Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(3): 3186-3192
Received: 04-03-2019
Accepted: 06-04-2019

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Documentation of traditional veterinary medicines used by camel owners in Marwar region of Rajasthan, India

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Abstract
Information was collected from 290 camel keepers in the arid zone to identify the technical details of camel management and to crosscheck data for relevance testing. A total of 156 practices were identified and scientific relevance values obtained for each. Overall 93, 34 and 39 practices had high, medium and low relevance values, respectively. In the case of trypanosomiasis, impaction, overall feeding and breeding, the variation between traditional and scientific management practices was found to be significant (P <0.01), but for manage, the variation was not significant. Most single camel owners (58.79%) opted for modern veterinary drugs; owners of >5 camels (45.58%) preferred the traditional approaches, while owners of 2-5 camels (49.78%) believed in a mixed management system. The number of camels significantly (P <0.01) influenced these management practices. The study concluded that a balanced combination of traditional and scientific practices cope better with problems of camel management at grass-roots level, and practices having a high and medium scientific relevance value must be preserved before they are lost.

Keywords: Camel, traditional knowledge, veterinary and disease management

Introduction
Traditional animal healthcare practices, also called ethno-veterinary 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 universally recognized and for these reasons, it has no place in mainstream veterinary medicine. The discovery of uses of ethno-veterinary medicinal plants must have occurred in a number of ways, not only by the principal of trial and error mechanism but also through other ways which include; watching animals treat themselves by eating and rubbing themselves with special plants when ill and subsequent adoption of the same remedies, communication and interacting with other traditional ethno-veterinary medical practitioners.

The camel (*Camelus dromedaries*) is a useful component of the arid environment of desert ecosystem, where the vegetation of marginal land energy. Camels are able to sustain 20-22 % of body weight loss during severe famine conditions, whereas other livestock, such as cattle and buffalo, cannot sustain losses beyond 10-12 % (Sahani and Mehta (2004) [28]. Mainly due to the short payback period and higher cost-benefit ratio, the short payback period and higher cost-benefit ratio, the carting and farming use of camels is profitable and advantageous in arid environments. The world camel population is 19.32 million, with 1.03 million camels in India (Anonymous 2012). The Indian camel population is mainly confined to the North western states, with the highest density in Rajasthan. Ethno-veterinary practices are used extensively, effectively, for keeping camels healthy by employing the knowledge passed on verbally from generation to generation. Technical knowledge represents an indigenous process for camel production management among camel keepers. The principal focus of camel production and management is health, feeding, breeding and economics. Despite the effectiveness of modern veterinary drugs, their availability, accessibility and cost still remain a major constraint for camel keepers. So, they still prefer and rely on various practices to cope with problems, which include traditional, as well scientific, management practices. They use one or a combination of practices, and drug dose and frequency depend upon the severity of the disease. Camel keepers have extensive traditional technical knowledge, which is a somewhat ecological approach to manage health problems. Traditional technical know-how is often cheap, safe, time tested and based on easily available resources. It can also provide a useful alternative to conventional practices. There is a strong reliance by farmers on the technical knowledge, with respect to suitable plant identification, classification, feed supplementation, local reproduction, breeding,

milking and surgical techniques. It is therefore, necessary to investigate the prevalence and scientific relevance of technical knowledge of camel management practices in an arid environment. In the present study an attempt has been made to identify ethno-veterinary practices being practiced by the farmers for sustainable camel rearing in arid environment.

Materials and Methods

The study investigated camel management practices at grass-roots level in the Marwar region of Rajasthan, Pali district during 2017-18. The father of family generally hands down all technical knowledge to their sons, who continue with the practice. The task of identifying indigenous knowledge was accomplished by a pilot study, with a questionnaire on different management aspects. Based on the pilot survey, a detailed interview schedule was prepared. The required data were collected in a suitably developed and pre-tested questionnaire by an in-depth survey method. This grass roots level study covered various aspects of camel management practices, viz. social status of camel keepers, ongoing agriculture practices, number of livestock indigenous technical knowledge of camel health hazards, treatment pattern, feeding, breeding, surgical management practices, economics, etc. the scientific relevance score test[2] for each management practice was estimated, based on the experience and opinion of 35 veterinary and scientists. Scientific Relevancy Test (SRT) is an evaluation that depends upon four major factors availability, accessibility and cost effectiveness of resources. Respondents were selected using stratified random sampling technique. Information was collected from sample farmers both in irrigated and non-irrigated villages of the Pali district of Rajasthan. Indigenous technical knowledge of camel management practices were meticulous recorded from 290 camel keepers of 6 blocks belonging to 14 villages (Pali district), *viz*. Dayalpur, Bhagwanpura, Jaitpur, Wayad, Khundawas, Sukarlai, Gurvalia, Nayagoa, Phoolad, Ranawas, Roopawas, Khandi, Sanji and Malwa. A sample of 30 experienced camel keepers was drawn from each village randomly for data collection.

Results and Discussion

Details of indigenous knowledge for camel management, indicating traditional, as well as scientific, practices have been reported in Table 1. For treatment of manage, endosulphon/melathion and *neem* (*Azadirachta indica* A. Juss) combination had a high Scientific Relevancy Test (SRT) value (Kohler-Rollefson 1994) [18] reported that the Indian *Raikas* also used pulverized bark of *the rohira (Tecomella undulate* Sm. Seem*) + whey*. Sulpher + engine oil had a medium SRT value, while sulpher + coppersulphate + mansil + potash + oil had an SRT of value of 0.90. A butter-milk application was of medium relevance, but used by a large number of respondents. As regards treatment for contagious skin necrosis, practices were of high relevancy. Salty soils and salt water have been shown to have preventive properties in a number of livestock health problems (Namanda 1998) [23], Tariq *et al.* (2014) [13, 34], Rautrary *et al.* (2016), Shinwari *et al.* (2011) [31] and Punjani and Pandey (2015) [24]. Ringworm was well managed by zinc oxide application. Gupta (1999) [11] reported the use of burnt cow-dung in such cases. Camel keepers have extensive traditional technical knowledge of a rather ecological approach for managing tryapanosomiasis. A *satawar*/turmeric combination and allopathic drugs (quinapyramin sulphate + quinapyramin chloride) had high SRT values. The *dholmungsuri*/*tumba* (*Citrullus colocynthis* L. Schard) combination was of medium value, but was used by large number of farmers. Kohler-Rollefson (1994) [18] reported the use of *tumba* (*Citrullus colocynths* L. Schard) + salt + water as an oral treatment for trypanosomiasis. For managing implication, most practices were of high SRT value 22.11% of farmers' favourable fast movement to get rid of impaction. Maximum mortality in camels (48.78%) involved problems of the digestive system (Mehta 2003, Dudi and Meena 2015, Galav and Katewa 2013) [21, 9, 10].

In case of pneumonia, a *babul* root and ginger combination had a medium to high relevancy. To combat other respiratory problems, *gundh* of babul was more effective[5] (Gupta 1999) [11] recorded the use of powdered *methi* (*Trigonellia foenumgrccum* L.) or seeds, with saffron oil in cases of pneumonia in camels. Incidences of camel pox were managed by practices having high relevancy. Deworming of camels was accomplished very successfully by feeding a copper sulphate/*chiraita* (*Swertics chirata* Buch. Ham) combination (Bhakt and Sahni 2007).

Diarrhea problems were resolved with rice combinations, which had medium SRT values; higher values were also found in cases of feeding with *Khejri* (*Prosopis cineraria* L. Druce) leaves and *chhoti bui* (*Aerva lanata* Linn. Juss. ex Schult) root. To control diarrhea in sheep Kumar[9] found that the use of barley (*Hordeum vulgare* L.) flour + rice starch had a SRT value of 0.54 and was used by 73.33% of farmers. The findings confirm with the findings of Khateen *et al.* (2015), Singh *et al.* (2014) [32], Banitez *et al.* (2012) and Bodapti *et al.* (2013) [7].

Abscess/wound/saddle gall problems were treated by 20 different practices. *Neem (Azadirachta indica* A. Juss), turpentine oil, *kapoor*, *loresine/himax* cream and applying a hot iron to the affected part were found to have higher SRT values. Chronic wound/abscess and inflammation problems are often treated by burning the affected areas with hot iron rods in different forms and patterns, or with crude surgery. To treat placenta retention, root bark of *berbush* (*Zizyphus mauritiana* Lam) + water drenching is of medium relevance, while other practices had high SRT values (Khaongsai *et al* 2011) reported the use of decoction of molasses, root bark of *berbush* (*Zizyphus mauritiana* Lam) and milk as having SRT value of 0.50, and being used by 87.33 % of farmers, for cases of placental retention in sheep. Pulled tendon/muscle cases are often resolved by hot fomentation with mudwater, since mud can retain heat for a longer time on affected parts, facilitating better circulation. Mouth ulcer was well managed by salt and *saji* (*Salsola baryosma* Schult.) application. Sudden colic was greatly reduced by drenching with *ajwain* (*Trachysperurmum ammi*) + water. The bark of the gangeray tree was best in cases of fracture in camels. Muscle pain could be well managed by feeding a *methi* (*Trigonellia foenumgrccum* L.) or *alam* combination. Farmers overcame exhaustion in camels by feeding *Jo*, which is basically lower in thermodynamic substances Kumar and Bharet (2013), Deeba (2009) [8], Mishra (2013) [22], Hassan *et al.* (2014) [13], Khadda *et al.* (2018) [14], Bhanotra and Gupta (2016) [6], Rao *et al.* (2014) [26], Akhtar *et al.* (2013) [3] and Gupta *et al.* (2014) [12].

Crude surgical methods have been used to treat cases of tail gangrene and various methods of cauterization employed to halt bleeding. Cauterization was also used for a number of problems connected with the nervous system, locomotion, dislocation, fractures, sprains and injuries (Khanna *et al.* 1990) [15]. The patterns of cauterization varied with the nature of the disease and symptoms. To cope with tympany, a hinge

combination was of high SRT value. Tympany in sheep has been treated by giving a mixture of mustard oil + *kachri* (*Cucumis melo ssp. agrestis*) + common salt + whey; it had a 0.72 SRT value and was practiced by 93.33 % of respondents (Rajkumar and Shipix 2012) [25]. Constipation problems were highly resolved by feeding a *kachri (Cucumis melo ssp. agrestis*) /magnesium sulphate/*tumba (Citrullus colocynthis* L. Schard*)* combination, although a few farmers also made camels run to treat constipation (Gupta 1999) [11] and (Shah *et al*. 2008) reported *ajwian* (*Trachysperurmum ammi*) + salt as being used for treating constipation in camels.

All types of illness were managed by some practice having a medium to high SRT value (Abass *et al.* (2002) found that ethno-veterinarians have acquired a vast store of information on camel diseases and the use of plant varieties for treatment. Various practices were used in pregnancy milking or working stages of camel. In fact, farmers have a detailed knowledge regarding roughage, concentrate, etc. which is used for balanced feeding or during specific periods when additional nutrient requirements are essential. A comparison of traditional and specific management practices in camel rearing is given in Table 2. In cases of mange, the variation between traditional and scientific practices was not significant because a comparatively greater number of farmers used management practices, which were well recognized by the scientific community. As for trypanosomiasis, impaction, overall feeding and breeding, the variation between traditional and scientific management practices was found to be significant (P <0.01). Table 3 expresses the impact of camel numbers on management practices. Most single camel numbers on management practices. Most single camel owners (58.79%) opted for modern veterinary drugs, those keeping 5> camels (45.58%) preferred the traditional approach and the owners of 2-5 camels (49.78%) believed in mixed management. Initially, this group applied traditional practices, but if a cure was not forthcoming they switched to modern veterinary drugs. A chi-square test was applied and the value was found to be significant, which indicated that the number of camels in the herd significantly (P <0.01) influenced these management practices.

The main purpose of this economic analysis is to support decision making regarding limited resources allocation. Cost of resource providing a basis for making rational choice among alternatives under various circumstances. The treatment cost depends upon severity of particular disease. The traditional treatment cost of mange was low as compared to allopathic treatment cost. The traditional treatment cost varied Rs. 20-125/- per camel. The allopathic treatment cost varied Rs. 250-500/- per camel (injectable type) and Rs. 90-160 (spray/application type). The traditional treatment cost of Trypanosomiasis (Rs. Per camel) varied Rs. 450-1000/- where as allopathic treatment cost varied Rs. 90 -100/-. The traditional treatment cost for pneumonia varied from Rs. 40 - 80/- per camel per day. Monterey values are used as a common denominator for the valuation of particular resources. This economics indicate the confidence one can have in their priority ranking of various strategies. All technical knowledge is based on personal experience and is cost effective, arid environmentally sound and socially acceptable. Therefore, this study indicates that a balanced combination of traditional and scientific practices can cope better with problems of camel management at grass-roots level in an arid environment, and the practices having high and medium SRT values must be preserved before they are lost. It will be appropriate to hand over the know-how obtained and refinements achieved back to the arid farmers, and they should be part of the scientific and commercial process.

Table 1: Traditional knowledge for camel management (N=290)

S. No.	Traditional knowledge	% distribution	SRT value
a	**Mange**		
1	Sulpher + engine oil paste apply	24.55	0.57
2	Engine oil + *alam* (hydrated aluminum potassium sulfate salt)	21.45	0.52
3	Burnt engine oil-apply	11.17	11.22
4	Endosulphon/melathion + water-apply	16.33	0.84
5	Melathion/endosulphan + butter milk	10.76	0.50
6	Endosulphan + *til* oil (*Sesamum indicum* L.)	06.32	0.27
7	Endosulphan + ash-apply	07.16	0.29
8	*Neem* (*Azadirachta indica* A. Juss) leaves boil in water cool apply	16.79	0.76
9	Neem (*Azadirachta indica* A. Juss) leaves (tender)-feed	12.43	0.69
10	*Lahsun* (*Allium sativum* Linn.)-feed	10.48	0.47
11	*Lahsun* (*Allium sativum* Linn.) + *Haldi* (*Curcuma longa* L.) + water -drench	07.99	0.40
12	DDT + whey -apply	06.43	0.21
13	Bark of *Rohida* (*Tecomella undulate* Sm. Seem) + whey apply	10.54	0.19
14	Slightly warm mustard oil (*Brassica campestris*)	22.11	0.54
15	*Dalda ghee*-drench	11.88	0.47
16	*Jal*'s ash (*Salvadora oleoides*) = *kheemp's* (*Leptadenia pyrotechnica* Forssk. Decne) juice –apply after that *Taramira* (*Eruca sativa*) oil apply	23.90	0.59
17	*Taramira* oil (*Eruca sativa*)	14.33	0.56
18	Sulpher + Copper sulphate + *Mansil* + Potash + oil apply	12.55	0.90
19	Butter milk apply	12.78	0.29
b	**Contagious skin necrosis**		
1	Salt (100-200gm) feeding for 8 to 10 days	11.33	0.95
2	Keeping separate from other animals	10.76	0.89
c	Ring worm		
1	Zinc oxide apply	17.87	0.64
2	*Akra* (*Calotropis procera* Ait R. Br.) juice apply	16.71	0.55
3	*Ghee* + Salisalic + Benzoic acid apply	13.60	0.68
4	*Neem* (*Azadirachta indica* A. Juss) leaves apply	15.32	0.71

d	**Tryapanosomiasis**		
1	*Satawar* (*Asparagus racemosus*) + Buffalo milk feed in repeated dose	11.19	0.78
2	*Haldi* (*Curcuma longa* L.) + buffalo milk feed in repeated dose	11.90	0.81
3	*Dholmungsuri* (*Phaseolus sublobatus*) + buffalo milk repeated dose	22.41	0.58
4	Salt + *Kalajira* (*Nigella sativa* L.)+ *Ajwain* (*Trachyspermum ammi*)+ *methi* (*Trigonellia foenumgrccum* L.) powder + Molasses + *Alam* + water drench	19.09	0.60
5	Half kg of *dalia* of *Bajri* (*Pennisetum glaucum*)+ 1 kg molasses + 100g red chilies powder + 100gm *alam* + hinge feed	14.48	0.14
6	*Saji* (*Salsola baryosma* Schult.) + water drench	19.00	0.18
7	Suspension of *Tumba* (*Citrullus colocynthis* L. Schard.) + salt + water feed	17.11	0.33
8	*Kalajira* (*Nigella sativa* L.) + *Hing (Ferula assafoetida* Linn.) feed	15.99	0.68
9	Injection (*Tribaxin/Triquin*)	13.44	0.99
10	Naganoil-3 times-3 days -feed	13.10	0.97
e	**Impaction**		
1	*Ajwain* (*Trachysperurmum ammi*)-feed	14.42	0.73
2	*Ajwain* (*Trachysperurmum ammi*) boil in water cool feed	12.59	0.68
3	*Ajwain* (*Trachysperurmum ammi*) + *Alam* + *Saji(Salsola baryosma* Schult*)*-grinding + water -drench	13.11	0.69
4	*Ajwain* (*Trachysperurmum ammi*) + Molasses + Salt-boil-cool-drench	21.66	0.49
5	Himalayan *batish*a-feed	07.16	0.69
6	Half kg sodium bicarbonate + 2kg *patsa*-feed	10.19	0.93
7	Magnesium sulphate + sodium bicarbonate-feed	11.44	0.95
8	*Alam* + water –boil and next day drench in early morning	09.54	0.19
9	Mustard oil (*Brassica compestris*) =water drench	23.67	0.54
10	*Taramira* oil (*Eruca sativa*)-drench	07.76	0.65
11	*Arandi* oil (*Ricinus communis*)-drench	11.32	0.27
12	Allow for fast movement	13.44	0.66
13	*Kachri* (*Cucumis melo ssp. agrestis*) + *Rai* (*Brassica nigra*)-grinding-feed	23.44	0.51
14	Milk (Cow or buffalo) + Sugar boil-cool-drench	10.33	0.77
15	*Adarak* (*Zingiber officinale*)+ onion (*Allium cepa*) + *Long* (*Syzygium aromalicum*)-feed	08.66	0.10
f	**Pneumonia**		
1	Ginger (*Zingiber officinale*) + *Ajwain* (*Trachysperurmum ammi*) + Water + Salt-boil cool-drench	22.67	0.72
2	*Haldi* (*Curcuma longa* L.) + salt + ginger + water –boil-cool-drench	21.28	0.64
3	Root of *babul* (*Accacia nilotica* Linn. Del. Sub *sp. Indica* Bench) + water –boil-cool-drench	16.76	0.54
4	Jaggery (*Saccharum officinarum*)-feed	14.58	0.19
5	Mixture of turmeric and jiggery-feed	11.22	0.27
6	Powdered *methi* (*Trigonella foenumgraecum*) + saffron oil-feed	07.88	0.17
7	Ginger (*Zingiber officinalis*)+ onion (*Allium cepa*) + *long* (*Syzygium aromalicum*)-feed	22.32	0.71
g	**Other respiratory problems**		
1	*Gudha* of *babool* (*Acacia nilotica* Linn. Del *sub sp. indica*, Bench) + water –boil-cool-drench	17.45	0.67
2	Flour of *Jo* (*Hordeum vulgare* L.) + *Alam*-boil-feed	12.58	0.17
3	Flour of *Jo* (*Hordeum vulgare* L.)-feed	19.07	0.19
4	Old *mehndi* (*Lawsonia inermis*) + mustard oil (*Brassica compestris*)-drench	22.33	0.54
h	**Camel pox**		
1	Keeping separate from other animal	16.66	0.82
2	*Dalda ghee*-apply	08.99	0.56
3	Zink oxide-apply	12.41	0.65
4	Camel milk apply	04.09	0.43
i	**Deworming**		
1	*Lal mirch* (*Capsicum annum* L.) + water –drench	06.65	0.14
2	Any tab (*Albendazole/Panacure/Nilwarm etc*.)-feed	13.65	0.98
3	Copper sulphate + *Tambaku* (*Nicotiana tabacum*) + *Arendi* oil (*Ricinus communis*)-feed	23.00	0.64
4	*Chyrata* (*Swertia chirayita*)-feed	15.50	0.76
j	**Diarrhoea**		
1	Dalia of *Bajri* (*Pennisetum glaucum*) + water-drench	22.45	0.58
2	*Bajri* (*Pennisetum glaucum*) flour + whey-feed	09.21	0.29
3	Rice (*Oryza sativa* L.) grinded + water –boil-feed	24.16	0.58
4	*Dhan* flour + water -feed	15.55	0.66
5	Whey -feed	17.80	0.52
6	Flour of *Jo* (*Horedium vulgare* L.) + water -drench	06.87	0.14
7	*Neblon* powder	17.88	0.76
8	Butter milk + salt-feed	10.43	0.41
9	Himalayan *batisha*-feed	13.11	0.67
10	*Khejri* leaves (*Prosopis cineraria*)-feed	22.89	0.68
11	Root of *Bui* (*Aerva pseudotomentosa*) + water –boil-cool -feed	18.90	0.65
k	**Breeding/reproductive problems**		
	Retention of placenta		
1	*Bajri* (*Pennisetum glaucum*)-feed	21.78	0.67
2	*Bajri* (*Pennisetum glaucum*) + molasses + wheat (*Triticum aestivum* L.)	21.09	0.56
3	Molasses + ghee-cool-drench	08.66	0.76

4	*Ajwain* (*Trachyspermum ammi*) + molasses + water-boil-cool-drench	18.56	0.27
5	Uteroton/replanta-feed	16.54	0.79
6	Manual cleaning + furia bolus-keep insitu	11.22	0.98
7	*Moth* (*Vigna acontifolia* Jacq. Marechal) + Guar's (*Cyamopsis tetragonoloba* L. Taub) *Dalia*-feed	08.87	0.69
8	Root bark of *berbush* (*Zizyphus mauritiana* Lam) + water-drench	19.89	0.59
l	**Maintenance of pregnancy**		
1	*Ghee* + molasses –feed	15.67	0.75
2	*Methi* (*Trigonellia foenumgrccum* L.) + Jaggary-feed	17.33	0.38
3	Molasses +ginger (*Zingiber officinalis*) + *Ajwain* (*Trachysperurmum ammi*)-feed	14.65	0.23
4	Moth bean (*Vigna acontifolia* Jacq. Marechal)–feed	17.88	0.59
5	*Bajri* (*Pennisetum glaucum)*-feed	25.58	0.60
m	**Abscess/wound/saddle gall**		
1	*Ash* + *Alam* –apply and clean	18.90	0.55
2	*Ash* apply	15.76	0.21
3	*Neem* (*Azadirachta indicia.* A. Juss) water –clean wound	11.57	0.89
4	*Neem* (*Azadirachta indicia.* A. Juss) leaves-grinding-apply	12.45	0.94
5	*Neem* (*Azadirachta indicia.* A. Juss) leaves-apply and clean by *alam*	13.65	0.97
6	*Alam* with –boil-apply	10.21	0.56
7	*Alam* + neem's (*Azadirachta indicia.* A. Juss*)* leaves-grinding-apply	11.43	0.57
8	*Alam* heated on *tawa* and make powder-apply	17.90	0.67
9	*Alam* –paste-apply	08.32	0.60
10	Ker's (*Capparis deciduas* Forssk. Edgew) bark-grinding-apply	09.12	0.44
11	Phenol-apply	04.67	0.17
12	*Kerosene* oil -apply	06.77	0.19
13	Turpentine oil-apply	14.55	0.91
14	*Haldi* (*Curcuma longa* L.) + oil-apply	11.22	0.80
15	Mustard oil (*Brassica compestris*) –boil-pour-fire around	21.33	0.44
16	*Kapoor*-grinding-apply	11.09	0.66
17	Potassium per magnate-clean	13.15	0.79
18	Cram (*Lorexine*/*himax*)-apply	08.97	0.98
19	Hot iron touch on affect part	22.11	0.65
20	*Sindhna* (*Bixa orellana*)-apply	15.33	0.56
n	**Muscle/tendon pulled**		
1	Mustard (*Brassica campstris*) oil-apply	24.87	0.54
2	Turpentine oil-apply	32.77	0.19
3	*Iodex*-apply	08.65	0.88
4	Hot iron touch on affected part	25.54	0.52
5	Mustard oil (*Brassica compstris*+ *alam*-boil-massage	09.00	0.23
6	*Haldi* (*Curcuma longa* L.)+ mustard oil-drench	05.20	0.28
7	Hot fomentation with *alam* water/mud water	26.87	0.84
o	**Mouth ulcer**		
1	Sugar + *Alam* mix-feed	11.90	0.24
2	Salt-apply	21.11	0.66
3	*Saji (Salsola baryosma* Schult.)+ water-boil-cool-apply	23.31	0.53
p	**Sudden colic**		
1	One fourth heated up + 1.5kg water-drench	14.45	0.17
2	*Ajwain* (*Trachyspermum ammi*) + water-drench	16.88	0.77
3	*Alam* + water –boil-drench	22.11	0.52
q	**Fracture**		
1	Bark of gingery (*Grewia tenax*) + milk-drench	17.67	0.79
r	**Muscle pain**		
1	*Methi* (*Trigonellia foenumgrccum* L.)-feed	18.99	0.76
2	*Alam* + Jaggery-feed	24.44	0.79
s	**Exhaustion**		
1	*Ghee*-feed	12.76	0.68
2	Molasses + *til (Sesamum indicum)* oil mix-cool-drench	21.09	0.52
3	*Duwa* (*Raw rabri*)-drench	08.06	0.19
4	*Jo* (*Horedium vulgare* L.)-grinding + water -feed	15.65	0.88
5	*Alam* + water -feed	14.54	0.76
t	**Tail gangrene**		
1	Affected part of tail drip in boiled mustard oil	17.59	0.78
2	Hot iron touch on affected part	19.08	0.69
u	**Tympany**		
1	One fourth hinge (*Ferula asafetida* Linn.) + half kg *dalda* -feed	19.07	0.68
2	Magnesium sulphate + water-drench	19.88	0.79
3	*Ajwain* (*Trachysperurmum ammi*) + salt-feed	09.55	0.61
4	Salt water-feed	05.65	0.29
5	*Tumba* (*Citrullus colocynthis* L.Schard) + salt-feed	16.90	0.69
6	Make camel to run	06.66	0.21

v	Any illness		
1	Molasses-feed	11.81	0.61
2	Boiled molasses + ginger-feed	12.57	0.56
3	*Bajri* (*Pennisetum glaucum*) *dalia*-feed	22.07	0.54
4	*Ajwain* (*Trichyspermum ammi*)-feed	11.43	0.56
5	*Alam* -feed	23.22	0.87
w	**Maintenance of milking camel**		
1	*Methi (Trigonellia foenumgrccum* L.*)*-feed	09.76	0.55
2	*Methi (Trigonellia foenumgrccum* L.*)* + mustard oil-feed	05.65	0.64
x	**Maintenance of camel**		
1	Moth bean (*Vigana accontifolia*)-feed	15.67	0.54
2	*Ghee* + molasses-feed	18.98	0.69
3	*Guar* (*Cyamopsis tetragonoloba* L. Taub) *ki dal*-feed	14.29	054

Table 2: Comparison between traditional and scientific management practices of camel rearing (N=290)

Parameter	Traditional management practices (MPS)	Scientific management practices (MPS)	'Z' value
Disease			
Mange	63.12	42.65	0.22_{NS}
Trypanosomiasis	89.46	13.44	7.45**
Impaction	84.54	17.98	6.13**
Feeding	72.66	29.09	4.11**
Breeding	78.89	25.67	5.55**

** Significant at $P<0.01$, NS –Non-significant

Table 3: Impact of number of camel on management practices

S. No.	Number of camels	Modern veterinary drugs	Inter mixed management (Traditional +Modern vet. Drugs)	Traditional practices	Overall
1	1 Camel	58.79	26.63	18.23	34.55
2	2-5 Camel	16.34	45.58	37.07	32.10
4	>5 Camel	15.45	38.69	46.77	33.64
	Overall	30.19	36.96	34.02	N=290
	Chi square	$\chi = 38.56$**			

** Significant at $P>0.01$

Conclusion

It may be concluded that in cases of the mange, the variation between traditional and scientific practices was not significant because a comparatively greater number of farmers used management practices, which were well recognized by the scientific community. As for trypanosomiasis, impaction, overall feeding and breeding, the variation between traditional and scientific management practices was found to be significant. The traditional treatment cost of mange was low as compared to allopathic treatment cost. All technical knowledge is based on personal experience and socially acceptable. Therefore, this study indicates that a balanced combination of traditional and scientific practices can cope better with problems of camel, and the practices having high and medium scientific relevance test (SRT) values must be preserved before they are lost. It will be appropriate to hand over the know-how obtained and refinements achieved back to the arid farmers and they should be part of the scientific and commercial process.

Acknowledgement

Sincere thanks are expressed to all veterinary doctors, the scientist and camel keepers for providing the necessary information to accomplish this work.

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