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RESEARCH ARTICLE

Participatory evaluation of ethno-veterinary livestock health practices by farmers from surrounding villages in Ranthambore Tiger Reserve, India

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Abstract: The present study was conducted to document the ethno-veterinary practices, 360 livestock farmers from the 30 villages surrounding the tiger reserve were interviewed using an open-ended interview schedule to enlist all the practices against the ailments of livestock from the purposefully chosen zone namely Critical Tiger Habitat and buffer zone of the tiger reserve. For participatory assessment of the identified ethno-veterinary practices, Quantification of Indigenous Knowledge and to identify the best practices among overall practices one way variance followed by DMRT method was applied. Use of *Drimia indica* (Roxb.) Jessop was found most effective practice against mastitis and use of seeds of *Sorghum halepense* L. against the diarrhoea, stem bark of *Salodora persica* L. for fever, and fruits of *Areca catechu* for treatment of prolapse in the livestock were found most effective practices. The pharmacodynamics of these ethno-veterinary techniques could therefore be studied before further replication and implementation.

Keywords: Farmers, Indigenous knowledge, Livestock, Ranthambore Tiger Reserve

Introduction

HERBS and plant concoctions have been utilized to treat numerous ailments around the world since ancient times, and they have a special affinity with humans (Sharma et al. 2005). Because of higher cultural acceptance, compatibility with the human body, and fewer side effects, such formulations are still the mainstay of basic health care for roughly 75–80 percent of the world's population, particularly in third-world nations (Kamboj 2000). Ranthambore Tiger Reserve (RTR) is an abode to a plethora of plant species and homemade ingredients that have been used time and again by the locals to cure many health problems in the livestock. The use of natural products of plants are not restricted to human but also helped to treat various diseases of livestock (Dzoyem et al. 2020). Most of the rural communities depend on livestock for their livelihood but the impact of livestock diseases severe for the rural people who have not able to access modern medicine therefore indigenous knowledge they highly depend on their traditional knowledge to treat various diseases (Eiki et al. 2021). The ethno-veterinary medicine is cheaper and more cost-effective than modern medicine (Masika et al. 2010). Farmers in the vicinity of RTR are unable to access modern veterinary facilities due to a lack of awareness and knowledge about modern medicine and solely depend on their traditional knowledge to treat their diseased animals. These knowledge treasures are poorly documented, and the knowledge base is in danger of extinction. Hence, the purpose of this study was to document and appraise ethnoveterinary treatments used to treat common livestock health problems.

Material and Methods

Study area

In India, there are 52 Tiger Reserves, covering 5.26 per cent of the country's geographical area.

Out of 52, Ranthambore Tiger Reserve was selected because the highest number of villages (306 villages) with one million human population, and these people primarily depend on agriculture and livestock for their livelihood and on their traditional knowledge to treat various livestock diseases. For the documentation of the ethno-veterinary practices, a study was conducted from September 2021 to November 2021, and for the assessment of the practices in January 2022.

Data Collection

Ranthambore Tiger Reserve is divided into two zones namely Critical Tiger Habitat also known as Core Zone (Ranthambore National Park, Sawai Madhopur Wildlife Sanctuary, Sawai Man Singh Wildlife Sanctuary) and buffer zone (Kaila Devi Wildlife Sanctuary) both zones were selected, and 30 villages were

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selected, randomly from both zone of RTR and 12 farmers who are engaged with livestock rearing was selected randomly, thus, a total of 360 livestock farmers were interviewed at their homes with help of an open-ended interview schedule for documentation of ethno-veterinary practices with the rationale used by them to treat different diseases of their livestock.

Data Analysis

Assessment of ethno-veterinary practices had been done through QuIK (Quantification of Indigenous Knowledge) method by key informants, using the method (QuIK) developed by De Villiers (1996) (De Villiers 1996). QuIK methodology represents a rapid and relatively cheap way to elicit ethno-veterinary practices. In QuIK, PRA tool, i.e. matrix ranking is combined with an interview schedule to elicit numerical data from key informants. Farmers were mainly using ethno-veterinary practices to cure four important diseases e.g. mastitis, diarrhoea, fever, and prolapse. Therefore these four diseases were selected for the participatory validation, and key informants were identified by socio-metric method (Moreno 1951) among the selected livestock farmers, and those were having depth understanding and knowledge of selected ethno-veterinary practices. Thus, 42 key informants were identified for participatory validation of mastitis. Accordingly, 38, 31, and 57 key informants were identified for the participatory validation of diarrhoea, fever, and prolapses, respectively. Four criteria or parameters, viz. availability, ease of preparation, healing effect, and lower side effect, were selected to appraise the comparative and relative effectiveness of the identified ethno-veterinary practices. Key informants were asked to put a required number of pieces of stone out of each block of the matrix as per their perception of each criteria/parameter of the identified ethno-veterinary practices. Data from each key informant were treated as an independent result. Data collected from the key informants on several criteria were subjected to a one-way analysis of variance followed by Duncan's Multiple Range Test (DMRT) modified by (Kramer 1957) was used to identify the most effective practices among the identified practices.

Results and Discussion

Ethno-veterinary practices used against various ailments in the livestock by the respondents

Mastitis

The respondents used a total of five practices **(Table 1)** to treat mastitis in animals. In the first practice, participants collected *Drimia indica* (Roxb.) *Jessop* leaves from the forest area, made a paste out of the plant leaves, and administered it to the animals' affected parts twice a day for two to three days. In the second practice, they prepared a paste of leaves of *Vitex negundo* L. and give it to animals orally for three to four days together with water and bread. As the third practice, a paste made from *Datura stramonium* L leaves was applied to the affected parts twice daily for three to four days. Due to its potent analgesic and sedative properties, datura was utilized by tribal in Rajasthan's Banswara district to cure mastitis in livestock (Yadav and Rajput 2015). The use of *Datura stramonium* L and *Chenopodium ambrosioides* L was found to be most effective against mastitis disease in livestock (Naseer et al. 2021). In case of the fourth practice, crushed *Capparis decidua* fruit was prepared into a paste and then applied to the animals' affected udder parts. And respondents used *Zingiber officinale* and ground it up, mixed it with sugar, and applied it to the affected udders of animals as the fifth practice. Mastitis is a common milking livestock like buffalo and cow disease that caused a tremendous economic loss to dairy farms. *Zingiber officinale* has antibacterial properties which helped to treat mastitis disease in dairy animals (Masniari 2011)

For the assessment of ethno-veterinary practices for the treatment of mastitis, a total of 42 key informants were interviewed. Matrix ranking for the relative performance of the options concerning each criterion, e.g. availability, ease in preparation, healing effect, and lower level of side effect was done with a score of 1 to 5 as presented in Table 2. The result shows discernible differences in different ethno-veterinary practices. The fifth practice used ginger as the most effective in terms of availability but in terms of ease of preparation, respondents perceived the use of Kair as the most effective significantly different from the first practice. And in the case of healing effects and lower levels of side effects, respondents perceived the use of Kolikanda most effective practice and has significant differences from all the practices and were finally adjudged as the most effective practice against the treatment of mastitis of livestock. The third practice use of Datura was least effective in terms of availability, ease of preparation as well as in healing effect. Forth practice use of Kair was most effective in ease of preparation as its less time in preparation but was perceived as least effective in healing effects and had a lower level of side effects. Fifth practice use of Adhrak was easily available at home and also in the market but was having least

Table 1: Ethno-veterinary practices used by the respondents for treatment of Mastitis in the livestock

Practice	Local name	Scientific name	Habitat	Part used	Form of product
First	Kolikanda	*Drimia indica* (Roxb.) Jessop	Herb	Leaves	Paste
Second	Nirgundi	*Vitex negundo* L.	Shrubs	Leaves	Paste
Third	Datura	*Datura stramonium* L.	Herb	Leaves	Paste
Fourth	Kair	*Capparis decidua*	Shrubs	Fruits	Paste
Fifth	Adhrak	*Zingiber officinale*	Rhizome	Rhizome	Paste

effective healing effect as it's taking much time to heal also least effective in the lower level of side effects so it was not found more efficient than other practices as per the perception of the respondents. Though they perceived that first practice use of *Drimia indica* (Roxb.) Jessop (Kolikanda) to the livestock against mastitis was more effective in terms of healing effect and lower level of side effects than other practices due to this reason first practice was the most effective practice.

Diarrhoea: A total of four ethno-veterinary practices were used by the framers for the treatment of diarrhoea (Table 3). In the case of the first practice, respondents collected seeds of *Sorghum halepense* (Linn.) and seed flour mixed with little water and given to animals orally for two-three days to cure diarrhoea. For the second practice, respondents collected roots of *Phoenix dactylifera* L and crushed then mixed them into the water and given to animals orally for two days. About 25-30 grams of leaves of *Phoenix dactylifera* L paste and given to animals with either help of water or bread or fodder or two-three times a day for three days in the third practice and case fourth practices respondents prepare leaves to paste of *Moringa oleifera* Lamk then given to animals. Mullukruma tribes of Kerla are knowing using of paste of *Moringa oleifera* Lamk for the treatment of diarrhoea (Silja et al. 2008) and used of *Moringa oleifera* also helped to not only decrease the incidence of diarrhoea but also helped *to increase feed utilization and* increased enzymatic antioxidants among the pre weaned calves (Kekana 2021). But Meena et al. (2023) found that A powder of sahjan (*Moringa oleifera*) root, nirgundi (*Vitex negundo*) leaves, desi ajwain (*Fumaria indica*), and a little salt was produced by Raika camel reaer of Rajasthan. Finally, this powder mixed with ghee and administered to the camel twice daily for 4-5 days to cure *trypanosomiasis* (Surra) in the camel.

For the assessment of ethno-veterinary practices, 38 key informants were interviewed with four criteria viz. availability, ease of preparation, healing effect, and low level of side effects with a scoring pattern of 1-4 matrix of decision criteria for each practice for curing of diarrhoea in the livestock such as buffalo, cattle, and goat is presented in the Table 4. The first practice Jowar seed flour mixed with water was found to be the most effective practice against the curing of diarrhoea in comparison to the other three practices. With its easily available, preparation and lower level of side effects, therefore, this practice was perceived as the best effective one. There is no significance in the case of the healing effect of all practices but has a significant difference in the case of availability, ease of preparation, and lower level of side effects. Respondents perceived second practices roots of Khajuras as most effective in the lower level of side effects but these practices were not perceived best in case of availability and ease in preparation that's why this practice was judged second most effective practice in comparison to others. Third practice leaves of Sahjan were not easily available and also had a complexity to preparation due to this reason this practice was the least effective practice among others.

Fever

A total of four ethno-veterinary practices were used by the respondents for curing fever (Table 3). In case of first practice, first respondents take the bark of *Salvodora persica* L and mixed

Table 2 Participatory assessment of ethno-veterinary practices for treatment of Mastitis in the livestock by the livestock respondents (n=42)

Criteria	First Practice	Second Practice	Third Practice	Fourth Practice	Fifth Practice
Availability	2.10 ± 0.906^{d}(IV)	1.88 ± 0.145^{d}(V)	2.79 ± 0.220^{c}(III)	3.64 ± 0.148^{b}(II)	4.45 ± 0.109^{a}(I)
Ease in preparation	2.67 ± 0.225^{b} (IV)	2.67 ± 0.220^{b} (V)	2.81 ± 0.178^{b} (III)	3.57 ± 0.190^{a} (I)	3.52 ± 0.224^{a} (II)
Health effect	3.79 ± 0.209^{a} (I)	3.31 ± 0.217^{a}(II)	2.93 ± 0.194^{b}(III)	2.86 ± 0.185^{b}(IV)	2.10 ± 0.204^{c}(V)
Lower level of side effect	4.45 ± 0.128^{a}(I)	2.60 ± 0.202^{c}(IV)	3.19 ± 0.181^{b}(II)	2.64 ± 0.228^{c}(III)	2.19 ± 0.168^{c}(V)
Overall effect	13.00 ± 0.375^{a}(I)	10.45 ± 0.353^{c}(V)	11.71 ± 0.377^{b}(IV)	12.71 ± 0.418^{a}(II)	12.26 ± 0.334^{b}(III)

(a,b,c,d means bearing different superscripts in a row under each criterion differ significantly ($P<0.05$). The multiple comparisons are based on the DMRT Post Hoc test. Values in parenthesis indicate the respective rank under each criterion).

Table 3: Ethno-veterinary practices used by the respondents for treatment of Diarrhoea in the livestock

Practice	Local name	Scientific name	Habitat	Part used	Form of product
First	Jowar	*Sorghum halepense* L.	Plant	Seeds	Liquid solution
Second	Khajur	*Phoenix Dactylifera* L.	Tree	Roots	Liquid solution
Third	Pudina	*Thymus vulgaris* L.	Shrub	Leaves	Paste
Fourth	Sahjan	*Moringa oleifera*	Tree	Leaves	Paste
Ethno veterinary practices used by the respondents for treatment of Fever in the livestock					
First	Pilu	*Salvodora persica* L.	Tree	Stem bark	Liquid Solution
Second	Kanthari	*Capparis sepiaria* L.	Shrub	Stem bark	Liquid Solution
Third	Isharmul	*Aristolochia indica* L.	Shrub	Roots	Powder
Fourth	Amrud	*Psidium guajava* L.	Tree	Leaves	Liquid Solution

it into juice form and give it to animals orally for two-three days however the paste of roots of *Salvodora persica* given to animals is effective against the fever (AI et al. 2020). In the second practice, respondents prepare the juice of the stem bark of *Capparis sepiaria* L. and give it to animals twice a day for three days to affected animals. *Capparis sepiaria* L. is good in giving relief to pain as well as fever and infection in animals (Meena et al. 2020). Prepare powder root of *Aristolochia indica* Linn. and given to animals orally with the help of water or chapati in the third practice. The study area is very famous for guava farming so they first collected leaves of *Psidium guajava* Linn and extracted them in the juice form of almost one liter and given to affected animals orally for at least three days. But paste of alum, given to animals was most effective practice against the fever in small ruminants (Chand et al. 2021).

For the assessment of ethno-veterinary practice, 31 key informants were interviewed with four criteria namely availability, ease of preparation, healing effect, and low level of side effects with a scoring pattern of 1-3. The matrix of decision criteria for each practice for curing fever in the livestock is presented in Table 4. The first practice, use of stem bark juice of *Salvodora persica* L. was found to be the most effective practice for treating fever when compared to the other three methods since it was the easiest to prepare, had a healing effect, and had less side effects. Fourth practice usage of *Psidium guajava* Linn was thought to be readily available but ranked second in other criteria. The use of *Aristolochia indica* Linn was found to be the least effective since it was not easily available, difficult to prepare, and required a lot of time to heal.

Prolapse

A total of three practices were used by the respondents for curing prolapses as presented in Table 5. In the first practice, respondents crushed the fruits of *Areca catechu* which is available in the market, and make a paste of the fruits then given to animals along with a small quantity of ghee and sugar for two days. 15-20 pieces of *Areca catechu* also known as Supari first soaked in a small quantity of ghee then given to animals (Chopra et al. 1956). and in case of second practice respondents used to give orally raw fruits of *Lagenaria siceraria* for two days this helps to make body temperature level of the livestock. 250-gram desi ghee along with almost 2-3 kg *Cucurbita pepo*. And in the case of the last practice, the livestock keeper first brought roots of *Zezyphus sativa* then crushed it and made the paste, and gave it to animals twice a day for two days for curing prolapse in the livestock. Talukdar et al. 2015 found that almost 200 gram root of two different Rhamnaceae family plants namely *Ziziphus mauritiana* L. and *Chrysopogon zizanioides* mixed and decocted with three liters of water until the volume is reduced by one-third. The mixture is then filtered through muslin cloth and placed in a bottle for storage then 100 ml of the mixture is administered twice daily for 7–10 days to treat prolapse in cattle.

Table 4 Participatory assessment of ethno-veterinary practices for treatment of Diarrhoea in the livestock by the livestock respondents (n=38)

Criteria	First Practice	Second Practice	Third Practice	Fourth Practice
Availability	2.95 ± 0.151^{a}(I)	2.63 ± 0.148^{b}(II)	2.05 ± 0.185^{b}(IV)	2.29 ± 0.199^{b}(III)
Ease in preparation	2.92 ± 0.194^{a}(I)	2.55 ± 0.167^{b}(II)	2.05 ± 0.141^{c}(IV)	2.47 ± 0.199^{c}(III)
Health effect	2.66 ± 0.197^{a}(I)	2.53 ± 0.154^{a}(I)	2.47 ± 0.176^{a}(I)	2.34 ± 0.201^{a}(I)
Lower level of side effect	2.37 ± 0.183^{b}(III)	3.05 ± 0.130^{a}(I)	2.55 ± 0.187^{b}(II)	2.08 ± 0.190^{b}(IV)
Overall effect	10.89 ± 0.331^{a}(I)	10.76 ± 0.265^{a}(II)	9.13 ± 0.307^{b}(IV)	9.18 ± 0.377^{b}(III)

Participatory assessment of ethno-veterinary practices for treatment of Fever in the livestock by the livestock respondents (n=31)

Criteria	First Practice	Second Practice	Third Practice	Fourth Practice
Availability	2.13 ± 0.190^{b}(III)	2.42 ± 0.137^{b}(II)	1.94 ± 0.185^{b}(IV)	3.32 ± 0.176^{a}(I)
Ease in preparation	2.87 ± 0.206^{a}(I)	2.35 ± 0.200^{b}(III)	2.16 ± 0.186^{b}(IV)	2.61 ± 0.200^{a}(II)
Health effect	3.29 ± 0.155^{a}(I)	2.19 ± 0.182^{b}(III)	2.10 ± 0.176^{b}(IV)	2.42 ± 0.221^{b}(II)
Lower level of side effect	3.45 ± 0.145^{a}(I)	1.90 ± 0.199^{c}(IV)	2.29 ± 0.148^{b}(III)	2.48 ± 0.212^{b}(II)
Overall effect	11.74 ± 0.328^{a}(I)	8.87 ± 0.396^{b}(III)	8.48 ± 0.347^{b}(IV)	10.84 ± 0.412^{a}(II)

(a,b,c means bearing different superscripts in a row under each criterion differ significantly ($P<0.05$). The multiple comparisons are based on the DMRT Post Hoc test. Values in parenthesis indicate the respective rank under

Table 5 Ethno-veterinary practices used by the respondents for treatment of Prolapse in the livestock

Practice	Scientific name	Local name	Habitat	Part used	Form of product
First	*Areca catechu*	Supari	Tree	Fruits	Paste
Second	*Lagenaria siceraria*	Loki	Climber	Fruits	Fruits
Third	*Zezyphus sativa*	Ber	Shrub	Root	Paste

Table 6 Participatory assessment of ethno-veterinary practices for treatment of prolapses in the livestock by the livestock respondents (n=57)

Criteria	First Practice	Second Practice	Third Practice
Availability	2.26±0.121[a](I)	2.12±0.071[a](II)	1.61±0.108[b](III)
Ease in preparation	1.93±0.090[b](II)	2.60±0.096[a](I)	1.40±0.066[c](III)
Health effect	2.61±0.082[a](I)	1.44±0.066[c](III)	1.93±0.109[b](II)
Lower level of side effect	2.39±0.774[a](I)	1.72±0.102[b](III)	1.89±0.102[b](II)
Overall effect	9.19±0.196[a](I)	7.88±0.162[b](II)	6.84±0.200[c](III)

(a,b,c means bearing different superscripts in a row under each criterion differ significantly (P<0.05). The multiple comparisons are based on the DMRT Post Hoc test. Values in parenthesis indicate the respective rank under each criterion)

For the assessment of ethno-veterinary practices, 57 key informants were interviewed with four criteria e.g. availability, ease of preparation, healing effect, and lower level of side effect with a scoring pattern of 1-3 matrix of decision criteria with respect to each practice for curing prolapses of livestock are presented in Table 6. The first practice use of *Areca catechu* was found to be the most effective practice to control prolapses in the livestock in comparison to the other two practices. The first practice was perceived to rank first in availability, healing effect, and lower level of side effects due to this reason it was found to be the most effective practice, and in the case of the second practice it has no significant difference at <0.05 with the first practice in availability and this practice was perceived rank first in case of ease preparation. The third practice use of *Zezyphus sativa*was not easily available as well as took much time in preparation so it was the least effective practice in comparison to other practices.

Conclusion

Livestock farmers in the vicinity of the Ranthambore Tiger Reserve are highly dependent on their traditional knowledge for the treatment of various ailments in the livestock. Participatory assessment appraised the use of *Drimia indica* (Roxb.) Jessop to treat mastitis, while *Sorghum halepense* L. seeds were shown to be the most effective treatment for diarrhoea. Concerns about efficacy, quality, safety, and dose standardization continue to exist. As a result, the pharmacodynamics of these ethno-veterinary methods must be evaluated urgently before they can be replicated and used.

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Reference

Al Bratty M, Makeen M, Alhazmi HA, Syame SM, Abdalla AN, Homeida HE, Khalid A (2020) Phytochemical, cytotoxic, and antimicrobial evaluation of the fruits of miswak plant, Salvadorapersica L J Chem http://doi.org/10.1155/2020/4521951

Chand S, Meena BS, Yadav SP, Yadav ML, Baindha A, Sharma NK (2021) Ethno-veterinary Practices Followed by Farmers for Treatment of Reproductive Disorders in Dairy Animals. Int J Livest Res 11: 65-70

Chopra RN, Nayar SL, Chopra IC (1956) Glossary of Indian Medicinal Plants Council of Scientific and Industrial Research. New Delhi, 89

De Villiers AK (1996) Quantifying indigenous knowledge: a rapid method for assessing crop performance without field trials. Network Paper-Agricultural Administration (Research and Extension) Network (United Kingdom).

Dzoyem JP, Tchuenteu RT, Mbarawa K, Keza A, Roland A, Njouendou AJ, Assob JC N (2020) Ethnoveterinary medicine and medicinal plants used in the treatment of livestock diseases in Cameroon. In Ethnoveterinary medicine (pp. 175-209). Springer, Cham

Eiki N, Sebola NA, Sakong BM, Mabelebele M (2021) Review on Ethnoveterinary Practices in Sub-Saharan Africa. Vet Sci 8: 99

Kamboj VP (2000). Herbal medicine. Curr Sci 78: 35- 39

Kekana TW, Marume, U, Muya CM, Nherera-Chokuda, FV (2021) Moringa oleifera leaf meal as a feed supplement for dairy calves. S Afr J Anim Sci 51: 550-559

Kramer CY (1957) Extension of multiple range tests to group correlated adjusted means. Biometrics 13: 13-18

Masika PJ, Van A, Sonandi W (2010) Use of herbal remedies by small-scale farmers to treat livestock diseases in central Eastern Cape Province, South Africa J S vet Assoc 71: 87-91

Masniari P (2011) The effect of red ginger (Zingiber officinale Roscoe) extract on the growth of mastitis causing bacterial isolates. Afr J Microbiol Res *5*: 382-388

Meena DC, Garai S, Maiti S, Bhakat M, Meena BS, Kadian KS (2020) Ethno-Veterinary practices used for common health ailments of sheep and goat: A participatory assessment by the Raika pastoralists of Marwar region of Rajasthan. Indian J Anim Sci 90: 1310-1315.

Meena DC, Garai S, Maiti S, Bhakat M, Meena BS, Kadian KS (2023) Ethno-veterinary practices for camel diseases: A participatory assessment by the Raika pastoralist of Rajasthan. Indian J Anim Sci 93: 45-50

Naseer M, Kamboh AA, Soho AB, Burriro R (2021) In vitro antimicrobial efficacy of some plant extracts against multi-drug resistant Staphylococcus aureus and Streptococcus pyogenes isolated from buffalo mastitic milk. Buffalo Bull 40: 31-44

Sharma PK, Chauhan NS, Lal B (2005). Studies on plant associated indigenous knowledge among Malanis of Kullu district, Himachal Pradesh. Indian J Tradit Know 4: 403-408.

Silja VP, Varma KS, Mohanan KV (2008) Ethnomedicinal plant knowledge of the Mullukuruma tribe of Wayanad district, Kerala. Indian J Tradit Know 7: 604-612

Talukdar D, Talukdar P, Ahmed K (2015) Documentation of traditional herbal medicines for reproductive disorders of livestock in Kamrup district of Assam. Int J Agric Sci Res 5:221-228

Yadav M., Rajput DS (2015) Ethno-veterinary practices by tribals of Banswara district of Rajasthan. Indian J Nat Prod Res 6: 237-240