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ETHNO-VETERINARY TREATMENT OF BUFFALO IN ARID REGION OF RAJASTHAN, INDIA

Aishwarya Dudi* and M.L. Meena

ABSTRACT

Traditional animal healthcare practices, also called ethnoveterinary medicine, provide low cost alternatives in situation where western type drugs and veterinary services are not available or are too expensive. These practices were developed and practiced through trial and error methods and deliberate experimentation and is therefore, less documented and not uni+versally recognized and for these reasons, it has no place in mainstream veterinary medicine. The majority raise buffalo or buffaloes. The present study was carried out in the purposively selected arid region of Rajasthan. A multistage stratified random sampling design was used to select the districts, blocks, villages and sample households. A sample of 240 households was selected for the present study. Data were collected personally through a well structured and pre-tested interview schedule. Keeping these facts in view, the present study was conducted with the specific objectives to document the consultation and vaccination pattern followed by the buffalo farmers of the region for the treatment of their sick animals as well as their isolation. It was found that majority of the households (66.25%) were initially providing self medication using traditional practices and in cases of severity of disease/ailment, village quack was consulted. Vaccination of buffalo was followed in only 48.75% of the selected households. In addition, only 36 households (31.25%) the sick animals were isolated from the herd. A variety of traditional practices were observed being followed for treatment of various ailments and diseases of the buffalo with the use of locally available material, herbs, etc.

Keywords: buffaloes, *Bubalua bubalis*, ethno-veterinary practices, Raika, arid region, traditional and household

INTRODUCTION

The *Rebari/Raika* are the most numerous pastoral group in western India which live in Rajasthan and Gujarat, with some fraction living in Punjab, Haryana, and Madhya Pradesh and in other states. The term *Raika* is applied exclusively to the *Rebari* of the Marwar area of Rajasthan which denotes camel breeder with it. Sources from the colonial period describe the *Maru Raika* as camel breeders and the *Godwar Raika* as buffalo raisers, but this does not apply any longer, since both groups herd buffalo as well as cow (Kohler, 1997). The *Raika* have retained their reputation

Indian Council of Agricultural Research, Central Arid Zone Research Institute, Krishi Vigyan Kendra, Pali-Marwar, Rajasthan, India, *E-mail: aishwaryadudi@rediffmail.com

as "camel people" until today, but only a minority now engages in camel breeding. The majority raise buffalo or buffaloes. Nomadic pastoralism is critically important to the economy of Rajasthan. Aridity and poor soils, especially in the western districts, make it well-suited to a combination of agriculture and livestock rearing (IIRR, 1994). Here *Raika* agro-pastoralists combine buffalo husbandry with crop production for part of the year. The large number of animals in Marwar area of Rajasthan cannot be supported by existing fodder resources. Therefore a significant number of animals migrate annually in search for grazing grounds. It is interesting to see that the *Raikas* have build up a large network of traditional healers (*bhopa, ghuni and daam*) and make use of a large variety of indigenous plants, minerals and animal products to cure their buffalo especially under local circumstances (Maithias, 1996; Catley, 1999). Therefore the present study was undertaken to estimate the extent of traditional healthcare system with buffalo husbandry in *Raikas* which is also referred to as ethnobotany / ethno-pharmacology.

Marwar region of Rajasthan comprises of four districts *viz*., Jodhpur, Jalore, Pali and Barmer state of Rajasthan. This region is located between 24.45 to 26.75 degree N latitude and 72.48 to 74.20 degree E longitude at an altitude ranging between 212 m to about 220 m above mean sea level with a total geographical area of 51,387 square kilometers (DOA, 2014). Livestock rearing forms an important occupation in rural areas of this region. The contribution of livestock sector is as high as 60 to 65% of the total income from agriculture in the region (Singh, 2014). Buffalo farming is an important component of livestock rearing system in the region. Besides providing benefits of nutrition, additional income and employment to the rural households, the importance of this enterprise is highlighted in light of the direct bearing it has on the agriculture of the region. This enterprise provides farm families the farmyard manure for maintaining the fertility of the saline and salt affected soil and draught power for performing the farming operations in the rainfed condition and important by it provides insurance against frequent crop failures in the region. The buffalo farming though holds immense importance in regional rural economy; it is still a household enterprise. The size of the buffalo herd maintained in the region is small varying from 25-50 animal heads including the young one also (Sah, 1999). The relatively difficult terrain and poor accessibility to the remote villages have led to a lesser influence of scientific buffalo farming technologies in the region. In areas where these technologies find accessibility, small herd owners operating in difficult biophysical conditions usually prefer cheaper veterinary aid in order to keep the buffalo farming enterprise cost effective.

The modern veterinary options are in most cases are cost intensive as well as several issues as that of accessibility, availability, regularity, etc. are involved. The Government veterinary aid available in the region is too meager to support all the buffalo keepers. This all have ultimately lead to development of an alternative knowledge base among the buffalo owners of the region for the treatment of their buffalo which is commonly called as indigenous or traditional knowledge. These traditional methods of treatment besides being cheaper, accessible and prepared from locally available material, are also better adapted to the local conditions. The very fact that traditional methods or knowledge base has its base in the years of experimentations by the local people in their own conditions on sustained basis makes them worth the attention of the research system by means of

documenting and validating them. Keeping these facts in view, the present study was conducted with the following specific objectives:

1. To document the consultation and vaccination pattern followed by the buffalo farmers of the region for the treatment of their sick animals as well as their isolation.

2. To document the traditional methods of treatment followed for the various ailment/diseases of buffalo.

MATERIALS AND METHODS

Marwar region of Rajasthan comprises of four districts *viz.,* Jodhpur, Jalore, Pali and Barmer state of Rajasthan. This region is located between 24.45 to 26.75 degree N latitude and 72.48 to 74.20 degree E longitude at an altitude ranging between 212 m to about 220 m above mean sea level with a total geographical area of 51,387 square kilometers (DOA, 2014). The present study was carried out in the purposively selected arid region of Rajasthan. A multistage stratified random sampling design was used to select the districts, blocks, villages and sample households. On the basis of composite index of agricultural development calculated by Narain *et al.* (1995), then 2 districts of the region were classified into two strata-one of the developed district and second of poorly developed district. From each stratum, one district was selected randomly. Thus, the district Jodhpur represented developed and district Pali poorly developed district of the study area. Further, for the next two stages of sampling, i.e., blocks and villages, two strata on the basis of distance from the respective headquarters were formed and random selection of 4 blocks and 8 villages was done. From each of the selected 8 villages, 30 households representing the small (1 to 5 buffaloes), medium (6 to 10 buffaloes) and large (above 10 buffaloes) herd size categories were selected randomly and probability proportionate to the size. Thus, samples of 240 households were selected for the present study (Meena, 2005). The data were collected personally through a well structured and pre tested interviewed schedule. This was also supported by the informal discussion with farmers as well as the guided field walk with them. The data thus collected were compiled, tabulated and subjected to the appropriate statistical tools to draw meaningful conclusions. It was computed by multiplying total score of the respondents by 100 and divided by the maximum obtainable score under each practice.

$$\text{Mean Percent Score} = \frac{\text{Total score obtainted}}{\text{Maximaum obtainable score}} \times 100$$

RESULTS AND DISCUSSION

Background information of the respondents

The data presented in results that 85.7% respondents had farming as their main occupation while, only one buffalo keepers 0.8% opted for caste occupation as his main occupation. There were 10.4% respondents who were practicing business as a main occupation and agriculture as subsidiary while, only 3.5% buffalo owners had service either government or private as main occupation. The present study was not formulated with any of the specific objectives for studying the background information of the respondents. The data presented in Table 1 revealed that out of a total of 240 respondents 51.5% were in the middle age groups of 26 to 45 years. The respondents above 45 and below 26 years of age constituted 38.89% and 09.6% respectively. On the basis of size of land

holding, the respondents were grouped into three categories i.e. small, medium and large. Results shows that majority 57.8% of buffalo owners had big land holding i.e. more than 2 hectare, out of which large buffalo owners population was the high comprising 53.3%. There were only 36.7% and 09.2% of buffalo keepers who possessed medium (1 to 2 hectare) and small (less than 1 hectare) land holdings respectively. it is evident from the contents in results nearly half (47.9%) of the total buffalo keepers were from high income group, 40% respondents were from medium income group (Rs 1001 to 5000 per month), whereas only 4.5% and 8.6% of respondents belonged to low (<1000 per month) and very high (> 10000) income groups, respectively.

An in-depth understanding of existing buffalo farming practices would help not only in getting a comprehensive account of the level of development of livestock in the locale, but also in planning and taking up any research or development activity. An attempt, therefore, was made, to study the traditional practices of treatment followed for buffalo farming being followed in the study area. In addition, the consultation pattern adapted for treatment of sick animals, their isolation and vaccination pattern was studied. The results are discussed under the following subheads:

Consultation pattern for sick animals

The data presented in Table 1 clearly indicated that majority of the households (66.25%) were initially providing self medication using traditional practices and in cases of severity of disease/ailment, village quack was consulted. While 11.25% of the household resorted to self medication only and depended on village quack. However, in 09.17% of the households village

Table 1. Frequency distribution of the selected households on basis of existing methods of treatment of buffalo.

S. No.	Particulars	Frequency and percentage distribution		Pooled (N=240)
		Jodhpur (N=120)	Pali (N=120)	
I	**Consultation pattern for sick animals**			
1	Veterinarian	7 (05.83)	2 (01.67)	9 (03.75)
2	Livestock extension officer (LEO)	13 (10.13)	7 (05.83)	20 (8.33)
3	Village quack	15 (12.50)	7 (05.83)	22 (09.17)
4	Self medication	11 (09.17)	16 (13.33)	27 (11.25)
5	Self medication followed by village quick	85 (70.83)	74 (61.67)	159 (66.25)
6	Village quick followed by LEO/Veterinarian	09 (07.50)	12 (10.00)	21 (08.75)
II	**Vaccination of buffalo**			
1	Yes	83 (69.17)	34 (28.33)	117 (48.75)
2	No	41 (34.17)	90 (75.00)	131 (54.58)
III	**Isolation of sick animals**			
1	Yes	49 (40.83)	26 (21.67)	75 (31.25)
2	No	73 (60.83)	98 (81.17)	171 (71.25)

quack was initially consulted, and when the cases were beyond their comprehension, LEO/ veterinarians were consulted. Veterinary staffs including veterinarians and livestock extension officers (LEO) were reported consulted by 08.33% of the selected households only.

Vaccination of buffalo

Vaccination of buffalo was followed in only 48.75% of the selected households. Further, a considerable difference could also be observed between the number of households following vaccination of buffalo in district 1 (83) and district 2 (34). Findings lead to infer that as high as about 75% of the households in district 2 did not vaccinate their animals (Table 1).

Isolation of sick animals

It is evident from the same table that out of the 240 selected households, in only 75 (31.25%) cases the sick animals were isolated from the herd. The number of households following isolation of sick animals was higher in district 1 (49) as compared to that in district 2 (26). The present findings are in line with those of Pandey (1996); Mohanty (1999). The above results clearly indicated lack of awareness among the buffalo farmers and farm women of the region about the importance of isolating the sick animals from the herd to prevent spread of diseases.

Traditional methods of treatment of various buffalo diseases

The appreciation of traditional wisdom of farmers has been operationalised through proper documentation by the researchers and development personnel. Traditional/ indigenous herbs and practices for treating animals are locally available, easily accessible, culturally appropriate and, therefore, readily comprehensible. In the present section an attempt has been to synthesize the documented traditional methods of treatment followed by the selected households in the study locale.

Diarrhoea

A total of nine indigenous methods for treatment of *diarrhoea* in buffalo were documented in the study locale. From the Table 2, it is evident that *arvi* (*Colocasia esculenta*) plant was of great use in treatment of *diarrhoea* of animals in the study area. Paste of its dry leaves, frothed solution of green leaves and stem of this plant were used by 66.25%, 55.83% and 55.42% of the households, respectively. Majority of the households were also reported giving frothed solution of soybean (*Glycine max*.) 55.41% and paste of soaked chickpea (*Cicer arietinum*) 36.67%, respectively. Paste of *latjeera* (*Aleurites moluccuna*) root, ground tuber of *gethi* (*Dioscorea kumaunesis*), mustard oil and paste of dry leaves of *bhang* (*Cannabis sativa*) plant were also used in 31.25%, 37.50%, 33.33% and 26.67% of the selected households, respectively. Use of paste of dry leaves of *bhang*, soaked chickpea, and stem of *arvi* plant, ground *gethi* tuber and mustard oil were observed to be higher in district Jodhpur as compared to another district. While, use of frothed solution of soybean and green leaves of *arvi* (*Clocasia esculenta*) plant, paste of *latjeera (Aleurites moluccuna) root* were higher in district Pali. The indigenous methods of treatment of *diarrhoea* as identified in the study locale were found to be different from those reported by Gupta and Patel (1994); Pandey (1996); Hamed (1998); Mandal (1999); Mohanty (1999).

Bloat (*Affara*)

Affara was one of the most widely prevalent

health disorder reported by the respondents (Table 3). In a large percent of the households, *asofoetida* (*Ferula assafoetida*) and *ajwain* (*Trachyspermum ammi*) (87.92%), *ajwain* and black salt (79.17%), and asofoetida and *ajwain* with jaggery (56.67%), frothed solution of soybean (55.83%) and *Tumba furit* powder *(Citrullus colocynths)* (53.75%) were given to the buffalo suffering from *Affara*. In a considerable percent of households, powder of roasted *chamsur* (*Lepidium latifolium*) (50.00%),

Table 2. Traditional methods of treatments of diarrhea in buffalo by the farmers.

S. No.	Particulars	Frequency and percentage distribution		Pooled (N=240)
		Jodhpur (N=120)	Pali (N=120)	
1	Frothed solution of soybean (Glycine max.)	44 (36.67)	89 (74.17)	133 (55.41)
2	Frothed solution of green leaves of Arvi plant	49 (40.83)	85 (70.83)	134 (55.83)
3	Paste of Latjeera (Aleurites moluccuna) roots	19 (15.83)	56 (46.67)	75 (31.25)
4	Paste of dry leaves of Arvi plant	66 (55.00)	93 (77.5)	159 (66.25)
5	Stem of Arvi plants (Clocasia esculenta)	80 (66.67)	53 (44.17)	133 (55.42)
6	Paste of dry leaves of bhang (Cannbis sativa)	39 (32.50)	25 (20.83)	64 (26.67)
7	Paste of soaked chickpea (Cicer arietinum)	43 (35.83)	45 (37.50)	88 (36.67)
8	Ground Gethi tuber (Dioscorea sativa)	53 (44.17)	37 (30.83)	90 (37.50)
9	Mustard (Brassica compestris) oil	47 (39.17)	33 (27.50)	80 (33.33)

Table 3. Traditional methods of treatments of bloat (*affara*) in buffalo by the farmers.

S. No.	Particulars	Frequency and percentage distribution		Pooled (N=240)
		Jodhpur (N=120)	Pali (N=120)	
1	Ajwain (*Trachyspermum anum*) and block salt	97 (80.83)	93 (77.50)	190 (79.17)
2	Asofoetida (Ferula assafoetida) and ajwain	108 (90.0)	103 (85.83)	221 (87.92)
3	Asofoetida and Ajwain with jaggry	55 (45.83)	81 (67.50)	136 (56.67)
4	*Tumba* fruit powder (*Citrullus colocynths*)	60 (50.00)	69 (57.50)	129 (53.75)
5	Paste of fennel (*Foeniculum vulgare*), Chirayata (Swertia chirata), ginger (*Zingiber officinale)*	43 (35.82)	73 (60.83)	116 (48.33)
6	Powder of roasted Chamsur (*Lepidium latifolium*)	37 (30.83)	83 (69.17)	120 (50.00)
7	Paste of Gurju stem (*Pistacia integerrima*)	25 (20.83)	77 (64.17)	102 (42.50)
8	Sesame cake (*Sesamum indicum*)	56 (46.67)	29 (24.17)	85 (35.42)
9	Frothed solution of soybean	53 (44.17)	81 (67.50)	134 (55.83)
10	Drumstick (*Moringa plerygospermar*) leaves with cow milk	20 (6.67)	50 (41.67)	70 (29.17)

paste of fennel (*Foeniculum vulgare*), *chirayata* (*Swertia chirata*) and ginger (*Zingiber officinale*) (48.33%), paste of *gurju* stem (42.50%), sesame cake (*Sesamum indicum*) (35.42%) and Drumstick (*Moringa plerygospermar*) with cow milk (29.17%) were fed as a treatment of *affara*. Ajwain was used with many things like black salt, *asofoetida*, asafetida and jaggery for treatment of *affara* in a higher percent of households in district Jodhpur as compared to district Pali. Similar was the case with use of sesame cake while the rest of the methods of treatment were in use in a higher percent in district Jodhpur. Use of ginger, ajwain, asafoetida, hing and black salt for the treatment of bloat was also reported by De (1994); Pandey (1996); Mohanty (1999). Anti-flatulence property of *asofoetida* and *ajwain* was confirmed by Singh *et al.* (1994).

Snake/Scorpio bite

Drumstick (*Moringa plerygoperma*) leaves and ground turmeric powder (60.33%), neem leaves, hibiscus leaves and *Marva* (66.09%) leaves, *Burgad* leaves (*Ficcuss bengalensis*), custard apple (Annona squamosa) leaves and mixture of 1 part of linseed oil (45.33%), 1 part of eucalyptus oil, 1 part of gingelly oil (22.50%) applied on the site of bite by snake/Scorpio (Table 4). The findings confirm with the findings of Amitendu, *et al*. (2004); Sah and Dubey (2010).

Internal parasites

Six different treatments were reported by the respondents for tackling the problem of internal parasites in animals. Neem (*Azadirachta indica*) leaves, leaves of marva (*Origanum majorana*), roots of *Latjeera* (*Aleurites moluccuna*) and decoction prepared from leaves, roots and bark of *karanj* (*Artemisia hilagirica*) with jaggery and bran were used in 52.50%, 49.58%, 38.33% and 38.33% of the selected households, respectively (Table 5). Paste prepared from bark of *simal* (*Ceiba pentandra*) tree and wheat bran was also used by a sizable percent of households for treatment of internal parasites. A considerable difference in use of paste of *simal* tree bark, roots of *latjeera* and decoction of leaves, roots, bark of *Karanj* with jaggery and wheat bran was noted between the households belonging to the two districts. Feeding

Table 4. Traditional methods of treatments of snake and scorpio bite in buffalo by the farmers.

S. No.	Particulars	Frequency and percentage distribution		Pooled (N=240)
		Jodhpur (N=120)	Pali (N=120)	
1	Drumstick (*Moringa plerygoperma*) leaves and turmeric powder	80 (66.67)	70 (58.33)	150 (62.50)
2	Hibiscus leaves and *marva* (*Origanum majorana*)	85 (70.83)	75 (62.50)	160 (66.67)
3	Burgad (*Ficcuss bengalensis*), custard apple (*Annona squamosa*) leaves and mixture of one part of linseed oil	78 (65.00)	30 (25.00)	108 (45.00)
4	1 part of eucalyptus oil and 1 part of gingelly oil	33 (27.50)	21 (17.50)	54 (22.50)

the extract of neem leaves as a treatment of internal parasites was also reported by Mandal (1999).

Ectoparasites

Animals affected with ectoparasites were taken care of in a variety of ways in the households in the state. Rubbing of petrol (70.83%), burning of dry leaves and farm waste near animals (63.33%), roots of *Goja* grass (53.75%) and mustard oil (53.33%) on the body of affected animals were the most common ways to mitigate the ectoparasites. *Bara nimbu* (*Citrus lemon*), salt and mustard oil were applied externally in 42.92% and 53.33% of the households (Table 6). Application of paste of neem leaves (26.25%), burning of neem and *akda* (*Calotropis gigantean*) leaves near the buffalo herd (45.42%), rubbing frothed solution of *ritha* (*Sapindus mukorossi*) fruit (43.33%), rubbing extract of tobacco leaves (40.00%), kerosene (38.33%), vinegar (37.92%) were also found. Further, paste of lemon leaves, dry leaves of *dhatura* (*Artemisia parviflora*), *haldi* (*Curcuma domestica*) with lemon and sesame oil were practiced by 49.58%, 37.50%, 33.33% and 21.67% of the households, respectively. Application of powder of dry leaves of *pati* (*Artemisia parviflora*), paste of leaves of custard apple (*Annona squamosa*), rubbing *gammaxene* with cow dung, crushed nephthalene balls in oil and DDT with ash on the body of affected buffalo were also practiced in the study locale. Creating fumes by burning of neem leaves near affected animals for tackling the problem of ectoparasites was also reported by De (1994); Pandey (1996); Mandal (1999). The finding is in line with that of Sah (1996) who reported burning of dry leaves and dry farm waste near such animals. Application of kerosene oil on the affected part of the animal was also reported by De (1994); Pandey (1996).

Mastitis

Most commonly used methods of treatment of mastitis in the region involved application of honey (68.33%), paste of roots of *doob* grass (68.33%) on and inserting the root of *doob* grass (*Cynodon dactylon*) in the affected teat (78.33%). Paste of crushed *kair* fruits (*Capparis deciua*) was also applied on affected teat in 53.75% of the selected households (Table 7). A considerable percent of households were found applying paste

Table 5. Traditional methods of treatments of internal parasite in buffalo by the farmers.

S. No.	Particulars	Frequency and percentage distribution		Pooled (N=240)
		Jodhpur (N=120)	Pali (N=120)	
1	Wheat bran	33 (27.50)	23 (19.17)	56 (23.33)
2	Leaves of *Marva* (*Origanum majorana*)	53 (44.17)	66 (55.00)	119 (49.58)
3	Neem leaves (*Azadirachta indica*)	69 (57.50)	57 (47.50)	126 (52.50)
4	Paste of bark of Simal tree (*Ceiba pentandra*)	43 (35.82)	42 (35.00)	85 (35.42)
5	Root of *Latjeera* (*Aleurites moluccun*)	30 (25.00)	62 (51.67)	92 (38.33)
6	Decoction of leaves, root, bark of Karanj (*Artemisia bilagirica*)	19 (15.82)	73 (60.83)	92 (38.33)

of molasses on udder and hip point (34.17%) and paste of green crushed leaves of *pilu* (*Salvaodora oleoides*) tree (29.17%). In 33.75% and 24.17% of the households, ash was thrown and paste of fresh rhizome of *haldi* was applied on affected udder, respectively. The indigenous methods of treatment of mastitis as explained above were different from those reported by Gupta *et al.* (1996), Sah (1996); Mohanty (1999).

Foot and mouth disease (FMD)

Foot and mouth disease locally known as '*Khuriya* and *Bang'* was tackled in several ways in the selected households (Table 8). For foot lesions, the common indigenous treatments included application of muck on hooves of the affected animal or the animal is made to stand in the muck (55.00%), application of mustard oil and salt (51.25) and paste of *haldi*, *doob* grass and salt (44.17%). In substantial percent of households, paste of *marva* (*Origanum majorana*) leaves (38.75%) and paste of leave buds of *pilu* (*Salvaodora oleoides*) and *karanj* (*Millettia pinnata*) tree (35.00%) were also applied. Pouring the lime solution, petrol, phenyl

Table 6. Traditional methods of treatments of ectoparasite in buffalo by the farmers.

S. No.	Particulars	Frequency and percentage distribution		Pooled (N=240)
		Jodhpur (N=120)	Pali (N=120)	
1	Bara *nimbu* (*Citrus lemon*)	47 (39.17)	56 (46.67)	103 (42.92)
2	Crushed naphthalene balls in oil	32 (26.67)	40 (33.33)	72 (30.00)
3	*Dhatura* (*Artemisia parviflora*) leaves	37 (30.83)	53 (44.17)	90 (37.50)
4	Frothed solution of Ritha fruit (*Sapindus mukorossi)*	34 (28.33)	70 (58.33)	104 (43.33)
5	Paste of *Goja* grass	60 (50.00)	69 (57.50)	129 (53.75)
6	Mustard oil	59 (49.17)	69 (57.50)	128 (53.33)
7	Paste of *haldi* (*Curcuma domestica*) with lemon	33 (27.50)	47 (39.17)	80 (33.33)
8	Petrol	89 (74.17)	81 (67.50)	170 (70.83)
9	Kerosene	49 (40.83)	43 (35.83)	92 (38.33)
10	Vinegar	37 (30.83)	54 (45.00)	91 (37.92)
11	DDT with ash	25 (20.83)	17 (14.17)	42 (17.50)
12	Gammaxene with cow dung	26 (21.67)	18 (15.00)	44 (18.33)
13	Sesame oil	33 (27.50)	19 (15.83)	52 (21.67)
14	Paste of custard apple leaves (*Annona squamosa)*	28 (23.33)	49 (40.83)	77 (32.08)
15	Paste of neem leaves	37 (30.83)	26 (21.67)	63 (26.25)
16	Paste of lemon leaves	66 (55.00)	53 (44.17)	119 (49.58)
17	Powder of dry leaves of *Dhatura* (*Artemisia parviflora)*	39 (32.50)	50 (41.67)	89 (37.08)
18	Burning dry leaves of *neem* and *ank* () near the buffalo herd	43 (35.83)	66 (55.00)	109 (45.42)
19	Burning of dry leaves and farm waste near buffalo herd	62 (51.67)	90 (75.00)	152 (63.33)
20	Extract of tobacco leaves	55 (45.83)	41 (34.17)	96 (40.00)

Table 7. Traditional methods of treatments of mastitis in buffalo by the farmers.

S. No.	Particulars	Frequency and percentage distribution		Pooled (N=240)
		Jodhpur (N=120)	Pali (N=120)	
1	Honey applied on the affected teat	55 (45.83)	109 (90.83)	164 (68.33)
2	Root of *doob* grass (*Cynodone dactylon*) into the affected teat	85 (70.83)	109 (90.83)	164 (68.33)
3	Paste of roots of *doob* grass	85 (70.83)	103 (85.83)	188 (78.33)
4	Paste crushed kair fruits (*Capparis decidua*)	69 (57.50)	60 (50.00)	129 (53.75)
5	Paste of fresh rhizome of *haldi*	27 (22.50)	31 (25.83)	58 (24.17)
6	Paste of molasses applied on udder and hip point	49 (40.82)	33 (27.50)	82 (34.17)
7	Paste of wood of pilu tree (*Salvoadora oleoides*)	21 (17.50)	49 (40.83)	70 (29.17)
8	Ash thrown on affected udder	43 (35.82)	38 (31.67)	81 (33.75)

Table 8. Traditional methods of treatments of foot and mouth diseases (FMD) in buffalo by the farmers.

S. No.	Particulars	Frequency and percentage distribution		Pooled (N=240)
		Jodhpur (N=120)	Pali (N=120)	
A	**Foot lesions**			
1	Application of muck/animals made to stand in it	63 (52.50)	69 (57.50)	132 (55.00)
2	Paste of *haldi*, *doob* grass and salt	49 (40.83)	57 (47.50)	106 (44.17)
3	Paste of leaves buds of pilu and karanj *(Millettia pinnata*) tree	29 (24.17)	55 (45.83)	84 (35.00)
4	Paste of marva (*Origanum majorana*) leaves	40 (33.33)	53 (44.17)	93 (38.75)
5	Pouring lime solution	55 (45.82)	31 (25.83)	86 (35.83)
6	Mustard oil and salt	67 (55.82)	56 (46.67)	123 (51.25)
7	Pouring kerosene	31 (25.82)	21 (17.50)	52 (21.67)
8	Pouring petrol	40 (33.33)	27 (22.50)	67 (27.92)
9	Pouring phenyl	43 (35.82)	21 (17.50)	64 (26.67)
B	**Mouth lesions**			
1	Application of ash	63 (52.50)	85 (70.83)	148 (61.67)
2	Rubbing of salt	63 (52.50)	74 (61.67)	137 (57.08)

and kerosene on the hooves of the affected animal was practiced in 35.83%, 27.92%, 26.67% and 21.67% of the selected households respectively. Similar to the present finding, *i.e*., making the affected animal walk in mud to control foot lesions was also reported by Gupta and Patel (1991); Sah (1996); Mandal (1999). Pouring limewater on infected hooves as a treatment for foot lesions was also reported by Gupta and Patel (1991); Pandey (1996). For mouth lesions, in 61.67% of the households, ash was applied and in 57.08% salt was rubbed. Gupta and Patel (1991); Mandal (1999) also reported application of salt solution inside the mouth as well as between the hooves of animal affected with FMD.

Fever

The most common indigenous practices followed in the study area for treatment of fever were feeding paste of *kutaki* (*Gentiana kurroo*) roots (60.00%), decoction of *kilmodi* (*Eerberis aristata)* roots and bark with sugar syrup (60.83%) and decoction of *chalmodi* (*Geranium pratense*) leaves, roots and bark (52.92%). Concentrate solution of *haldi* (*Abina cordifolia*), leaves and paste of onion (*Allium cepa*), ajwain, dhania (*Coriandrum sativum*) and jaggery were also fed in 39.58% and 48.33% of the households (Table 9). In 54.17% of the households animal was drenched with solution of soybean, while in 47.50% of the households, paste of green leaves of *brahmi* (*Woodfordia floribunda*) was kept on forehead of animal for treatment of fever. The indigenous treatments provided to animals in case of fever in the study area were found to be different from those reported by Pandey (1996); Sah (1996); Mandal (1999).

Sprain/Fracture

The indigenous treatments of sprain/ fracture followed in the selected households in the descending order of their extent of use were, application of warm paste of *haldi* (66.00%); paste of *maitha* (*Polygonatum verticillatum*), *bhang* (*Cannabis sativa*) and ash (48.33%); paste of *haldi, doob* and leaves of *arandi* (*Ricinus communis*) tree

Table 9. Traditional methods of treatments of fever in buffalo by the farmers.

S. No.	Particulars	Frequency and percentage distribution		Pooled (N=240)
		Jodhpur (N=120)	Pali (N=120)	
1	Paste of *Kutali* roots (*Gentiana kurroo*)	47 (39.17)	97 (80.83)	144 (60.00)
2	Decoction of *Kilmodi* roots (*Eerbris aristata*)	48 (40.00)	98 (81.67)	146 (60.83)
3	Decoction of *Chalmodi* leaves (*Geranium pretense*)	54 (45.00)	73 (60.83)	127 (52.92)
4	Concentrate solution of *haldi* leaves	40 (33.33)	55 (45.83)	95 (39.58)
5	Paste of onion (*Allium cepa*), ajwain, coriander (*Coriandrum sativum*)	49 (40.83)	67 (55.83)	116 (48.33)
6	Animal drenched with solution of soybean	73 (60.82)	57 (47.50)	130 (54.17)
7	Paste of green leaves of *Brabmi* (*Woodfordia floribunda)* kept on forehead of affected buffalo	27 (22.50)	87 (72.50)	114 (47.50)

(30.83%); paste of leaves and roots of *shauriya* (*Elaeodendron glaucum*) (24.58%) and paste of *haldi* and lime 15.42% (Table 10). Use of *haldi* in the treatment of fracture was also reported by Darji (1993); Mandal (1999); Singh and Chauhan (2010).

Wound

Haldi heated in ghee, juice of *Haldi* leaves and powdered seeds of *kusum* (*Schleichera oleosa*) tree were used in 60.42%, 52.50% and 27.08% of the selected households, respectively, for treatment of wounds (Table 13). Application of *haldi* and ghee as an indigenous treatment of wounds was also reported by De (1994); Dudi and Singh (2007); Pandey (1996).

Skin diseases

In case of skin diseases, paste of neem leaves was applied on the affected area in 31.25% of the households, followed by 17.92% of households in which solution of roots leaves and bark of *banbasa* (*Viola biflora*) with honey was fed to affected animal (Table 11). Whole plant of *jharbari* (*Zizypus jujuba*) was boiled in water and concentrated solution was fed to affected animal in 17.50% of households. Paste of *henna* (*Lawsonia inermis*) leaves and paste of *jangli piyaz* (*Urginea indica*) were fed in 16.25% and 11.67% households, respectively. The findings confirm with the findings of Karthikeyan and Chandrakandan (1996).

Retained placenta

A perusal of Table 12 revealed that a total of nine treatments were followed for expulsion of retained placenta, which were singly used, as well as in combination. In majority of the selected households, sugarcane (*Saccharum officinarum*) leaves (75.83%), bamboo (*Bambusa arundinacea*) leaves (69.58%), cotton seeds (56.25%) and whole barley (*Cotoneaster accuminata*) (48.33%) were used. However, in 47.08%, 40.00%, 40.00%, 33.33% and 31.25% of the households' *kina leaves* (*Sapium insigue*), whole paddy (*Oryza sativa*), chickpea and cluster bean *dry leaves*, *Riu* (Cotoneaster accuminata) leaves and *kusa* leaves (*Desmostachyya bipinnata*) were used, respectively. In about 39.17% of the households, for expulsion

Table 10. Traditional methods of treatments of sprain/fracture in buffalo by the farmers.

S. No.	Particulars	Frequency and percentage distribution		Pooled (N=240)
		Jodhpur (N=120)	Pali (N=120)	
1	Paste of *haldi*, doob grass and castor leaves	33 (27.50)	43 (35.00)	76 (31.67)
2	Paste of *Maitha* (*Polygonatum verticillatum*), *Bhang* (*Cannabis sativa*) and ash	46 (38.33)	70 (58.33)	116 (48.33)
3	Warm paste of *haldi*	73 (60.83)	86 (71.67)	159 (66.25)
4	Paste of leaves and roots of *Shauriya* (*Elaeodendron glaucum)*	23 (19.17)	36 (30.00)	59 (24.58)
5	Paste of *haldi* and lime	11 (09.17)	26 (21.67)	37 (15.42)

Table 11. Traditional methods of treatments of wound in buffalo by the farmers.

S. No.	Particulars	Frequency and percentage distribution		Pooled (N=240)
		Jodhpur (N=120)	Pali (N=120)	
1	Juice of leaves	60 (50.00)	66 (55.00)	126 (52.50)
2	Powdered seed of *Kusum* (*Schleichera oleosa*)	28 (23.33)	37 (30.82)	65 (27.08)
3	Haldi heated in cow ghee	66 (55.00)	79 (65.83)	145 (60.42)

Table 12 Traditional methods of treatments of skin diseases in buffalo by the farmers.

S. No.	Particulars	Frequency and percentage distribution		Pooled (N=240)
		Jodhpur (N=120)	Pali (N=120)	
1	Solution of roots, leaves, barks of *banbasa* (*Viola biflora)* with honey fed	17 (14.17)	26 (21.67)	43 (17.92)
2	Whole plant of *Deshi ber* (*Zizyphus jujuba*) boiled in water and concentrate fed	23 (19.17)	19 (15.83)	42 (17.50)
3	Paste of *Neem* leaves applied	48 (40.00)	27 (22.50)	75 (31.25)
4	Paste of Henna (*Lowsonia inermis*)	12 (10.00)	19 (15.83)	39 (16.25)
5	Paste of *Jangli piyaz* (*Urginea indica*)	11 (09.17)	17 (14.17)	28 (11.67)

Table 13. Traditional methods of treatments of retain of placenta in buffalo by the farmers.

S. No.	Particulars	Frequency and percentage distribution		Pooled (N=240)
		Jodhpur (N=120)	Pali (N=120)	
1	Sugarcane leaves (*Saccharum officinarum*)	83 (69.17)	99 (82.50)	182 (75.83)
2	Bamboo (*Bambusa arundinacea*) leaves	80 (66.67)	87 (72.50)	167 (69.58)
3	Kusa (*Desmostachya bipinnata)* leaves	39 (32.50)	36 (30.00)	75 (31.25)
4	Whole paddy (*Oryza sativa*)	25 (20.82)	56 (46.67)	96 (40.00)
5	Dry leaves of chickpea and cluster bean	63 (52.50)	33 (27.50)	96 (40.00)
6	Whole barley (Horedeum vulgare)	51 (42.50)	65 (54.17)	116 (48.33)
7	Cotton seeds (*Gossypium arboretum*)	37 (30.83)	98 (81.67)	135 (56.25)
8	*Kinna* (*Sapium insigue*) leaves	25 (20.83)	88 (73.33)	113 (47.08)
9	*Riu* (*Cotoneaster accuminata*) leaves	31 (25.82)	49 (40.82)	80 (33.33)
10	A light weight tied at the end of the placenta to facilitate	12 (10.00)	82 (68.33)	94 (39.17)

of retained placenta a lightweight was tied at the end of the placenta to facilitate the expulsion. Patel *et al*. (1993) also reported that for expulsion of retained placenta, a lightweight was tied at the end of placenta. However, Pandey (1996) reported that ban leaves were fed for easy and smooth expulsion of placenta unlike the present findings.

CONCLUSION

It may be concluded that the relative difficult biophysical conditions and poor economic resource availability of the buffalo farmers operating in this Marwar region of India have caused lesser influence of scientific buffalo farming technologies in the region. As of result of which, over the years of experimentations, buffalo farmers of this region have evolved an alternative knowledge base for the treatment of their animals. As presented in above paragraphs, a variety of traditional practices were observed being followed for treatment of various ailments and diseases of the animals with the use of locally available material, herbs etc. These traditional methods are of much importance because majority of buffalo farmers in the region were resorting to self medication using traditional practices only, while the other agents like quack and staff of formal veterinary services were consulted only in cases of severity of disease/ ailment. In addition, less than half of the selected farm households were observed vaccinating their animals against diseases, while isolation of diseased animals was practiced in only 30% of the household.

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