Journal of Research in Biology

An International Scientific Research Journal

Original Research

Treatment of digestive tract ailments in cattle with herbal folk-medicines: A preliminary study in Ganjam District.

Authors:
Dibakar Mishra

Institution:
Department of Zoology, Polasara Science College, Polasara, District: Ganjam, Odisha, 761 105 India.

Corresponding author:
Dibakar Mishra.

Email:
drdkm@hotmail.com

Tel:
(+91)9778098432

Web Address:
http://jresearchbiology.com/documents/RA0322.pdf.

ABSTRACT:

Use of medicinal plants for the prevention and treatment of digestive tract ailments in cattle has originated long back in the history. An attempt was made to list out different successful preparations used by rural traditional healers and farmers to cure the common digestive tract ailments of the domestic cattle, mainly cows and buffaloes. Personal interviews with pre-structured questionnaire, observation of preparation of herbal medicines and their administration, results attained etc. were made to make a preliminary study of the traditional method of treatment. Collection of sample plant species and their identification, refinements of the methods adopted for preparation of these herbal medicines were done with the help of the local people especially the village heads and older persons. A total of 66 plant species of 40 families distributed in 61 genera was recorded. Efficacy of these preparations was examined in the subsequent visits. Problems identified by the farmers include: lack of support for validation of these herbal medicines and less availability of some medicinal plants due to their seasonal nature. Such traditional/folk medicines used against digestive tract ailments of domestic cattle, continuing with the rural folk of the study area, still remained unnoticed and undocumented.

Keywords:
Ethno-veterinary, folk medicine, Ganjam, traditional healers, traditional knowledge.

Abbreviations :
g = Gram ; ml = milliliter ; Km = Kilometer ; sq = Square .

Article Citation:
Dibakar Mishra.
Treatment of digestive tract ailments in cattle with herbal folk-medicines: A preliminary study in Ganjam District.
Journal of Research in Biology (2013) 3(2): 818-827

Dates:
Received: 11 Jan 2013 **Accepted:** 10 Feb 2013 **Published:** 07 Mar 2013

INTRODUCTION

India has a vast knowledge of herbal preparations for treatment of different ailments both of human and of animals. Major part of this art of healing has either been vanished or been ignored. Still it is found with some people living in the remote corners, who are either farmers or animal owners. Their system of treatment varies greatly either due to geographical gap or due to climatic differences. It has also been observed that these preparations show wonderful results, without any side-effects in comparison to their modern counterparts, the allopathic medicines. (Vijai *et al.,* 2009).

This traditional science of healing is purely based on trial and error by the aboriginal people and was transmitted through words of mouth from generation to generations. Further as plants are inseparable from human life, their uses cannot be ignored. While plants fulfill the basic requirements of human civilization like food, shelter and clothing, it also is used for their better health. India and Indian culture have exploited about more than 2500 plants for medicinal purpose and this art of treatment has become a part of folklore medicines. Such medicines are at present practiced by a small segment of our society who has a separate identity as "Pasu vaidya" or the animal doctors or more commonly the traditional healers. (Chendel *et al.,* 1996; Sankar Ganesh *et al.,* 2007). Since no written records of such drugs are available, it is possible that this invaluable knowledge of our farmers would get lost in history.

The traditional folk-medicines that are inseparable from the rural life of India are better known as "Ethnoveterinary Medicines" (EVM) which can better be defined as the result of a long term practice of herbal treatment of animals which has been deeply integrated with the custom and tradition of Indian life. (Mathius-Mundy and McCorkle, 1989).

By this time steps are being taken to establish this traditional heritage of folk medicinal science and the present work is the first step in this regard in the study area. Apart from different cattle ailments, digestive disorders were observed frequently which make the animals sick, thus affecting the economy of the owners and thus it was selected for the present study.

MATERIALS AND METHODS

The study area, Ganjam district extends between 19.4^{o}N to 20.17^{o}N latitude and 84.7^{o}E to 85.12^{o}E longitude and occupies an area of 8070.6 Km^2 with a population density of 385/Km^2. It has 22 blocks and 18 urban local bodies. There are 3212 villages constituting 475 gram panchayats. Forest area recorded is about 58136sq Kms. Agriculture and animal husbandry being the most important economic sectors of the district and the inhabitants chiefly live in rural and semi-urban areas. (Dist. Stat. Handbook Ganjam, 2007). Diseases of the domestic animals mostly affect the socio-economic status of the inhabitants and usually depend upon their own traditional method of herbal treatment.

During 2008 to 2011 the work was scheduled with the aim to record all the available EVM in the district. Extensive survey was conducted throughout the district to identify the traditional healers or locally called the pashu vaidya and persons with this knowledge.

Data collection was done by interviews, pre-structured questions, group discussions with the local people within the age group of thirty to seventy including both the sexes. Livestock owners, traditional Healers (THs), veterinarians, farmers, and housewives were contacted for collection of data.

During subsequent visits data verification, identification of plants used, methods of drug preparation and modes of drug administration were recorded. Most of the THs were illiterate and some were only able to read and write while few attended primary schooling.

Sample specimens of each medicinal plant species were collected during the field visits and allotted collection numbers. The collected specimens were then

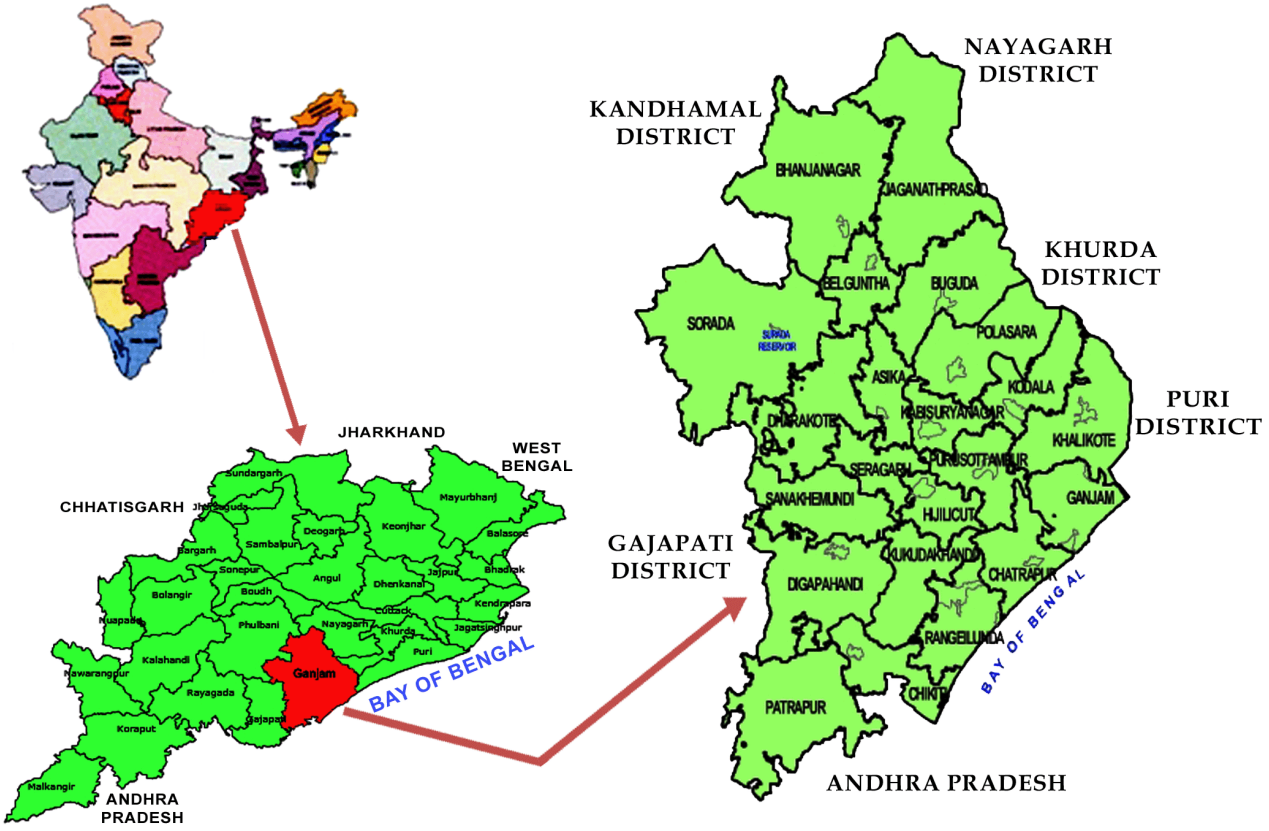

Figure 1. study Area-Ganjam district.

dried, identified through Flora of Orissa. (Saxena and Brahmam, 1994-1996).

During the following seasons, preparations were examined on-field to get concurrent result. Case history of common digestive ailments of cattle, response of the cattle owners to the disease, prescriptions of the THs and farmers, dose and administration of the herbal preparations, effectiveness of EVM were recorded. Standardization of the quantity of herbal materials taken by the THs was also done to get accurate results. The specific and reliable information was cross checked with at least 50% of the informants were incorporated. Out of different cattle diseases only seven common intestinal ailments were selected for the present study.

Details of medicinal plants used in this study are presented with botanical name followed by family in italics within parentheses.

RESULTS

During the course of the present work significant information regarding treatment of some common digestive tract ailments were observed and recorded. The preparations those are frequently used with remarkable results are described under.

Anorexia

1. 10 to 12 Leaves of *Cymbopogon citratus* D.C. Stapf. (Poaceae), black salt-10 g ground together with rice water to make a volume of 500 ml. The liquid is drenched to the infected animal.
2. *Apium graveolens* L. (Apiaceae) 15 g, *Carum carvi* L. (Apiaceae) 15 g, *Myristica fragrans* Houtt. (Myristicaceae) 5 g, dry ginger 30 g, *Piper nigrum* L. (Piperaceae) 25 to 30 pieces, and fried *Ferula assafoetida* L. (Apiaceae) 10 g are dry ground and mixed together. Half teaspoonful of this powder mixed with 200 ml pre-boiled and cooled

water to prepare the tonic. It is drenched to the animal once a day for 7 days. (Mishra, 2010)

3. *A. graveolens*, *C. carvi* and dry ginger in a ratio of 1:1:2 are dry ground to make a powder. 1 teaspoonful of this powder is mixed with 1 teaspoonful of jaggery to prepare a paste which is fed to the animal as such or rubbed with its tongue once a day for seven days. (Mishra, 2010)
4. Dry ginger 25 g and common salt 1/2 teaspoonful with a little water is ground to make a paste. It is fed to the animal once daily.
5. 2-3 fruits of *Citrus aurantifolia* L. (Rutaceae) are ground to paste and mixed with a bit of *P. nigrum* powder and black salt. This is administered orally as appetizer especially during fever.
6. Five to seven unseeded fruits of *Terminalia chebula* Retz. (Combretaceae) powdered and mixed with a little black salt and jaggery for oral administration as a paste to increase digestive power.
7. Whole plant extract of *Mormodica charantia* L. (Cucurbitaceae) is prepared in cold water and bottle-fed to the animal to increase its appetite.
8. *T. chebula*, *Terminalia bellerica* Roxb. (Combretaceae) and *Embelica officinalis* Gaertn. (Euphorbiaceae) in equal amount are pulverized. 15 to 20 g. of this powder with cold water is drenched to the cattle as an appetizer. Commonly this powder is called as 'Trifala'.
9. Seedless *T. belerica* 25 g is ground with a little of black salt and water, and fed to the ailing animals twice daily for seven days.
10. 8-10 plants of *Mentha spicata* L. (Lamiaceae) are crushed to extract juice. Juice is fed with salt in the mornings and evenings.

Ascariasis

1. Black salt, *C. carvi*, *Solanum nigrum* L. (Solanaceae) or *Embelia tsjeriam-cottam* (Roem. & Schult.) DC. (Myesinaceae) in equal proportions are ground together in water and administered orally twice daily.
2. *C. carvi* 15 g. is ground with water and administered orally for five to seven times daily yields a very good result.
3. Fresh young leaf juice of *Phoenix sylvestris* Roxb. (Arecaceae), *Ananas sativus* Schult. f. (Bromeliaceae) and *C. carvi* seed with black salt are ground together with water and drenched to the animal.
4. Cattle leaf supplements containing *Azadirachta indica* A. Juss. (Meliaceae) leaf powder is the best worm killer.
5. *Juglans cinerea* L. (Juglandaceae) extracts in water administered orally once daily for seven days eliminates worms in intestine.
6. The root of *Mucuna prurita* Hook. (Fabaceae) is administered orally with straw to kill and remove intestinal worms of cattle.
7. 20 g of adventitious roots of *Ficus benghalensis* L. (Moraceae) is crushed and mixed in 100 ml of water. Mixture is fed to the animal twice in a day treat worms. Animal is completely relieved in 2 days.

Coccidiosis

1. Freshly prepared rice with *A. indica A. Juss.* (neem) leaves mixed with a little of *P. nigrum* L. (black pepper) powder is fed to the animal.
2. Flowers of *Musa paradisiaca* L. are ground with water mixed with leaf extracts of *Feronia limonia* L. Sw. administered orally.
3. Young leaf extract of *Sesbania sesban* L. is given as drink to the young calf.
4. Young leaf extract of *M. charantia*, *C. citratus*, mixed with fresh *Curcuma longa* L. in equal proportions are administered orally as a liquid food gives best result.
5. *Brassica campestris* L. (mustard) seeds (100-150 g) are ground with a little water to make a paste and are

given daily once for one week to control intestinal parasites in cattle.

6. Leaves of *Chenopodium ambrosioides* L. are good to expel worms in calves.

Coli-Bacilosis / Septisemic Coli-Bacilosis

1. Dry ginger (Sonth) 50 g, *Cuminum cyminum* L. (cumin) seeds 25 g, salt as per requirement are ground together and mixed with luke warm water (about 100-150 ml.). It is given to the animal to drink or given with the help of a pipe or bottle twice or thrice as per the condition of the calf with an interval of 4 - 6 hours.
2. *C. ciratus* leaves 10-12 g ground with rice-water and salt are given to the infected calf thrice daily for 2 - 3 days.
3. 50 g *C. longa* (turmeric) powder 200 g jaggery, 100 g fresh soft *C. dactylon* are mixed together and given to the animal as feed. If the calf is unable to eat then the same may be ground in water and administered orally twice daily.
4. Rice water, salt, and *C. cyminum* L. (cumin) seeds 25 g are ground finely and given to the calf as syrup twice daily for 3-5 days.
5. Farmers use a powder crushed separately with few leaves of *Punica granatum* L. (pomegranate) 50 g, *Pennisetum americanum* (L.) Leeke (pearl millet) 50 g, fenugreek (*Trigonella foenum-graecum*) seeds 50 g, *Brassica campestris* L. (mustard) 25 g, ajmoda (*Trachyspermum ammi*) and 50g of black pepper (*Piper nigrum*). It is mixed together and soaked in one litre water for 12 hours. The water is boiled, filtered and stored in a clean glass bottle. This solution (100 ml) is given to the affected calf before it is allowed to suck. Within two days the calves excrete dead worms.

Constipation

1. 25 leaves of *C. citratus*, 100 g of ginger, *Zingiber officinale* Rosc. and 25 g of common salt are ground together with water to make a paste. This is added to water to make a volume of 250 ml. The mixture is drenched to the cattle twice daily for 3-4 days.
2. 20 leaves of *C. citratus* and one teaspoonful of black salt is ground together with 200 ml. water and given to the cattle twice daily.
3. Sonth 50 g, *T. chebula* 3-4 pieces and common salt are ground together with water and administered orally to the animal.
4. *T. chebula* 2-3 pieces, *C. carvi* 50 g, 10-15 dry leaves of *Cassia angustifolia* Vahl., 20g of black salt are ground together to powder. 10-15g of this powder mixed with 50 g old jaggery mixed together to make a bolus which is fed to the animal once daily for 4-5 days.
5. Root juice of *Ruta graveolens* L. is given to the animal once daily for 4 -5days.
6. Two teaspoonful of *Triphala* powder is given to the animal with warm water (300 - 500ml) once daily for 5 days.
7. *Solanum viarum* Dunal whole plant extract with a bit of black salt is given to the animal for relief.
8. 75 g rhizome of *Z. officinale*, a little amount of *Aloe vera* L., 400g of table salt, 200 g of molasses made from *Saccharum officinarum* L. is mixed with 100 ml warm water, thoroughly mixed and fed to cattle while still warm.
9. 400 ml coconut (*Cocos nucifera* L.) water is slightly warmed and given to cattle.
10. 250 g whole plant of *Boerhavia repens* L. is crushed thoroughly to extract juice and the juice fed with table salt at eight hour intervals.

Diarrhoea

1. One flower of *Musa paradisiaca* L. ground to paste with 10-15 black pepper (*P. nigrum* L.) is given to the animal once daily for 4-5 days.
2. One flower each of *M. paradisiaca* and *Feronia limonia* L. Sw. are ground together with

water and drenched to the animal once daily for 5 days.

3. One handful young leaves of *Sesbania sesban* L. is fed to the animal twice daily for 3 days.
4. Leaf extract of *M. charantia*, fresh *C. domestica*, *C. citratus* in equal proportions mixed with sonth (*Z. officinale*) powder is drenched to the animal twice daily for 5 days. In case of calves up to 2 years the dose is reduced to half.
5. Root bark of *Calotropis procera* R.Br. 20 g ground with 10 gms of *C. carvi* to make a paste. With freshly prepared rice this paste is fed to the animal twice daily for 5days.
6. Bark of *Strychnos asper* Lour. is boiled with water to prepare a tincture. One tablespoon of Sonth (*Z. officinale*) powder is mixed with one glass of the tincture and drenched to the animal twice daily.
7. Leaf extract of *Aegle marmelos* (L.) Corr., *F. limonia*, extract of *Z. officinale* Rosc., common salt and sonth powder mixed together and drenched twice or thrice daily for 3 days.
8. Pulp of 10 g of ripened *Tamarindus indica* L. is fed to the animal for 2-3 days.
9. 50 ml sap of *Psidium guajava* L. leaves is fed twice daily. (In case of goats this is much effective).
10. Roots of *Mimosa pudica* L., *Achyranthes aspera* L., *Cassia occidentalis* L., bark of *Yucca gloriosa* L. are to be mixed and grounded. 100 pieces of *P. nigrum* and 2 teaspoons of ghee are added to it. In case of calf 40 pieces of black pepper are to be added. The preparation is given 100g daily.
11. Leaf Juice of *Ananas comosus* (L.) Merr. is mixed with water and drenched 100ml. once daily for 2-3 days.
12. Neem (*A. indica A. Juss*.) leaves and bark of *Coriandrum sativum* L. are mixed and juice is extracted from the mixture and then 100ml of it is drenched everyday for 3-4days.
13. Six pieces of *Bombax insigne* L. seeds are pulverized and mixed with 250 ml of buttermilk, then filtrate of this is taken and mixed with goat faeces and to be fed 3-4 times.
14. Leaves of *Nymphaea nouchali* Burm. f. are mixed with soda and fed to the cattle 50 ml daily for 2-3 days. This is very effective in blood diarrhoea.
15. Sap of 250 ml *M. paradisiaca* leaves and 100 ml. sap of *Bambusa arundinacea* (Retz.) Willd. are mixed with 250 g of sugar and fed to the cattle for 2-3 days.
16. Bark and fruit of *T. bellerica* are pulverised and mixed with water and boiled. 50 ml of this preparation is drenched everyday for 4 - 5 days.
17. 50 ml. sap of leaves of *T. indica* and *Cassia fistula L.* are mixed with the powder of 30 pieces black pepper (*P. nigrum*) and administered orally once a day for 3-4 days.
18. 100 ml. extract of *Holarrhena antidysenterica* Wall. ex A. DC. leaves are to be fed to the cattle for 2-3 days.
19. 50 ml. juice obtained from the bark of *Shorea robusta* Gaertn.f. is drenched to the animal.
20. 50-60 ml of tincture of stem bark of *A. catechu* is given to the animal twice daily for 2-3 days.
21. Barks and leaves of *A. catechu* (L. f.) Willd. are crushed, boiled in water and the water fed to cows, buffaloes or goats every morning and evening.
22. *T. indica* L. leaves 25 g are mixed with 15 g of mustard (*Brassica campestris* L.) seeds and fed in the morning for 3 days. Alternately, leaves are boiled in water and fed to cattle.

Dysentery

1. 100-150 g of stems & leaves of *Hemidesmus indicus* are ground and juice is extracted and mixed with honey and is fed to the animal.
2. 3 pieces of black pepper (*P. nigrum*), 2 teaspoonful ghee and 50 g smashed *Glycyrrhiza glabra* are

mixed with 250 ml cold water and drenched to the cattle.

3. 100 ml sap extracted from *Centella asiatica*, *Coleus aromaticus* Benth. and *Cyanodon dactylon* are drenched to the cattle for 2 - 3 days.
4. 50 ml extract of *Tagetes erecta* shoot mixed with 50 ml extract of *Cyanodon dactylon* are drenched to the animal for 3 - 4 days.
5. 3 pieces of black pepper (*P. nigrum*) , 5 g *C. carvi* and 5 g of *Swertia angustifolia* are grounded and fed to the animal for 3 - 4 days.
6. 100 g bark of Bombax insigne is boiled in 500 ml of water and then drenched to the animal.
7. Latex of *Alstonia scholaris* is mixed with black pepper (*P. nigrum*) in the ratio of 3:2 and given to the animal.
8. Bark of *Butea monosperma* is boiled with 250 ml of water and filtered after cooling. The extract is drenched to the cattle.
9. 200 g leaves of *Andrographis paniculata* and 100 g leaves *Centella asiatica* are ground to paste and fed to the animal.
10. 100 ml extract of *Holarhena antidysenterica* leaves is drenched to the animal for 2-3 days.
11. Decoction of *Acacia arabica* root is mixed with mustard *Brassica campestris* L. oil in the ratio of 1:3 and to be drenched to the animal.
12. 8-10 plants of *Mentha spicata* L. (Lamiaceae) are crushed to extract juice. 25 ml of juice is fed with salt in the mornings and evenings.

DISCUSSION

Traditional knowledge of rural communities of Ganjam has high ethnoveterinary importance. They utilize numerous plants and their various parts viz., roots, leaves, stems, barks, flowers, fruits and rhizome etc for various ethnoveterinary practices. In the present study seven common digestive tract ailments of domestic cattle are discussed in detail with the common herbal folk-medicines. Plants used were described with their botanical names followed by the common methods of their preparations using different parts and ingredients, dose and methods of their administration.

A total of 66 ethno-medicinal plant species belonging to 40 families distributed in 61 genera have been recorded. The most dominant families in this study are Apiaceae (6), Poaceae (5), Caesalpiniaceae and Rutaceae (4 each), Fabaceae and Mimosaceae (3 each), Apocynaceae, Arecaceae, Combretaceae, Lamiaceae, Meliaceae, Solanaceae and Zingiberaceae (2 each) and the remaining families like Acanthaceae, Agavaceae, Amaranthaceae, Asclepiadaceae, Asteraceae, Bombacaceae, Brassicaceae, Bromeliaceae, Chenopodiaceae, Cucurbitaceae, Dipterocarpaceae, Euphorbiaceae, Gentianaceae, Juglandaceae, Leguminosae, Liliaceae, Moraceae, Musaceae, Myrsinaceae, Myristicaceae, Myrtaceae, Nyctaginaceae, Nymphaeaceae, Periploaceae, Piperaceae, Punicaceae, Strychnaceae were represented with one species each.

36 remedies use single plants and the rest 37 use more than one plant. Local population of the district use 22 preparations for diarrhoea followed by 12 for dysentery, 11 for constipation, 10 for Anorexia, 7 for Ascariasis, 6 for Coccidiosis and 5 for Coli-baciliosis

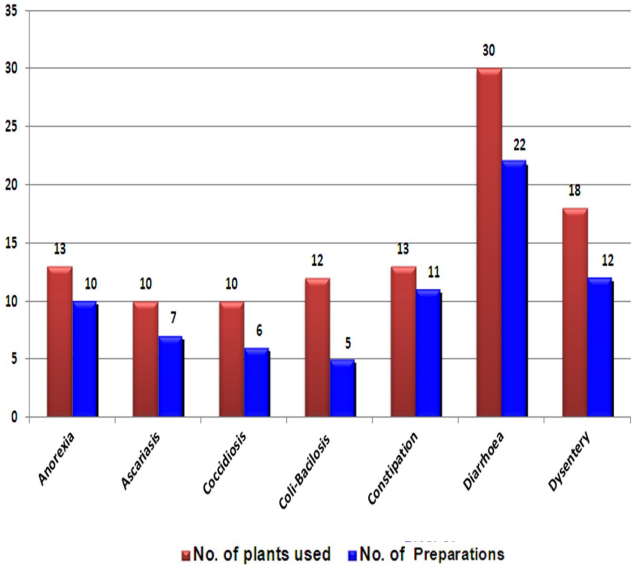

Figure 2. No. of plants and preparations used.

which are plotted in figure-2. All these remedies are prepared with ingredients like water, common salt, black salt, rice water, butter milk, jaggery, and ghee.

Similarly the methods of preparation of the above remedies fall into 9 categories such as solutions (23), paste (20), decoctions (7), solid (5), juice (3), bolus (1), powder (1) and tincture (1) as presented in figure-3 .

With regards to the prescriptions *C. carvi* is used in 7 preparations for 6 diseases while *P. nigrum* in 9 preparations for 5 diseases. In the top of the list of plants that are used in preparations and for different diseases are *Zingiber Officinale* Rosc. 8 and 4, *C citratus* 6 and 5, *Brassica campestris* L. var 4 and 4, respectively.

The THs and animal owners use different parts of plants. Among these, leaves are most frequently used (34) followed by seeds (28), whole plant (13), fruit and rhizome (10 each), bark and root (8 each), flower (4), latex and stem (2 each).(Figure-4)

During the course of study, the common experience gained regarding the ethno-veterinary practices in the district are that, the modern veterinary medicines (MVM) are beyond the reach of the natives due to their poor economic conditions. They frequently adopt EVM as the most appropriate method of treatment of many, if not all animal diseases. While for immediate relief MVM is the best choice, but both EVM and MVM can be used in an integrated way to get better results. The traditional knowledge of medicine (folk-medicines) needs to be properly documented and validated. To achieve this necessary awareness regarding their applications, effectiveness, farming, conservation are absolutely required at the first hand.

CONCLUSION

Traditional herbal medicines are in use by most of the communities worldwide mainly among people of the developing countries because they are cheaper, more sustainable, readily available, and reliable as they are in use traditionally, and frequent alternatives to modern veterinary medicines. The advantages of such medicines are many and they are found to be time tested, socio-economically related. Hence there is a growing need to sum them up for any type of scientific validation. (Varshneya, 2006)

Throughout the globe where traditional herbal treatment is in use it is found that the traditional healers have their own way of identification and classification of animal diseases as well as medicinal herbs, drug preparation, dose and administration. It has almost become the first choice of the THs and animal owners mostly due to their economic status and also easy accessibility of the herbs.

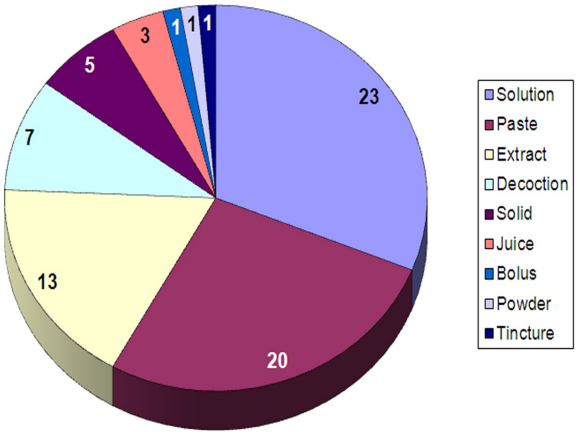

Figure 3. Categories of Preparations

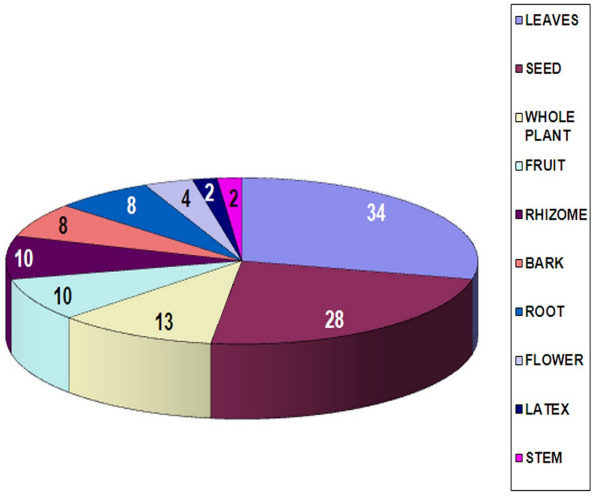

Figure 4. Plant part used

Local knowledge is at the local level and investments should be concentrated in improving a range of practices that are appropriate and sustainable. (Caleb A. Cudi, 2003) EVM is the first choice of the common people in the developing countries as MVM is beyond the reach of the rural folk. It plays an important role in the day to day life of a common man which has strong background of belief, religion, and ancestral time-tested medicinal system. Plant preparations by the THs and animal owners cost them much less than MVM and they can prepare their own crude herbal medicines which are safe and tested with the long trial and error based examinations. In this context Charaka can rightly be quoted here:

"Yogadapi visham tikshnamuttamam bheshajam bhavet,
Bheshajam chapi duryuktam tikshnam sampadhyte visham.
Tasmannabhishaja yuktam yuktibahyen bheshajam,
Dhimta kinchidadeyam jivitarogyakankshina."
(Charak Samhita, 1(1):127 & 128)

which says: "even venomous poison when administered properly can be used as medicines but when medicine is used improperly it becomes poison. Thus it is important for those who love life and good health not to take medicines from such vaidyas who are not up to the mark in their medical profession."

Taking the above points into consideration, there is no doubt that among the large numbers of herbal preparations used by the indigenous practitioners during the past several centuries, there are many that deserve the reputation they have proved to be effective. Such preparations need to be investigated with modern technologies for their successful implementation in the practice of good health.

Although the information gathered from the local traditional healers, in clinical terms, have tested the medicinal value of these plant species for ages, yet their confidence regarding the medicinal value of these plant species was not sufficient to validate their claims. Reports regarding the present ethnoveterinary preparations require sufficient biochemical and pharmacognosical validation to provide wide-spread application providing much cheaper alternative treatments to the economically poor farmers and animal keepers. (Mishra, 2011)

ACKNOWLEDGEMENTS

The author is thankful to the informants and traditional healers who shared their traditional knowledge on medicinal uses in the field and Prof. Bhaskar Padhy (Retd.), Berhampur University for his guidance.

REFERENCES

Caleb A. Cudi. 2003. Ethno-Veterinary, complementary and low cost treatment and management of working animals, TAWS Workshop, Sisoe Research Institute, UK. 1-10. http://www.taws.org.

Chandel, KPS, Shukla G and Neelam S. 1996. Biodiversity in medicinal and aromatic plants in India. Conservation and utilization. NBPGR, New Delhi. 1-239.

District Statistical Handbook Ganjam. 2007. Directorate of Economics and Statistics, Orissa, Bhubaneswar.

Ganesh KS, Sundaramoorthy P, Chidambaram AA, Baskaran L. 2007. Folklore Value of weeds grown in the wastelands of Vedharanyam and Kodiakarai, Nagapattinam District of Tamilnadu. *Ad. Plant Sci.,* 20 (2):551-553.

Mathius-Mundy E and McCorkle CM. 1989. Ethnoveterinary medicine: An annotated bibliography. Bibliographies in Technology and Social Change, No. 6. Technology and Social Change Program, Iowa State University, Ames, Iowa, USA. 199.

McCorkle CM and Green EC. 1998. Intersectoral health care delivery. *Agric. Hum.*, 15(2):105-114.

Mishra D. 2010. Ethno Veterinary practices among the rural people of Ganjam District (Orissa) India: A Case Study On some Common Veterinary Ailments, Webindia123). http://www.webindia123.com/health/article.asp?a_no=242&article=Ethno+Veterinary+practices+among+the+rural+people+of+Ganjam+District+(Orissa)+India3A+A+Case+Study+On+some+Common+Veterinary+Ailments

Mishra D. 2011. Identification of some ethnoveterinary practices for treatment of foot and mouth disease in Polasara block, Ganjam District, Odisha, India. Journal of research in Biology, 1(7): 543-549

Saxena HO and Brahmam M. 1994-1996. *The Flora of Orissa*. Orissa Forest Development Corporation Ltd., Bhubaneswar. 1-4.

Varshneya C. 2006. Ethno veterinary practices of India with particular reference to use of plant bio resources in animal health care. http://hillagric.ernet.in/edu/covas/vpharma/winter%20school/lectures/33%20Ethnoveterinary%20practices%20of%20India.pdf.

Vijai DK. Sankar Ganesh P, Sundaramoorthy. 2009. Ethnobotanical Survey Of Plants Used For Respiratory Diseases, Recent Research in Science and Technology 1 (1):023-025.