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Ethno-veterinary medicines of South Punjab, Pakistan

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SUMMARY

Flora is listed not utilized as forage or fodder, but also to treat a range of health issues, particularly in pet and domestic fauna. This study is the primary baseline research on folklore veterinary usage of flora carried out in Cholistan. The purpose of this study was to establish whether therapies were still in usage and to write traditional veterinary uses to conserve it and avoid its extinction due to oral transmission. This research was carried out between 2020 and 2021 with the goal of recording ethnopharmacological flora consumed to cure animal illnesses. 99 informants offered knowledge on how to cure various animal illnesses via semi-structured interviews, conversations, and a guided transect walk. In all, 42 plant species from 23 families were identified as being utilized to treat various livestock illnesses by indigenous tribes in the research region. The Poaceae family was the most prominent in this study, followed by the Fabaceae, Euphorbiaceae, and Amaranthaceae, among others. Plant species' leaves are the most widely utilised portions in the production of traditional veterinary remedies. On the basis of the RPL index, *Cenchrus setiger, Cymbopogon jwarancusa, Cassia senna, Cynodon dactylon, Calotropis procera, Citrullus colocynthis, Panicum antidotale, Capparis deciduas, Zizyphus numularia, Cenchrus ciliaris, Sporobolus ioclados, Avera javanica, Cenchrus biflorus,* and *Euphorbia caducifolia* were documented to be the highly popular species in Cholistan, Pakistan. The maximum use value was reported for *Cenchrus setiger* (0.31). The traditional healthcare system is solely known to folklore health therapy. The new study makes a significant contribution to the preservation of customary flora-based data. And, Medicinal and phytochemical research of common flora species may result in the development of innovative medications to treat health problems.

Keywords: Ethno-veterinary medicine, Flora, Animal health

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INTRODUCTION

Almost every society on the planet has a relationship with livestock and natural flora and animals. This biodiversity provides them with food, trade, cloth, leather, fertilizers, decoration pieces, ethnomedicine and responses as a wealth amass (Ngeh *et al.*, 2007). Despite the large number of livestock and the significant financial investment, the department has not progressed beyond a survival of endeavor, and it

has also stays with low results for a variety of reasons, the most serious of that are livestock ailments (Yadav, 2007).

In various societies around the world, practices related to the usage of ethnopharmacological fauna and flora for the treatment of ailments has been passed down from forefathers to the next generation. In fresh years, the customary usages of many pharmacological fauna and flora have been confirmed by scientists (Bischoff *et al.*, 2016; Khan *et al.*, 2017; Muhammad *et al.*, 2017a; Muhammad *et al.*, 2017b; Muhammad *et al.*, 2017c; Umair *et al.*, 2017b). However, the biological resources used for medicine are not limited to the treatment of human ailments, but are also widely used to cure livestock illnesses (Lans *et al.*, 2006; Di Sanzo *et al.*, 2013; Piluzza *et al.*, 2015; Bullitta *et al.*, 2018). These uses fall within the ethno-veterinary medicine remit. The pharmacopoeia of ethno-veterinary usually has constituents sourced from different societies and may include mineral deposits, flora and fauna (Bartha *et al.*, 2015). Further, medicinal plant information was passed down orally from one generation to the next generation, though, in the whole world, traditional information is at risk of vanishing (Anyinam, 1995). In Iran, India, Brazil, America, Spain, Morocco, Algeria, Italy, Palestine and Pakistan ethno-veterinary surveys on the synthesis and use of herbal therapy have been documented (Pieroni *et al.*, 2004; Bullitta *et al.*, 2007; Akerreta *et al.*, 2010; Martínez and Luján, 2011; Sindhu *et al.*, 2012; Benarba *et al.*, 2015; Yadav *et al.*, 2015; Ali-Shtayeh *et al.*, 2016; Baharvand-Ahmadi and Asadi-Samani, 2017; Kujawska *et al.*, 2017; Bullitta *et al.*, 2018; Amaghnouje *et al.*, 2020).

As verified by scientists, the traditional biomedical data revival connected to their use of therapy is one of the most vital and significant topics requiring attention. Popular traditions' preservation can give rise not only to recognizing novel usages of flora species and sustain ethno-biodiversity, but finally to finding new active biological compounds to cure ailments (Menale *et al.*, 2016). However, the purpose of current research work was to conduct a review of Cholistan veterinary traditional therapy, not only those connecting the usage of flora but also elements of their mixes, in order to utilize researches on Bahawalpur, south Punjab customary veterinary appliances. The study's other goals were to establish which therapies were in employ and to note folklore veterinary medicine in order to conserve it and avoid its loss due to verbal communication.

MATERIALS AND METHODS

STUDY AREA

Bahawalpur (29°24′0″N, 71°41′0″E) is a city in the southern province of Punjab, covering an area of 24.8 thousand km^2. According to the 2017 census, the population of this district is around 11.4 million. The Bahawalpur district consists of a large area, which includes six cities: Bahawalpur City, Saddar, Khairpur, Hasilpur, Yazman, Ahmedpur, and Tamewali (Figure 1). The main water sources of the district are well-irrigated canal systems and rivers, with an annual rainfall ranging from 95 to 210 mm. The Cholistan desert, which extends to the Indo-Pak border and contains a diverse flora and fauna, is located to the south of the city. It is located in the southeastern

portion of Punjab, where the summers are extremely hot, with dust storms in May and June, while the winters are extremely cold.

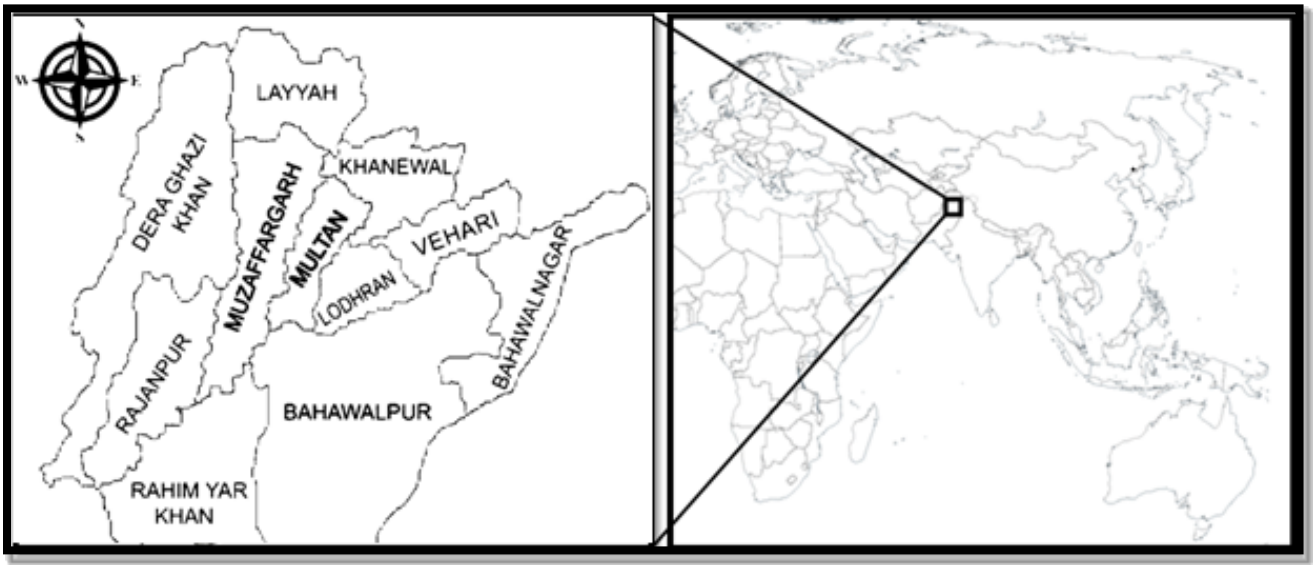

Figure 1: Map of the study area showing the sampling sites in the south Punjab province, Pakistan.

FIELD INTERVIEWS

During field visits in 2020–21, data on ethno-medicinal applications of plant species were obtained through semi-structured interviews and discussions using the methods previously described (Umair *et al.*, 2017a; Umair *et al.*, 2019). Prior informed permission (PIC) was acquired from all local informers after they were briefed on the research aims prior to data collection. A total of 99 people, THPs, villagers, farmers, hakims, fishermen, and livestock owners, were interviewed. The surveys were initially developed in English before being translated into Punjabi, Saraiki, and Urdu.

PLANT COLLECTION AND IDENTIFICATION

Flora having traditional medicinal value was gathered, and present in herbarium sheets. Voucher specimens were deposited at the herbarium of the "Department of Forestry, Range, and Wildlife Management, The Islamia University of Bahawalpur, Punjab, Pakistan". Germplasm of medicinal plants was also collected and deposited at the herbarium of "The Islamia University of Bahawalpur, Punjab, Pakistan" (Figure 2). Plant species were correctly identified and recognized during data collection, and the identifications were completed by utilizing the "flora of Pakistan" (Nasir and Ali, 1971-2007; Ali and Qaiser, 1993). "The international plant name index" (http://www.ipni.org), "the plant list" (www.theplantlist.org), and "the GRIN taxonomy site" (http://www.ars-grin.gov/cgi-bin/npgs/html/queries.pl) were utilized to confirm the medicinal flora taxonomy. Documented flora were determined by utilizing the "Flora of Punjab" (Ahmad, 1980) and "Flora of West Pakistan" (Stewart, 1972).

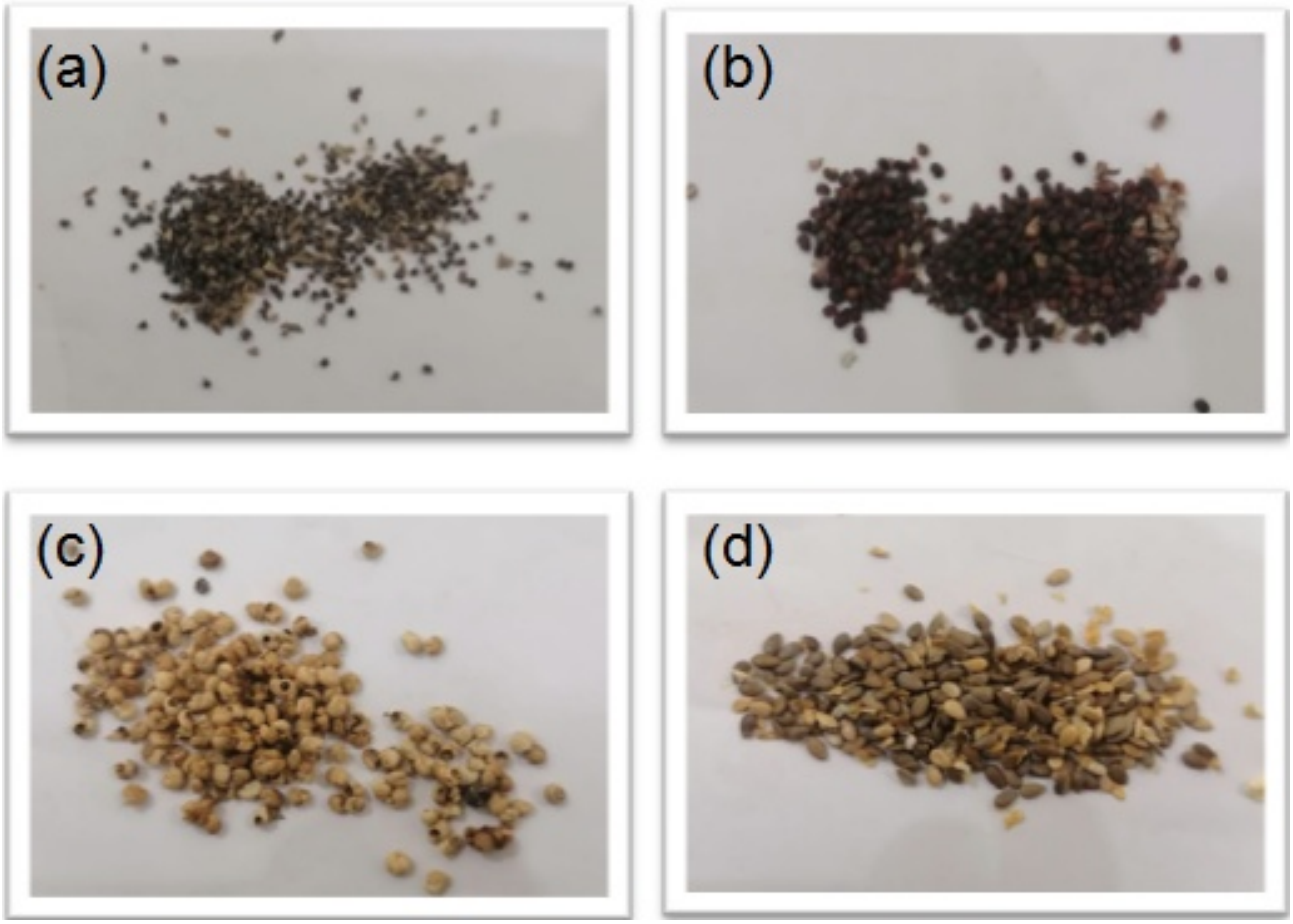

Figure 2: Germplasm of some important medicinal plant species in the study area; (a) *Argemone Mexicana* (b) *Alhagi marorum* (c) *Citrullus colocynthis* (d) *Capparis deciduas.*

QUANTITATIVE ANALYSIS

Different indices like "UV i.e. Use Value", "RPL i.e. Relative Popularity Level", "FL i.e. Fidelity Level" and "ROP i.e. Rank Order Priority" were used to analyze the ethno-medicinal data of plant species. The index values are reported in proportions and percentages.

USE VALUE (UV)

The value of species' uses is explained by their UV according to:

$$UV_i = \frac{\Sigma U_i}{N}$$

Where "UV_i" stands for the "use value" of ith species, "U_i" stands for the number of uses reported for ith species, and "N" stands for the total number of respondents in the field sites.

FIDELITY LEVEL (FL%)

Fidelity level is the proportion of informers in a research who cited using various medicinal plant species to cure a specific ailment. The "FL%" is obtained utilizing the earlier mentioned equation (Umair *et al.*, 2017a; Umair *et al.*, 2019).

$$FL\% = \frac{N_p}{N} \times 100$$

Where “Np” represents the no. of informers who claimed to have utilized precise taxa for an exacting sickness, and “N” represents the total no. of informers who used the species for any sickness. The greatest “FL” shows that the species is frequently utilized by the respondents in the research area to cure a certain ailment.

RELATIVE POPULARITY LEVEL (RPL)

The proportion of the total number of diseases cured by a certain plant species to the total number of respondents ("N") for any ailment is known as RPL. Plant species with similar FL may, however, have different therapeutic effects. As a result, an adjustment scale has been developed, in which all species are sorted into "popular" and "unpopular" categories. The "relative popularity level" has a range of 0 to 1.0, with "1" indicating the entire familiarity of a medicinal plant for significant diseases and "0" indicating that a plant species does not treat any ailments. When all plant species are often used to treat some significant diseases, the "RPL" index reaches its maximum of "1.0". However, as the RPL of the species diverges toward the unpopular side, the popularity index drops to zero. The "RPL" value is logically determined to equal unity (i.e., 1) for popular plant species, whereas the "RPL" for unpopular plant species is "1". The "RPL" value for each species can be calculated based on its exact location on the graph (Umair *et al.*, 2017a; Umair *et al.*, 2019).

RANK ORDER PRIORITY (ROP)

The “Rank order priority” is a correction factor that is utilized to categorize flora based on their “RPL” and “FL” values. ROP is calculated by multiplying the “RPL” and “FL” indices, as previously reported (Umair *et al.*, 2017a; Umair *et al.*, 2019).

$$ROP = RPL \times FL$$

STATISTICAL ANALYSIS

The contribution of plant part usage was displayed in “chord diagrams” using the “*circlize package*” (24) in “R software 3.6.3”. All information was calculated using Microsoft Office “Excel 2010” (Microsoft, Redmond, WA, USA), “R software 3.6.3” and “PAST 3.20” (Hammer *et al.*, 2001).

RESULTS AND DISCUSSION

DEMOGRAPHICS OF RESPONDENTS

A total of 99 local respondents were questioned, comprising 73 men and 26 women (Figure 3). These informants were divided into distinct classes based on demographic data, as shown in Figure 3. Local Indigenous people (IP) accounted for 69.7 percent of the 99 respondents, compared to 30 percent of Indigenous traditional health practitioners (THPs). Fishermen, farmers, hunters, traditional healers, or hakims, teachers, shopkeepers, and housewives were among the participants. The informant's age ranged from 19 to 70 years. Most informants (45.1%) were more than 40 years

old and had significant traditional knowledge as compared to young informants. A total of 38 informants (24.2%) were illiterate, while the other informants had varying levels of education, including: less than five years of education (19.2%), eight years of education (17.2%), ten years of education (15.2%), twelve years of education (11.1%), fourteen years of education (8.08%) and more than sixteen years of education (5.05%). When compared to educated respondents, illiterate informants had more information on the medicinal use of plant species. Similar findings were found in research studies from Ethiopia (Gedif and Hahn, 2003; Giday *et al.*, 2009) and Thailand (Wester and Yongvanit, 1995). Because the residents of the study area are not well due to poverty, however, they are significantly reliant on medicinal herbs for a number of uses to sustain their needs.

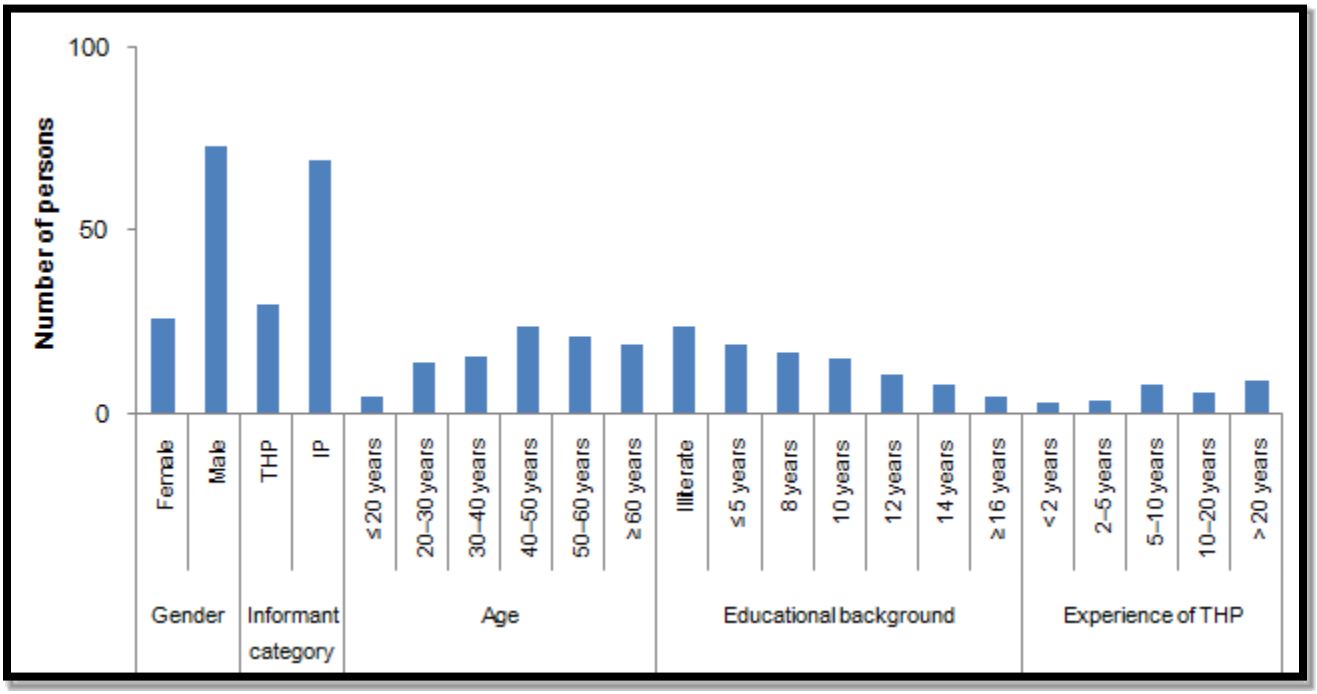

Figure 3: Number and percentage of study participants. Distribution of gender, age, education background and experience of traditional health practioners (THPs) interviewed. Informants are categorized as traditional health practioners (THPs) and indigenous peoples (IP).

TAXONOMIC CLASSIFICATION

In total, 42 ethnomedicinal flora species from 23 families were reported (Figure 4). Poaceae had the most species with seven, followed by Fabaceae (5 species), Euphorbiaceae (4 species), Amaranthaceae (3 species), Acanthaceae, Asclepiadaceae, Capparidaceae, and Simaroubaceae (2 species each), and other families each had one (Figure 4).The use of Poaceae family species for ethno-veterinary remedies was consistent with ethno-botanical studies from Pakistan and other parts of the globe (Cakilcioglu *et al.*, 2011; Abbasi *et al.*, 2013; Majeed *et al.*, 2020). This could be attributed to the extensive distribution of plant species belonging to the Poaceae family (Majeed *et al.*, 2020) and their medicinal usage, which are known by indigenous groups all over the world.

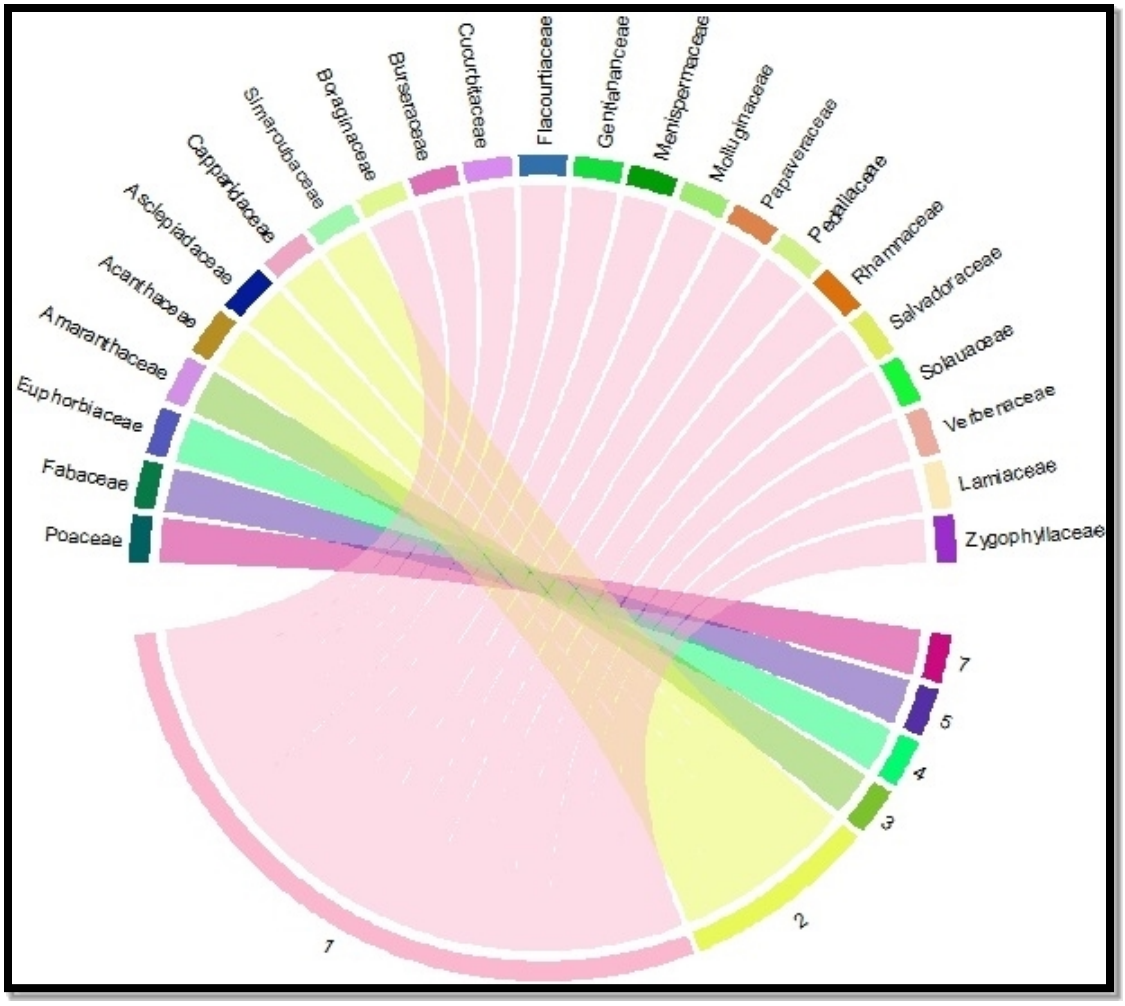

Figure 4: Number of (a) families and (b) life form of medicinal plants from study area.

PLANT PART(S) USED

The "Leaves" were the most used part of flora in ethno-veterinary medicine, accounting for 42% of all uses (Figure 5), followed by whole plant, seed, root, and fruit (11% each), flower (5%), milky latex (4%), bark (3%), and gum (2%) (Table 1). In other studies, leaves are also known to be a regularly used plant part in ethno-veterinary medicines by the indigenous peoples of Italy and islands (Bradacs *et al.*, 2011; Leto *et al.*, 2013). It has been claimed that using leaves rather than whole plants, roots, and stems helps to guarantee the long-term possibility of therapy herbs gathered by herbalists (Zheng and Xing, 2009).

Figure 6 depicts the life forms of the species. Herbs contribute the most (33%) of the encountered plant species (Figure 5), which is similar to (Umair *et al.*, 2017a), who found that wild herbs contribute 44% of the therapeutic plants consumed by indigenous peoples of Hafizabad district, Punjab, Pakistan. These findings corroborate previously published reports (Mahmood *et al.*, 2013; Umair *et al.*, 2017a; Umair *et al.*, 2019). Herbs are commonly used by indigenous peoples due to their

convenience and great usefulness in the healing of ailments as evaluated to other (Bharati and Sharma, 2012; Eswaran *et al.*, 2013).

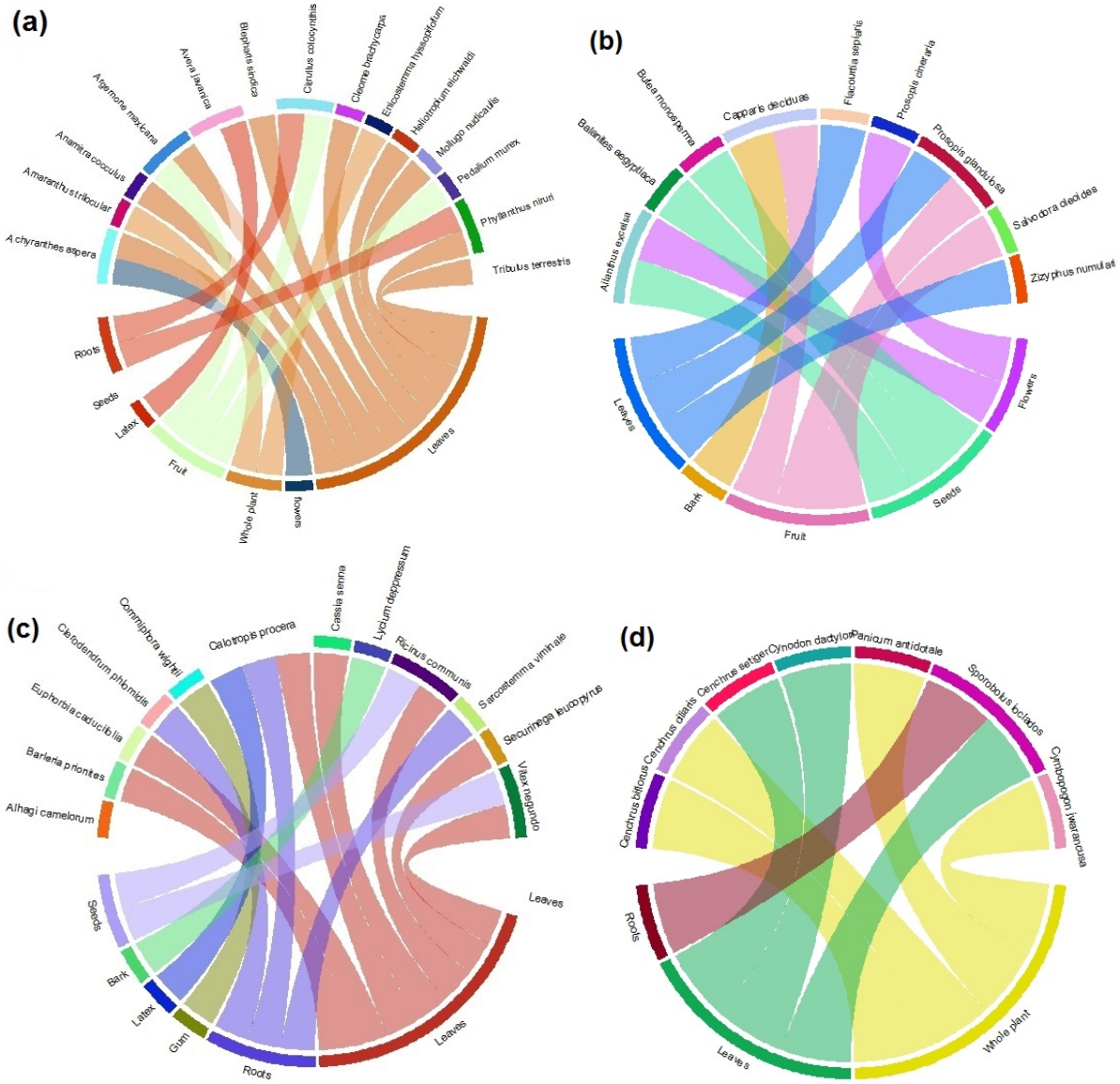

Figure 5: Plant species distribution according to the usage of different plant parts in south Punjab province, Pakistan. Plant species are classified as (a) herbs, (b) trees, (c) shrubs and (d) grasses.

USED VALUE (UV)

The UV of species varied from 0.01 to 0.21 in the Bahawalpur district (Table 1). *Cenchrus setiger, Cymbopogon jwarancusa, Cassia senna*, *Cynodon dactylon*, *Calotropis procera,* and *Citrullus colocynthis* were the most used species, having more than 0.25 UV. For example, 500 g of *Citrullus colocynthis* mixed with 250 g each of black salt was given to cattle in a 50–100 g concentration for the treatment of helminthes. The lowest UV was recorded for *Vitex negundo*.

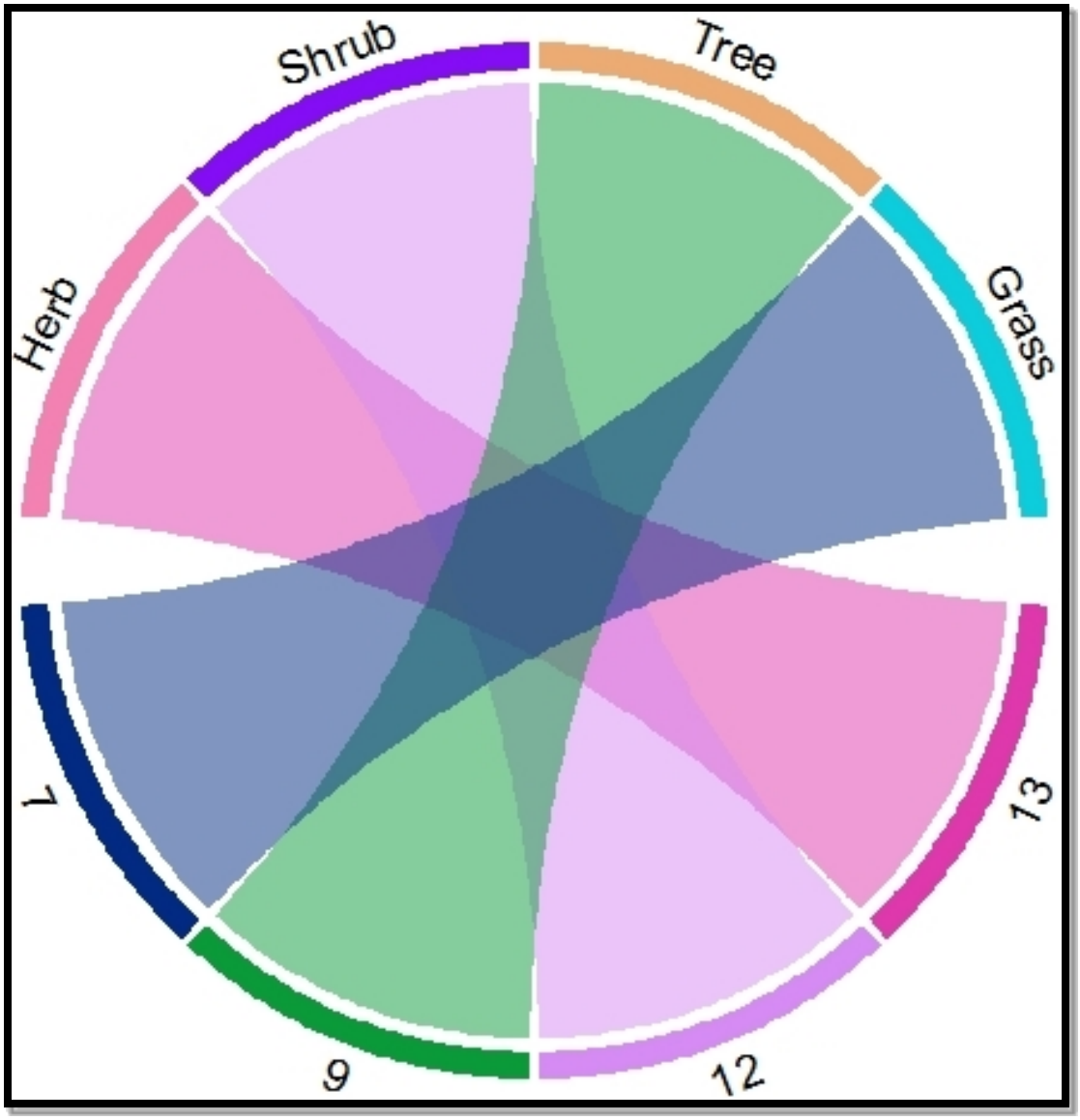

Figure 6: Number of life form of medicinal plants from study area.

FIDELITY LEVEL (FL)

The "fidelity level" of the 42 species used in ethno-veterinary medicine varied from 25 to 90% (Figure 7). Generally, the maximum "FL%" of a particular species reflects the presence of a explicit ailment in a specific area and the inhabitants' use of flora to cure it (Srithi *et al.*, 2009; Bibi *et al.*, 2015). *Cymbopogon jwarancusa* depicted 90% FL against cow metritis and fever (Table 1). In another study, *Cymbopogon jwarancusa* has been documented for the treatment of reproductive diseases (Majeed *et al.*, 2020). A significant "FL value" indicates the prevalence of a certain disease in a location and the usage of the same species by the local informant to cure it (Srithi *et al.*, 2009; Bibi *et al.*, 2015). Plants with significant "FL values" are more widely used by nearby people than flora with low F"L values" (Hussain *et al.*, 2013). The flora is utilized to cure different livestock disorders since ancient times and can be used as model plants for biochemical and pharmacological evaluation to validate their

authenticity in future. They are used either as single or in combination with others. This demonstrates that, despite the presence of a government health care centre in the region, the therapeutic value of plants is not lost on the locals.

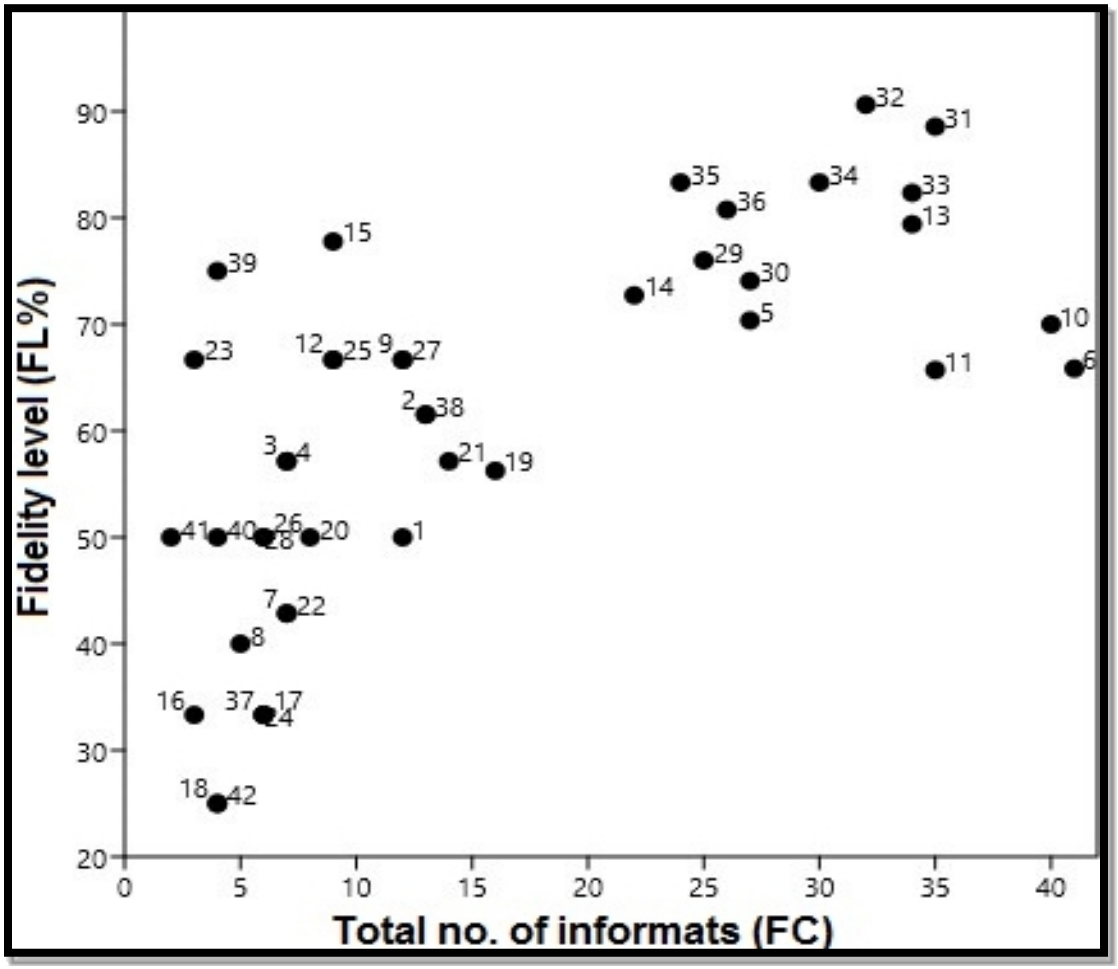

Figure 7: Relationship between numbers of informants (FC) and fidelity level (FL%). Numbers represent the plant names as they appear in Table 1

RELATIVE POPULARITY LEVEL (RPL)

The RPL values increase in direct proportion to the number of respondents. The RPL of species in this area varied from 0.09 to 1.00 (Table 1). The most popular species (1.00 RPL) in the Bahawalpur district were *Cenchrus setiger, Cymbopogon jwarancusa, Cassia senna, Cynodon dactylon, Calotropis procera, Citrullus colocynthis, Panicum antidotale, Capparis deciduas, Zizyphus numularia, Cenchrus ciliaris, Sporobolus ioclados, Avera javanica, Cenchrus biflorus,* and *Euphorbia caducifolia* (Figure 8). The significant popularity of these species is likely due to their high familiarity and indigenous peoples' awareness of their use as ethno-veterinary medicines. This is the first baseline study to investigate the traditional knowledge of indigenous communities about the use of popular species to treat a specific livestock ailment. Previous research reports on the status of popular medicinal plants have found similar results (Farooq *et al.*, 2008; Majeed *et al.*, 2020).

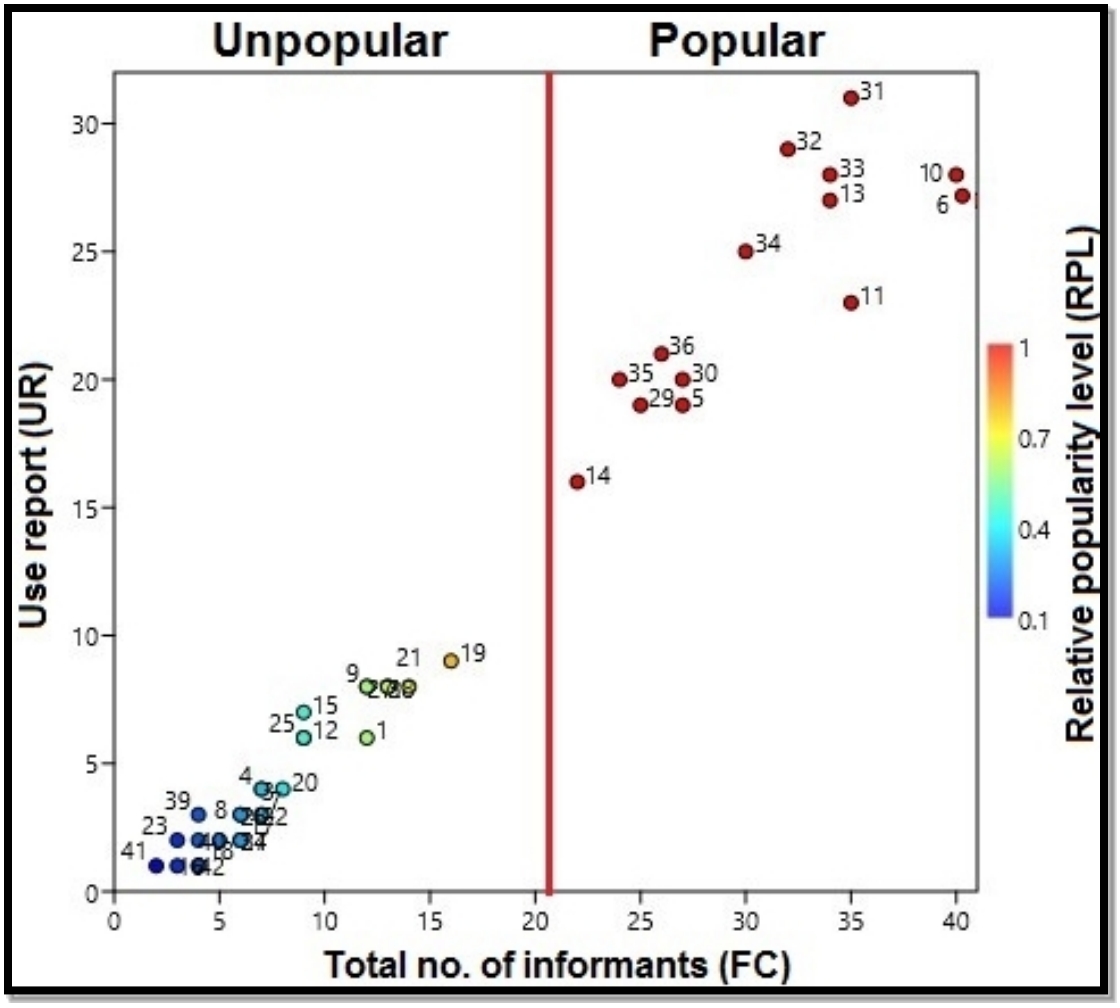

Figure 8: Relationship between numbers of informants (FC) claimed use of certain plant for particular disease (UR). The plant species' relative popularity level (RPL) is determined and classified as popular or unpopular. Numbers represent the plant names as they appear in Table 1.

RANK ORDER PRIORITY (ROP)

The corrected fidelity level, or rank order priority index, is appropriately employed to rank the popular species with various "FL" values. Only 15 of the 42 species had a ROP greater than 50 (Table 1). This is most likely related to the declining familiarity of herbal remedies among the indigenous peoples of the research site. *Cymbopogon jwarancusa* (ROP = 91) was the most commonly used species for livestock ailments. The other popular species with higher ROP values were: *Cenchrus setiger, Panicum antidotale, Capparis deciduas, Sporobolus ioclados, Cynodon dactylon, and Zizyphus numularia* (89, 83, 83, 82, and 81, respectively) (Table 1). These results were consistent with earlier reports from Hafizabad district (Umair *et al.*, 2017a) and the Negev district, Israel (Friedman *et al.*, 1986). This was most expected attributable to the increased popularity of ethno-veterinary medicines among the population of the research region. Furthermore, respondents in rural areas had better expertise and

information about the use of species for livestock diseases than informants in urban areas.

CONCLUSION

Indigenous peoples of the Bahawalpur area employ medicinal herbs for ethno-veterinary uses. To address cattle illnesses, the people employed 42 medicinal herbs. The traditional healthcare system is solely known to traditional health practitioners, elderly community members, and farmers. Some popular plant species like *Cenchrus setiger, Cymbopogon jwarancusa, Cassia senna, Cynodon dactylon, Calotropis procera, Citrullus colocynthis, Panicum antidotale, Capparis deciduas, Zizyphus numularia, Cenchrus ciliaris, Sporobolus ioclados, Avera javanica, Cenchrus biflorus,* and *Euphorbia caducifolia,* etc. are playing an important role in ethno-veterinary medicine of southern Punjab. *Cymbopogon jwarancusa* was recorded to have the highest fidelity level and used value. The new study makes an imperative input to the save of traditional plant derived data. Pharmacological and phytochemical research to find active chemical components, as well as in "vitro" and/or in "vivo" effectiveness of the found plants against certain animal illnesses, is required.

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Table 1. Medicinal plants used for the treatment of different parasitic diseases of livestock reported by the local respondents in southern Punjab, Pakistan.

S. No.	Species name / Family / Local Name / Specimen No.	Life form	Part(s) Used	MOA	Livestock ailments	UV	FL%	RPL	ROP
1.	*Barleria prionites* L. / Acanthaceae / Karunta, Kala bansa/BHA-09	S	Leaves	O, T	Skin diseases, diarrhea	0.06	50.00	0.59	29
2.	*Blepharis indica* L. / Acanthaceae / Asad /BHA-10	H	Leaves	O	Galactagouge	0.08	61.54	0.63	39
3.	*Achyranthes aspera* L. / Amaranthaceae / Puth Kanda /BHA-01	H	Leaves, Flowers	O, T	Urinary stones, myiasis, anthelmintic	0.04	57.14	0.34	20
4.	*Amaranthus trilocular* Fisch. / Amaranthaceae / Lal Sag /BHA-04	H	Whole plant	O	Fecal impaction	0.04	57.14	0.34	20
5.	*Avera javanica* L. / Amaranthaceae / Boil /BHA-07	H	Latex, Seeds	O, T	Antiulcer, anti-parasitic, malarial fever	0.19	70.37	1.00	70
6.	*Calotropis procera* (Willd.) R.Br. / Asclepiadaceae / Ak/BHA-12	S	Latex, Leaves, Roots	O, T	Flatulence, anorexia, indigestion, anthelmintic, inflammation, snakebite, rabid dog bite, paralysis	0.27	65.85	1.00	66
7.	*Sarcostemma viminale* L. / Asclepiadaceae / Sooma/BHA-37	S	Roots	T	Snakebite, scorpion bite, dog bite	0.03	42.86	0.34	15
8.	*Heliotropium eichwaldi* Steud / Boraginaceae / Uthchara/BHA-27	H	Leaves	T	Earache	0.02	40.00	0.24	10
9.	*Commiphora wightii* (Arnott) Bhandari / Burseraceae / Guggul/BHA-21	S	Gum	O	Stomach troubles, swellings, Respiratory infection, Throat pain	0.08	66.67	0.59	39
10.	*Cassia senna* L. / Fabaceae / Sanna makki/BHA-14	S	Leaves	O, T	Eyes infection, Joint pain, skin diseases, intestinal worms.	0.28	70.00	1.00	70
11.	*Capparis deciduas* (Forsk) Edgew / Capparidaceae / Kar, Kary/BHA-13	T	Fruit, Bark	O, T	Anti-diarrheal, anorexia, indigestion, Joint pain	0.23	65.71	1.00	66
12.	*Cleome brachycarpa* Vahl ex. DC. / Capparidaceae / Kasturi/BHA-19	H	Leaves	T	Anti-parasitic	0.06	66.67	0.44	29
13.	*Citrullus colocynthis* Schard / Cucurbitaceae / Tuma/BHA-18	H	Fruit, Roots	O	Anthelmentic, purgative, jaundice and rheumatism, wounds,	0.27	79.41	1.00	79
14.	*Euphorbia caducifolia* Haines / Euphorbiaceae / Danda thor, Dhodhi/BHA-25	S	Leaves	O	Snakebite, scorpion bite, dog bite	0.16	72.73	1.00	73

15.	*Phyllanthus niruri* L. / Euphorbiaceae / Bhumi amala, Dodia/BHA-32	H	Roots, Leaves	O, T	Stomachache, wounds, skin burn	0.07	77.78	0.44	34
16.	*Ricinus communis* L. / Euphorbiaceae / Arandi/BHA-35	S	Seeds, Leaves	O	Constipation, Placental expulsion	0.01	33.33	0.15	5
17.	*Securinega leucopyrus* (Willd.) Muell. / Euphorbiaceae / Hartho/BHA-38	S	Leaves	T	Fungal infection	0.02	33.33	0.29	10
18.	*Butea monosperma* (Lain.) / Fabaceae / Palasha, Dhak, Chichrah/BHA-11	T	Seeds	O, T	Intestinal worms, skin diseases	0.01	25.00	0.20	5
19.	*Prosopis cineraria* L. / Fabaceae / Kandi, Jandi, Khejari/BHA-33	T	Flowers	T	Joint pain, inflammation, soreness	0.09	56.25	0.78	44
20.	*Prosopis glandulosa* L. / Fabaceae / Devi/BHA-34	T	Leaves, Fruits	T	Bone fracture	0.04	50.00	0.39	20
21.	*Flacourtia sepiaria* Roxb. / Flacourtiaceae / Amaloka/BHA-26	T	Leaves	T	Snakebite, Joint pain	0.08	57.14	0.68	39
22.	*Enicostemma hyssopifolium* (Willd.) Verdoorn / Gentiananceae / Nandho/BHA-24	H	Whole plant	T	Snakebite	0.03	42.86	0.34	15
23.	*Clerodendrum phlomidis* L.f., / Lamiaceae / Tankar, Arni/BHA-20	S	Roots	O	Indigestion and edema	0.02	66.67	0.15	10
24.	*Anamitra cocculus* L. / Menispermaceae / Kakanari, kakanasa/BHA-05	H	Leaves	O	Indigestion and diarrhea	0.02	33.33	0.29	10
25.	*Mollugo nudicaulis* Lamk / Molluginaceae / Rangatio khar/BHA-29	H	Leaves	T	Skin problems, boils	0.06	66.67	0.44	29
26.	Argemone *maxicana* L. / Papaveraceae / Pella dhatoora, Satianasee/BHA-06	H	Fruit, Leaves	O	Lice killer, fever	0.03	50.00	0.29	15
27.	*Alhagi camelorum* Roxb. / Fabaceae / Javan, Jawasa, Kas/BHA-03	S	Leaves	O	Malarial fever	0.08	66.67	0.59	39
28.	*Pedalium murex* L. / Pedaliaceae / Farid booti/BHA-31	H	Fruit	O	Anti-diuretic	0.03	50.00	0.29	15
29.	*Cenchrus biflorus* Roxb / Poaceae / Mohabat Boti/BHA-15	G	Whole plant	O	Anti-diuretic, fever	0.19	76.00	1.00	76
30.	*Cenchrus ciliaris* L. / Poaceae / Dhaman/BHA-16	G	Whole plant	O	Anti-diuretic, fever	0.20	74.07	1.00	74
31.	*Cenchrus setiger* Vahl / Poaceae / Chuti Daman/BHA-17	G	Leaves	O	Antiviral, sore, wound, antidiuretic	0.31	88.57	1.00	89
32.	*Cymbopogon jwarancusa* (Jones) Schult. / Poaceae / Katrin or Khavi/BHA-22	G	Whole plant	O	Cow metritis, fever	0.29	90.63	1.00	91
33.	*Cynodon dactylon* L. / Poaceae / Khabal ghas/BHA-23	G	Leaves	O, T	Eye pain, skins injuries, anemia, anti-inflammatory, dysentery, bone fracture	0.28	82.35	1.00	82
34.	*Panicum antidotale* Retz. / Poaceae / Murot or Banssi ghaa/BHA-30	G	Whole plant	O	Anthrax, blackquarter and tuberculosis	0.25	83.33	1.00	83

35.	*Sporobolus ioclados* (Nees ex Trin.) Nees / Poaceae / ghaa/BHA-39	G	Leaves, Root	O, T	Wounds, allergy, weakness	0.20	83.33	1.00	83
36.	*Zizyphus numularia* W.& A. / Rhamnaceae / Kaken Ber, Jangra, Badari, Bordi/BHA-42	T	Leaves	T	Antiulcer, Skin diseases	0.21	80.77	1.00	81
37.	*Salvodora oleoides* / Salvadoraceae / Pilo, Jhal, Mithi Wan/BHA-36	T	Fruit	O	Fever, lochial	0.02	33.33	0.29	10
38.	*Ailanthus excelsa* (Burm, f.) Juss. ex Schult. / Simaroubaceae / Mahanimba/BHA-02	T	flowers and seeds	O	Diarrhea and haematuria	0.08	61.54	0.63	39
39.	*Balanites aegyptiaca* L. / Simaroubaceae / Hinghot/BHA-08	T	Seeds	O, T	Intestinal worms, skin diseases	0.03	75.00	0.20	15
40.	*Lycium deppressum* Stocks / Solauaceae / Chirchita/BHA-28	S	Bark	O	Throat pain, respiratory infection	0.02	50.00	0.20	10
41.	*Vitex negundo* L. / Verbenaceae / Banah, Nirgud/BHA-41	S	Seeds, Leaves	O	Joint pain, anthelmintic	0.01	50.00	0.10	5
42.	*Tribulus terrestris* L. / Zygophyllaceae / Kundai, Bahkra, Gokhru/BHA-40	H	Leaves	O	Stomachache	0.01	25.00	0.20	5

Abbreviations used: Life form; S— Shrub, H—Herb, T—Tree, G—Grass; MOA—Mode of application; O—Oral, T—Topical; UV—Used value, RPL—Relative popularity level, ROP—Relative popularity index

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