



Indigenous Technical Knowledge Practices Followed by Pastoralists for the Treatment of Livestock Diseases in Hills of Jammu & Kashmir State in India

Adil Masood Khateeb^{1*}, S. A. Khandi¹, M. S. Bhadwal¹, Muneer Ahmed Dar², Sajad Ahmed Wani³ and R. A. Bafanda¹

¹*Division of Veterinary and Animal Husbandry Extension Education, Faculty of Veterinary Sciences and Animal Husbandry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, R. S. Pura, Jammu-181102, J&K, India.*

²*Division of Veterinary Pharmacology and Toxicology, Faculty of Veterinary Sciences and Animal Husbandry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, R. S. Pura, Jammu-181102, J&K, India.*

³*Division of Veterinary and Animal Husbandry Extension Education, KCVAS, Amritsar, India.*

Authors' contributions

This work was carried out in collaboration between all authors. Author AMK designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author MSB guided the author AMK during whole research period and edited the manuscript. Author SAK managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/CJAST/2017/36739

Editor(s):

(1) Ahmed Mohamed El-Waziry, Professor, King Saud University, College of Food and Agriculture Sciences, Kingdom of Saudi Arabia.

Reviewers:

(1) Pooja Juyal, Uttarakhand Open University, India.

(2) Joan Vallès, Universitat de Barcelona, Spain.

Complete Peer review History: <http://www.sciedomains.org/review-history/21586>

Original Research Article

Received 12th September 2017

Accepted 14th October 2017

Published 27th October 2017

ABSTRACT

The study was conducted in the hilly regions of Jammu and Kashmir State for documentation of unique Indigenous technical knowledge practices used for the treatment of various animal diseases. The information presented here is being collected from the indigenous technical knowledge practitioners of district Doda of Jammu and Kashmir. 120 ethno-veterinary practitioners of various age groups were interviewed during the study. Thirty six indigenous technical knowledge practices were identified and documented during the study. The data was collected with the help of a

*Corresponding author: E-mail: adil.masood09@gmail.com;

structured interview schedule through personal interview technique. In this paper 22 species of plants used for the treatment of 14 different ailments has been reported. The documented practices were for the treatment of maggot infestation, ectoparasites and endoparasites, retention of placenta, anestrus, mastitis, milk fever, foot and mouth disease, black quarter, poisoning, snake bite and for increasing milk production.

Keywords: Pastoralists; indigenous technical knowledge; animal treatment; traditional; ethno-veterinary.

1. INTRODUCTION

With the development of modern medicine, especially after the Second World War, traditional medical practices were increasingly replaced and overlooked at the international level, mostly because many people regarded them as ineffective and useless. Modern medicine was thought to be able to solve almost all health problems of humans and animals. But, this over-estimation of modern medicine has changed in the course of the 'green wave' since the 1970's particularly in industrialized countries. The 'green wave' has been characterized by an increasing demand for natural products in the form of drugs, food and cosmetics and was mainly triggered by the side effects resulting from the increasing use of chemicals in various areas of life including medicine. The reconsideration of traditional medicinal systems in the industrialized world and the fact that modern medicine was too expensive for many developing countries, the World Health Organization (WHO) in the 1970's decided to promote traditional medicinal systems by checking scientifically the efficacy of plants used in traditional medicine and identifying the principles responsible for genuine therapeutic effects [1].

After independence all efforts in India were concentrated on developing an allopathic based veterinary infrastructure entirely under the government sector. In recent years emphasis has shifted towards modern science in the maintenance and development of livestock. There has been neglect of traditional systems and knowledge to the extent that many of us, even those specializing in veterinary medicine, are unaware of ancient literature and some are even skeptical about it [2]. India, the country of "Rishi & Krishi" has livestock raisers and healers everywhere, who have traditional ways of classifying, diagnosing, preventing and treating common animal diseases. Many of these indigenous practices offer viable alternatives or complements to conventional, western style medicine, especially where the latter is unavailable or inappropriate. The unique

advantage is that India is one of the world's twelve mega diversity countries accounting for 8% of the global plant genetic resources and higher share of microorganisms. All over India there are experienced and knowledgeable specialists who practice indigenous techniques but their knowledge is not well documented, and is merely being transmitted verbally from one generation to the next. Such indigenous technical practices are dwindling fast with the death of the owner bearing ITK. So in order to save this knowledge it is imperative that it must be documented and conserved through systematic studies before it is lost forever.

Jammu & Kashmir is known to be having rich heritage of indigenous technical knowledge, but no step has been taken so far to document them. Due to geographical remoteness of the area and socioeconomic condition of the local populace ethno-veterinary medicine is still commonly used in Doda. Documentation of indigenous technical knowledge in hilly district Doda of Jammu & Kashmir State of India has not been done so far and there is a grave danger of losing this precious knowledge as most of these practices are transferred to next generation by only verbal means. It was therefore imperative to collect and document these practices so that this knowledge could be made available for use in animal health care. Therefore a study was conducted to document the indigenous technical knowledge among pastoralists for the treatment of animal diseases in the Doda district of Jammu and Kashmir.

2. MATERIALS AND METHODS

The study was carried out during the months of May to August in year 2012-2013 in Doda district which is sandwiched between the middle and outer himalyan ranges of Jammu region of Jammu and Kashmir state. It is located at of 32° 17' to 32° 40' North longitude and of 74° 35' to 75° 10' East latitude at an altitude of about 8000 ft to 15000 ft. Total area of the district is 11691 sq.km which is inhabited by 409576 people. Majority of the population, mainly in rural areas,

depends on agriculture and livestock activities for their livelihood. Doda district is having rich flora and fauna and is the place of various rare himalyan herbs. The established prevalence of nomadism and traditional farming system in the hills and valleys of this region was considered fit for such a study. District Doda has a good population of pastoralists from Gujjar, Bakerwal and Gaddi community. Out of 8 blocks of district Doda, 4 blocks where indigenous technical knowledge was extensively practiced were selected purposely. The selected blocks were Bhaderwah, Bhalesa, Thathri and Marmat. A comprehensive list of the villages of the selected blocks was prepared. Three villages where indigenous technical knowledge was extensively used for the treatment of animals were selected for the study. Thus, a total of 12 villages were selected. For selection of the respondents, 10 pastoralists who were known for using indigenous technical knowledge were selected purposely from each village. So a total of 120 respondents were selected for the study. The data was collected with the help of a structured interview schedule through personal interview technique. Prior informed consent of some most famous traditional healers of Bhaderwah region was taken. Plants prescribed for the treatment were personally collected in presence of traditional healers from the study area and specimens were cross checked, identified and classified scientifically. Some rare plants were photographed on site, in their habitat before collecting for the herbarium.

3. RESULTS AND DISCUSSION

The results of the present study are presented in Table 1. Thirty six indigenous technical knowledge practices were identified and documented. A total of 22 species of plants were used in the study area for treatment of different ailments. Some of the plants were used in more than one disease condition. The respondents administered the remedies to the animals mostly orally as decoctions, topical or external application. Doses of the remedies were highly variable and farmers did not have exact knowledge about the doses. The respondents were of the opinion that dose of the drug depends on size of animal or availability of plants used for treatment. Many of the ingredients employed by the pastoralists were spices that were found in every household and were widely used to cure ailments. Most of the times, the plants that were indigenous to an area were collected by the ITK practitioners themselves or

were purchased from the local market. It was found that the mode of preparation of ethno-veterinary medicines varied according to the active ingredient to be extracted. For preparation of a medicine, parts of the plant that were mostly utilized by the respondents were roots, bark, wood, leaves, stem, flower, fruit, resin, latex, grains, buds, bulbs and seeds, this is in agreement with findings of Abbas et al. [3], Giday et al. [4] Ole-Miaron [5] and Viegi et al. [6]. The common method of extraction of a drug was grinding, soaking, brewing or boiling different parts of plants or whole plant.

3.1 Helminthosis and Ectoparasites

Ethno-veterinary Practices for ecto and endoparasites were very common among the pastoralists. Several plants along with other materials were reported to be used for these conditions. The animal owners reported many indigenous technical knowledge practices used in case of helminthosis and ectoparasites. The most frequently used plant for helminthosis and external parasites was processed resin of *Cedrus deodara* used almost in all the species. *Cedrus deodara* has been reported to be used for external parasites in Jammu and Kashmir by Slathia et al. [7] and in Pakistan by Sindhu et al. [8]. *Aconitum deinorrhizum* and *Sarcococca saligna* were other widely used plants in almost all the parasitic and other skin conditions in animals. Use of *Rabdosia rugosa* and *Gentiana kurroo* as remedy of helminthosis in livestock has also been reported in Jammu and Kashmir by Kumar et al. [9]. *Nicotiana tabacum* reported from the study area for treatment of maggots has been documented earlier in the literature by Nfi et al. [10] for the same ailment. *Saussurea costus* reported for maggot infestation has also been reported for the same condition in Jammu and Kashmir by Khan et al. [11] and in Uttaranchal by Bisht et al. [12].

3.2 Reproductive System Disorders

For reproductive disorders, respondents reported use of ITK practices mainly for retention of placenta and anoestrus. *Coccinia indica* and *Dendrophthoe falcata* were used for the treatment of retention of placenta which have been reported as galactogogue and for the treatment of tuberculosis by Singh et al. [13]. In the present study, oil of *Cedrus deodara* and *Ferula asafoetida* were reportedly used for the treatment of retention of placenta, these findings were in agreement with Jabbar et al. [14].

Cannabis sativa L. was documented for use in anoestrus, however it has been documented for treatment of wounds and diuresis by Mahmood et al. [15].

3.3 Mastitis and Galactagogue

A number of ITK practices were reported by the respondents for prevention and treatment of mastitis. *Ocimum tenuiflorum* was most frequently reported plant used for the treatment of mastitis in bovine. This plant has been reported to be used for dysentery but not

specifically for the treatment of mastitis by Singh et al. [16]. In the present study, butter and mustard oil (*Brassica juncea*) were also reported for the treatment of mastitis. *Polygonum glabrum* was mostly used by the bovine owners as galactagogue. Similarly a mixture of *Vigna mungo*, *Trigonella foenum-graecum*, *Trachyspermum ammi* and jaggery were used for increasing milk production. *Vigna mungo* has been documented as a galactagogue by Prajapati et al. [17] while *Polygonum glabrum* has been reported to be used as a galactagogue and anti helminthic by Mahmood et al. [15].



Fagopyrum esculentum (Chok drou)



Hedera helix (Bail)



Cannabis sativa (Bengai)



Coccinia indica (Van lath)



Ocimum tenuiflorum (Babri buol)



Sapindus saponaria (Rainta)

Some of the plants used by Indigenous technical knowledge practioners

Table 1. Plants used by pastoralists in treatment of animal diseases

S. no.	Disease	Scientific name of plant/ingredient	Local name of plant/ingredient	Part used	Method	Animal species
1.	Maggots	<i>Aconitum deinorrhizum</i> Stapf.	Bish	Root	Little amount of the paste of root of <i>Aconitum deinorrhizum</i> is applied topically	Cow/buffalo/ sheep/ goat
		<i>Saussurea costus</i> Falc.	Kuth	Root	Paste of root of <i>Saussurea costus</i> is applied topically once a day	Cow/buffalo/ sheep/ goat
		<i>Sarcococca saligna</i> D.Don	Duon	Leaves	Paste of leaves of <i>Sarcococca saligna</i> is applied topically once a day	Cow/buffalo/ sheep/ goat
		<i>Nicotiana tabacum</i> L. genome	Tamokh	N/A	Paste of <i>Nicotiana tabacum</i> genome is applied topically once a day	Cow/buffalo/ sheep/ goat
2.	Ectoparasite	<i>Cedrus deodara</i> Roxb. ex D.Don	Kelam	Oil	Oil of <i>Cedrus deodara</i> is applied topically once a day	Cow/buffalo/ sheep/ goat
		Processed oil of <i>Cedrus deodara</i> Roxb.exD.Don+ <i>Brassica juncea</i> (L.) Czern.	Kelam+ sarsoon	Oil	Oil of <i>Cedrus deodara</i> is mixed with pure mustard oil and applied topically once a day	Cow/buffalo/ sheep/ goat
3.	Endoparasite	<i>Rabdosia rugosa</i> Wallich ex. Benth	Sulie	Leaves	200 g leaves of <i>Rabdosia rugosa</i> are fed twice daily for 3 days	Cow/buffalo/ sheep/ goat
		<i>Aconitum deinorrhizum</i> Stapf	Bish	Root	Root of <i>Aconitum deinorrhizum</i> is finely powdered and 100 g powder is given to 100 sheeps/goats	sheep/ goat
		Processed oil of <i>Cedrus deodara</i> Roxb. ex D.Don <i>Capsicum annum</i> L.	Kelam Redchilli +common salt	Oil	5 ml oil of <i>Cedrus deodara</i> is mixed with salt and given to sheep/ goat 10 g red chilli and salt is fed to animal early morning empty stomach	sheep/ goat
4.	Liver flukes	<i>Gentiana kurro</i> Royle	Butein	w/plant	About 100 g <i>Gentiana kurro</i> is given to animal 2 to 3 times a day	Cow/buffalo/ sheep/ goat
5.	Nasal worms	<i>Sapindus saponaria</i> L.	Rainta	Seed	Grind seeds of <i>Sapindus saponaria</i> to powder and then put the powder in nostrils of affected animal.	Cow/buffalo/ sheep/ goat
6.	Retention of placenta (ROP)	<i>Coccinia indica</i> Wight&Arn.	Vanlarh	Root	Grind 200 g root of <i>Coccinia indica</i> and feed two times a day for 2 to 3 days	Cow/buffalo/ sheep/ goat
		<i>Dendrophthoe falcata</i> L.f	Hawaipatta	w/plant	100 g <i>Dendrophthoe falcate</i> is given to animal, twice a day for 2 to 3 days.	Cow/buffalo/ sheep/ goat

S. no.	Disease	Scientific name of plant/ingredient	Local name of plant/ingredient	Part used	Method	Animal species
		Processed oil of <i>Cedrus deodara</i> Roxb. ex D.Don	Kelam	Oil	About 10 ml oil of <i>Cedrus deodara</i> is mixed with water and given to animal, twice a day for 3 days.	Cow/ buffalo
		<i>Ferula asafoetida</i> L.	Hing	Resin	10 g of <i>Ferula asafoetida</i> is given, daily for 7 to 10 days before parturition(prevention)	Cow/ buffalo
7.	Anestrus	<i>Cannabis sativa</i> L.	Bengai	w/plant	About 400 g <i>Cannabis sativa</i> is grinded and then given to animal, once a day for 3 days	Cow/ buffalo
8.	Mastitis	<i>Ocimum tenuiflorum</i> Linn.	Babri buol	Seed	About 10 g seeds of <i>Ocimum tenuiflorum</i> are mixed with water and given to animal once daily for 3 to 4 days	Cow/ buffalo
			Ghee + Butter		250 g of ghee and butter is fed to animal once a day for 3	Cow/ buffalo
		<i>Brassica juncea</i> L. Czern	Mustard oil + Salt		100 ml of pure mustard oil <i>Brassica juncea</i> with little amount of salt is given to animal once a day for 3 to 4 days	Cow/ buffalo
9.	Enhance milk production	<i>Polygonum glabrum</i> Willd	Salam misri	Tuber	Grind about 500 g tuber of <i>Polygonum glabrum</i> and mix with 500 ml milk and feed to animal once a day for 3 to 4 days.	Cow/ buffalo
		<i>Trigonella foenum-graecum</i> L. + <i>Trachyspermum ammi</i> L. Sprague	Jaggery+Methi +Ajwain	Seed	10 g <i>Trigonella foenum-graecum</i> and 10 g <i>Trachyspermum ammi</i> is mixed with 250 g jaggery and fed to animal once a day for 3 days	Cow/ buffalo
			Milk+Sugar		Dissolve sugar in milk and give to animal twice a day for 4 days	Cow/ buffalo
		<i>Vigna mungo</i> L.Hepper + <i>Oryza sativa</i> L	Mahdal+ Rice +Sharini (processed sugar)		Make a mixture of <i>Vigna mungo</i> , <i>Oryza sativa</i> and sharini (processed sugar) and feed about 500 g of mixture to animal twice a day for 4 days	Cow/ buffalo
10.	Milk fever		Desi ghee		Feed about 200 g desi ghee twice a day for 3 to 4 days	Cow/ buffalo
11.	Foot and mouth disease (FMD)	<i>Fagopyrum esculentum</i> Moench	Chok drou	Leaves	About 250 g leaves of <i>Fagopyrum esculentum</i> are fed to animal twice daily for 5 to 7 days	Cow/sheep/ goat
		<i>Tamarindus indica</i> L.	Imli		200 g <i>Tamarindus indica</i> is given to animal once a day	Cow/sheep/ goat

S. no.	Disease	Scientific name of plant/ingredient	Local name of plant/ingredient	Part used	Method	Animal species
		Copper sulphate	Fish		250 g fish wrapped in chapatti is given to animal	Cow/sheep/ goat
			Snail		Snail is wrapped in some leaves or bread and given to animal	Cow/sheep/ goat
			Neela thotha		Neela thotha is mixed in water and hoofs of animal are washed twice a day	Cow/sheep/ goat
12.	Black quarter	<i>Gentiana kurroo</i> Royle	Butein	w/plant	About 100 g <i>Gentiana kurroo</i> is given to animal 2 to 3 times a day	Cow/buffalo/ sheep/ goat
			Ear vein puncture		Ear vein of the animal is punctured and blood is made to ooze out from ear vein	Cow/buffalo/ sheep/ goat
			Branding with hot iron		Hot sickle branding is done on upper side of hind limbs	Cow/ buffalo
13.	Poisoning	<i>Tamarindus indica</i>	Imli	Whole plant	125 g <i>Tamarindus indica</i> and salt is fed to animal twice a day.	Cow/buffalo/ sheep/ goat
14.	Snake bite	<i>Hedera helix</i> L.	Bail	Leaf	Paste is made from the leaves of <i>Hedera helix</i> and applied on the area of bite.	Cow/buffalo/ sheep/goat

3.4 Foot and Mouth Disease and Black Quarter

A strong agreement among the pastoralists was observed that the infectious diseases do not find sole solution in ethno-veterinary medicines. They have to integrate the ethno-veterinary and allopathic treatment to cure the ailments. This is in close agreement with the statement made by livestock owners in other studies, that ethno-veterinary medicine was not effective against acute infections such as foot and mouth disease Kudi [18]. The most frequently used plants for the treatment of foot and mouth disease were *Fagopyrum esculentum* and *Tamarindus indica*. *Fagopyrum esculentum* documented in the present study have not been documented for foot and mouth disease so far as no information regarding its use was available in the literature, however, it has been documented for the treatment of anaemia by Ratan et al. [19]. Similarly *Tamarindus indica* has been reported for the treatment of black quarter after mixing with soil of ant hill and applying it on the back or thigh region by Deshmukh et al. [20] in early studies. Feeding of fish and snail to animals in order to prevent and treat foot and mouth disease was also reported from the study area which has also been reported for the treatment of foot and mouth disease in Sargodha district of Pakistan by Dilshad et al. [21]. Use of plant decoctions and chemicals like copper sulphate as external washes for treatment of foot and mouth disease was recorded in the study area. The observations were in agreement with earlier findings of Pieroni et al. [22]. For the treatment of black quarter respondents were using indigenous techniques like puncturing the ear vein and allowing the blood to ooze out and branding the hind portion of affected animal with red hot sickle, which do not find any mention in the available literature.

3.5 Toxicosis and Snake Bite

Tamarandus indica was reportedly used against toxicity but no information regarding it could be gathered from available literature. In case of snake bite, *Hedera helix* was used by the respondents in the study area against snake bite, however, it has been documented for use in bruises and arthritis by Singh et al. [23].

4. CONCLUSION

Ethno-veterinary practices used for the treatment of various diseases in livestock are considered to

be better in terms of cost effectiveness and treating the ailment without side effects. The study shows the richness of the time-tested indigenous knowledge applied for treating animals. Majority of the pastoralists placed their trust in the traditional ITK which has since times immemorial been able to recover their herds from various ailments. These ITK practices need to be validated scientifically along with the identification and isolation of active ingredients present in the materials used. An important observation of this study was that the traditional healers complained about the slow disappearance of rare plants in the region as instead of collecting the only required portion of a medicinal plant, the whole plant was being uprooted by some healers. The region remains covered under snow blanket for most part of the year which gives a very less opportunity to explore the region and find the plant.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Bizimana N. Scientific evidence of efficacy of medicinal plants for animal treatment, ethno-veterinary medicine: Alternatives for livestock development. Proceedings of an International Conference Held in Pune. Abstracts. 1997;2:11-12.
2. Rangnekar VD. Random thought on ethno-veterinary practices and their validation in relation to livestock development. ICAR Short Course Entitled Techniques for Scientific Validation and Evaluation of Ethno-veterinary Practices. 1998;24-27.
3. Abbas B, Al-Qarawi A, Al-Hawas A. The ethno-veterinary knowledge and practice of traditional healers in Qassim region, Saudi Arabia. Journal of Arid Environments. 2002;50:367-379.
4. Giday M, Asfaw Z, Elmqvist T, Woldu Z. An ethno-botanical study of medicinal plants used by the Zay people in Ethiopia. Journal of Ethnopharmacology. 2003;85: 43-52.
5. Ole-Miaron JO. The Maasai ethno diagnostic skill of livestock diseases: A lead to traditional bio-prospecting. Journal of Ethnopharmacology. 2003;84:79-83.
6. Viegi LA, Pieroni A, Guarrera PM, Vangelisti R. A review of plants used in folk veterinary medicine in Italy as basis for a

- data bank. Journal of Ethnopharmacology. 2003;89:221-244.
7. Slathia PS, Bhagat GR, Singh S. Traditional knowledge on utility of *Cedrus deodara*. Indian Journal of Traditional Knowledge. 2007;6(3):518-520.
 8. Sindhu Z, Zafar I, Muhammad N, Jonsson N, Muhammad S. Documentation of ethno-veterinary practices used for treatment of different ailments in a selected hilly area of Pakistan. International Journal of Agriculture and Biology. 2010;12:3.
 9. Kumar M, Yash P, Anand VK. An ethno-botanical study of medicinal plants used by the locals in Kishtwar, Jammu and Kashmir, India. Ethno-botanical Leaflets. 2009;13:1240-56.
 10. Nfi AN, Mbanya JN, Ndi CA, Kameni A, Vabi M, Pingpoh D, Yonkeu S, Moussa C. Ethno-veterinary medicine in the northern provinces of Cameroon. Veterinary Research Communication. 2001;25:71-76.
 11. Khan ZS, Khurro A, Dar GH. Ethno-medical survey of Uri, Kashmir. Indian Journal of Traditional Knowledge. 2004;3(4):351-357.
 12. Bisht AK, Bhatt A, Rawal RS, Dhar U. Prioritization and conservation of himalayan medicinal plants, *Angelica glauca*: a case study. Ethno-botany Research and Application. 2006;4:11-24.
 13. Singh MP, Panda H. Medicinal herbs with their formulations. Daya Publishing House, New Delhi. 2005;270-273.
 14. Jabbar A, Raza MA, Iqbal Z, Khan MN. An inventory of the ethno-botanicals used as anthelmintics in the southern Punjab (Pakistan). Journal of Ethnopharmacology. 2006;108:152-154.
 15. Mahmood A, Mahmood A, Mamoona M. Indigenous wild medicinal plants used by local people of Dudial area, district Mirpur, Bangladesh. Journal of Medicinal Plants Research. 2012;6(13):2686-2690.
 16. Singh MP, Panda H. Medicinal herbs with their formulations. Daya Publishing House, New Delhi. 2005;613.
 17. Prajapati ND, Purohit SS, Sharma AK, Kumar T. Handbook of medicinal plants. Agrobios, Jodhpur. 2003;522-523.
 18. Kudi CA. Ethno-veterinary, complementary and low cost treatment and management of working animals. In: Workshop, the challenge of improving the transport animal welfare in the world: Ways forward. Organized by World Association for Transport Animal Welfare and Studies (TAWs), Silsoe Research Institute, UK; 2003.
 19. Ratan P, Kothiyal P. *Fagopyrum esculentum*. (common buckwheat) edible plant of himalayas: A review. Asian Journal of Pharmacy and Life Science. 2011;1(4): 426-442.
 20. Deshmukh RR, Rathod VN, Pardesi VN. Ethno-veterinary medicine from Jalna district of Maharashtra state. Indian Journal of Traditional Knowledge. 2011;10(2):344-348.
 21. Dilshad SMR, Rehman NU, Ahmad N, Iqbal A. Documentation of ethnoveterinary practices for mastitis in dairy animals in Pakistan. Pakistan Veterinary Journal. 2009;30(3):167-71.
 22. Pieroni A, Howard P, Volpato G, Santoro RF. Natural remedies and nutraceuticals used in ethno-veterinary practices in inland southern Italy. Veterinary Research Communication. 2004;28:55-80.
 23. Singh MP, Panda H. Medicinal herbs with their formulations. Daya Publishing House, New Delhi. 2005;425-450.

© 2017 Khateeb et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://sciencedomain.org/review-history/21586>