

## ETHNOVETERINARY USES OF MEDICINAL PLANTS AS HERBAL DRUGS FOR SUSTAINABLE LIVESTOCK IN SOUTHERN DESERTS OF SINDH PAKISTAN

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### Abstract

The southern desert of Sindh, Pakistan is considered as green desert in the World due to rich diversity of medicinal plants and livestock production where ethnoveterinary medicines (EVM) are commonly practiced. Currently, this region is facing famine and natural disaster resulting in mortality of livestock. The present study was aimed to document and analyze the ethnoveterinary herbal recipes made from precious medicinal plants species. Data was collected through field surveys through opened questioners, semi structure interviews, group discussion and personal observation during field survey; and analyzed through quantitative indices such as relative frequency of citation (RFC) and the use value (UV); and to describe the preferred plant species, methods of preparation and plant part used. The data was collected from 225 informants including 145 animal experts and 80 local people. In total, 34 plant species belonging to 19 plant families were reported. The most preferred species were *Senna italica*, *Phyla nudiflora*, *Solanum surrattense*, *Fagonia bruguieri* and *Asphodelus tenuifolius*. The frequently reported plant part used were whole plants (31%) while less used was latex and bark (1%). The frequent mode of utilization was decoction (27%) while least was extract and juices (1%). The UV varied from 0.052 (*Fagonia bruguieri*) to 0.013 (*Capparis spinosa*) whereas the value of RFC ranged from 0.052 (*Senna italica*) to 0.014 (*Amaranthus viridis*). The present study would offer baseline data for clinical research in veterinary sciences. Ethnoveterinary data documented in the present study could offer an extraordinary background for conducting studies intended at implementing clinical phytotherapy research for livestock healthcare and production. It is recommended that plant species with high citations, quantitative indices values and preferred by pastoralists should be studied for phytochemical and pharmacological properties for future drug discovery development.

**Key words:** Pharmacology, Veterinary Sciences, Drug discovery, Medicinal plants, Indigenous knowledge.

### Introduction

The deserts of Southern Sindh-Pakistan face famine and natural disaster resulting mortality of livestock. In deserts, livestock is important source of livelihood of local people. Globally, medicinal plants have been utilized as ethnoveterinary medicines among many indigenous communities and traditional healthcare systems for centuries (Tariq *et al.*, 2014; Najeebullah *et al.*, 2021). Ethnoveterinary medicine (EVM) describes the folk recipes, indigenous knowledge and norms and traditions of the local people regarding the health of livestock and other animals (Bhardwaj *et al.*, 2013). It is reported that EVMs are considered as cheapest alternative medicine as compare to other forms of medications (Benítez *et al.*, 2012). The most of the EVMs, are based on traditional belief and uses practiced over a time by pastoralists, shepherds, rural farmers and local people for the healthcare and livelihood of livestock (Sani & Gray, 2004). Among various countries, Ethiopia is considered for the highest livestock population production (Chamberlin & Schmidt, 2012). It is reported that livestock growth and production shares major part of the Ethiopian agriculture and represent about 40% of the total agriculture (Giday & Ameni, 2003). Like Ethiopia, the Deserts of Sindh -Pakistan are also one of the biggest communities with livestock production and rural population worked as pastoralists. Livestock is considered as major source of economy and livelihood in the desert region of Sindh- Pakistan but its productivity and sustainability are relatively poor as compare to rest of the world. Various factors such as poor health conditions,

high morbidity and mortality rate; and available facilities are responsible for the low in economic growth productivity (Kidane *et al.*, 2014; Monteiro *et al.*, 2011).

In developing countries, the EVMs are frequently used in the management and cure of various livestock diseases (Scantlebury *et al.*, 2013). In underdeveloped countries, about 90% of health care of livestock population depend up on plant-based recipes (Van Wyk & Prinsloo, 2018). In the desert populations of the Sindh most of the pastoralists and farmer use medicinal plants as livelihood and health care of livestock. Currently, the ethnoveterinary knowledge and practices are affected by various factors such as loss of traditional knowledge, degradation of culture, loss of plant resources and fast shift in trend from rural to urban life (Giday *et al.*, 2009; Yineger & Yewhalaw, 2007; Shinwari *et al.*, 2020). It is also notable that the knowledge of EVMs is transferred from one generation to upcoming generation but this wealth of knowledge is prone to loss due to improper documentation of ethnoveterinary knowledge and practices through oral tales (Birhanu & Abera, 2015; Mekelle, 2012). Thus, this loss will be continued unless the useful ethno-traditional practices are preserved, properly documented, and analyzed, for future generation and research.

The most of livestock farmers in deserts of Pakistan are poor and own averagely 5 to 6 animals per family (Hassan *et al.*, 2014) and cannot afford expensive allopathic drugs that finally lead to various problems in livestock and ultimately affects economic development of local people. In the desert populations, the EVMs can be used as alternative medicine for treating diseases in livestock and other grazing animals. The EVMs can help in improvement in livelihood and economic uplift of

country through poverty alleviation. The knowledge of veterinary persists in various populations transferred from generation after generation and can be documented through ethnobotanical surveys and data analysis (Nfi *et al.*, 2001; Yirga *et al.*, 2012). Although, few studies have been conducted in selected regions of Pakistan (Abbasi *et al.*, 2013; Deeba *et al.*, 2009; Dilshad *et al.*, 2010; Farooq *et al.*, 2008; Hassan *et al.*, 2014; Ahmad *et al.*, 2020), but the deserts of Sindh have been ignored due to lack of proper research activities in the region. In Southern Deserts of Sindh, there is diversity of medicinal plants as well as culture, linked to ethnoveterinary practices.

The southern desert of the Sindh is characterized as the green desert of the World due to rich diversity of the plants as well as animals. Southern Deserts of Sindh is a hot arid-semiarid sandy desert, with variety of precious medicinal plants where is environment characterized with various factors. The temperature ranges from 20 to 51°C, the hottest months are May to July where temperature reaches to maximum limit while lowest temperature is reported in January. Most of the region in southern desert of Sindh are arid where dry seasons occurs in clusters. Average rainfall ranges from 88 to 135 mm, whereas major rainfall occurs through May to July during monsoon. Most of the Southern Desert regions of Sindh-Pakistan contain small to large sized sand dunes occupying a diversity of palatable medicinal plant species that provide ample biomass for livestock consumption (Qureshi & Bhatti, 2005).

Keeping in view of diversity of plant species linked to livestock, culture, environment and medicinal plants, there may be precious herbal recipes practiced by the rural communities for the livelihood and the healthcare of cattle. Thus, the present study is aimed to document and analyze the ethnoveterinary recipes and practices in the regions of Southern desert Sindh and highlight the plant species for future perspectives in ethnoveterinary medicines. The major objective of the study is to highlight the major plants species and their recipes used by the local communities for the treatment of various ailments in livestock and grazing animals.

## Material and Methods

**Data collection:** Field surveys were conducted from spring 2018 to fall 2019 for documentation of traditional knowledge. The data was collected from pastoralists, shepherded, Hakeem (*Dahaa*), Herbalists, local people and rural livestock expert and animal trainers. The data was collected in local language through opened questioners, semi structure interviews, group discussion and personal observation during field survey and stay in the study area. The questionnaire used in the data collection was composed of two components that demographic part and plant part. The demographic part of questionnaire comprises information on age, gender, education, and experience of uses of plant species. Plant part of questionnaire contain detailed information on names of plant (Local and Botanical), plant part used, mode of administration and utilization, disease treated and localities of plant species. From each informant, data on plant parts used, method of preparation, dosage, route of administration, disease treated, conservation status, cultivation practice and acquisition/transfer of indigenous knowledge was collected. During field, local names and

uses were also confirmed from key informants having sound information about uses of plants in EVMs and have experience of livestock production. Interviews were conducted in informant's homes, field, and markets. Further, where possible, walks in the countryside also were organized to collect plant specimens and to complete the list of plant uses known by the informant.

**Plant identification and preservation:** In field surveys, samples of each reported plant species were collected with the support of study participants. The plant samples were pressed, tagged, labeled, and preserved for proper identification using methods recommended by Martin, (2014) slightly modified by Yaseen *et al.*, (2015a). The correct botanical name and family were authenticated from The Plant List ([www.theplantlist.com](http://www.theplantlist.com)) and Plants of the World online Kew science ([www.plantsoftheworldonline.org](http://www.plantsoftheworldonline.org)). The identified plants specimens were deposited in the Herbarium of Pakistan (ISL), Quaid-i-Azam University Islamabad, Pakistan. The digital photography was also done using camera (Nikkon-D 3400).

**Data analysis:** The ethnoveterinary quantitative indices such as relative frequency of citation (RFC), use report (UR), frequency of citation (FC) and the use value (UV) were applied for data analysis. In data analysis, commonly reported species common method of recipes preparation and mode of utilization was also analyzed.

**Relative frequency citation (RFC):** The relative frequency of citation (RFC) index was calculated by using the given formula:

$$RFC = FC/N (0 < RFC < 1)$$

where, "FC" stands for frequency of citation. It represent the number of informant for each species and "N" represent the total number of informants in the study (Faruque *et al.*, 2018). RFC values varies from 0 to 1 (When one refers to plants as a useful one the RFC value is 0 when all the informants discussion it as useful than the RFC value is 1 (Yaseen *et al.*, 2015a).

**Use values (UV) and use report (UR):** The use value (UV) shows the relative significance of plant species known locally (Maema *et al.*, 2019) was calculated using the following formula:

$$UV = \sum U/N \times 100$$

whereas U stand for number of uses reported for each species and "N" present the total number of informants for each species. The UV is determined to highlight the most precious species based upon treated diseases (Kayani *et al.*, 2015; Tchicailat-Landou *et al.*, 2018).

## Results and Discussion

The present study described 34 precious medicinal plant species along with their adjuvants (plants or other products) for preparation of herbal recipes used in the treatment for diseases of livestock in Southern Deserts of Sindh-Pakistan. Table 2 presents scientific names, local names, family, plant part used, mode of utilization, various diseases treated and herbal recipes.

**Demographic data of pastoralists:** In total, 225 informants were interviewed for documentation of data. Among interviewees, 145 were livestock experts, animals' healthcare traditional practitioners, camel trainers, dairy farmers, and shepherds, while 80 informants were local peoples. With respect to gender, 200 informants were male while 25 were female. In most of the ethnobotanical studies, male informants are found common as compare to female. The main reason behind this is female informants were not allowed to talk to male out of their families. So, contribution of female informants was too less throughout the ethnoveterinary data documentation. In present study, shepherds and camel trainers had more ethnoveterinary knowledge as compare to rest of informants. In literature, Yaseen *et al.*, (2015a) reported that ethnomedicinal knowledge is always common in the people who are directly linked to animal, husbandry or as occupation. In another study, it was reported that traditional knowledge about treatment of ailments of animals is commonly found in shepherds and pastoralists (Geerlings, 2001). However, Yaseen *et al.*, (2015b) also reported that traditional medicinal knowledge may be prevalent in rural people, as compare to urbanized one. It was also observed that Traditional health practitioners had enough knowledge of treatment of animal. In a study, it was concluded that traditional health practitioner's knowledge is more useful for ethnoveterinary science.

In present study, most of the informants (total: 65) belonged to above 60-year age, while 60 informants had age of (45 to 55) years (Table 1). In previous studies, it was commonly reported that traditional knowledge about herbal recipes is always prevalent in elders as compare to youngsters. Furthermore, 15 informants interviewed were above 85 years of age. The lowest count of such informants is might be due to interviewer access to them. Most of such informants were unable to walk out of their homes and found difficulty in interviews. With respect to education, most participants (113 informants) were less educated, (5 years of education) followed by illiterate informants (75 informants). The common prevalence of less educated informants is might be due to their interest, and occupation linked to livestock as compare to high educated people having less knowledge about ethnoveterinary medication.

**Medicinal plant diversity:** Ethnomedicinal plants species are found to be valuable in traditional healthcare of animals in the Southern Deserts of Sindh –Pakistan. In present study, 34 highly precious medicinal plant species belonging to 19 families (Figs. 1 and 2) were reported in (Table 2). In plant families, five species belong to Amaranthaceae followed by Fabaceae (four species), the rest of species belong to Convolvulaceae (three species), Capparaceae (two species), Apocynaceae (two species), Zygophyllaceae (two species), Cucurbitaceae (two species) Asteraceae (two species) and Solanaceae (two species). In literature, (Bibi *et al.*, 2014; Kayani *et al.*, 2015) reported Asteraceae and Lamiaceae as most commonly reported Families. On other hand, in deserts arid, and semi-arid regions Amranthaceae and Fabaceae are commonly reported (Ashfaq *et al.*, 2019; Yaseen *et al.*, 2015a). In present study, the prevalence of species of Amaranthaceae and Fabaceae is might be due to their common use by pastoralists and THPs in healthcare practices of livestock.

**Plant part used in folk recipes:** In folk herbal recipes, various plant parts were used to treat different diseases of livestock in the study area. In present study, the most commonly used plant part used were whole plants (31%) followed by seed (26%), leaves (23%), root (9%), fruit (5%), flower (3%), latex and bark (1%), as mention in Fig. 3. In previous studies, whole plant as the most dominantly used part have also been reported in other ethnoveterinary studies in Pakistan and China (Khattak *et al.*, 2015; Shen *et al.*, 2010). The reported reason behind the common use of whole plants was easily collection and less hard work as compare to other parts such as fruits, leaves and flower. Roots, leaves, bark and fruits are also used for various animals' diseases (Khuankaew *et al.*, 2014). On other hand, leaves are also predominately reported because leaves exhibit various pharmacological properties due to presence of various active compounds such as flavonoids and phenolics. Benarba, (2016) reported that in ethnomedicinal studies leaves and seeds are commonly used due to their therapeutic potential that depends on variety of active compounds.

**Table 1. Demographic data of informants in Southern Desert of Sindh Pakistan.**

S. No.	Variable	Categories	Number of person
1.	Categories of Informant	Traditional health practitioners	105
2.	Categories of Informant	Herbalists	80
3.	Categories of Informant	Cow Shepherd	100
4.	Categories of Informant	Indigenous people	100
5.	Categories of Informant	Camel Trainer	44
6.	Categories of Informant	Dairy farmer	60
7.	Gender	Male and Female	
8.	Age	40-50	150
		50-60	110
		60-70	115
		70-80	80
		80-90	20
		90-100	14

Table 2. Ethnoveterinary documentation of Medicinal plants from Southern Deserts of Sindh.

S. #	Botanical name	Family	Local name	Plant part used	Mode of utilization	Treated disease	Treated animal	Recipes	UR# <sup>2</sup>	UV# <sup>3</sup>	FC# <sup>4</sup>	RFC# <sup>5</sup>
1.	<i>Accacia nilotica</i> (L.) Delile	Fabaceae	Babar	Leaves, Seed, Bark	Decoction/Paste	Swollen Nipple, sexual increases Cough	Camel, Cow, Buffaloes, Goat, Sheep	For treating Swollen Nipple, 720 gm fresh leaves are grinded mix with 200gm Turmeric. Paste is roasted on specific swollen part. This mixture is rapture on to animals 3 times a day for 5days. Dosage include Goat and Sheep:40gm, Cow: 50gm, Camel: 80gm, Buffaloes:60gm For treating Cough, 500gm fresh bark is grinded mix with 100gm black salt and 400 gm old jiggery. Paste is boiling in water for 10 mints. This mixture is given to animals 3 times a day for 5days. Dosage include Goat and Sheep:1/2nall, Cow: 1nall, Camel:2 nall Animals eat dried seed and increase enhance sexuality ability	4	0.018	14	0.029
2.	<i>Achyranthes aspera</i> L.	Amaranthaceae	Ubat Kandri	Seed, Leaves	Paste, Decoction	Cough, Joint Pain	Goat, Cow and Camel, Sheep, Dog,	For treating cough, 500 gm fresh leaves are grinded and mix with 200 gm brown sugar. This mixture is given to animals three times a day, for 3 days. Dosage involved Camel: One Nall*1, Cow:1/2 nall Goat and Sheep:1/3 nall Dog:1/4 nall For treating, Joint pain 500gm Seed are grinded with 250 gm Garlic paste is boiled in water for 5 minute the seed is given to animals for 3 days at quantity involved Camel:1/2 nall, Cow:1/3 nall, Goat and Sheep:1/4 nall, Dog:1/4 nall	6	0.027	10	0.021
3.	<i>Aerva javanica</i> (Burm.f.) Juss. ex Schult	Amaranthaceae	Booh	Leaves, Seed	Paste, Powder	Female reproductive system infection and increases milk production and stomach acidity	Goat	For treating female sex organ infection, dry leaves are 230 gm are grinding and combine with the hot ghee 90 gm Bitter (Cow). This mixture paste is given to animals 3 times a day for 5 days quantity take in Goat: 1/3 nall Dry seed 200 gm are grinding and combine with Curd 100 gm this mixture is given to Goat 2 times a day for 2 days, for treating Stomach acidity. Quantity contain take in Goat: 1/2 nall	4	0.018	13	0.027
4.	<i>Amaranthus viridis</i> L.	Amaranthaceae	Morjhal	Whole plant	Raw	Increases milk production and fate	Cow and Goat animals	Whole plant raw eating and taste for fodder animals	8	0.036	7	0.014
5.	<i>Amberboa ramose</i> (Roxb.) Jafri	Asteraceae	Lubh	Whole plant	Paste	Skin disease and increases production	Especially camel and cow	The fresh plant material (500gm) is grinded along with sulfur (90gm). This paste is roasted in butter (70gm) for 8 minutes. This is roasted material is paste on animal skin. The dosage range is Camel (85gm), Cow (80gm). The raw plant is given as fodder to animals for increase in milk production.	10	0.045	9	0.018
6.	<i>Arthrocnemum macrostachyum</i> (Moric.) K.Koch	Amaranthaceae	Laaran	Leaves, Seed,	Stomach problem, reproduction increase,	Decoction	Buffaloes, Camel, Cow, Goat, Sheep	For treating Stomach, 730gm whole plant is grinded is mixed with 318gm Old jiggery Paste is boiling in water for 5mints. This mixture is given to animals 2 times a day for 5days. Dosage include Buffaloes:1 nall, Goat and Sheep:1/2nall, Cow: 1nall, Camel:2 nall Animals eating the seed raw form and increase sexuality	5	0.022	9	0.018

Table 2. (Cont'd.).

S. #	Botanical name	Family	Local name	Plant part used	Mode of utilization	Treated disease	Treated animal	Recipes	UR* <sup>2</sup>	UV* <sup>3</sup>	FC* <sup>4</sup>	RFC* <sup>5</sup>
7.	<i>Asphodelus tenuifolius</i> Cav.	Liliaceae	Jungli Basri	Whole plant	Decoction	Nipple infection and Blood in Nipples	Buffaloes	For treating Nipple infection blood mix with along with milk, Whole plant dry 1000gm are grind mix with sugar 480gm. This mixture is given to animal 2 days After than use 500gm Buffaloes, Cow. one camel three days proper use and well bleeding decrease and after three days	3	0.013	19	0.04
8.	<i>Boerhavia procumbens</i> Banks ex Roxb.	Nyctaginaceae	Satti	Flower	Decoction	For increases in Sex	Cow, Goat, Camel and Buffaloes	For increasing tonic 600gm dry flower are grinded mix along with 250gm old date palm (Fruit) is boil in 200gm Butter for 5 minutes. This mixture is given to animals one time a day for 7 days. Quantity given to Camel: 1 nall, Buffalose:1/2 nall, Cow:1/2 nall, Sheep and Goat:1/3 nall.	6	0.027	8	0.016
9.	<i>Calotropis procera</i> (Aiton) Dryand	Apocynaceae	Akk	Leaves, Latex	Decoction/ Paste	Joint pain legs, Brain infection	Camel, Cow, Buffaloes, Sheep, Goat	For treating Joint pain, 830 gm Leaves are grinded mix with 3250gm Bitter (Dasee ghee Cow). This mixture is given to animals 2 times a day for 3days.Dosage include Cow: 1 nall, Buffaloes:1 nall, Camel: 2nall, Sheep and Goat:1/3 nall For treating Brain infection, 400ml mix with 100gm black salt and 210 gm old jiggery. Paste is boiling in water for 5 mints. This mixture is given to animals 3 times a day for 5days. Dosage include Goat and Sheep:1/2nall, Cow: 1nall, Camel:1nall	4	0.018	11	0.023
10.	<i>Capparis spinosa</i> L.	Capparaceae	Berri Whalah	Root, Fruit, Leaves	Decoction	Liver infection, Gall bladder, Skin diseases	Cow, Camel, Goat, Sheep, Donkey	For treating Liver infection, 730gm root are grinded is mix with 400gm Old jiggery. Paste is boiling in water for 16 mints. This mixture is given to animals 3 times a day for 10days. Dosage include Goat and Sheep:1/2nall, Cow: 1nall, Camel:2 nall For treating Dehydration, 550gm dry Fruit is grind mix with 200gm black salt and 300 gm old jiggery. Paste is boiling in water for 10 mints. This mixture is given to animals 3 times a day for 5days. Dosage include Goat and Sheep:1/2nall, Cow: 1nall, Camel:2 nall, Donkey:1/3 nall For treating Gall bladder, 640gm fruit are grind combine with 235gm Old jiggery. Paste is boiling in <i>Hakoo</i> water for 5 mints. This mixture is given to animals 3 times a day for 6days. Dosage include Goat and Sheep:1/2nall, Cow: 1/2nall, Camel:1 nall, Donkey:1/2 nall For treating Skin diseases, 530gm leaves are grind mix with 150gm black salt and 325gm old jiggery. Decoctions boiling in water for 10 mints. This mixture is given to animals 2 times a day for 6days. Dosage include Goat and Sheep:1/2nall, Cow: 1nall, Camel: 1nall, Donkey:2 nall	3	0.013	14	0.029

Table 2. (Cont'd).

S. #	Botanical name	Family	Local name	Plant part used	Mode of utilization	Treated disease	Treated animal	Recipes	UR* <sup>2</sup>	UV* <sup>3</sup>	FC* <sup>4</sup>	RFC* <sup>5</sup>
11.	<i>Citrullus colocynthis</i> (L.) Schrad	Cucurbitaceae	Trooh	Whole plant, Fruit, Leaves, Root	Decoction/ Powder	Food poisoning and internal infection of liver and joint pain, Diarrhea	Camel, Sheep, Buffaloes, Cow, Goat, Sheep, Horse, Donkey	For treating Food poisoning, 1200gm dry Whole plant is grinded are combines with 650gm old jiggery. This mixture is given to animals 3 times a day for 2 days dosage includes. Camel: 1 nall, Cow: 1/2 nall, Buffaloes: 1 nall Goat and Sheep: 1/4 nall, Horse: 1/2 nall Donkey: 1/3 nall. For treating internal infection of liver, 820gm dry fruit are grind combine up with 425gm old jiggery. Decoction is boiling in water for 11 mints. This mixture is given to animals 3time a day for 8 days. Dosage include Camel: 1nall, Cow: 1/2 nall, Goat: 1/3, Sheep and Goat: 1/4 nall, Horse: 1/2 nall, Donkey: 1/2nall. For treating joint pain, dry root 600gm are grind mix with 320gm Jaran decoction boil in 500gm bitter (Cow) for 9 mints. This mixture is given to animals 3 times a day for 2 days. Dosage include Camel:1/2 nall, Cow and Buffaloes:1/3 nall, Sheep and Goat: 1/4 nall, Horse and Donkey: 1/3nall For treating diarrhea, 800gm dry leaves grinded mix with 430 gm sorghum decoction boil in water for 56mints. This mixture is given to animals 3 times a day for 3 days. Quantity take in Camel:1 nall, Cow and Buffaloes:1/2 nall, Sheep and Goat:1/4 nall, Horse and Donkey:1/3 nall	7	0.031	14	0.029
12.	<i>Cleome viscosa</i> L.	Capparidaceae	Kinni Butti	Whole plant, Seed	Paste, Decoction, Powder	Removal of Leach and Infection of Nipples, external worms of the skin diseases	Especially Buffaloes Camel, Cow Dog,	For removal of Leach 400gm fresh whole plant are grind mix with 150gm black salt. Past is rapture on specific body part Leach is invaded. Leach lead down is fast. This paste is rapture on animal skin for one day. Quantity take in Buffaloes: 500gm, Camel: 530 gm, Cow: 430gm Dog: 300gm. For treating in external warms skin, 500gm dry seed grind combine with 200gm Black salt. Fusion is boiling in water for 7 minutes. This mixture is given to animals 2 times a day for 4 days. Quantity given to Camel: 1/2 nall, Buffaloes: 1/2 nall, Cow: 1/2 nall, Sheep and Goat: 1/4nall.	5	0.022	14	0.029
13.	<i>Convolvulus arvensis</i> L.	Convolvulaceae	Naaro	Whole plant	Raw	Increase in milk productions	Epically goat, Sheep	Whole plant is eaten as fodder	3	0.013	15	0.031
14.	<i>Corchorus depressus</i> (L.) Stocks	Tiliaceae	Mundheri	Whole plant, Leaves, Root	Extract juice	Sexual tonic, urinary infections	Goat, Camel, Cow, Deer, Sheep	For increasing tonic 600gm fresh whole are grinded as mix with 250gm old date palm (Fruit) is boil in 300gm Bitter for 9 minutes. This mixture is given to animals one time a day for 10 days. Quantity given to Goat: 1/4 nall, Camel: 1 nall, Cow: 1/2 nall, Deer:1/3 nall, Sheep:1/4 nall For treating Urinary infection 1100 gm fresh leaves are juice extract and combine along with 250gm Cheese. Fusion is boiled in water for 4 minutes. This fusion is given to animals 2 time a day for 6 days. Dosage include Goat: 1/3 nall, Camel:1 nall, Cow:1/2 nall, Deer:1/2, Sheep 1/3 nall.	9	0.040	11	0.023

Table 2. (Cont'd.).

S. #	Botanical name	Family	Local name	Plant part used	Mode of utilization	Treated disease	Treated animal	Recipes	UR* <sup>2</sup>	UV* <sup>3</sup>	FC* <sup>4</sup>	RFC* <sup>5</sup>
15.	<i>Cressa cretica</i> L.	Convolvulaceae	Utah Charo/ Oin	Whole plant	Decoction	Dehydration	Goat, Camel Sheep, Cow, Buffaloes	For treating Dehydration, 940gm fresh whole plant grinded are mix along with 225gm gm black salt paste boil in water for 8mints. This mixture is given to animals 3 times a day for 3 days. Quantity take in Goat: 1/4 nall, Camel:1 nall, Sheep:1/4 nall Cow: 1/3 nall, Buffaloes: 1 nall For treating breast infection, 520gm dry whole plant are grinded is mix with 460gm Sugar and Lemon juice 50 ml. Paste boil in water for 12mints. This mixture is given to animals 3 times a day for 3 days. Dosage include Camel: 1 nall, Camel:1 nall, Cow: 1 nall, Goat and Sheep:1/2 nall For treating Dysentery 250gm dry root are grind mix with 200gm gm old jiggery decoction boil in water for 9 mints. This mixture is given to animals 2 times a day for 3 days. Dosage include Camel: 1 nall, Camel:1 nall Goat and Sheep:1/2nall, Cow: 1 nall,	6	0.027	11	0.023
16.	<i>Crotolaria burhia</i> Buch-Ham	Fabaceae	Feer,Makhan booti	Whole plant Root, Seed	Paste/ Decoction	Breast infection, Dysentery, Blood along with faces	Camel, Buffaloes, Cow, Sheep, Goat	For treating Blood during in faces, 900gm dry seed grind mix with 500ml curd and 100 ml Brassica oil decoction boil in water for 6mints. This mixture is given to animals 3 times a day for 15days. Dosage include Camel: Inall; Buffaloes: 1/2 nall, Goat and Sheep:1/4 nall, Cow: 1/3 nall, Camel:1 nall Whole plant is eating for fodder.	4	0.018	15	0.031
17.	<i>Cucumis melo</i> L.	Cucurbitaceae	Mitero/ Chabar	Fruit	Powder/ Decoction	Mouth infection, infection in tongue	Buffaloes, Cow, Sheep, Donkey, Goat, Camel	For treating Mouth infection, 650gm gm dry fruit grinded aremix with 200 gm turmeric and 2 eggs. This paste given to animals. Dosage include Buffaloes and Cow:1/3 nall, Sheep and Goat:1/4 nall, Donkey:1/3nall, Camel:1/2 nall	10	0.045	20	0.042
18.	<i>Cymbopogon jawarancusa</i> (Jones) Schult.	Poaceae	Kattan	Whole plant,	Decoction	Fever, joint pain, and increase in milk production	Cow, Sheep, Goat, Camel	For treating fever, 530gm fresh whole plant grinded is mix with 220gm gm jharan t decoction boil in water for 5mints. This mixture is given to animals 3 times a day for 3 days. Quantity take in Cow: 1/2 nall, Sheep:1/3 nall, Goat:1/3nall, Camel: 1 nall For treating joint pain, 620gm dry whole plant grind mix with 200gm gm cheese paste boil in water for 6mints. This mixture is given to animals 3 times a day for 3 days. Dosage include Cow: 1/3 nall, Goat and Sheep:1/4 nall, Camel: 1/2 nall,	5	0.022	8	0.016
19.	<i>Cyperus rotundus</i> L.	Cyperaceae	Kabah	Seed	Decoction	Urinary bladder infection	Cow calf, Buffaloes calf, goat baby	Dried seed (180 gm) are grinded with the seed of <i>Withania coagulans</i> . The powder is boiled in water for 7 minutes. The decoction is used for the treatment of urinary bladder infections for the duration 4 with days 3 times a day. The dose range is: Buffaloes 60 ML, Calf 50 ML, and Goat baby 40ML.	11	0.05	12	0.025

Table 2. (Cont'd.).

S. #	Botanical name	Family	Local name	Plant part used	Mode of utilization	Treated disease	Treated animal	Recipes	UR <sup>#2</sup>	UV <sup>#3</sup>	FC <sup>#4</sup>	RFC <sup>#5</sup>
20.	<i>Digera muricata</i> (L.) Mart.	Amaranthaceae	Lulur	Whole plant, Seed	Decoction	Urinary bladder ulcer and increase milk fat	Sheep, Cow, Goat, Camel, Donkey, Sheep	For treating Urinary ulcer, 600gm dry seed grinded is mix with 20 ml Nitric acid paste boil in water for 6mints. This mixture is given to animals 3 times a day for 3 days. Dosage include Cow: 1/2 nall, Goat :1/4 nall, Camel: 1nall, Donkey:1/3 nall, Sheep:1/4 nall Whole plant is used for fodder, increase fat and milk quantity	4	0.018	15	0.031
21.	<i>Fagonia brugieri</i> DC.	Zygophyllaceae	Dramaaho	Whole plant, Leaves, Seed	Decoction/ Powder	Skin Diseases, fever, anti-cancers and Use for Fodder	Buffaloes, Camel, Cow, Goat, Sheep	For treating Skin diseases, 620gm dry whole plant grinded is mix with 240gm gm cheese paste boil in water for 13mints. This mixture is given to animals 3 times a day for 3 days. Dosage include Buffaloes: 1/2 nall, Camel:1 nall Goat and Sheep:1/4 nall, Cow: 1/3 nall, For treating fever, 1120gm dry leaves are grind mix with 200gm gm old jiggery decoction boil in water for 7mints. This mixture is given to animals 3 times a day for 3 days. Dosage include Buffaloes: 1 nall, Camel:1 nall Goat and Sheep:1/2nall, Cow: 1 nall, For treating cancer, 940gm dry seed grind mix with 300gm gm garlic and 150 gm turmeric decoction boil in water for 6mints. This mixture is given to animals 3 times a day for 15days. Dosage include Buffaloes: 1/2 nall, Goat and Sheep:1/4 nall, Cow: 1/3 nall, Whole plant used as fodder for eating	12	0.054	21	0.044
22.	<i>Fumarria indica</i> (Hausskn.) Pugsley	Fumariaceae	Shahatro	Whole plant	Juices/ Decoction	Ear diseases, Dysentery	Camel, Buffaloes, Cow, Goat, Sheep, Dog	For treating dysentery, 500gm dry whole plant is grinded is mix with 300gm garlic decoction boil in water for 5mints. This mixture is given to animals 3 times a day for 5days. Dosage include Camel: 1 nall, Buffaloes: 1/2 nall, Goat and Sheep:1/4 nall, Cow: 1/3 nall, Dog:1/4 nall For increasing milk production lipid, dry seed are grinded 530 gm mix with 400gm millet flour decoction is boil in water for 4 mints. This mixture is 3 time a day for 3 days. Dosage include Sheep:1/2 nall, Cow:1 nall, Goat:1/2 nall	8	0.036	18	0.037
23.	<i>Heliotropium bacciferum</i> Forssk.	Boraginaceae	Khrasan	Seed	Decoction Raw	Increase in milk production and in lipid milk	Sheep, Cow, Goat		5	0.022	9	0.018



Table 2. (Cont'd.).

S. #	Botanical name	Family	Local name	Plant part used	Mode of utilization	Treated disease	Treated animal	Recipes	UR <sup>#2</sup>	UV <sup>#3</sup>	FC <sup>#4</sup>	RFC <sup>#5</sup>
24.	<i>Ipomoea batatas</i> (L.) Lam.	Convolvulaceae	Ghajar lahori	Whole plant Seed	Powder/ Decoction	Joint pain, Food Poisoning	Cow, goat, camel,	For treating joint pain, 900gm dry seed are grind and combine with 500gm old jiggery. This mixture is given to animals 4 time a day for 3 days dosage include Camel: one nall, Cow:1/2 nall, Goat:1/3 nall For treating Food poisoning, 500gm fresh whole plant are grind mix with 200gm dry tamarind decoction is boil in water for 10 mints. This mixture is given to animals 2 time a day for 3 days. Dosage include Camel: one nall, Cow:1/3 nall, Goat:1/4 nall For treating Urinary disorder, 740 gm dry whole plant are grinding mix with 307gm Butter ( <i>Dasee ghee Cow</i> ). This mixture is given to animals 2 times a day for 3days.Dosage include Cow: 1 nall, Buffaloes:1 nall, Camel: 2nall, Sheep and Goat:1/3 nall For treating Mouth infection, 530gm dry seed are grinded mix with 100gm black salt and 400 gm old jiggery. Paste is boiling in water for 7 mints. This mixture is given to animals 3 times a day for 5days. Dosage include Goat and Sheep:1/2nall, Cow: 1nall, Camel: 1nall	4	0.018	16	0.033
25.	<i>Leptadenia pyrotechnica</i> (Forssk.)	Apocynaceae	Khup	Whole plant, Seed	Decoction	Urinary disorder, Mouth infection	Cow, Buffaloes, Camel Sheep, Goat	For treating Mouth infection, 530gm dry seed are grinded mix with 100gm black salt and 400 gm old jiggery. Paste is boiling in water for 7 mints. This mixture is given to animals 3 times a day for 5days. Dosage include Goat and Sheep:1/2nall, Cow: 1nall, Camel: 1nall	9	0.040	9	0.018
26.	<i>Phyla nodiflora</i> (L.) Greene	Verbenaceae	Bukkan	Whole plant, Leaves, Seed	Decoction/ Paste, Powder	Swollen body, Vomiting, Urinary disorders	Camel, Buffaloes, Goat, Sheep, Dog, Donkey	For treating infection, 940gm fresh whole plant is grinded is mix with 300gm turmeric. This paste rapture on specific swollen body part. This paste is bind to animals 2 times a day for 3 days. Dosage include Camel: 150gm, Buffaloes:140gm, Goat and Sheep:90gm, Cow: 120gm, Dog:60gm, Donkey:95gm For treating vomiting, 820gm dry leaves are grind mix with 330gm garlic. Decoction is boiling in water for 8mints. This mixture is given to animals 3 times a day for 3days. Dosage include Camel:1 nall, Buffaloes: 1/2 nall, Goat and Sheep:1/4 nall, Cow: 1/3 nall, Dog:1/4 nall, Donkey:1/3 nall For treating Urinary disorder, 630gm dry seeds are grind mix with 30ml Nitric acid. Decoction is boiling in water for 5mints. This mixture is given to animals 3 times a day for 3days. Dosage include Camel:1 nall, Buffaloes: 1/2 nall, Goat and Sheep:1/4 nall, Cow: 1/3 nall, Dog:1/4 nall, Donkey:1/3 nall	9	0.040	25	0.052

Table 2. (Cont'd.).

S. #	Botanical name	Family	Local name	Plant part used	Mode of utilization	Treated disease	Treated animal	Recipes	UR* <sup>2</sup>	UV* <sup>3</sup>	FC* <sup>4</sup>	RFC* <sup>5</sup>
27.	<i>Pulicaria boissieri</i> Hook. f.	Asteraceae	Kolmir	Leaves, Seed	Decoction/ Paste	Leach removing, internal parasite	Buffaloes, Cow, Camel, Goat, Sheep	For treating Leach removing, 920gm fresh leaves are grinding mix 130 gm black salt. Paste is roasted on specific part there is invading leach. This paste is rapture on body given to animals one times a day. Dosage include Goat and Sheep:60gm, Cow: 90gm, Camel:150gm, Buffaloes:130gm For treating internal parasite, 510gm dry flower are grind mix with 200 gm old jiggery. Paste is boiling in water for 5 mints. This mixture is given to animals 3 times a day for 3days. Dosage include Goat and Sheep:1/2nall, Buffaloes:1 nall, Cow: 1nall, Camel:1nall	5	0.022	10	0.021
28.	<i>Rhynchosia capitata</i> (Roth.) DC.	Fabaceae	Mattar wallah	Leaves, Flower	Decoction /Paste	Fever, Urinary disorder	Buffaloes, Camel, Cow, Goat, Sheep	For treating Fever, 940gm dry Leaves are grinded mix with 310 gm <i>jaran</i> . Decoction is boiling in water for 5mints This mixture is given to animals 2 times a day for 3days. Dosage include Cow: 1 nall, Buffaloes:1 nall, Camel: 2nall, Sheep and Goat:1/3 nall For treating Urinary disorder, 400gm dry flower are grind mix with 200ml lemon juice and 210 gm old jiggery. Paste is boiling in water for 5 mints. This mixture is given to animals 3 times a day for 5days. Dosage include Goat and Sheep:1/2nall, Cow: 1nall, Camel:1nall	7	0.031	14	0.029
29.	<i>Senna italica</i> Mill.	Fabaceae	Ghorwal	Whole plant, Seed, Root, Leaves	Powder/ Decoction	Joint pain, Breast Swollen, Removal of placenta after delivery, Old cough	Camel, Cow, Buffaloes, Goat, Sheep, Horse, Donkey	For treating joint pain, 1100gm dry Whole plant are grinded and combine with 550gm old jiggery. This mixture is given to animals 2 time a day for 3 days dosage include Camel: 1 nall, Cow: 1/3 nall, Buffaloes: 1 nall Goat and Sheep: 1/4 nall, Horse: 1/2 nall Donkey: 1/3 nall. For treating Breast swollen, 500gm dry seed are grind combine up with 300gm old jiggery. Decoction is boiling in water for 12 mints. This mixture is given to animals 2 time a day for 5 days. Dosage include Camel: one nall, Cow: 1/2 nall, Goat: 1/3, Sheep and Goat: 1/4 nall, Horse: 1/3 nall, Donkey: 1/3nall. For treating placenta replacement dry root 900gm are grind mix with 720 gm wheat decoction boil in 500gm bitter (Cow) for 15 mints. This mixture is given to animals 3 times a day for 2 days. Dosage include Camel:1/2 nall, Cow and Buffaloes:1/3 nall, Sheep and Goat:1/4 nall, Horse and Donkey: 1/3nall For treating old cough, 1000gm dry leaves grind mix with 430 gm cheese paste boil in for 5 mints. This mixture is given to animals 2 times a day for 10 days. Quantity take in Camel:1 nall, Cow and Buffaloes:1/2 nall, Sheep and Goat:1/4 nall, Horse and Donkey:1/3 nall.	8	0.036	25	0.052

Table 2. (Cont'd.).

S. #	Botanical name	Family	Local name	Plant part used	Mode of utilization	Treated disease	Treated animal	Recipes	UR*2	UV*3	FC*4	RFC*5
30.	<i>Solanum surattense</i> Burm. f.	Solanaceae	Kandi	Whole plant, Leaves, Root	Decoction/ Powder	Joint pain, Old cough, Spleen infection	Buffalo, Cow, Camel, Sheep, Goat, Donkey, Dog	For treating Joint pain, 1200gm dry whole plant is grind mix with 520gm Old jiggery. Decoction is boiling in water for 14mints. This mixture is given to animals 3 times a day for 3days. Dosage include Camel: 1 nall, Buffaloes: 1nall, Goat and Sheep: 1/2 nall, Cow: 1nall, Dog: 1/3 nall, Donkey: 1/2 nall For treating Old cough, 400gm dry Leaves is grind mix with 200gm cheese. Paste is boiling in water for Camel, Sheep, 6mints. This mixture is given to animals 2 times a day for 3days. Dosage include Camel: 1 nall, Goat, Donkey, day for 3days. Dosage include Camel: 1 nall, Buffaloes: 1nall, Goat and Sheep: 1/3 nall, Cow: 1nall, Dog: 1/4 nall, Donkey: 1/2 nall For treating Spleen infection, 700gm dry root is grind mix with 230gm Old jiggery. Paste is boiling in water for 14mints. This mixture is given to animals 3 times a day for 3days. Dosage include Camel: 1 nall, Buffaloes: 1nall, Goat and Sheep: 1/2 nall, Cow: 1nall, Dog: 1/3 nall, Donkey: 1/2 nall	7	0.031	23	0.048
31.	<i>Solanum americanum</i> Mill.	Solanaceae	Paat Pero	Seed, Leaves	Powder/ Paste, Raw	Blood during delivery. For cultural Identification of variety of Goat	Cow, Camel, Goat, Sheep	For treating Blood flow during delivery, 600gm seed are grinded mix with 330gm Cheese. Paste is boiling in water for 10 mints from 2 times a day for 3days. Dosage include Cow: nall, Camel: 2 nall, Goat and Sheep: 1/2 nall For treating Skin, 500gm fresh leaves are grind mix with 400gm old jiggery. This Decoction is boiling in water for 18 mints 2 times a day for 4days. Dosage include Cow: 1 nall, Camel: 2 nall, Goat and Sheep: 1/2 nall For Protection Mosquito, 530gm leaves are grind mix with 150gm black salt and 325gm old jiggery. Decoctions boiling in water for 10 mints. This mixture is given to animals 2 times a day for 6days. Dosage include Goat and Sheep: 1/2nall, Cow: 1nall, Camel: 1nall, Buffaloes: 1 nall Leaves are eating in this plants Goat and purity of in Kamori Breeding Goat faithfully identified.	7	0.031	15	0.031

Table 2. (Cont'd.).

S. #	Botanical name	Family	Local name	Plant part used	Mode of utilization	Treated disease	Treated animal	Recipes	UR* <sup>2</sup>	UV* <sup>3</sup>	FC* <sup>4</sup>	RFC* <sup>5</sup>
32.	<i>Spergularia marina</i> (L.) Griseb.	Caryophyllaceae	Naaro thulo	Seed, Leaves	Decoction/Drop	Fungal infection in Nipple, warts on nipple	Buffaloes, Camel, Cow, Goat, Sheep	For treating Eye infection, 300 gm seed are grinded is mix with 150ml old honey. This paste is given to animals in the drop from 2 times a day for 3days. Dosage include Goat and Sheep:8 drop, Cow: 11 drops, Camel:13 drop For treating Breast spot, 500gm fresh leaves are grind mix with 140gm Sulfur. This paste is roasted on Nipple part in animals 2 times a day for 4days. Dosage include Goat and Sheep: 30 gm, Cow: 50 gm, Camel:70 gm, For Protection Mosquito, 530gm leaves are grind mix with 150gm black salt and 325gm old jiggery. Decoctions boiling in water for 10 mints. This mixture is given to animals 2 times a day for 6days. Dosage include Goat and Sheep:1/2nall, Cow: 1nall, Camel: 1nall, Buffaloes: 1 nall	8	0.036	12	0.025
33.	<i>Tribulus terrestris</i> L.	Zygophyllaceae	Sarang	Whole plant, Seed	Decoction	Gall bladder, and increases in milk production	Goat, Sheep, Cow, Camel	For treating Gall bladder, 725gm dry seed is grinded is mix with 320gm Old jiggery. Paste is boiling in water for 10 mints. This mixture is given to animals 3 times a day for 3days. Dosage include Goat and Sheep:1/2nall, Cow: 1nall, Camel:2 nall Whole plant use for fodder and increase milk production	5	0.022	16	0.033
34.	<i>Zaleya pentandra</i> (L.) C. Jeffrey	Aizoaceae	Wahoo	Whole plant, Seed	Decoction	Cough, Dehydration,	Camel, Cow, Sheep, Goat,	For treating Cough, 730whole plant is grinded mix with 318gm Old jiggery Paste is boiling in water for 10 mints. This mixture is given to animals 3 times a day for 5days. Dosage include Goat and Sheep:1/2nall, Cow: 1nall, Camel:2 nall For treating Dehydration, 550gm dry seed is grind mix with 200gm black salt and 300 gm old jiggery. Paste is boiling in water for 10 mints. This mixture is given to animals 3 times a day for 5days. Dosage include Goat and Sheep:1/2nall, Cow: 1nall, Camel:2 nall	9	0.040	13	0.027

N\*<sup>1</sup>= Nall approximately 1.5 litter, UR\*<sup>2</sup>= Use report, UV\*<sup>3</sup>=Use value, FC\*<sup>4</sup>= Frequency citation, RFC\*<sup>5</sup>= Relative frequency citation

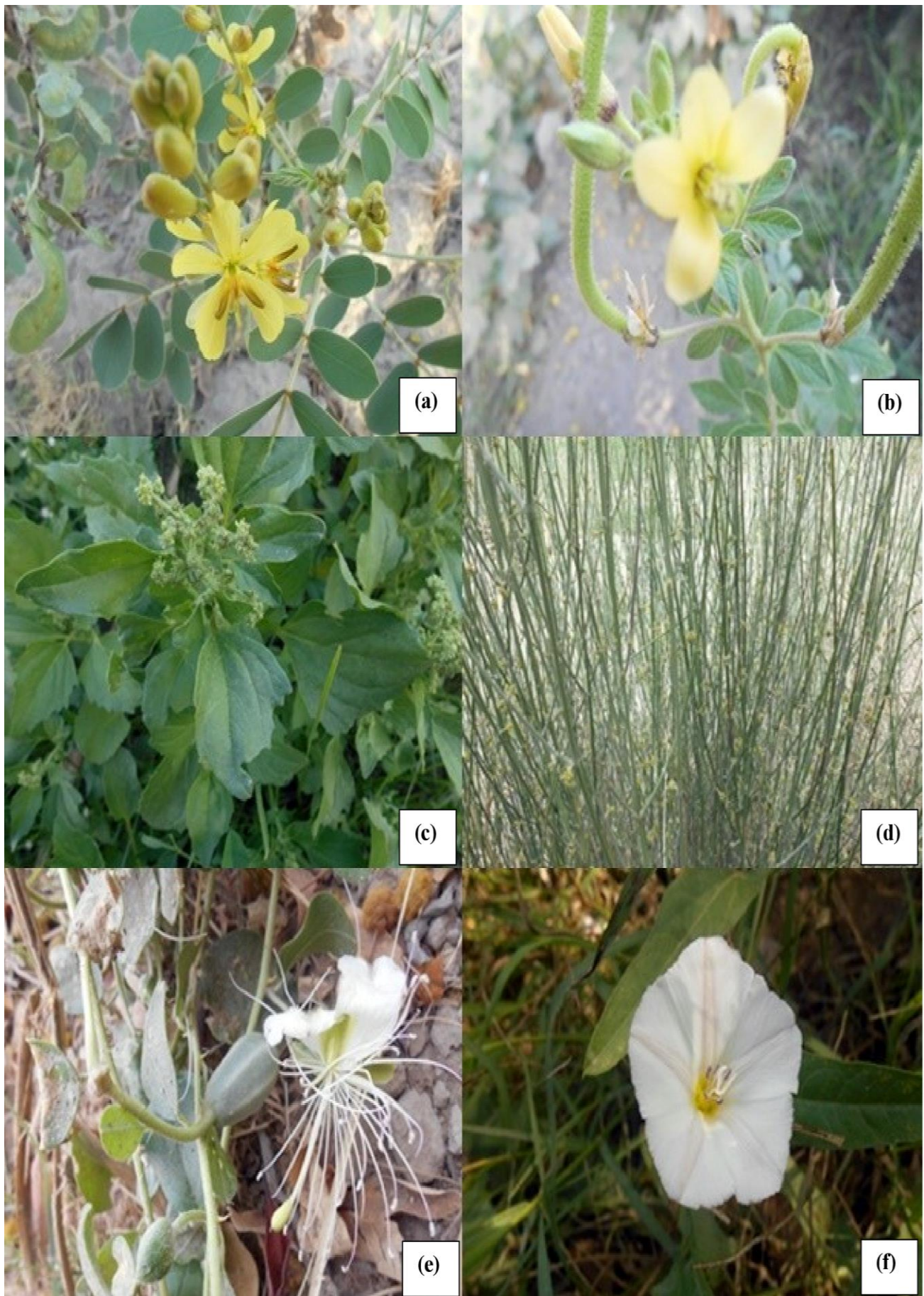


Fig. 1. (a) *Senna italica*, (b) *Cleome viscosa* L., (c) *Chenopodium murale* L., (d) *Leptadenia pyrotechnica* (Forssk.), (e) *Capparis spinosa* L., (f) *Convolvulus arvensis* L.



Fig. 2. (a) *Asphodelus tenuifolius* Cav. (b) *Cucumis melo* L., (c) *Fumaria indica* (Hausskn.) Pugsley (d) *Corchorus depressus* (L.) Stocks (e) *Rhynchosia capitata* (Heyneex Roth.) (f) *Phyllanthus reticulatus* Poir.

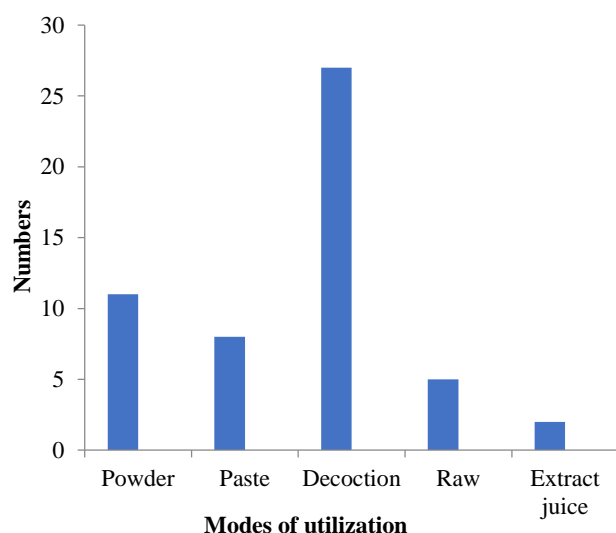


Fig. 3. Modes of Utilization of herbal recipes.

**Mode of utilization of herbal recipes:** In the present study, various modes of utilization of herbal recipes were reported (Fig. 4). Among reported modes, the decoction was commonly reported (27%), was followed by powder (11%) and paste (8%), while least mode was extract and juices. In previous studies on ethnoveterinary Maphosa & Masika (2010) reported decoction as dominant form of utilization. In ethnobotanical studies, decoctions always commonly reported. Decoction is prepared by boiling plant material in water or any other liquid for a proper time. It is reported that on boiling of plant material various active compound are extracted in liquid which are responsible for therapeutic potential (Ahmad *et al.*, 2008; Ramawat *et al.*, 2009). In other studies, Yaseen *et al.*, (2019); and Yaseen *et al.*, (2015a) it was concluded that decoction may be responsible for synergetic effect of herbal recipes, that are made from two or more plant species. In present study, *Achyranthes aspera*, *Citrullus colocynthis*, *Cressa cretica* and *Fagonia bruguieri* were commonly reported for decoction. The commonly reported species may be further studied using their decoction.

**Most commonly used plant species:** In present study, the rich heritage and cultural knowledge regarding ethnoveterinary uses of precious plants in the Southern deserts is reported. Among reported plant species, the most used species were *Senna italica*, *Phyla nudiflora*, *Solanum surrattense*, *Fagonia bruguieri*, *Asphodelus tenuifolius* and *Fumaria indica*. *Senna italica* was commonly reported for removal of placenta after delivery of fetus, infections on nipples and joint pain. In literature from deserts, *Senna italica* is reported against amoebic dysentery constipation and uses as liver stimulant (Mahmood, 2015). In India, it was reported that it is used for treatment of various diseases. Water extract is applied topically for three days to cure abscess and scabies. Leaves and seeds of *Senna italica* are purgative and anthelmintic. Powder of its leaves is mixed with vinegar and applied externally to cure skin diseases. Root infusion is also used as eye drops for sore eyes (Sasidhar *et al.*, 2016). In pharmacological studies, *Senna italica* have showed antioxidant and anti-cancerous activities (Aboul

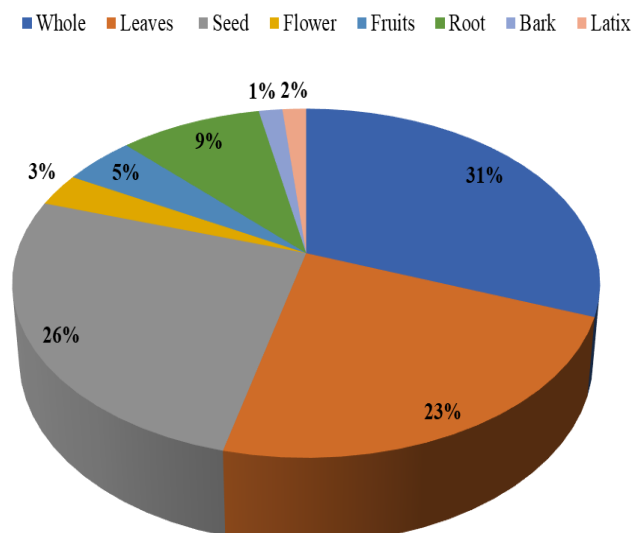


Fig. 4. Plant part used in Herbal recipes.

*et al.*, 2014; Sree *et al.*, 2013). *Phyla nudiflora* was reported for the treatment of urinary disorders and vomiting. (Padal *et al.*, 2012) reported *P. nudiflora* in traditional management of micturition, dysuria, bleeding piles, skin gums, venereal disease and bronchial disorders. Paste of fresh leaves is applied on head to prevent premature graying of hair. Vegetative parts are also used as teeth cleaner which also strengthen the poor teeth. antipyretic, astringent, boils, cooling, demulcent. *Solanum surrattense* was reported against enlarged spleen, respiratory disorders and skeletal disorders. In previous studies it is commonly reported in ethnobotanical studies for asthma, rheumatism, wound healing and used as vermifuge. It was reported it is commonly used for bronchial asthma, headache, cough, joint pain and diabetes, indigestion, diarrhea, stomachache. Berries are used in toothache. The decoction of plant is used for sore throat, body pains, fever, rheumatism, anti-diabetic, and chest complain (Umair *et al.*, 2017). In various pharmacological studies it is found to be effective against viral, bacterial, and fungal infections. *Fagonia bruguieri* was reported for infections related to blood, such as blood cancer and skin infections. In study area, *Fagonia bruguieri* is considered as best fodder for the good health of livestock. In literature, it is also commonly reported for the anti-fungal and anti-allergic activities. Whole plant is useful in diabetes asthma, fever, thirst, vomiting, skin eruption cures, dysentery, ophthalmia, toothache and obesity, stomatitis. It is also used as blood and heart tonic. Mixture of root paste and stem paste on tumors (Puri & Bhandari, 2014; Saleem *et al.*, 2019). *Asphodelus tenuifolius* was commonly documented for release of blood along with milk from nipples. It was found to be most effective species for these infections. In previous studies, *Asphodelus tenuifolius* is reported for anti-inflammatory activity, also used against paralysis, sexual problems and diarrhea, phlegmatic cough, constipation, piles, asthma. Fresh leaves or whole plant is crushed, and the extract is used for phlegmatic cough (Aslam *et al.*, 2016). *Fumaria indica* was commonly documented for ear infections of cattle. (Gupta *et al.*, 2012; Kirtikar & Basu, 1985) reported it for the treatment of influenza,

liver complaints and plant is regarded as diuretic and diaphoretic, chronic skin infections, dyspepsia, liver complaints, leprosy. Its decoction is considered useful in blood purification, antipyretic, carminative, diaphoretic and laxative. In various biological activities it is recommended for cardiovascular and anxiety disorders.

**Relative frequency of citation and use value:** In present study, for quantitative analyses, relative frequency of citation and Use value indices were applied. The use value is applied for determination of important species based upon reported uses. The use value ranged from 0.054 to 0.13 where highest value was reported for *Fagonia bruguieri* followed by *Cypers rotundus* (0.05) and *Cuccumus melo* (0.045). The lowest value was accounted for *Capparis spinosa* and *Convoluvalus arvensis*. Rashid *et al.*, 2015 reported that the plant species that are commonly used in study are always has highest use value. In literature, it is concluded that plant species with highest use value may be selected for further experimental studies in drugs discovery development (Cerqueira *et al.*, 2020). In present study it is observed that plant species with highest use value are commonly used by local people for ethnoveterinary medicine.

The relative frequency of citation is applied to highlight the reported plant species based upon local province. In present study, the relative frequency of citation ranged from 0.052 to 0.014. The highest value was found for *Senna italica* followed by *Solanum surrattense* and *Fagonia bruguieri* (0.048). Lowest value of RFC was reported for *Amaranthus viridis* (0.014) followed by *Cymbopogon jawarancusa* (0.016). In various studies, it is showed that plant species with local prominence have highest relative frequency of citation (Khan & Razzaq, 2018) and such species should be preferred over other during selection of species for further phytochemical and pharmacological activities (Amiri *et al.*, 2012).

**Future perspectives:** The present study provides the baseline information of precious medicinal plant species commonly used in the healthcare of livestock in the desert regions of Sindh-Pakistan. The plant species with common use, high quantitative indices values and unique use may be further studied using laboratory experiments for alternative drug discovery development that may be used in the veterinary clinics at local, regional, and global level. In future, it is suggested that detailed clinical investigations may be carried out to scientifically prove the effectiveness of drugs prepared from the different parts of commonly reported specie. The plant species such as *Senna italica*, *Phyla nudiflora*, *Solanum surrattense*, *Fagonia bruguieri*, *Asphodelus tenuifolius* and *Fumaria indica*, and *Cypers rotundus* may be further studied for pharmacological activities. These species may be validated using correct taxonomic names, effective extraction techniques, role of synergism, mechanism of action of compounds on single or multiple targets, toxicology, proper dose duration, chemical structural elucidation in relation to their pharmacological actions and link to their folk traditional usage.

## Conclusion

The ethnoveterinary medicine are commonly practiced in various parts of the world. The present study is confined to exploration of herbal recipes made from precious medicinal plant species for the treatment of various chronic diseases in livestock. It is concluded that the Southern deserts of Sindh-Pakistan exhibit the large population of livestock owned by rural pastoralists. The majority of pastoralist rely on their livestock for livelihood and economic development. During present study, it is observed that the study area is occupied by diversity of important plant species used in the healthcare of livestock. The pastoralists have rich ethnoveterinary knowledge and practices for the management of livestock diseases and production. The study reported that the various populations of livestock experiences the various diseases such as infections in female reproductive system, infections in nipples, urinary bladder infections, food poisoning, immobile placenta during delivery, enlargement of spleen, mouth infections, low fat in milk and respiratory infections. Most of the local people occupy the buffaloes, cows, camels, goats and sheep in their livestock. For the treatment of diseases, pastoralists use the herbal recipes made from local plants and other adjuvants such as butter, milk, Sulphur, jaggary, black salt and plant products such as Garlic, onion and *withania sominifera*. In herbal recipes, most used form is decoction and powder while the dose varies according to animal category. It was reported that commonly used species are *Senna italica*, *Phyla nudiflora*, *Solanum surrattense*, *Fagonia bruguieri*, *Asphodelus tenuifolius* and *Fumaria indica*, and *Cypers rotundus*. It is predictable that data presented here will be helpful for the treatment of various gastric, intestinal, dermatological, and other health issues among animals and it could also be utilized for phytochemical or validation studies of medicinal plants, which may lead to drug discovery. It is more urgent to record this rich information not only for the purpose of bio-culture protection but also for insights to scientists investigating new herbal veterinary therapies. It is also expected that this assessment will stimulate further ethnoveterinary research among livestock ailment administration practices in Southern Desert in Sindh. Ethnoveterinary data documented in the present study could offer an extraordinary background for conducting studies intended at implementing clinical phytotherapy research for livestock healthcare and production. It is recommended that plant species with high citations, quantitative indices values and preferred by pastoralists should be studied for phytochemical and pharmacological properties for future drug discovery development.

## Acknowledgment

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