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Scientific rationality, perceived effectiveness and adoption of traditional knowledge practices associated with Sahiwal cattle breed of Rajasthan

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ABSTRACT

The present study aimed at elucidating indigenous traditional knowledge practices associated with Sahiwal cattle which are considered to be the best indigenous milch cattle breed of India. Accordingly, the present study was carried out in Sri-Ganganagar district of Rajasthan where, Sahiwal cattle's population is highest. A total of 96 indigenous practices were documented through primary data collection and these practices were assessed by thirty subject matter experts for its scientific rationality and found that only 38 indigenous practices were scientifically rational which could be further assessed, documented and propagated for the benefit of farming community. Of the total 38 validated practices, nine were related to breeding and reproduction management practices, three on increasing milk production and twenty six practices were related to health care management of Sahiwal cattle. The perceived effectiveness and adoption rate analysis of these valid 38 ITKs indicated that, nine practices were rational and highly effective (mean score value >2.5) with more than 50% of adoption rate among the respondents, twenty were rational and effective (mean score value 2 to 2.5) and nine practices were found as rational and less effective (mean score value <2) with the adoption rate of 27% and 13% respectively.

Key words: Indigenous, Traditional knowledge, Perceived effectiveness, Rajasthan, Scientific rationality, Sahiwal

Our country is well known for very rich heritage of traditional wisdom that was inherited through generations and it is an integral part of our local community. This traditional knowledge practices finds greater applicability in management of dairy animals in general and treating of various cattle diseases in particular. The traditional health care practices and ethno-veterinary medicine provides low cost alternatives in situation where western type veterinary drugs and services are either not available or too expensive to be afforded by the farmers. Further, many of these traditional practices were evolved over a period of time and adopted by our farmers as it is more specific to their context, cost them less and it is locally available. ITKs have been percolating from one generation to another by oral transmission and considered to be the holistic approach for livestock management methodologies adopted by non-literate cultures (Devaki and Mathialagan 2015). Traditionally farmers prefer to more than one measure which follow more than one measure, i.e. adoption of traditional practices alone and/or traditional practices with allopathic medicines (Bodapti and Chander 2013). These traditional practices are more relevant and responsive to indigenous or native breeds of cattle than the exotic breeds. Thus, it has become imperative to collect and validate these indigenous practices with special emphasis on assessing its field level applicability in management of indigenous cattle breeds. In this context, the present study was carried out to document and validate Indigenous Technical Knowledge (ITK) practices known and adopted by the farmers in their indigenous breed cattle farming.

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MATERIALS AND METHODS

The present study was conducted in Sri-Ganganagar district of Rajasthan where highest number of Sahiwal cattle is present. From the selected district two blocks, viz. Suratgarh, Gharshana were selected randomly and a total of sixty Sahiwal cattle rearers were contacted for the present study. Rationality scale was used to judge the rationality of the indigenous practices. The rationality of indigenous technologies was assessed by using the scoring procedure adopted by Venkatesan and Sundaramari (2014). The Perceived Effectiveness Index (PEI) methodology (developed by Sundaramari 2014) was used for measuring the PEI of ITKs. To ascertain the extent of adoption of indigenous technical knowledge practices among the non

sample-respondents in the study area, it was measured in two point continuum whether they had adopted the ITK in question in the past. The scores awarded by all respondents for a particular ITK were summed up to work out adoption index of a particular ITK practice.

RESULTS AND DISCUSSION

Status of ITK practices in the study area: The present study has documented 96 indigenous practices pertaining to Sahiwal cattle management; however, only 38 practices were rational and were considered as valid ITKs. Among the 38 ITK practices related to Sahiwal cattle management practices, nine ITK practices were rational (>2.5) and highly effective (>2.5), twenty were rational (>2.5) and effective (2 to 2.5) and nine practices were rational (>2.5) and less effective (<2). The study highlights that most of the documented valid ITKs belonged to three major areas of cattle management practices, viz. 68.42% of the practices belonged to health care management followed by breeding and reproduction (23.64%) and to increases milk production (7.8%) of indigenous cattle.

Medicinal plants play an important role in practicing indigenous technical knowledge especially ITKs related to animal health care and management practices. Most of the ITKs related to health care practices are directly or indirectly depend upon the availability and accessibility to medicinal plants or its parts in their locality. In total documented indigenous practices, there were about 20 medicinal plants comprised of 19 genera and 18 species which includes all types of plants like shrubs, herbs, trees and climbers which were frequently used in different ITKs management practices by the respondents and local healers. Out of 20 medicinal plants that were used in valid ITK practices, 40% of the total medicinal plants were herbs in type, followed by 30% shrubs, 20% trees and 10% climbers. The plant parts of medicinal plants used by the respondents to treat various ailments in Sahiwal cattle mainly comprised seeds, fruits and leaves. The most frequently utilized medicinal plant parts in the study area comprised seeds (30%) followed by fruits (25%), leaves (20%), rhizome (15%) roots (5%) and latex (5%).

Rational and highly effective ITKs: Among the many documented indigenous practices (Table 1), only those valid ITKs which were 'rational and highly effective' are hereby explained and discussed with its rationality score, perceived effectiveness index, adoption rate and scientific rationale behind its usage. In the case of treatment for repeat breeders, the documented ITK was rated as rational (3.02), perceived as highly effective (2.50) and adopted by 35% of the respondents as Ajwain (*Trachyspermum amini*), Jaggery and Phitkari were easily available in their locality and hence very cost effective measure. Rationally, mustard oil have stimulant, irritant, appetizer, cordial diaphoretic and tonic substances and Phitkari act as anti-asthmatic and Ajwain seed increases gastro-intestinal secretion which enhances the efficiency of digestive systems function. Yadav *et al.* (2015) also reported that, mustard oil is very cost effective measure for treating the repeat breeders. The ITKs related to prevention of abortion, the documented ITKs was rated as a rational (2.67), perceived as highly effective (2.51) and adopted by 32% of the respondents. Rationally, turmeric contains curcumin, a substance with powerful anti-inflammatory and antioxidant properties and helpful in treating menstrual related problems and mustard oil is known for its antifungal and antibacterial properties. The documented ITK related to removal of retained placenta was rational (3.52), highly effective (2.55) and adopted by 63.3% of the respondents. The rationale behind its usage was that these ingredients provide warmth and strength to animal body and it helps to expel out the retained placenta within 1–2 h. These results were in agreement with the findings of Yadav *et al.* (2015). Nivas *et al.* (2013) also found that ITK practices as very useful in removal of retained placenta. Related to problem of indigestion, the ITK practiced by the respondents was rated as a rational (3.03), perceived as highly effective (2.62) and adopted by only 13.3% of the respondents due to seasonal availability of Tumba plant (*Citrullus colooynthsis*) and time consuming preparation process. Rationally, Tumba fruit have analgesic, anti-bacterial, anti-inflammatory and anti-diabetic properties. Kumar and Singh (2011) also reported that ITK practice of feeding turmeric and Hing was useful for indigestion. For treating dysentery, the documented ITK was rated as rational (2.67), highly effective (2.61) and adopted by 57% of the respondents due to its effectiveness, easy availability, low cost and ease in administration. Rationally, tea acts as anti-oxidant, anti-inflammation and useful in immune system related diseases. Patel *et al*. (2016) also found that ITK practice of drenching of Palas tree (*Butea monosperma*) bark boiled with water is very effective in controlling dysentery in dairy cattle. Related to treatment of respiratory diseases, the ITK was rated as rational (3.41), highly effective (2.52) and adopted by 38% of the respondents. It was perceived as highly effective as Jaggery, Ginger (*Zingiber officinale*), Ajwain (*Trachyspermum amini*) and Fennel seeds (Sunf) (*Foneniculum vulgare*) are easily available in the study area, further it is cost effective and easy to prepare. Rationally, ginger is known for anti-inflammatory, anti-viral and Ajwain is known for anti-bacterial, gastro-intestinal secretions and prevent from stomach disorder and fennel is known for carminative property. The findings of the study were in agreement with Pandy *et al.* (2007) and Sharma *et al.* (2012). In the case of burn, the documented ITKs was rated as rational (3.13), highly effective (2.64) and adopted by 70% of the respondents. The neem leaves are readily and freely available and easy in administration. Rationally, neem plant is anthelminthic, anti-viral, anti-septic, fly repellent and boiled mustard oil has anti-microbial, anti-fungal and anti-bacterial properties. This was in accordance with the findings of Yadav *et al.* (2015). For treatment of heat stroke, the ITK was rated as rational (2.65), highly effective (2.56) and adopted by 57% of the respondents. Rationally, Gond Katira (*Tragacanth gum*) is adaptogen and protects body

Table 1. ITKs specific to Sahiwal indigenous cattle breed

Indigenous Technical Knowledge (ITK) Practices		Rational	MPEI	Adoption %	Remark
Breeding and Reproduction					
To induce heat in cattle					
ITK-1	Jaggery 500 g fed to cattle regularly for 10 days.	3.5	2.10	32	R+E
ITK-2	Jaiphal (*Myristica fragrans*) fruits (2–4 numbers) are fed to cattle along with chapatti regularly for one week	2.4	2.00	25	R+E
Treatment for repeat breeder					
ITK-3	Ajwain seed (*Trachyspermum amini*) 200 g, 200 g Phitkari and 200 g Jaggery mixed and fed to cattle along with concentrate regularly for 12 days.	3.02	2.50	35	R+HE
ITK-4	Ghee 250 g, Sugar 250 g and 250 g of Ber (*Ziziphus mauritiana*) root cortex mixed and boiled in water and cooled extract is given to cattle along with concentrate feed regularly for 4 days.	3.01	02.0	43.3	R+E
ITK-5	One kg of Multani sand (*Fullers earth*) mixed with 2.5 litres of water and kept for 2 days and given to cattle along with concentrate feed regularly for 2 days.	2.53	2.15	6.6	R+E
Treatment for prevention of abortion					
ITK-6	Mustard oil (*Brassica nigra*) 250 ml mixed with 50 g turmeric along with concentrate feed and given to cattle immediately after mating and continued for 3 months.	2.67	2.51	13.3	R+HE
For removal of retained placenta					
ITK-7	Jaggery 250 g and 250 g Ajwain seed (*Trachyspermum amini*) boiled in 2 litres of water and after cooling extract is drenched to cattle.	3.52	2.55	63.3	R+HE
ITK-8	Big Eliachi fruit (*Amomum subulatum*) 100 g and 100 g Ajwain seed (*Trachyspermum amini*) grounded and mixed with 150 g of jaggery and fed to cattle.	3.41	1.98	6.6	R+LE
ITK-9	Jaggery 500 g boiled in 2 litres of water and mixed with 2 kg of mustard oil (*Brassica nigra*) cake fed to cattle.	3.00	1.86	36.1	R+LE
To increase milk production					
ITK-10	Jaggery 1 kg fed to cattle regularly for 15 days either alone or with concentrate feed.	3.36	2.1	15.1	R+E
ITK-11	Powdered Saunf seed (*Foneniculum vulgare*) of 150 g fed to cattle regularly along with concentrate immediately after calving and continued for 3 months.	3.21	82.0	3.3	R+E
ITK-12	One kg sugar and 100 g citric acid crystals drenched to cattle regularly for one week before one month of calving.	2.93	52.00	10	R+E
Health care of cattle					
Treatment for indigestion					
ITK-13	Tumba fruit 100 g (*Citrullus colooynthsis*), 50 g of black salt and 100 g Ajwain seed (*Trachyspermum amini*) powdered and drenched to cattle along with water.	3.03	2.62	13.3	R+HE
ITK-14	Old home made pickle 150 g and 100 g Tumba (*Citrullus colooynthsis*) fruit mixed and grounded well and drenched to cattle with water.	2.86	2.17	30.5	R+E
Treatment for diarrhoea					
ITK-15	Powder of Taramira seed (*Eruca sativa*) mixed with 250 g of jaggery and fed to cattle along with concentrate feed.	3.31	2.01	53.3	R+E
To overcome constipation					
ITK-16	Extract of Tumba plant root (*Citrullus colooynthsis*) 100 g mixed with 1 litre of water and drenched to cattle.	3.26	2.30	36.6	R+E
Treatment for dysentery					
ITK-17	Tea leaves (*Camelia sinensis*) 150 g boiled in one litre water and extract drenched to cattle.	2.67	2.61	57.1	R+HE
Bloat					
ITK-18	Mustard oil (*Brassica nigra*) 250 ml, 50 ml of kerosene oil and 500 ml of milk mixed together and drenched to cattle.	3.21	2.5	40	R+HE
ITK-19	Citric acid crystals 50 g mixed with water and orally given to cattle.	2.58	2	14.1	R+E

ITK-20	Hing powder (*Ferula assafoetida*) 100 g mixed with water and drenched to cattle.	3.53	2.01	11	R+E
ITK-21	Turmeric (*Curcuma longa*) 50 g and 500 g of mustard oil (*Brassica nigra*) mixed and drenched to cattle.	3.07	1.82	37	R+LE
Treatment for stomach pain					
ITK-22	100 g black salt, 150 g Amla fruit (*Emblica officinalis*), 150 g Hard (*Terminalia chebula*) and 50 g Hing resin (*Ferula assafoetida*) powdered and along with water drenched to cattle.	3.08	2.00	33.3	R+E
ITK-23	Turmeric (*Curcuma longa*) 50 g and 250 ml of mustard oil (*Brassica nigra*) mixed and drenched to cattle.	2.71	1.70	7.4	R+LE
To control ecto-parasites and endo-parasites					
ITK-24	Tobacco leaf (*Nicotiana tabucum*) and Rai seed/white mustard (*Brassica alba*) mixed and applied on externally on the cattle body.	3.12	1.93	3.3	R+LE
Treatment for wound					
ITK-25	Mixture of turmeric (*Curcuma longa*) and mustard oil (*Brassica nigra*) boiled and applied on outside wound.	2.57	2.03	63.3	R+E
Respiratory disease					
ITK-26	Jaggery 150 g, 100 g of dry Ginger rhizome (*Zingiber officinale*), 100 g of Ajwain seed (*Trachyspermum amini*) and 50 g of Saunf seed (*Foneniculum vulgare*) mixed and boiled in 1 litre of cattle milk and drenched to cattle.	3.41	2.52	38.1	R+HE
ITK-27	Jaggery 150 g and 250 g Ajwain (*Trachyspermum amini*) mixed and boiled in water and drenched to cattle.	2.93	2.21	76.6	R+E
ITK-28	Saunf seed (*Foneniculum vulgare*) 100 g, 100 g of Ajwain seed (*Trachyspermum amini*), 150 g of big Elachi fruit (*Amomum subulatum*) and 1 kg jaggery mix are boiled in water and cooled extract drenched to cattle.	2.91	2.16	3.31	R+E
Treatment for mastitis					
ITK-29	Mustard oil (*Brassica nigra*) 500 ml mixed with 3 litres water drenched to cattle.	2.72	2.06	16.6	R+E
ITK-30	Citric acid 100 g mixed with sugar and given to cattle regularly for one week.	2.84	2.01	23.3	R+E
Treatment for poisoning					
ITK-31	One litre of ghee orally given to cattle in case of poisoning or snake bite.	2.52	1.89	11.1	R+LE
Treatment for burn					
ITK-32	Neem leaves (*Azardirachta indica*) boiled in mustard oil (*Brassica nigra*) and applied on burns.	3.13	2.64	70	R+HE
Treatment for urogenital tract problem					
ITK-33	Barley (*Hordeum vulgare*) soaked in water for overnight and the extract is given to cattle in the next day.	3.02	2.02	63.6	R+E
ITK-34	Cold lassi with salt given to cattle regularly for one week.	2.64	1.99	26.6	R+LE
Eye infection					
ITK-35	5–6 drops of boric acid eyewash diluted solution (0.1%) applied into eye for watery eyes.	3.62	2.49	6.61	R+E
To overcome heat stroke					
ITK-36	Gond katira (*Astragalus gumnifer*) in powder form of 150 g mixed with water and kept it overnight and next day morning given to cattle along with curd or water.	3.41	2.52	38.1	R+HE
ITK-37	Mehndi leaves (*Lawsonia alba*) 100 g mixed with concentrate and fed to cattle regularly for 10 days.	2.93	2.21	76.6	R+E
ITK-38	Two kg of mustard oil (*Brassica nigra*) cake soaked with water and fed to cattle regularly for one month.	2.91	2.16	3.31	R+E

*R, Rational; HE, Highly effective; E, Effective; LE, Less effective

from stress (heat stroke).

The present study indicates that many of the ITK practices are much effective in treating the dairy animals for different ailments. Further, majority of the farmers were adopting ITK practices irrespective of livestock species they reared; however, the quantity of the same varied due to many factors important among them was the level of knowledge they possessed and expertise they gained over period of time in practicing ITK practices in dairy animal management. Hence, there is an urgent need of a comprehensive analysis and more stringent scientific validation of these ITK practices and popularise them amongst the farmers for its wider adoption. The revitalization of these indigenous systems can provide self-reliance in primary health care and can even contribute to the frontiers areas of modern veterinary medicine. A scientific blend of both traditional wisdom with modern remedies practiced by the researchers, extensionists, local healers, farmers and the government and non-government organization would lead to conservation of our rich wisdom for our future generations.

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