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A Cross-Cultural Examination of Medicinal Plants Used in the Treatment of Lumpy Skin Disease in Bovine Herds in Sargodha, Punjab, Pakistan

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Abstract

Medicinal plants are being used for the treatment of various livestock ailments by the local peoples since earliest times. It is a recognized fact that plants are an important source of ethnoveterinary medicines. From the last decade, ethnoveterinary practices have gained tremendous importance due to the discovery of some effective ethnoveterinary products. Ethnoveterinary practices are more common in developing countries including Pakistan due to different socioeconomic factors. The studies showed that many medicinal plants used for the treatment of Lumpy skin disease (LSD). Ethno-pharmacological content was obtained from 200 people with knowledge and experience of using plants as medicines for this disease in different areas of Sargodha and Khushab, Punjab, Pakistan. The field study was carried out from January-2023 to June-2023. All the data was collected by evaluation and interviews by calculating Use value (UV). The result from this study shows that 20 medicinal plants that belong to fifteen families greatly represented by Family Meliaceae were significant in treating LSD. This study indicated that the ethno-medicinal practices and knowledge are still used in District Sargodha and Khushab plants that support health care and help in the improvement of alternative system of medicines. These results gave commencing information on the significance use of medicinal plants. It can be tested for use in the future that leading to new discoveries of medicines in the treatment of LSD and other diseases of cattle.

Keywords: Ethnopharmological study, medicinal plants, lumpy skin disease, Ethnobotany, pathogenesis, transmission

INTRODUCTION

Agriculture is Pakistan's largest and important sector of the economy, which contributes to one fourth of the total gross domestic product (Al-Salihi, 2014). In agriculture sector livestock is very important and its population in Pakistan has increased up to 167.5 million heads, which is contributing 51.1% in an agriculture

economy (Bhardwaj et al., 2005). Due to high dependency on agriculture and livestock, Pakistan is the world's 5th largest milk producing country (Chauhan et al., 2014). Approximately 53 million people of Pakistan reside in rural areas and mostly derive their income from livestock through different methods particularly from cows (Dhadwal et al., 2017). They have limited resources available for feeding to their cows and use whatever is available, which ultimately leads to poor health of cows, resulting in economic losses. At present annual growth rate of meat and milk production from cow in Pakistan is very slow due to poor forage quality, high incidence of diseases, poor prophylaxis, and high cost of modern veterinary drugs (Gupta et al., 2020).

Lumpy skin disease (Neethling viral disease) is an infectious disease that caused by lumpy skin disease virus (LSDV). LSDV belongs to family "Poxviridae" and genus "Capripoxvirus". It is very familiar to goat and sheep pox virus. Lumpy Skin disease (LSD) is a disease of buffalo and cattle. Lumpy skin disease is vector borne disease that is transmitted by various biting blood feeding and biting of arthropods. LSD causes economic loss due to under feeding, sterile, no milk production up to 20% loss of life and damage to hides. The intensity of distant signs of lumpy skin disease depends on cattle breed and capripox virus (Anonymous et al., 1988). The maturation period is believed to be two to five weeks and appearance of lesions start in four to twenty days. Its first sign is fever that followed in 2 days by the development of mucous membrane and lesion on skin (Tuomas et al., 2009).

Pakistan has rich flora of about six thousand plant species, natural resources and many ecological zones. In many ecological zones of Pakistan, many medicinal plants are naturally grown and some other species are grown on small scale. Temperature is fluctuating from 50°C in plains of southern area and below zero in mountain region (Dhadwal et al., 2017). In Pakistan six thousand species are reported. Out of which 100 species of plants are recorded as aromatic and medicinal plants. Various species of plants were used at a time for treatment of single disease or various diseases. In Pakistan maximum 350 to 400 species of medicinal plants are exported to various medicinal markets. These plants are also used by homeopathic doctors and Unani (Bhardwaj et al., 2005). Hakims are just interested in the floral and vegetative ingredients of medicinal plants. In formulation of both Allopathic medication, Ayurveda and in homeopathic medicines herbs are used to prepare varieties of mother compounds

The interest in study of therapeutic plants spread throughout the world. They may be source of active irritants pharmacologically. Population is more in developing countries with bad sanitary system, their plants are used for cure of irrational illness. Living condition of countries is confined and sanitary system is poor, cause diarrhea and dysentery. These diseases cause mortality and illness of people. A research was conducted on 20 different plants of 20 different families that were chosen as medicinal plants for the treatment of lumpy skin disease of animals (Bhardwaj et al., 2005).

Majority of the Pakistani farmers own 4-5 numbers of livestock and it is very difficult for them to treat their animals with modern drugs due to high cost. Moreover issues like development of drugs resistivity in cows and consumers unfriendly effects like high antibiotic residues in milk and other by-products increase the importance of ethnobotanical and ethnoveterinary medicines in addition to their significance in animal health care system (Gari et al., 2010). Under such conditions traditional veterinary medicines provide a cheap therapy and easy accessibility as compared to modern veterinary drugs. It will also help in poverty alleviation by empowering peoples to use their own resources for treating livestock ailments (Chauhan et al.,2017). That is why majority of the rural population in Pakistan is dependent on medicinal plants for the treatment of their animals based on their traditional knowledge. Despite the fact that traditional knowledge is very much important for the livestock health and productivity, the documentation of this knowledge is very much neglected in majority of the remote areas of Pakistan (Kirtikar et al., 1918).

Present study was designed with the aim to document indigenous knowledge on ethnoveterinary practices of an unexplored remote region situated in Khushab, Sargodha, Punjab, Pakistan. Different ethnobotanical studies have been carried out in the adjacent areas due to higher dependency of tribal people on medicinal plants (Khan et al.,1993, Shinwari et al., 2010). Despite having strong agricultural background of Pakistan very less attention has been given to these potential areas from ethnobotanical and ethnoveterinary point of view. The present study is the first attempt to explore detailed ethnobotanical and ethnoveterinary practices of this region of Pakistan where people have sound traditional knowledge and are highly engaged in utilizing ethnobotanical and ethnoveterinary practices for improving the health of cows to compensate their income. Main objectives of the study are (i) to identify ethnobotanical and ethnoveterinary plants and detailed indigenous knowledge on herbal preparations; (ii) to identify plants with high bioactivity against specific ailments on the basis of informant consensus, fidelity level, and preference ranking; (iii) to identify candidate medicinal plants for further phytochemical and pharmacological investigation; and (iv) to identify multipurpose ethnoveterinary plants and factors responsible for their extinction in future using family rank

order. The present study would be a great contribution in conserving valuable traditional knowledge on ethnobotanical and ethnoveterinary practices and provide baseline information for future *in vitro* and *in vivo* studies that could lead toward identification of novel active compounds and manufacturing veterinary drugs with low cost and fewer side effects.

MATERIALS AND METHODS

Ethno-botanical and ethno-veterinary study in different areas i.e. Hakeem's clinic, pansar shops and other village areas to collect data about medicinal plants that used by the people to cure the lumpy skin disease of cows. The applications of different plants parts that help in the treatment of disease were also observed in the study area. This study involves qualitative and quantitative analysis.

Study Area

Sargodha (Khushab), Punjab, Pakistan was selected for this study. There are main 5 union councils and 21 villages that makeup the study area (Table 1).

Table 1: Selected union councils of Tehsil khushab District Sargodha

Sr.No	Union councils	Villages		Respondents	Sr.No	Union councils	Villages		Respondents
1	Sandral 16	1	Shawala kalan	10	4	Bijar 27	1	Janoobi Bijar	10
		2	Shawala Khurd	8			2	Shumali Bijar	10
		3	Kora	12			3	Chak 14/Mb	10
		4	Tallokar	10			4	Choha	10
		5	Waheer	10	5	Dodah54	1	Dodha	10
2	Katha Saghral 9	1	Nali	8			2	Tehri	10
		2	Nari	10			3	Dera-sangrana	10
		3	Daiwal	10			4	Hilana	11
		4	Mangwal	10			5	Naqebabad	4
3	Botala 20	1	Handan wala	12					
		2	Neher pul jabbi	6					
		3	Botala	9					

Data Collection

The field study was carried out from January-2023 to June-2023. Prior to data collection local representatives of the regions were visited and informed about the main theme of the study and to get their verbal consent for data collection and publication. The methods for the collection of data and voucher specimens during the field study followed that described by Martin (Tadeg et al., 2005). Total 200 informants were selected on the basis of their traditional knowledge regarding livestock treatment in different villages of Khushab, Sargodha Punjab, Pakistan. Ethical consent was taken individually from all the respondents by ensuring them that their traditional knowledge would be protected. This was done in order to acknowledge informants' cooperation in preserving the traditional knowledge of the study area and builds their confidence for providing reliable information. Out of 200 informants 188 were males and 12 were females. Age of the informants were ranged between 20 and 95 years old. Initially a questionnaire was designed and pretested with ten informants to identify the appropriateness for the data collection and later on modified according to the informants response. The modified questionnaire was then used to gather ethnoveterinary medicinal plants data of the study region from each informant individually. Informants were allowed to talk freely without any hesitation. The final purpose of study was to get the list of medicinal plants used and/or known by each informant. All interviews were carried out in local language (*Saraiki*) of the study area.

QUALITATIVE ANALYSIS

Questionnaires designed to the respondents (traditional healers) about medicinal plants knowledge were mainly focused on local name of medicinal plant, types of disease treated, remedy preparation, plant part used, mode of administration, dose requirement, recovery time, and usable duration regarding each medicine. The questionnaire also contained questions regarding general information of respondents such as name of the respondent, gender, age, education and occupation.

QUANTITATIVE ANALYSIS

The collected data was subjected to quantitative analysis by using Microsoft excel, regarding the percentages and graphical presentation.

Relative Frequency of Citation (RFCs)

FC is calculated by the following formula:
FC= (Number of occurrence of a certain specie) / (Total no. of occurrence of each species) × 100
RFCs is calculated on the basis of frequency citation FC (the number of informants mentioning) use species. The FC value is divided by total number of informants participating in the study (N), without considering the use categories (Pardo-de-santayana 2003). RFCs=FCs/N

Use value (UV)

The use value is a manifestation of the comparative importance of each plant species employed by the informants in the study range. The value is calculated by using the following formula proposed
UV=Σ U/n Where U is the number of use reports quoted by the each informants for a given plant species, n refers to the total number of informants for a given plant (Vendruscolo *et al*., 2009).

Family Rank Order (FRO)

FRO is the ranking of families as per number of plant species. The first ranked family will be with highest number of plants followed by others with maximum number of plants.

Fidelity level (FL)

The fidelity level (FL), is the percentage of informants using a certain plant species for the same purpose, calculated as: FL (%) = (NP/Nt) x 100
Where NP is the number of informants that claimed a use of certain plant species for a particular disease and Nt is the total number of informants citing the species for any disease. The maximum FL indicates the frequency and high use of plant species for a particular study area (Alexiades *et al*., 1996).

Taxonomic Classification

In total 20 medicinal plants species belongs to 15 families were documented. All species of medicinal plants were angiosperm. Fabaceae with 1 specie, Solanaceae (2 species), Zingerberaceae (2 species), Amaryllidaceae (2 species), Apiaceae (2 species), Piperaceae (2 species) and other families Gentinaceae, Mahogany, cucurbitaceae, Brassicaceae, Lamiaceae, Cannabaceae, Arecaceae, lythraceae (each with one specie was represented). The families Fabaceae and Brassicaceae as medicinal plants were in reported with ethno-medical values all over the world. This may be due to their utilization in different communities as medicine and due to distribution in all parts of the world.

Table 2 Taxonomic classification and Ethnoveterinary uses of selected medicinal plants

Sr. No.	Scientific name	Family	Common name	Plant parts	Uses	Reference
1	*Solanum nigrum*	Solanaceae	Black berry	Fruit	Skin problems	(Shahrajabian, 2019)
2	*Picrorhiza kurroa*	Fabaceae	Kohar	Leaves, stem	Infection of skin	(Tadeg et al., 2005)
3	*Swertia chirata*	Gentianaceae	Charaita	Leaves	Skin burning	(Kumar. et al., 2010)
4	*Solanum lycopersicum*	Solanaceae	Tomato	Fruit	LSD	(Sahana et al., 2011)
5	*Piper nigrum*	Piperaceae	Black pepper	Seeds	Skin diseases	(Araujo et al., 2001)
6	*Azadirachta indica*	Meliaceae	Neem leaf	Leaf, bark, seed	Skin disease	(Suita, 2016)
7	*Zingiber officinale*	Zingiberaceae	Ginger	Roots	Skin illness	(khan et al., 2011)
8	*Curcuma longa*	Zingiberaceae	Turmeric	Roots	LSD	(Khan et al., 2011)
9	*Aloe barbadensis*	Asphodelaceae	Aloe vera	Leaf	Skin disease	(Sunita, 2016)
10	*Trachyspermum ammi*	Apiaceae	Ajwain	Seed	Pain relief and skin infection	(Araujo et al., 2001)
11	*Citullus colocynthis*	Cucurbitaceae	Tuma	Dried pulp of fruit and its root	Skin disease and as insect repellent	(Robles et al., 2012)
12	*Allium cepa*	Amaryllidaceae	Onion	Leaves and root	LSD and Nervous sickness	(Shah et al., 2018)
13	*Eroea sativa*	Brassicaceae	Tara mira	Shoot	Skin diseases, blood purifier	(Pullaiah, 2006)
14	*Piper betle*	Piperaceae	Betel leaf	Leaf	Skin disorders	Chaauhan, 2016)
15	*Menthe pipertia*	Laminaceae	Mint	Leaves and stem	Infection, skin diseases	(Alqasoumi et al., 2009)
16	*Cannabis sativa*	Connabaceae	Bhang	Leaf	Skin disorders	Dhadwal et al., 2017)
17	*Cocos nucifera*	Arecaceae	Coconut oil	Seed	Skin disorders	(Verma, 2016)
18	*Lawsonia inermis*	Lythraceae	Mehndi	Dried leaves	Burning sensation	(Vlachojannis et al., 2010)
19	*Allium sativum*	Amaryllidaceae	Garlic	Whole plant	Skin problems	(Jaiswal et al., 2012)
20	*Pimpinella anisum*	Apiaceae	Aniseed	Seed	LSD	(Verma, 2016)

RESULTS

QUALITATIVE ANALYSIS

Dempographic Data of Respondent

Result based on interviews of 200 respondents in 5 union councils and 21 different villages of district Khushab, Sargodha, Punjab, Pakistan. The ages, genders, ages of gender, job, education of 200 respondents was divided into five categories; A, B, C, D, E. The age group B makes up the majority of respondents (68). Sixth group includes the respondent's education (illiterate to graduation). From this study it was observed that most of the respondents were illiterate and then followed by different education level s to graduate. Occupation of the respondents were divided into five groups; veterinary doctor, Hakeems, Pansaris, farmers and native people of study areas (Fig 1).

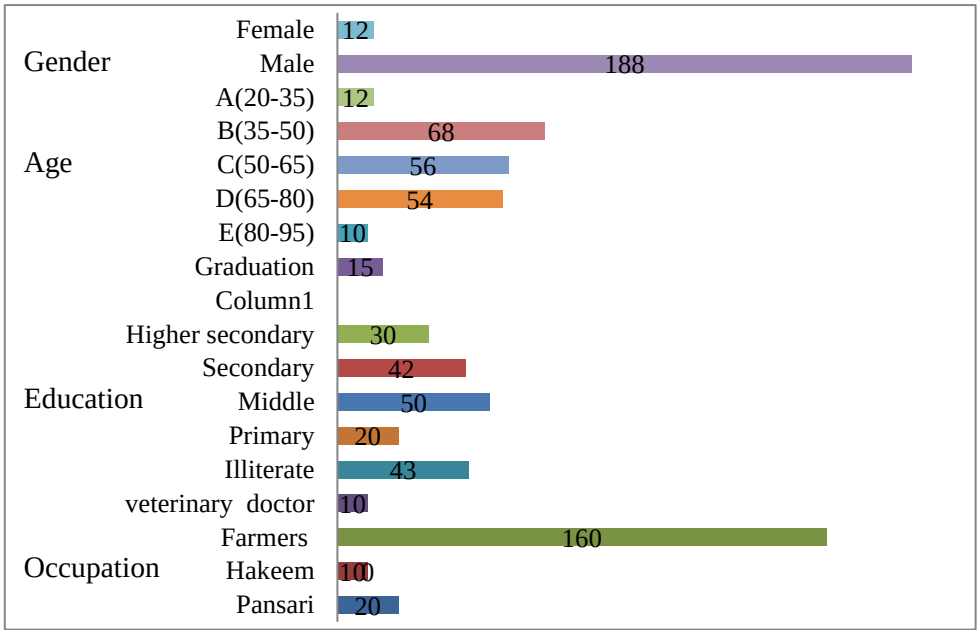
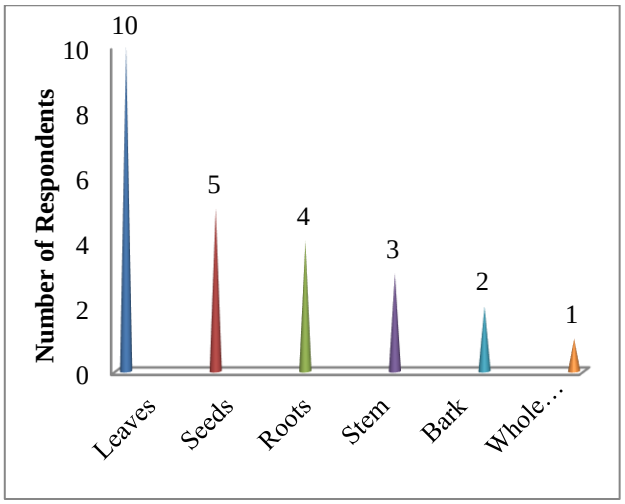


Figure 1 Demographic features of respondents

Plants parts used for medicine

All plant parts are used for treatment of lumpy skin diseases (Fig. 2). Plants used as medicines normally utilize whole plant. According to respondents, the mostly used plant parts are leaves which are followed by seeds, roots, stem, bark and whole plant. It was shown that how many respondents preferred the use of plant parts for the treatment of Lumpy skin disease.



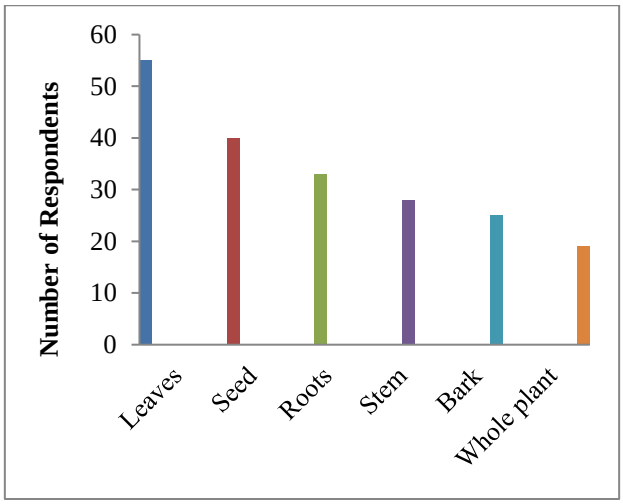


Figure 2: Plant parts used for medicine **No. of respondents preferred the plant parts for medicine.**

Available sources of medicinal plants and Storage/ preservation of medicinal plants

Most of the medicinal plants were collected directly from location (60%) as well as from Hakeems (25%) and from Pansaris (15%). The availability of the plant species in the study areas are as noted in (Fig 3). In the odd seasons, dry fruits, leaves, stems and flowers that are not available in fresh form in the district Sargodha and khushab are taken from herb dealers.

The 200 respondents stated that there are many ways to preserve medicinal plants; shade dry, boil, sundry and fresh and other methods (Fig 3). The majority of the medicinal plants suggested by (90) respondents are preserved by shade dry in the study of storage/preservation procedures.

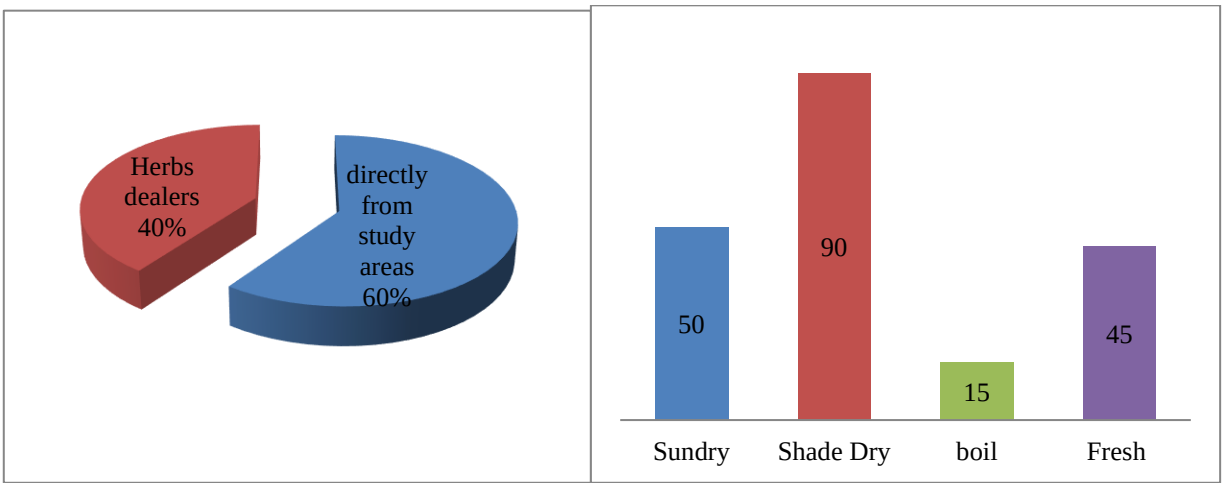


Figure 3 Available sources of medicinal plants and Storage/preservation of medicinal plants.

Use pattern of medicinal plants

All these medicinal plants were used singly or in combination with other plants (Fig 4) shows the percentages of therapeutic plants. Mostly plants are used as decoction form (42%) and then followed by powder (20), paste (15%), other (10%), solution (9%) and oil (4%).

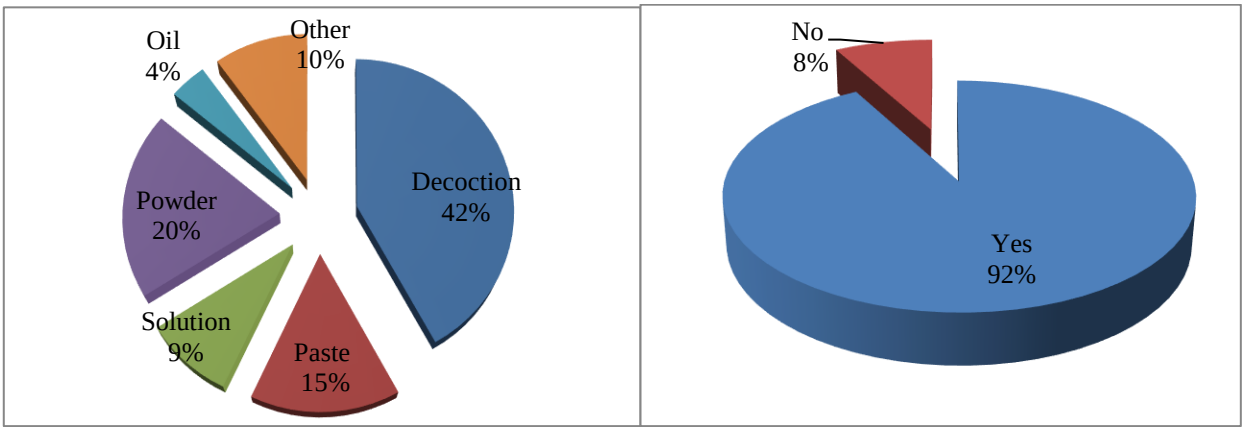


Figure 4 Use Patterns of Medicinal Plants **Commercial uses of medicinal plants**

Commercial uses of medicinal plants

20 medicinal plants were chosen, out of which 92% were used economically. However, 08 % of them were presented in (Fig 4).

Information obtained from

From 200 respondents in all over the interview were divided in to four primary classes (Farmers, Hakeems, Pansari and veterinary doctor) as shown in (Fig 5)

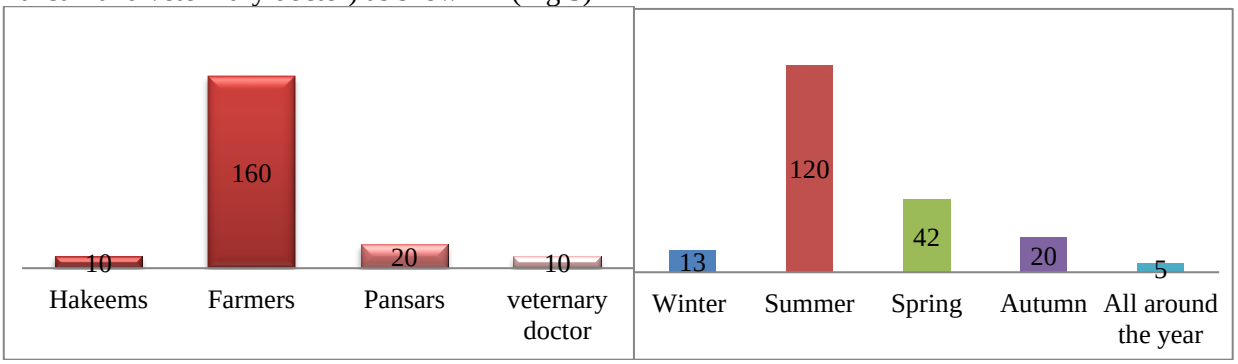


Figure 5 Information Obtained From **Harvesting seasons of selected medicinal plants**

Harvesting season of selected medicinal plant

Most of the plants are collected yearly. But some of the plants are growing in specific seasons as shown in (Fig 5). According to the respondents of District khushab and Sargodha, mostly medicinal plants were collected in summers.

QUANTITATIVE ANALYSIS
Family Rank Order (FRO)

FRO is the ranking of families as per number of plant species. The first ranked family was with highest number of plants followed by others with maximum number of plants. The total 20 species of medicinal plants from 15 families were identified (Table 3). Fabaceae with 1 specie, Solanaceae (2 specie), zingerberaceae (2 specie), Amaryllidaceae (2 species), Apiaceae (2 species), Piperaceae (2 species) and other families Gentinaceae, mahogany, cucurbitaceae, Brassicaceae, Lamiaceae, Cannabaceae, Arecaceae, lythraceae (each with its one specie is represented).

Fidelity level (FL)

The fidelity level (FL) of the most 6 significant plant species ranged from 64.81 to 39.7 % (Table 4). The highest fidelity against Lumpy skin disease was represented by *Swertia chirata*(61.67%), *Azadiracta indica*(55%),*Solanum nigrum* (64.81%), *Curcuma longa*(35.95%), *Zingiber officinale*(39.76%) and *Allium cepa*(46.84%).

Relative Frequency of Citation (RFC) and Use value (UV)

The RFCs and UV value are used to select the plant species for medicinal research and medicine development. The frequency citation is measured by the frequency of citation index. The values calculated for *Swertia chirata* (0.925), *Azadiracta indica*(0.95), *Solanum nigrum* (0.875), *Curcuma longa* (0.8), *Zingiber officinale* (0.775) *and Allium cepa (0.75).*

Table 3 Family Rank Order of selected medicinal plants

Sr No.	Families	Plants species	Respondents	Rank order
1	Meliaceae	1	40	1st
2	Gentinaceae	1	31	2nd
3	Solanaceae	2	26	3rd
4	Zingiberaceae	2	20	4th
5	Piperaceae	2	18	5th
6	Fabaceae	1	16	6th
7	Asphodelacea	1	10	7th
8	Apiaceae	2	9	8th
9	Cucurbitaceae	1	8	9th
10	Amaryllidaceae	2	7	10th
11	Brassicaceae	1	5	11th
12	Laminaceae	1	4	12th
13	Connabaceae	1	3	13th
14	Arecaceae	1	2	14th
15	Lythraceae	1	1	15th

Table 4 Fidelity Levels of Highly Utilized Plant Species of the Study

Sr. No.	Species Name	NP	Nt	FL
1	*Azadirachta indica*	38	69	55
2	*Zingiber officinale*	31	78	39.76
3	*Solanum nigrum*	35	54	64.81
4	*Swertia chirata*	37	60	61.67
5	*Curcuma longa*	32	89	35.95
6	*Allium cepa*	30	64	46.84
7	*Picrorhiza kurroa*	29	68	42.6
8	*Solanum lycopersicum*	21	65	32.3
9	*Piper nigrum*	25	69	36.2
10	*Aloe barbadensis miller*	12	55	21.8
11	*Trachyspermum ammi*	23	66	34.8
12	*Citullus colocynthis*	6	49	12.2
13	*Eroea sativa*	27	69	39.1
14	*Piper betle*	9	50	18
15	*Menthe pipertia*	15	60	25
16	*Cannabis sativa*	18	63	28.5
17	*Cocos nucifera*	5	49	10.2
18	*Lawsonia inermis*	17	66	25.7
19	*Allium sativum*	13	56	23.2
20	*Pimpinella anisum*	7	50	14

Table 5 Relative Frequency of Citation (RFC) and Use value(UV) of Highly Utilized Plant Species of the study

Sr. No.	Species Name	FC	NT	RFC	UV
1	*Azadirachta indica*	190	200	0.95	0.025
2	*Zingiber officinale*	155	200	0.775	0.05
3	*Solanum nigrum*	175	200	0.875	0.153
4	*Swertia chirata*	185	200	0.925	0.032
5	*Curcuma longa*	160	200	0.8	0.05
6	*Allium cepa*	150	200	0.75	0.05
7	*Picrorhiza kurroa*	145	200	0.725	0.0625
8	*Solanum lycopersicum*	105	200	0.525	0.14
9	*Piper nigrum*	125	200	0.625	0.055
10	*Aloe barbadensis miller*	60	200	0.3	0.1
11	*Trachyspermum ammi*	115	200	0.575	0.22
12	*Citullus colocynthis*	30	200	00.15	0.25
13	*Eroea sativa*	135	200	0.675	0.4
14	*Piper betle*	45	200	0.225	0.055
15	*Menthe pipertia*	75	200	0.375	0.5
16	*Cannabis sativa*	90	200	0.45	0.33
17	*Cocos nucifera*	25	200	0.125	0.5
18	*Lawsonia inermis*	85	200	0.425	2
19	*Allium sativum*	65	200	0.325	0.42
20	*Pimpinella anisum*	35	200	0.175	0.28

DISCUSSION

Ethno-botany is important for human existence as interdisciplinary science. This field has a lot of new point of view on the relationship of plant species and humans. Since the beginning of time, people depend on plants for food, clothing, housing and medicine. Many plants with therapeutic properties are present in Sargodha and khushab district. In the study areas, it is too much difficult to access the local areas and explore diverse areas. In both districts the knowledge of therapeutic plants are limited. The current study addresses

the role of therapeutic plant in Tehsil Sargodha and khushab. Herbal knowledge is passed from one generation to another. The rural studies use significant questionnaires to conduct all interviews with 200 respondents who are herbal experts and practitioners of 21 villages of district Sargodha and Khushab. The household surveys were also conducted to learn how native people use medicinal plants. The quantitative and qualitative analysis was used in this study. Data on respondent's Demographic is used in qualitative analysis.

QUALITATIVE ANALYSIS

Demographic Data of Respondents

From January 2023 to June 2023, 200 respondents in total were questioned. Male family heads who were over 65 to 95 years old made up the majority of respondents (64). The majority of participants were illiterate (43). The professions of most of the respondents are THPs and herb dealers. The majority of the older people expressed similar point of view bout medicinal plants. It shows that experienced family member tend to be primary recipient of ethno-botanical knowledge and that it is very difficult to transfer this ethno-botanical knowledge from older to younger generations (Oladunmeye et al., 2011). These findings concur with those of different other researchers (Hameed et al., 2011). Other researchers, such as those by Qaseem et al. (2017) from Kotli, Ahmed et al. (2017) from Neelum valley, and Kyani et al. (2014) from Abottabad, showed similar results.

Taxonomic Classification of Selected Plants

A total of 20 plants from 15 families were recorded in this study. Angiosperms, which include the both monocotyledonous and dicotyledonous groups, made up of all the recorded species. The Fabaceae family had the species (1), Gentinaceae (1), Apiaceae (2), Piperaceae (2), Amaryllidaceae (2), Cucurbitccae (1), Meliaceae (1), Solanaceae (2)**,** Zingiberaceae (2), Asphodelacea (1), brassicaceae, Laminaceae, Connabaceae, Arecaceae and Lythraceae (each with 1 specie) as shown in (Table 4.1). Pakistan has a wide range of climate conditions (seasons, temperature, rainfall), and its soil is rich in various herbs and medicinal plants that grow naturally throughout the year. In Pakistan, 75% of people of rural communities rely on traditional medicines for cure of diseases (Ullah et al., 2013). It is well knowledge that perennial herbs and medicinal plants need 6 to 8 year to mature. As a result, life cycles dominate over annual ones in different species of medicinal plants (Ahmed *et al*., 2014). These results agree with earlier studies (Akhtar et al., 2013, Amjad et al., 2017, Qaseem et al., 2019).

Medicinal Use of Selected Plants/Disease Treated

The majority of the responders were older than 50-year-old family heads (120). The majority of responders lacked basic literacy skills (43). The majority of respondents worked as Farmers (160), Hakeems (100), Pansri (20) and veterinary doctor (10). In this study, a total of 20 plants from 15 families were catalogued. The majority of selected medicinal plants were used for therapeutic purposes, followed by additional applications like clothing, food, fodder, and firewood etc.

The diuretic properties of *Allium cepa* have been utilized to lessen edema. Diabetes has been treated with *Alliun cepa*, which are used to reduce blood sugar levels. Onion is frequently consumed raw or as a decoction to cure infectious diseases. Additionally, it is utilized in different internal and external remedies to treat a number of illnesses, such as skin conditions, insect bites, digestive issues, metabolic disorders and nervous disorders (Jaradat et al., 2016; Shah et al., 2018).

Zingiber officinale (ginger) is used to treat skin disease, intestinal pain, anorexia, diarrhea, constipation, intestinal pain, dog bites and stomach diseases. It has also cooling effects on the body and acts as the digestive stimulant. One of the many health benefits is that it reduces pain, inflammation and swelling. A dried ginger extract, has all been found to have powerful anti inflammatory effects and analgesic (Young et al., 2005; Minghetti et al., 2007).

Azadirachta indica (Neem leaves) has been observed as plant system having a large amount of biologically active compounds. These are structurally complicated and chemically diverse. It is used as anti-fungal and anti-bacterial medicine. Their leaves, bark and seed's oil are effective for skin disorders (Suita, 2016)

Plant Part Used Medicinal Plants

All plant parts including stem, root, seeds, leaves, bark and whole plant are used as medicines to treat different diseases (Goyal et al., 2011). All plant parts are important for treating many diseases. Whole plants are used in therapeutic plants, according to (Fig 4.2 & Fig 4.3), as stated by informants. According to Bradacs et al. (2011) and Leto et al. (2012), leaves are a typical plant part used by people on Islands and in Italy for herbal treatment. According to reports, using leaves rather than the seeds, bark, roots, and stem which could pose a severe risk to the flora, is better for the survival of medicinal plants that herbs practitioner collect (Zheng et al. 2009). These results were comparable to the report from other nations.

Available sources of Medicinal Plants

All of the aforementioned ways were employed by respondents to obtain medicinal plants, including directly from location (60%), from Hakeems (25%) and Pansari (15%) (Fig4.4). It shows that the study area had the easy access to these medicinal plants. Off-season, plants were used as seeds and dried fruits, leaves and flowers. Some allopathic medications are synthetically prepared from chemicals obtained from therapeutic plants directly (Veeraeshaam et al. 2012).

Use Pattern of Medicinal Plants

Locals in the research areas prepare remedies for the treatment of variety of diseases using a variety of methods such as solution, decoction, powder, paste, oil and others etc. All of the medicinal plants were used both singly and in combination with other plants. The plants can either be used alone or in some form of combination with other part of plants (Qureshi et al., 2007). Our findings shows that herbal remedies used in domestic treatments for a variety of diseases in rural communities in the forms of solution, decoction, powder, paste, oil and others water extracts were also supported by some studies that conducted by other researchers (Lulekal, 2008). By personal experiences, ancestors' recommendations and historical uses, the local populations are familiar with benefits of medicinal plants and synthesis of raw medication from them (Haq et al., 2011). The previous documentation support our findings (Inta et al., 2013; Kadir et al., 2014; Amjad et al., 2017), Decoctions are highly used to treat disorders because they are simple to make and can be made by combining particular plant parts with other sources

Storage/ Preservation of Medicinal Plants

There are many ways to preserve medicinal plants including; boil, fresh, sundry, shade dry and other techniques according to responders. According to the 200 respondents, the majority of therapeutic plants were used in this study as storage/preservation method. Similar findings were noted by (Azher et al., 2012).

Commercial Use of Selected Medicinal Plants

The commercial usage of medicinal plants was stated by 200 respondents in this study. This study gave an explanation of therapeutic plants used for commercial purposes (91%) and plants not used for commercial purposes (8%). Similar studies have shown (Farooq, 2012) how medicinal plants can improve the socio-economic standing of local population. As a result, this resource is pivotal to local population since it supplies the livestock, medicines, clothing, wood and firewood needs of the study area, Sargodha and Khushab. The poorest people have the chance to earn some cash revenue by collecting medicinal herbs in the wild. Collecting wild herbs are common source of income for native people, especially those who have no access to farmland. The processing facilities for medicinal plants and industries depend on the availability of therapeutic plants in developing nations. Traditional herbal remedies have ability to evolve into legitimate modern market items will be contrived in the absence of governmental interest and financial assistance and infrastructure.

Reasons of Degradation and Harvesting Season

According to Hameed et al. (2011) and Khan et al. (2011), many species of medicinal plants are under danger of over grazing, crushing and immature reaping. According to respondents the main causes of degradation of different species of medicinal plants is carelessness, over population of people and overutilization.

Overutilization is due to rising demands of trade. All these factors contributing to extinction of most of the medicinal plants from all over the world (Zenebe et al., 2012). Harvesting season of therapeutically plants shows that medicinal plants gathered in summer coming in first, followed by other seasons such as spring, autumn, winter and all around the year.

QUANTITATIVE ANALYSIS

Frequency of Citation (FC), Use Value (UV) and Family Rank Order (FRO)

The RFC and UV values are used to elect medicinal plant species with the potential for advice in drug development and pharmacological research. The plant with the RFCs values of Meliaceae (0.95), Gentinaceae (0.925) and Solanaceae (0.875). The position of species of these medicinal plants are consistent with the fact that they were cited frequently because the greatest number ofrespondent reported them. The mostly used medicinal plants in the area of Sargodha and Khushab are determined using this index. The FC value of species of medicinal plants ranges from 0 (when it is not being used in these areas) to 1 (if all the informants consider these species to be beneficial for medicinal purposes). For one or multiple purposes, FC value highlights for each species (Kayanirt al., 2014) that's why these are prioritized for suitable use or conservation otherwise these plants will extinct from both areas in near future (Ahmed et al., 2017), Farooq et al., (2019). The plants with high value of RFC values would be interesting for pharmacological and phytochemicals processes (Mukherjee et al., 2012). Family rank order (FRO) is a ranking of different families that based on medicinal used in this ethno-botanical study. The total of 20 medicinal plant species from 15 families was identified. The most numerous family that was ranked first is Meliaceae (with 1 specie) then followed by Genetinaceae (1 specie), Solanaceae (2 species), Zingiberaceae (2 species), Piperaceae (2 species) and Fabaceae (1 specie).

Fidelity level of highly utilized species

The fidelity level of the 20 plant species ranged from 64.81% to 10.2%. Generally, a species high FL suggests that a particular sickness is frequent there and that local people are using these plant species to treat diseases (Bibi et al., 2014). The highest FL against Lumpy skin disease is shown by *Azadirachta indica* and *Swertia chirata* respectively. A species with high FL indicates significant use of a certain plant species to cure Lumpy skin disease in study area (Farooq et al., 2019). High FL value of some species indicates that can be used in pharmacological research. Other studies about ethno-botany published in the literature (Sirithi et al., 2009, Noreen et al., 2018, Farooq et al., 2019) also recorded high fidelity level for species used to treat disease.

CONCLUSIONS

The current study has shown that the local native population of the study area uses variety of species of medicinal plants to cure a variety of diseases in livestock and agriculture. The fact is that the native societies still use these traditional remedies despite the availability of modern health services. Our research builds a link between the scientific and conventional health care sectors by first information, which might be very helpful for discovery of new drugs. Ethano-botanical data has great value for conservation managers and policy maker in managing species of endangered medicinal plant. These species are threatened by over harvesting and extensive use. Therefore, such well known medicinal plant species could be examined further for biological activities of in vitro/vivo and bioactive components which may lead to new medications.

RECOMMENDATIONS

The qualified specialists are needed to preserve the traditional knowledge of therapeutically important plants by research and documentation. Educational institutions are required to utilize herbs, plans for capacity building properly. Education and economic considerations are regarding the importance of medicinal plants. The government should give funds to build infrastructure for professionals and local trade of medicinal plants.

Conflict of Interests

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

Authors contribution

Conceptualization, Muhammad Tahir Saleem and Atifa Masood; methodology, Noreen Khalid; software, Muhammad Faisal Maqsood and Taiba Walayat; lab analysis, Ayesha Saleem, Nimra Javed and Muhammad Luqman; writing – original draft preparation, Muhammad Tahir Saleem; writing – review and editing, Noreen Khalid, Sunbal Khalil. All authors have read and agreed to the published version of the manuscript.

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Abbreviations
LSD= Lumpy skin disease
LSDV=Lumpy skin disease virus
FL= Fidelity level
RFC=Frequency of Citation
UV= Use value
FRO=Family Rank Order
RFC=Relative Frequency of Citation

References

1. AdnAdnan, M., Ullah, I., Tariq, A., Murad, W., Azizullah, A., Khan, A. L., & Ali, N. Ethnomedicine use in the war affected region of northwest Pakistan. J. of Ethnobio and Ethnomedi.2014;10(1): 1-16.
2. Akhtar, A., Habibullah, Muhammad, A., Hidayatullah and Muhammad, A. Prevalence of sub clinical mastitis in buffaloes in district D.I. Khan. Pak J. Plant Sci. 2012;64:2.
3. Al-Salihi KA. Lumpy Skin disease: Review of literature. Mirror Res Veter Sci Ani. 2014;3:6-23.
4. Anonymous D. Lumpy skin disease. Paris: O.I.E. Disease Inform. 1988:1:1.
5. Badshah, L. and Hussain,F. People preferences and use of local medicinal flora in district Tank, Pak J. Med plant res.2011;5:22-29.
6. Badshah, L., Hussain,F., Sher,Z. and Burni,T. Harvesting and consumption of fuel and timber wood in rural area of district Tank, Pakistan, Pak J. Bot.2014;46(5):1719–1724.
7. Bhardwaj, S., Ghakar S.K.. Ethnomedicinal plants used by the tribals of Mizoram to cure cut and wound. Indian J Trad. Know.2005; 4(1): 75-80.
8. Chauhan, E.S., Aishwarya, J. & Singh. A. Department of Food Science and Nutrition, Banasthali University, Banasthali, Distt.- Tonk.2016;4(2):1-20.
9. Dhadwal, G. & Kirchhof, M.G. The Risks and Benefits of Cannabis in the Dermatology Clinic. J. Cutaneous Med Surg.2017; 22(2)1-20.
10. Evelyn, M. Ethnoveterinary medicine: harnessing its potential," Veterinary Bulletin.2004;10:74(8): 27–37.
11. Farooq, S., A. Barki., M. Y. Khan, and H. Fazal, "Ethnobotanical studies of the flora of Tehsil Birmal in South Waziristan Agency, Pakistan, Pak J. Weed Sci Res.2012;18(3):277–291.

12. Farooq, Z., Z. Iqbal., S. Mushtaq., G. Muhammad, M. Z. Iqbal, and M. Arshad, "Ethnoveterinary practices for the treatment of parasitic diseases in livestock in Cholistan desert (Pakistan), J Ethnophar. 2008;118(2):213–219, .
13. Gari, G., Waret-Szkuta, A., Grosbois, V., Jacquiet, P., & Roger, F.. Risk factors associated with observed clinical lumpy skin disease in Ethiopia. Epidem Infec,2010; 138(11): 1657-1666.
14. Gupta, T., Patial, V., Bali, D., Angaria, S., Sharma, M., and Chahota, R.. A review: Lumpy skin disease and its emergence in India. Veterinary Res Comm.2020;44:111-118.
15. Harun-or-Rashid, M., R. Tanzin, K. C. Ghosh, R. Jahan, M. A. Khatun, and M. Rahmatullah, "An ethnoveterinary survey of medicinal plants used to treat cattle diseases in Birishiri area, Netrakona district,Bangladesh. Adv Nat Appl Sci.2010;4(1):10–13.
16. Iqbal, Z., A. Jabbar, M. S. Akhtar, G. Muhammad, and M. Lateef, "Possible role of ethnoveterinary medicine in poverty reduction in Pakistan: use of botanical anthelmintics as an example, J. Agric Soc Sci.2005;1(2): 187–195.
17. Khan, M. T. J., Ashraf, M., Tehniyat, S., & Bukhtair, M. K. Antibacterial activity of Withania coagulants. FITOTERAPIA-MILANO.1993;64:367-367.
18. Khan, M.A., M. A. Khan, and M. Hussain, "Ethno veterinary medicinal uses of plants of Poonch Valley Azad Kashmir, Pak J Weed Sci Res. 2012;18:495–507.
19. Kirtikar, K. R., & Basu, B. D. Indian medicinal plants. Publisher not identified Basu, Bhuwaneśwari Âśrama.1918;2.
20. Kumar, K. P. S. ; Debjit B., Chiranjib, B.& Margret C. Swertia chirayita: traditional herb and its medicinal uses. J Chem Pharm Res.2010;2(1): 262-268.
21. Mahmood, A., Mahmood, A., Mujtaba, G., Mumtaz, M. S., Kayani, W. K., & Khan, M. A.. Indigenous medicinal knowledge of common plants from district Kotli Azad Jammu and Kashmir Pakistan. J. Med Plant Res.2012;6(35):4961-7.
22. Maithani, A., Parcha, V., Pant, G., Dhulia, I. & Kumar, D.Azadirachta neem leaf. J. Pharm Res.2011; 4(6):1824-1827
23. Martin, G. J. Ethnobotany: A Methods Manual, Chapman & Hall, London, UK. 1995.
24. Mussarat, S., N. M. Abdel-Salam, A. Tariq, S. M. Wazir, R. Ullah, and M. Adnan, "Use of ethnomedicinal plants by the people living around indus river, Evidence-based Complementary and Alternative Medicine.2014;2014: Article ID 212634, 14 pages.
25. Nouman, W., S. M. A. Basra, M. T. Siddiqui, A. Yasmeen, T. Gull, and M. A. C. Alcayde, "Potential of *Moringa oleifera* L. as livestock fodder crop: a review. Turk J Agric Fores.2014;38(1):1–14.
26. Qaisar, M., S. Farooq, S. N. Gilani et al., "Ethnobotanical survey of medicinal plants used in Wazir and Daur tribes of North Waziristan, Pakistan, Global Veterinaria,2013;11(3):285–292.
27. Ro, J. Y., Lee, B. C., Kim, J. Y., Chung, Y. J., Chung, M. H., Lee, S. K. & Park, Y. I. Inhibitory mechanism of aloe single component (Alprogen) on mediator release in guinea pig lung mast cells activated with specific antigen-antibody reactions. J. Pharm Exp Therap.2012 ;292(1):114-121.
28. Sahana, K., Nagarajan, S., & Rao.M. Cumin (Cuminum cyminum L.) Seed Volatile Oil: Chemistry and Role in Health and Disease Prevention. Nuts Seed Disease Prevention.2011; 417-427.
29. Shinwari, Z. K. Medicinal plants research in Pakistan. J Med Plants Res.2010;4(3),:161-76.
30. Sindhu, Z.D., S. Ullah, R. Z. Abbas, Z. Iqbal, and M. Hameed, "Inventory of ethno-veterinary practices used for the control of parasitic infections in District Jhang, Pakistan, Inter J Agric Biol.2012;14(6):922–928.
31. Sunita V. Medicinal plants in cure of skin diseases. Pelagia Res. Library.2016;7(3): 65-67.
32. Tadeg, H., Mohammed, E. & Asres, K. Antimicrobial activities of some selected traditional Ethiopian medicinal plants used in the treatment of skin disorders. J. Ethnopharm.2005;100(1).
33. Tuomas, P. J. Knowles, Christopher, A. & Waudby. An Analytical Solution to the Kinetics of Breakable Filament Assembly.2009;Sci. org/doi. 326(5959).
34. Tuppurainen, E.S.M & Oura, C. Review: lumpy skin disease: an emerging threat to Europe, the Middle East and Asia. Trans Emerg Dis.2012;(59):40–48.
35. Ugulu, I., Baslar, S., Yorek, N., & Dogan, Y. The investigation and quantitative ethnobotanical evaluation of medicinal plants used around Izmir province, Turkey J Med Plants. 2009;3(5):345-367.
36. Ul Hassan, H., W. Murad, A. Tariq, and A. Ahmad, "Ethnoveterinary study of medicinal plants in Malakand Valley, District Dir (Lower), Khyber Pakhtunkhwa, Pakistan, Irish Veter J. 2014;67(1):11-32.