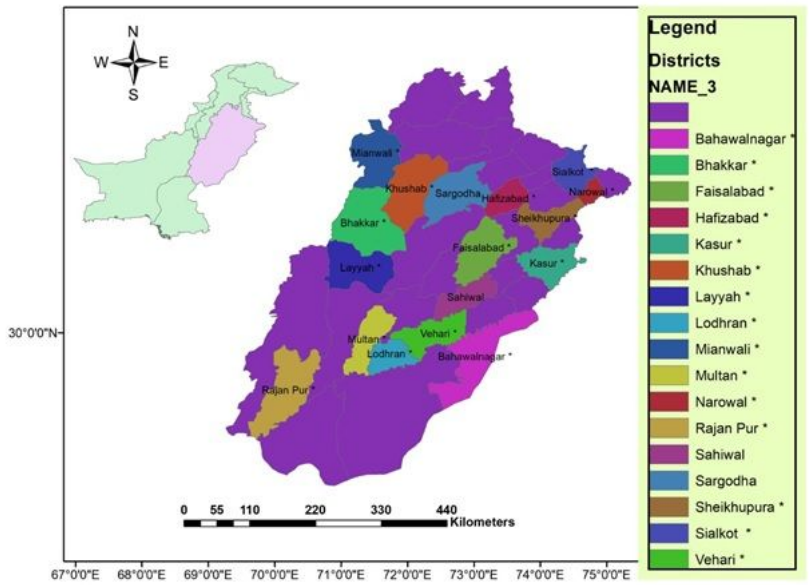

Figure 1

Map of study area showing all districts of Punjab, Pakistan.

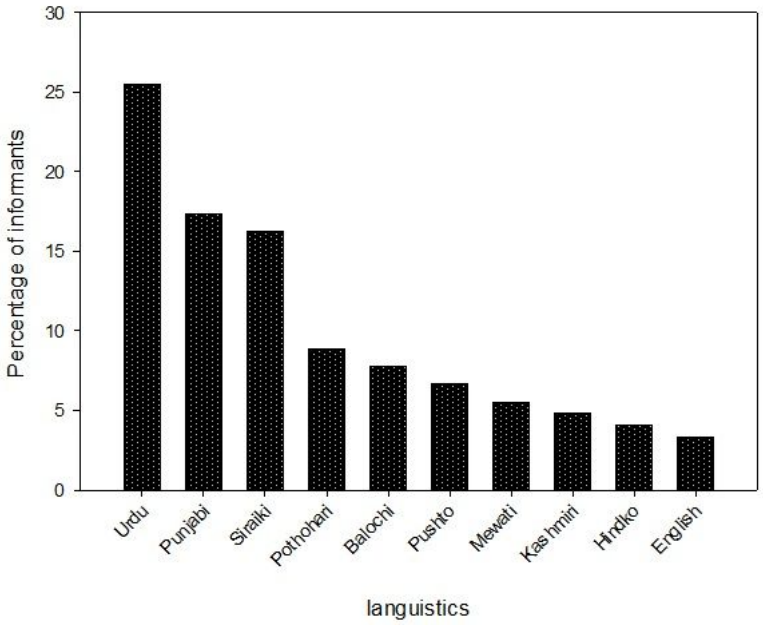

Figure 2

Linguistic wise classification of informants.

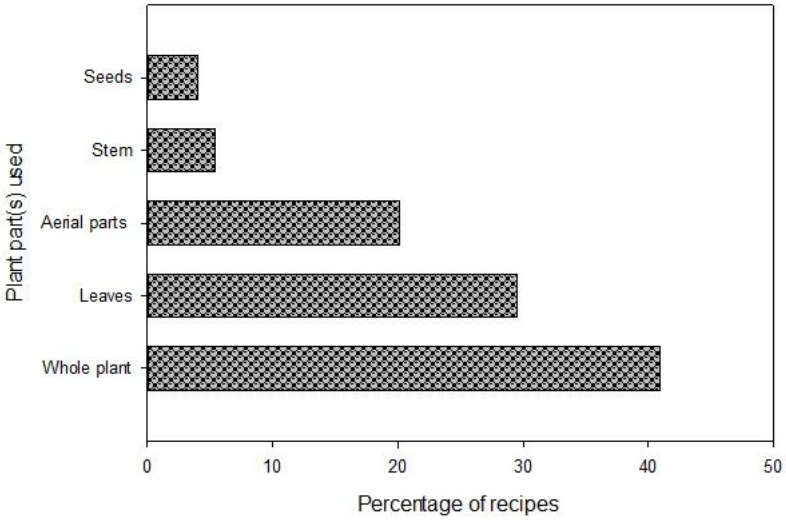

Figure 3

Proportion of plant part (s) used in different recipes.

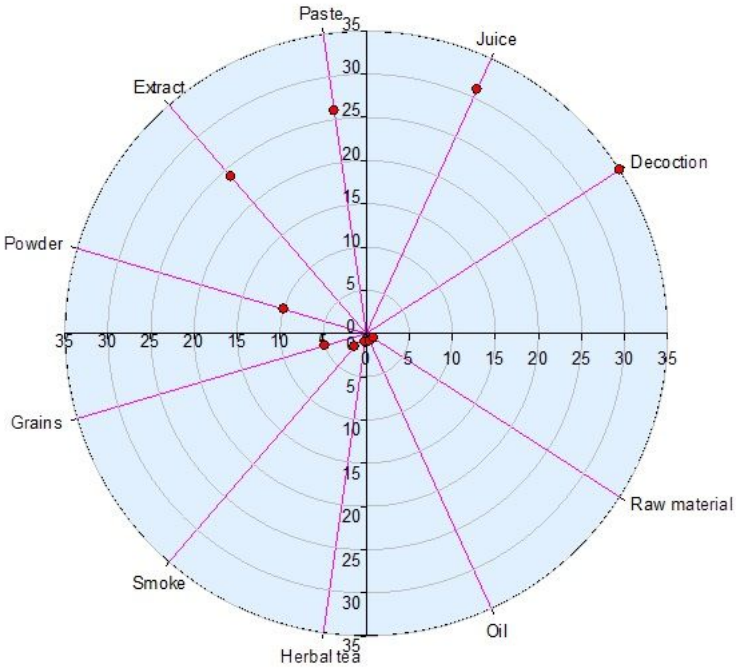

Figure 4

Methods of herbal preparations.

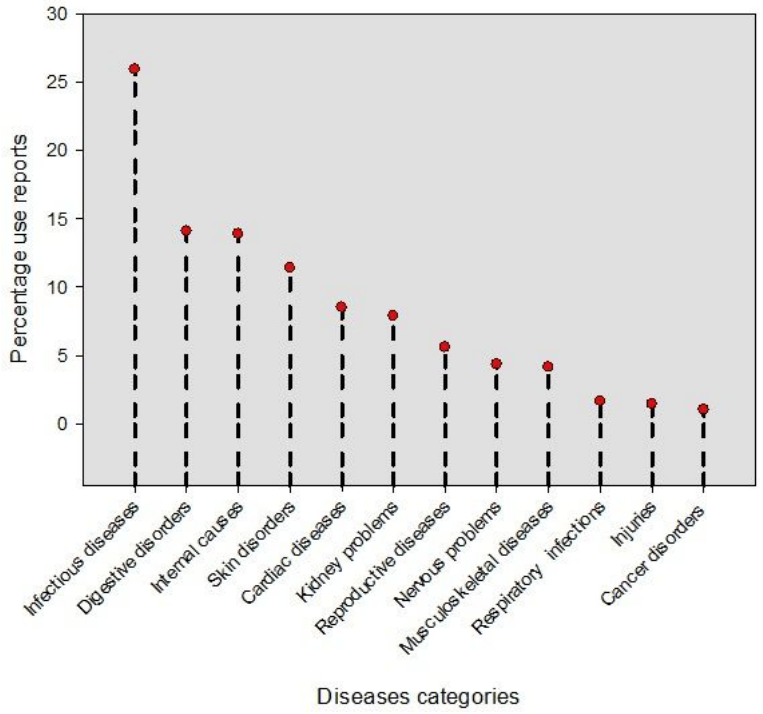

Figure 5

Percentage use reports of Poaceae taxa in different ailments

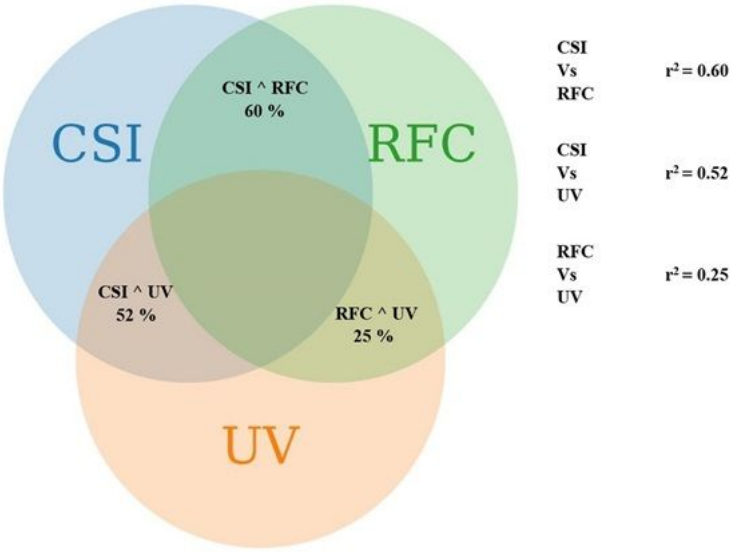

Figure 6

Correlation among various ethnobotanical indices.

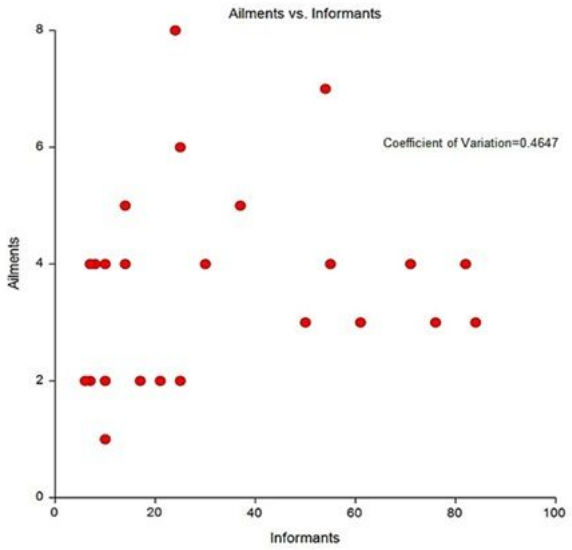

Figure 7

Correlation between number of informants and ailments.