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RESEARCH ARTICLE

Utilization Pattern and Validation of Indigenous Technical Knowledge (ITK) Prevailing among the Dairy Farmers of Northern Bihar

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ABSTRACT

Indigenous Technical Knowledge (ITK) in the fields of veterinary medicine and animal husbandry is the practical knowledge that has evolved from the experiences of farmers who have used their skills to solve some of their difficulties in their local environments utilizing locally accessible materials. The present study aims to document and validate the indigenous technical knowledge (ITK) procedures used by dairy farmers in northern Bihar. The study was conducted in three districts of northern Bihar. A total of 180 dairy farmers were interviewed for the data collection. The documented ITK from the dairy farmers was exposed to 25 randomly selected experts including veterinary professionals and veterinary scientists for the validation of the ITK. From the study area, various ITKs were documented and most of them were found to be scientifically valid by the veterinary professionals and scientists, which could be further assessed, documented, and propagated for the benefit of the farming community. There is a threat to the extinction of indigenous technical knowledge in animal husbandry, which is popular throughout rural India. Documenting these practices and determining their applicability is crucial. Many of the indigenous technical knowledge are on the verge of extinction, so there is an urgent need to record and preserve them. This will be helpful to create environmentally benign, site-specific, commercially successful, and socially acceptable technologies.

***Key words**: Animal husbandry; Dairy; Indigenous technical knowledge; North Bihar.*

India has developed dramatically, especially following the green revolution, in agriculture and related fields (*Swapna & Ahamed, 2005*). In the rural economy, dairy development plays a significant role in boosting the income of rural households, particularly those of landless, marginal, and small farmers (*Meena et al, 2009*). Traditional knowledge in dairy farming has helped the dairy producers from ages. Indigenous technological knowledge (ITKs) is our nation's greatest resource (*Singh & Tiwari, 2004*). Indigenous healing methods have been utilized to cure livestock since ancient times, and both livestock owners and local healers still employ them now for a variety of problems related to animal husbandry (*Das et al,* 2002). Indigenous Technical knowledge is specialized information specific to a certain culture or community. It serves as the foundation for a variety of other activities, including farming, health care, food preparation, education, and environmental preservation. It offers a tonne of room for creativity, particularly at the grassroots level (*Patel et al,* 2016). Since gaining its independence, India has focused all of its efforts on creating an allopathic-based veterinary infrastructure that is wholly governed by the public sector. Many of us, including those who specialize in veterinary medicine, are unaware of old literature, and some even have doubts about it due to the loss of traditional systems and expertise (*Rangnekar, 1998*). Modern science has become more important recently in the upkeep and development of livestock. Ayurveda, Unani, and homeopathy are just a few of the therapy philosophies that have been employed for animals since the dawn of time in India, the land of the *Rishi* and *Krishi*. These customs have been passed down orally from one generation to the next and are regarded as the holistic approach to livestock management

techniques used by non-literate civilizations. There are informed and skilled experts who use indigenous techniques all over India, but their knowledge is not properly documented and is only passed verbally from one generation to the next (*Amitendu et al, 2004*). It is practical and heavily relies on intuition, historical precedent, and immediately observable evidence of advantages (*Farrington & Martin, 1987*). The potential for innovation in indigenous technical knowledge (ITK), particularly at the community level, is enormous. India is a large country with many indigenous communities, each of which has its own distinct traditional knowledge and technological basis. Several of these skills and technologies are on par with the current knowledge base and technological infrastructure, and they have enabled indigenous tribes to live comfortably and independently. Indigenous knowledge emerges in a specific community and preserves a non-formal method of communication. Such information is held in common, cultivated over several generations, adaptable, and ingrained in a community's way of life as a means of survival. The contribution of Indigenous Technical Knowledge is outstanding within the larger context of Indigenous Knowledge. Although indigenous peoples' contributions to the world's biological and cultural variety as well as sustainable development are widely acknowledged, there are still many obstacles in the way of traditional knowledge and technology (*Borthakur & Singh, 2012*). Also, it will aid in the development of agricultural practices that are less harmful to the environment, which will ultimately lead to sustainability (*Ponnusamy et al,* 2009). Using herbs, herbal products, and other natural resources that are readily available locally, traditional rural veterinary procedures have been developed. Such treatment is thought to be effective and free of side effects and adverse effects, in addition to being less expensive *(Talukdar et al, 2012).* It will be possible to find concepts with a lot of potential for economic exploitation following value addition by studying indigenous knowledge. Understanding ideas and techniques illustrating sustainability components will also make it easier to integrate them into contemporary information systems for effective resource management (*Mukherjee, 2021*). The main goal of this study is to identify such hidden technologies and use them effectively in order to get them accepted scientifically at research institutes and made available nationwide for everyone to use for the benefit of our country's livestock. With this support, a study was conducted to identify, catalogue, and validate the ITKs used by dairy producers in the northern Bihar region.

METHODOLOGY

This study was conducted in northern Bihar. From North Bihar, three districts were selected on the basis of stratified random sampling, namely, Madhepura, Supaul, and Darbhanga. From each district, two blocks were chosen at random, one being closest to and the other being farthest from the district headquarters, bringing the total to six blocks. Twelve villages, two from each block were chosen randomly, and fifteen respondents were chosen randomly from each village, for a sample size of 180 respondents overall. For the study, dairy farmers were chosen who had at least five years of expertise in dairy farming and at least one animal producing milk. A well-structured, pre-tested, and standardized interview schedule created for the intended purpose was used for data collection. Focussed group discussion was also done for documentation. An ex-post facto research design was used for this study. For the analysis of the data, suitable statistical tools such as frequency, percentage, mean, and weighted mean were used. The ranking for the usage of ITK practices by the dairy farmers was done by calculating the weighted mean scores using the method adopted by *Sindhu & Malik, (2020).* The validity of the ITK was tested with a group of veterinary professionals and scientists for its relevance in the scientific scenarios. These were sent to 25 experts, including veterinary professionals and veterinary scientists, for their responses on the 3-point validity continuum, and the responses were 3, 2, and 1 for most valid, valid, and least valid, respectively. Thus, one ITK could get a maximum score of 75 and a minimum score of 25. For further calculation of the validity scores of each ITK, the following method used by *Ponnusamy et al, (2009)* was adopted.

Validity Score = Score 1×no. of responses+ Score 2× no. of responses+ Score 3×no. of responses

RESULTS AND DISCUSSION

The potential for innovation in indigenous technical knowledge (ITK), particularly at the local level, is enormous. The entire socio-economic growth of the communities has benefited greatly from this ancient knowledge and skills (*Anand et al, 2023*).

Utilisation pattern of various ITKs :

Treatment of diarrhoea in calves :Dairy animals are most commonly susceptible to diarrhoea. A digestive condition marked by aberrant faecal evacuation frequency and fluidity, typically indicating gastrointestinal distress or dysfunction. In calves, the issue is more severe. From Table 1, it was found among the dairy farmers of northern Bihar, feeding of bamboo leaves (*Bambusa tulda*) after the application of mustard oil (*Brassica campestris*) on them was the most prominent ITK followed. Feeding roasted brinjal (*Solanum melongena*) to the calves was the next important ITK practiced and feeding roasted *Datura* fruit (*Datura stramonium*) along with common salt to the calves was the next important ITK practiced for the treatment of diarrhoea in calves. These findings are similar to those reported by *Singh et al,* (2012).

Treatment of foot and mouth disease : Foot and mouth disease (FMD) is a serious, infectious viral disease that affects cattle and has a big financial impact. Lesions in the mouth, foot and mammary glands are where this disease typically presents. The amount of milk produced by milking animals drastically decreases, suckling calves typically pass away, pregnant animals may abort, and infertility may result from an abortion. It was commonly known as "*Bajha"* in the study area. It was revealed from the study (Table 1) that for the treatment of foot and mouth disease, sprinkling of water boiled with the bark of peepal tree (*Ficus religiosa)* on the affected parts of the animal's body was done, and it was the most preferred ITK practiced by the dairy farmers of northern Bihar. Next came the massaging of the animal's body with water boiled in neem leaves (*Azadirachta indica*), and washing of mouth and legs of animals with alum (*fitkari*) dissolved in lukewarm water was the third important ITK followed. Similar results were obtained by (*Kumar and Singh, 2011*). Keeping the animals standing in the mud was the next important ITK followed and treating the wound with turpentine oil was the fifth most prominent ITK used by the dairy farmers of northern Bihar. Similar results were obtained by *Patel et al,* (2016).

Treatment of mastitis in dairy animals : Heavy financial losses are caused by mastitis disease, which also lowers milk quality. Mastitis was called "*thanaila*" in the local language in the study area. Table 1 revealed that, for the treatment of mastitis, feeding of coriander to the animals was the most prominent ITK followed by the farmer, rubbing the udder of the affected animal with ice was the second most prominent ITK practiced. Application of the ground turmeric on the affected teats of the animals was the third important ITK practiced. Similar results were obtained by *Bhuyan (2016)* and *Ponnusamy et al, (2017).* The fourth prominent ITK followed was the washing of the teats of animals with lukewarm water mixed with common salt. Similar findings were reported by *Tiwari and Pande (2004).* Feeding the peeled lemon (*Citrus limon*) to the animals was the fifth important ITK practiced.

Treatment of cold : It was found in the study (Table 1) that, for the treatment of animals against the cold, rubbing of lukewarm mustard oil (*Brassica campestris*) mixed with garlic (*Allium sativum*) and black pepper (*Piper nigrum*) on the animal's body was the most prominent ITK practiced and further rubbing of the heated neem leaves on the animal's body was the second most prominent ITK, followed by the dairy farmers of the study area. Similar results were obtained by Patel et al, (2016), *Ponnusamy et al,* (2009), and *Niwas et al,* (2013).

Boosting the immunity of animals during the autumn season : The immunity of animals gets weakened in the winter. In this phase, animals are more prone to infectious diseases. Table 1 indicates that, for boosting the immunity of animals during the autumn season, feeding of *ber* fruits (*Ziziphus mauritiana*), turmeric (*Curcuma longa*), ginger (*Zingiber officinale*), and black pepper (*Piper nigrum*) after grinding and mixing it with mustard oil was the most important ITK practice followed, and feeding of bamboo leaves along with turmeric, jaggery (*gud*), ginger, and Datura fruit (*Datura stramonium*) after grinding was the second prominent ITK practiced by the dairy farmers in the study area.

Treatment of tick infestation in animals : Dairy animals suffer serious health issues as a result of tick infestations. Ticks were commonly called *"haavar"* in the study area. From the study (Table 1), it was found that the application of mustard oil (*Brassica campestris*) on the animal's body was the most prominent ITK followed by the dairy farmers for the treatment against tick infestation in animals. Rubbing ash from cow dung cakes on the body of animals was the second important ITK followed by the dairy farmers in the study area. Similar results were obtained by *Bhuyan* (2016) and *Ponnusamy et al,* (2017).

Providing nutrition and strength to the animals after parturition : Animals require advanced nourishment after they give birth to the new born offspring. Therefore, several indigenous methods are utilised for

providing nourishment and strength to dairy animals. As revealed by the study (Table 1), feeding of jaggery (*gud*), ripe banana, and black pepper (*Piper nigrum*) to the animal after parturition was the prominent ITK followed by the dairy farmers in the study area. Similar results were reported *by Ponnusamy et al*, (2009) and *Tiwari and Pande* (2004).

Validation of the various ITK practices followed in North Bihar by veterinary scientists and veterinary professionals : In Table 2, important ITKs that were identified along with their validity scores are presented. Even scientists were found to perceive different ITK procedures at varying degrees. A total of 20 ITKs are presented with their respective validity scores, out of which, more than half of the listed ITK (12 out of 20) had a score above 45, demonstrating their expanded use, relevance, and most common in the practice of ethno veterinary medication. Also, points ranked in the "most valid" column have contributed to the higher scores in these ITKs, indicating that these are well-

Table 1. Utilization pattern of the Indigenous Technical Knowledge Practices followed by dairy farmers of northern Bihar (N=180)

Indigenous Technical Knowledge Practices	Always (3)	Sometimes (2)	Never (1)	WMS
Treatment of diarrhoea in calves				
Mustard oil was applied to bamboo leaves (*Bambusa tulda*) and fed to the calves	47(26.11)	11(06.11)	122(67.78)	47.6(I)
Roasted brinjal (*Solanum melongena*) was fed to the calves	43(23.88)	07(3.88)	130(72.24)	45.5(II)
Roasted Datura fruit (*Datura stramonium*) along with common salt was fed to the calves	32(17.77)	17(9.44)	131(72.79)	43.5(III)
Treatment of Foot and Mouth disease				
Peepal tree (*Ficus religiosa*) bark was boiled in water and sprinkled on the affected part of the animal's body	46(25.55)	34(18.89)	100(55.56)	51.0(I)
Neem leaves (*Azadirachta indica*) were boiled in water and the animal's body was massaged with it	44(24.44)	29(16.12)	107(59.44)	49.5(II)
Animals were made to stand in the mud	17(09.44)	21(11.66)	142(78.9)	39.1(IV)
Mouth and legs were washed with alum (*fitkari*) dissolved in lukewarm water	29(16.12)	42(23.34)	109(60.54)	46.6(III)
The wound was treated with turpentine oil	17(09.44)	12(06.66)	151(83.9)	37.6(V)
Treatment of mastitis				
The teats were washed with lukewarm water mixed with common salt	28(15.55)	31(17.22)	121(67.23)	44.5(IV)
Turmeric was ground and applied to teats	29(16.11)	47(26.11)	104(57.78)	47.5(III)
Udder was rubbed with ice	32(17.77)	41(22.77)	107(59.46)	47.51(II)
Peeled lemon was fed to the animals	21(11.66)	38(21.11)	121(67.23)	43.33(V)
Coriander was fed to the animals	29(16.11)	48(26.66)	103(57.23)	47.66(I)
Treatment of cold				
Lukewarm mustard oil mixed with garlic (*Allium sativum*), and black pepper (*Piper nigrum),* was rubbed on the animal's body	46(25.55)	54(30.00)	80(44.45)	54.33(I)
Neem leaves were heated and rubbed on the body	14(07.77)	24(13.33)	142(78.9)	38.66(II)
For boosting the immunity of animals during the autumn season				
Bamboo leaves (*Bambusa tulda*), along with turmeric, jaggery (*gud*), ginger, and Datura fruit (*Datura stramonium*), were ground and fed to the animals	42(23.33)	33(18.33)	105(58.34)	49.5(II)
Ber fruit (*Ziziphus mauritiana*), turmeric (*Curcuma longa*), ginger (*Zingiber officinale*), and black pepper were ground, mixed with mustard oil, and fed to the dairy animals	48(26.66)	37(20.55)	95(52.79)	52.16(I)
Treatment of tick infestation in animals				
Mustard oil was applied to the animal's body	27(15.00)	35(19.44)	118(65.56)	43.16(I)
Ash from cow dung cakes was rubbed on the body of the animal	14(07.77)	28(15.55)	138(76.68)	39.33(II)
For providing nutrition and strength to the animals after parturition				
Jaggery, ripe bananas, and black pepper were fed to the animal after parturition	77(42.77)	38(21.11)	65(36.12)	62 (I)

established in the study area. ITKs with lower scores, however, cannot be disregarded because farmers in northern Bihar's experimental regions continue to utilize them. Similar findings were reported by *Goswami & Gangopadhyay (2017)*. Thus, additional testing of these ITKs is required to demonstrate their effectiveness. It is essential to look for an alternative in the form of fusing indigenous knowledge with modern dairying due to the resource limits faced by dairy producers and the rising prices of high-tech dairying. The extension agents should place a lot of emphasis on the ITKs with high levels of validity ratings since they will significantly lower the cost to farmers for animal health and welfare. A variety of plants with significant economic value in terms of their therapeutic and preventative capabilities should be preserved (*Karthickeyan & Gajendran, 2004, Sabarathnam, 2002*). The widespread use of ITKs for field applications is frequently hampered by a lack of understanding of processing herbs, a lack of time to record and validate ITKs, and a lack of information for developing adequate dosage forms. ITKs would be more practical and farmers would adopt them more quickly if they were combined with agricultural scientists' cutting-edge technologies, which would also boost the technology's benefits, applicability, and acceptability (*Ponnusamy et al, 2009*).

It is also important to mention the use of jaggery

Table 2. Validity scores of the ITK assigned by the veterinary professionals and veterinary scientist (N=25)

Indigenous Technical Knowledge Practices	Most Valid (3)	Valid (2)	Least valid (1)	Validity score
For the treatment of diarrhoea in calves				
Mustard oil was applied to bamboo leaves and fed to the calves	2	11	12	40
Roasted brinjal (*Solanum melongena*) was fed to the calves	2	13	10	42
Roasted Datura fruit (*Datura stramonium*) along with common salt was fed to the calves	6	5	14	42
For the treatment of Foot and Mouth disease				
Peepal tree (*Ficus religiosa*) bark was boiled in water and sprinkled on the affected part of the animal's body	6	14	5	45
Neem leaves (*Azadirachta indica*) were boiled in water and the animal's body was massaged with it	16	6	3	63
Animals were made to stand in the mud	3	3	19	34
Mouth and legs were washed with alum dissolved in lukewarm water	15	9	1	64
The wound was treated with turpentine oil	12	5	8	54
For the treatment of mastitis				
The teats were washed with lukewarm water mixed with common salt	8	10	7	51
Turmeric was ground and applied to teats	10	12	3	57
Udder was rubbed with ice	6	11	8	48
Peeled lemon was fed to the animals	3	13	9	44
Coriander was fed to the animals	3	12	10	43
For the treatment of cold				
Lukewarm mustard oil mixed with garlic (*allium sativum*), and black pepper (*Piper nigrum)* was rubbed on the animal's body	10	9	6	54
Neem leaves were heated and rubbed on the body	8	8	9	49
For boosting the immunity of animals during the autumn season				
Bamboo leaves (*Bambusa tulda*), along with turmeric (*Curcuma longa*), jaggery (*Gud*), ginger, and Datura fruit were ground and fed to the animals	9	11	5	54
Ber fruit (*Ziziphus mauritiana*), turmeric, ginger (*Zingiber officinale*), and black pepper were ground, mixed with mustard oil, and fed to the dairy animals	11	11	3	58
For treatment of tick infestation in animals				
Mustard oil was applied to the animal's body	7	8	10	47
Ash from cow dung cakes was rubbed on the body of the animal	3	8	14	39
For providing nutrition and strength to the animals after parturition				
Jaggery, ripe bananas, and black pepper were fed to the animal after parturition	17	7	1	66

(gud), ripe banana and black pepper for feeding the animals to give nourishment and strength after parturition (validity score 66), washing of mouth and legs of animals with alum dissolved lukewarm water for treatment against foot and mouth disease (validity score 64), use of neem leaves (*Azadirachta indica*) after boiling in water and massaging the animal's body with it for treatment against foot and mouth disease (validity scores 63), feeding of *ber* fruits (*Ziziphus mauritiana*), turmeric (*Curcuma longa*), ginger (*Zingiber officinale*), and black pepper (*Piper nigrum*) after grinding and mixing it with mustard oil for boosting immunity of animals during autumn season (validity score 58), application of ground turmeric on teats of animals for the treatment against mastitis (validity score 57), and treatment of wound with turpentine oil in case of foot and mouth disease (validity score 54), as they have top six highest scores obtained. A novel herbal medicine formulation for the efficient treatment of numerous ailments in dairy animals as well as other livestock species will be developed with the kind of validity obtained through experimental methods. It is important to work with researchers and scientists to develop acceptable technologies in partnership with the farmers using ITKs. There should be honour and appreciation for local ITK practitioners. Traditional practitioners may be inspired to share their expertise if local innovations are published in regional periodicals along with the innovators' names and photos. The data should be stored in straightforward files that the villagers themselves maintain.

Feedback of dairy farmers : In addition to the ITK that were validated, through the feedback of the farmers, it was found that farmers were also using several other ITKs (Table 3). Feeding of *bhainth* weed (*Clerodendrum viscosum*) after grinding it for the treatment against endo-parasites in calves and adult animals. Bamboo leaves were also fed to the animals after crushing. Leaves of the marigold plant (*Tagetes erecta*) were crushed and applied to the injured part of the animal's body. It stopped the bleeding and further healed the wound. Feeding of ajwain (*Trachyspermum ammiwas*) after grinding and mixing with common salt for the treatment against bloating. To enhance milk production, jaggery (gud), masoor daal (*Lens culinaris*), mangrail (*Nigella sativa*), ajwain (*Trachyspermum ammi*), and sua leaves (*Anethum graveolens*) were ground and fed to the dairy animals. To treat tail rot in animals, *arandi* oil (*Ricinus communis*) is applied to the affected tail. The tail was also dipped in hot *maand* (rice starch). To treat constipation, *ajwain* (*Trachyspermum ammi*) was boiled, and paste was made after mixing with common salt and was fed to animals. To treat the fungal infection (dermatomycosis), *kapur* (camphor) and coconut oil were mixed and applied to the affected part. In the case of repeat breeding, chhuhara (*Phoenix dactylifera*) was fed to induce heat in animals. Similarly, *achheni* weed (*Acorus calamus*) was also fed after grinding. Methi leaves (*Trigonella foenum-graecum*) were ground and applied to the animals' body for ectoparasite. In case of loss of appetite, dulpha leaves (*Leucas indica*), turmeric, and lemon leaves (*Citrus limon*) were ground, mixed with common salt, and fed to the animals. If urination was difficult, *jalkumbhi* (*Pistia stratioles*) was ground and fed to the animals and also applied on the navel of animals. Along with it, *bhatpurain* leaves (*Centella asiatica*) were crushed and fed to the animals. In a festival called *Govardhan*, a juice named *Pakheb*, extracted from a mixture of *bakain* (*Melia azedarach*), turmeric, *hafus*, and common salt was fed to the animals to provide strength and immunity for a longer period.

CONCLUSION

In India, there are rich traditions of animal husbandry that are used to treat animals. Although these customs are upheld from one generation to the next, the amount of ITK knowledge is rapidly diminishing due to the tendency towards modernization. The ITK that is currently available is based on experiments done by their predecessors that were successful in rural areas where there are no veterinary facilities for emergency situations. The ITKs can be adapted to local conditions and are socially acceptable because they have been tried and true with farmers. There is no risk of adverse reactions, withdrawal symptoms, or the presence of unwanted residues in the products made from livestock. The present study has documented 20 ITK practices on dairy management among the dairy farmers of North Bihar. Further, 27 more ITKs were also identified from the feedback of the farmers. The abundance of indigenous knowledge systems (ITKs) in the studied area demonstrates the depth of the locals' long-standing knowledge. The study also reveals that scientists have diverse levels of perception about various ITK practices. The respondents also had wide variation in utilisation pattern of ITK. All interested parties should actively participate in developing plans for the documentation and preservation of this priceless

Table 3. Other ITKs collected from the feedback of dairy farmers in the study area

Purpose	ITK used
For treating endo-parasites in calves and adult	Feeding of *bhainth* weed (*Clerodendrum viscosum*) after grinding it
For treating endo-parasites in calves and adult	Feeding of bamboo leaves
Treating the injured part of the animal's body	Crushed leaves of marigold plant (*Tagetes erecta*) were applied
Treatment for bloating	Feeding ajwain (*Trachyspermum ammiwas*) after grinding and mixing with common salt
To enhance milk production	Jaggery (gud), masoor daal (*Lens culinaris*), mangrail (*Nigella sativa*), ajwain (*Trachyspermum ammi*), and sua leaves (*Anethum graveolens*) were ground and fed
To treat the tick infestation	Onion (*Allium cepa*) was fed to the animals
To treat tail rot in animals	*Arandi* oil (*Ricinus communis*) is applied to the affected tail
To treat tail rot in animals	The tail was dipped in hot *maand* (rice starch)
To treat constipation	*ajwain* (*Trachyspermum ammi*) was boiled, and paste was made after mixing with common salt and was fed to animals
To treat the cold and cough	Mustard oil was mixed with ground *kali mirch* (*Piper nigrum*) and fed to the animals
To treat the fungal infection (dermatomycosis),	*Kapur* (camphor) and coconut oil were mixed and applied to the affected part.
To induce heat, in case of repeat breeding	Chhuhara (*Phoenix dactylifera*) was fed
To treat the blister on the tongue	Ghee made from sheep's milk was applied to the affected part of the tongue
To treat the ectoparasite infestation	Paan leaves (*Piper betel*) was rubbed on the animal's body
To treat the ectoparasite infestation	Methi leaves (*Trigonella foenum-graecum*) were ground and applied to the animals' body
Difficult urination	*Jalkumbhi* (*Pistia stratioles*) was ground and fed to the animals and also applied on the navel of animals
Difficult urination	*Bhatpurain* leaves (*Centella asiatica*) were crushed and fed to the animals
Retained water bag after parturition	Half a kilogram of paddy was fed to the animals
To provide strength and immunity	A juice named *Pakheb*, extracted from a mixture of *bakain* (*Melia azedarach*), turmeric, hafus, and common salt was fed to the animals
Eye infection	The water from Indian hukkah was sprinkled into the eyes of the animals
The wound on the body part	Ashes from the burned bhojpatra (*Betula utilis*) was mixed with kapur (camphor), mustard oil, and applied to the affected part
Damaged teats of animals due to calf feeding	Ground turmeric (*Curcuma longa*) mixed with mustard oil was applied to the affected teats
For foot and mouth disease	*Aak* leaves (*Calotropis gigantea*) were heated and rubbed on the affected parts of the animal's body
For foot and mouth disease	Animals were bathed in lukewarm water
Treatment for mastitis	Baking Soda (*Sodium Bicarbonate*) was applied to the udder of animals
Treatment for mastitis	Roasted lemon was fed to the animals
For mastitis	Pores of the teats were opened with bamboo/coconut straw

knowledge. Promoting these well-established ITKs through extension efforts or awareness initiatives can assist other farmers in reaping their benefits. Distribution of traditional knowledge among livestock farmers after it has been verified can help cut costs and provide quick relief for many animal ailments. For agricultural scientists interested in studying indigenous technologies used to improve animals and livestock, the documented ITKs would be a ready source of information.

CONFLICT OF INTEREST:

The authors have no conflicts of interest.

REFERENCES

Acharya, E., and Pokhrel, B. (2006). Ethno-medicinal plants used by Bantar of Bhaudaha, Morang, Nepal. *Our Nature*, **4**(1) : 96-103.

Amitendu, D.; Arya, H.P.S.; Tudu, B. and Goswami, A. (2004). Indigenous technical knowledge in animal husbandry. *Livestock Res. for Rural Dev.*, **16**(8).

Anand, A.; Mazhar, S.H.; Sahoo, S.; Mohanty, S. and Dash, S.S. (2023). Study on utilization pattern of indigenous technical knowledge (ITK) among farm families in Patna district of Bihar. *Biolo. Forum – An Intl J.*, **15**(1): 248-251.

Bhuyan, M. (2016). Perceived effectiveness of indigenous technical knowledge in dairying. *J. Ext.Edu.*, **28**(3): 5703-5708

Borthakur, A. and Singh, P. (2012). Indigenous technical knowledge (ITK) and their role in sustainable grassroots innovations: An illustration in Indian context. In Proceedings of International Conference on Innovation and Research in Technology for Sustainable Development (ICIRT 2012) (Vol. 38).

Das, P., Yadav, M.P., Das, S. K., Arya, H.P.S., Ratan, R.P.S., Mishra, A. and Rani Geetha, M. (2002). Indigenous technical knowledge-based technologies and their potentialities in organic animal husbandry. Key node address during National Workshop on Organic Animal Husbandry Standards, 26-27 Nov, IVRI, Izatnagar.

Farrington, J., and Martin, A. (1987). Farmer participation in agricultural research: a review of concepts and practices. Agricultural Administration (Research and Extension) Network Discussion Paper No.19. Overseas Development Institute, London.

Goswami, B., and Gangopadhyay, P. K. (2017). Controlling fish diseases through the use of ITK by the fish farmers of West Bengal, India. *Indian Res. J. Ext. Edu.,* **17**(2) : 29-32.

Karthickeyan, S.M.K., and Gajendran, K. (2004). Indigenous technical know-how in the healthcare of domestic animals, *Indian J Tradi. Knowledge*, **4** (4): 462-463.

Kumar, A., and Singh, B.B. (2011). Indigenous livestock practices of tribal farmers. *Indian Res. J. Ext. Edu.,* 11(1): 113-116.

Meena, B.S.; Singh, A.K.; Chauhan, J., and Sankhala, G. (2009). Farmers' knowledge on feeding practices of dairy animals in Jhansi District. *Indian Res. J. Ext. Edu.,* **9**(1) : 28-31.

Mukherjee, M.K. (2021). Perceived effectiveness of indigenous technical knowledge (ITK) in animal husbandry, prevalent among tharu tribes of Bihar. M.VSc. thesis (unpublished), Bihar Veterinary College, Patna, India.

Niwas, R.; Singh, D.; Yadav, S.M. and Balai, L.P. (2013). Traditional wisdom for diseases treatment in animal husbandry. *Popular Kheti*, 1(2): 30-38

Patel, S.J.; Patel, A.S.; Patel, J.H.; Patel, N R., and Parmar, V. N. (2016). Indigenous technical knowledge regarding animal husbandry practices. *Adva. in Life Sci.*, **5**(5): 1610-1617.

Ponnusamy, K.; Gupta, J., and Nagarajan, R. (2009). Indigenous technical knowledge (ITK) in dairy enterprise in coastal Tamil Nadu. *Indian J. Tradi. Knowledge*, **8**(2): 206-211.

Ponnusamy, K.; Kale, R.B.; Ravi, K.N.; Devi, M.C., and Sharma, P. (2017). Cross-regional analysis on usage of indigenous technical knowledge in dairy farming. *Indian J. Animal Res.*, **51**(3) : 549-556.

Rai, C.; Singh, K.; Lal, S.; Arti, and Azad, A. (2019). Adoption and perceived effectiveness of indigenous technical knowledge among tribal farmers for bovine management: An exploratory study. *Intl.J. Livestock Res.*, **9**(2) : 243-253

Rangnekar, D.V. (1998). Random thoughts on ethno veterinary practices and their validation in relation to livestock development in India, ICAR short course entitled "Techniques for scientific validation and Evaluation of Ethno veterinary practices" pp. 24-27

Sabarathnam V.E. (2002). Rapid, relaxed and participatory rural appraisal (Participatory Learning and Action) for research and extension in agriculture (for crops and livestock)

Saurav, S.K.; Chakravarty, R.; Chandran, V.; CO, Sruthi.; Mishra, S., and Pandey. S. (2023). A comprehensive study on the socio-economic profile of dairy farmers of northern Bihar. *Pharma Innov.,* **12**(2): 3582-3586

Sindhu, N., and Malik, J.S. (2020). Perceived effectiveness of indigenous technical knowledge (ITK) in modern agriculture in Haryana state. *Indian J. Ext. Edu.*, **56**(2): 61-55

Singh, R.P. and Tiwari, A. (2004). Wood and stone houses: An ITK to disaster management. *Indian Res. J. Ext. Edu.,* **4**(3) : 10-13

Singh, S. and Swami, S. (2021). Effectiveness of ITKs for sustainable production of horticultural crops in North Lakhimpur districts of Assam. *Indian Res. J. Ext. Edu.,* **21**(1): 99-102

Singh, S.K., and Chauhan, Jitendra (2016). Perceived effectiveness of ITK among livestock owners.*Indian Res. J. Ext. Edu.,* 10(1) : 12-15.

Singh, S.K.; Chauhan, Jitendra, and Singh, M.S.R. (2016). Awareness and adoption of indigenous therapies for various animal husbandry ailments in Chambal region of Agra district. *Indian Res. J. Ext. Edu.,* **12**(1): 122-127.

Swapna, T.R., and Ahamed, P. (2005). Rationality assessment of indigenous technical knowledge in banana. *Indian Res. J. Ext. Edu.,***5** (2&3) : 88-89

Talukdar, R.K.; Barman, S., and Hussain, A. (2012). Documentation and perceived rationale of indigenous technical knowledge (ITK) utilized in Boro rice cultivation by farmers of Kamrup district of Assam. *J. Acad. Indus. Res,* **1**(7), 412-418.

Tiwari, L., and Pande, P.C. (2004). Traditional veterinary practices in south-eastern part of Chamoli district, Uttaranchal. *Indian J. Tradi. Knowledge*, **3**(4): 397-406

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