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## **Non-Experimental Validation of the Effectiveness of Ethno-Veterinary Botanical Medicine (EVB-M) Materials Used in the Municipality of EchagueIsabela**

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This research was conducted to determine the extent and perception of the effectiveness of the Ethno- Veterinary Botanical Medicine (EVB-M) material use of the Yogad people at EchagueIsabela and validate its efficacy in treating animal ailments. To determine the extent and people's perception of the effectiveness of the EVB-M materials, a formulated questionnaire was distributed to 399 (95% CI) purposively selected animal raiser respondents. Potential efficacy of the materials was then validated based on a non-experimental method of validation. Four levels of confidence were then established as minimal, low, mid and high level of efficacy. Out of the 26 EVB-M materials identified, guava (30.32%), banana (10.64%) and lima bean (6.13%) was found out to be the most widely used remedies for animal ailments in the municipality. Based on the peoples' perception, 20/26 (76.92%) of the plants identified were found out to be 100% effective as claimed by majority (149/310 or 48%) of the respondents. Non-experimental validation of the effectiveness of the different EVB-M materials resulted to a high degree of efficacy for almost all of the plant materials identified. Few materials with its specified treatment indications however, to include banana for vomiting, chili and black pepper for chicken pox, guyabano for vomiting, ipil-ipil for diarrhea, samania, and tangerine orange for skin disease and pomelo for skin disease and vomiting were identified to be under the minimal and low levels of efficacy signifying inactiveness of the plant materials in the said conditions. As a result, some of the claimed effective EVB-M materials are lacking information upon validation proving inactiveness of the plant materials yet, are continuously used by the people. Some materials have specific beneficial properties hence, could be adapted while others needs yet to be investigated further through experimental methods.

**Keywords:** Ethno-Veterinary Botanical Medicine (EVB-M), Effectiveness, Non-experimental Validation

### **Introduction**

Traditional healing practices or “ethno-veterinary medicine” have been applied for centuries and have been passed from one generation to another

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(Morilla *et al.*, 2014). Documentation and validation of ethno-vet practices worldwide started early 1980s when people realized the death of the beliefs and practices established by their ancestors. Recently, interest in ethno-vet practices has grown because these practices are much less prone to drug resistance and have fewer damaging side-effects on the environment than conventional medicine (Köhler-Rollefson and Bräunig, 1998). This account was supported by the World Health Organization (WHO 2010) as cited by Kadetz (2010), reporting at least 70-80% of people in developing countries dependence on these practices for the control and treatment of various diseases that affect both animals and humans.

As a scientific term for animal health care, ethno-veterinary's focus is on maintaining livestock keepers' knowledge and approaches to animal health care and production. It covers information on diseases and their control; remedies and clinical practices for treatment and prevention; management, feeding and breeding strategies; spiritual elements; and the human resources that hold the information and experience (Mathias, 2004). It is often undertaken as part of a community-based approach that can contribute to farm incomes, maintain the resilience of farm communities, promote self-reliance and contribute to a safe and good quality food supply; in addition to providing improved and affordable livestock health care. It can strengthen rural community capacity building, leadership and skills development. As such it can serve as a contributor to the economic survival for needy communities (Toyang, 2007).

The continuous search for an appropriate and effective practice for livestock development often directs project planners to get information on the local people's knowledge and experiences. Some maybe comparable to the new practices and can be adapted directly while others may still need to be investigated further or maybe combined with the new ones. Focusing on the municipality of Echague, Isabela this study could provide a brief overview of how far livestock development and health care services have made use of the E-VBM materials. Ethno-veterinary medicine is still not so well recognized hence, one of the objectives of the study is the way to promote, develop, utilize and preserve it to maintain its most effective form. If given priority, the study would provide a locally-based sustainable long-term solution to animal health problems in Echague, Isabela.

## **Materials and Methods**

To determine the extent and people's perception of the effectiveness of utilization of EVB- M materials in the municipality of Echague, 399 animal

raiser respondents were purposively drawn using the Slovincs formula (95% CI) from the original population of the household families (National Statistics Office Census of Population, 2010) and served as the representative samples for the study. A formulated structured questionnaire were distributed to the selected household/ family and served as the source of the initial information on the extent of EVB-M materials used. All available information about the ethno-veterinary practices of the livestock farmers and their EVM-B Medicine preferences for treating their animals were reviewed. Following identification of respondents' preferences, information on the utilization of EVM-B Med was also identified particular on species of animals treated, ailment, and indication of treatment, frequency of medication, parts and stage of plant, preparation of materials for medication and perception of the effectiveness. Potential efficacy of the materials was validated based on a non-experimental method of validation.

The non-experimental method (Lanz *et al.*, 2007) consisted of: (1) Obtaining an accurate botanical identification of the herbal remedies reported; (2) Searching the pharmaceutical/pharmacological literature for the plant's identified chemical constituents in order to determine the known physiological effects of either the crude plant drug, related species, or isolated chemical compounds that the plant is known to contain. The information was then used to assess whether the plant used is based on empirically verifiable principles; (3) Supporting ethnobotanical data and pharmacological information was matched with the recorded folk use of the plant species identified. To determine degrees of confidence about its effectiveness, four levels of confidence was established:

a. Minimal level: If no information supports the use it indicates that the plant may be inactive.

b. Low level: A plant (or closely related species of the same genus), which is used in distinct areas in the treatment of similar illnesses (humans or preferably animals), attains the lowest level of validity, if no further phytochemical or pharmacological information validates the popular use. Use in other areas increases the likelihood that the plant is efficacious.

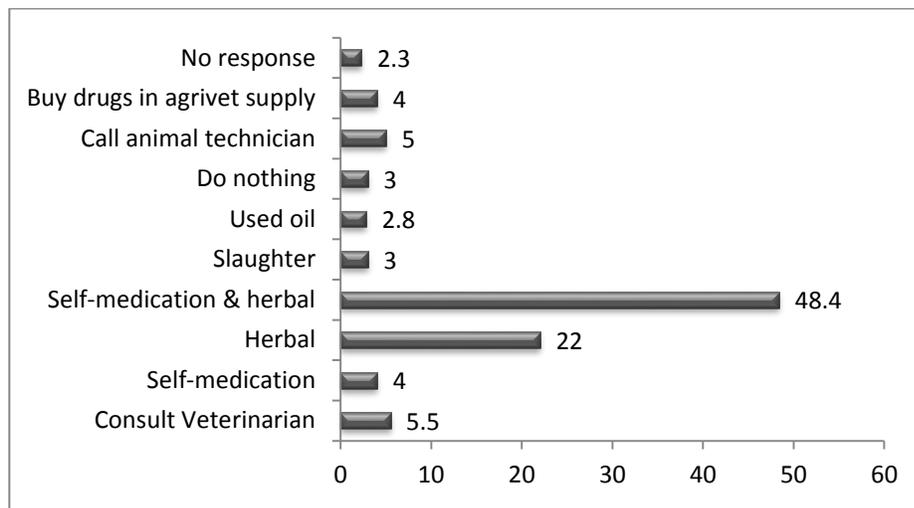
c. Mid level: If in addition to the ethno-botanical data, available phytochemical or pharmacological information is consistent with the use, this indicates a higher level of confidence that the plant may exert a physiological action on the patient.

d. High level: If both ethno-botanical and pharmacological data are consistent with the folk use of the plant, its use is classed in the highest level of validity and is considered efficacious.

All data gathered were collated and analyzed descriptively.

## Results and Discussion

Results revealed that out of the 399 purposively selected respondents, 236 (59%) are livestock raisers and 163 (40.8%) are companion animal raisers. Among the animals raised, only 133 out of 399 (22%) respondents are utilizing pure ethno-veterinary botanical medicine (EVB-M) for treating their animals while 193 (48.4%) used combinations of self-prescribed drugs and herbal materials (Figure 1).



**Figure 1.** Percentage distribution of respondents approach in managing ill animals

Of the 133 pure EVB-M material users and 193 combinations of self-medication and herbal, 310 responses were identified as some users claimed more than one plant materials for treating various animal ailments. Majority of the widely used EVB-M materials used in the municipality of Echague includes guava (94), followed by banana (33) and lima bean (19) (Figure 2.a). Fifteen of the other respondents utilized avocado and black pepper, tobacco, ipil-ipil, chili, kakawate, guayabano, oregano, lemon grass, bua, kutsai, star apple, anonas, andadasi, samania, kalamansi, lagundi, tangerine orange, neem, malunggay and kamias.



**Figure 2.a** Total number of EVB-M materials used by the respondents



**Figure 2.b.** Percentage distribution of respondents purpose for using the EVB-M materials

Accordingly, the said plant materials were used by the respondents due to the availability and abundance of the materials in the environment as attested by 40% of the respondents. Some have tried to use only the plant materials (22.3%), 17.1% used it due its observed effectiveness in humans, some just heard the use of the plant material (16.5%), others used it as cheap source of medication (10.3%), some used it based on the recommendation of their friends, relatives and other people (4.2%), some claimed it to be an economical means of treatment (4.2%), 3.5% said it is an old practice already adapted, 1.3

% used it due financial shortage and/ or lack of money to buy medicine and some used it due proven claims on the use of the plant material from profiled studies and 2.9% have no response (Figure 2.b). Such account was supported by Mathias (2013) that the accessibility, ease of preparation and administration, economic value, effectiveness and environmental friendliness of medicinal plants and by-products in EVM makes the practice advantageous over the conventional medicine especially in rural areas where veterinary services are inadequate and expensive and where people need to resort for indigenous animal health systems for emergency purposes. EVM could also serve as an option for livestock farmers who are not allowed to use allopathic drugs under certified organic programs or cannot afford to use allopathic drugs for minor health problems of livestock. EVM is now increasingly integrated into "participatory epidemiology" which seeks to improve epidemiological surveillance in remote areas and encourage community participation in disease control.

#### ***Indications of Treatment, Species of Animals Being Treated and Preparation Method***

The table below (Table 1) provides the general information on the commonly utilized plants in EVB-M treated animals, ailment, indication of treatment, parts and stage of plant and preparation of materials used for medication.

Results revealed that majority of the EVB-M materials used for treating skin diseases in dogs is with the use of Guava leaf extract/ poultice (23) followed by lima bean leaf extract/ poultice (19) and tobacco leaf extract/ poultice (13). On the other hand, guava leaf extract/ poultice (16) and boiled (15) still ranked the first EVB-M material used for treating skin disease in swine followed by Kakawate/ madre de cacao leaf extract/ poultice (10). Diarrhea cases were mostly treated by direct feeding of young leaf of banana as claimed by most of the swine raisers (22). Boiled guava leaf and avocado (8) could equally alleviate cases of vomiting in dogs. Eleven respondents also claimed application of ripe fruit of Chili (11) on treating cases of pox in chicken while black pepper of the same preparation as the chili could be used for pox in chicken and turkey. Cough or any signs of respiratory disease in pigs could be treated with direct feeding of oregano leaf as attested by 7 of the respondent users. Whereas, lagundi (4) boiled leaf could be used for dogs. Powderized fruit of bua mixed with feed (8) could be used for pigs suffering from helminth infestation followed by the use of ipil-ipil seeds. Some other recorded EVB-M materials identified for inflammatory cases in dogs is with the

use of kutsai leaf in poultice form as claimed by 7 of the respondents. Others include direct feeding of papait to treat cases of diabetes according to two (2) of the respondents. Few of the remaining EVB-M materials identified were used for different the above listed cases at different preparations and methods of application.

**Table 1.** E-VBM materials commonly used in the municipality of Echague and its treatment indications, animal species being treated and preparation method

<b>EVB-M Material</b>	<b>Animal</b>	<b>Plant Portion &amp; Method</b>	<b>Indications</b>	<b># of Users</b>	<b>%</b>
Guava	Dog	Leaf Extract/ Poultice	Skin disease	23	7.4
		Boiled leaf/ bathing	Skin disease	15	4.8
	Pig	Leaf extract/ Poultice	Skin disease	16	5.2
		Boiled leaf/ bathing	Skin disease	5	1.6
	Cat	Leaf extract/ poultice	Skin disease	7	2.3
	Pig	Young leaf/ direct feeding	Diarrhea	13	4.2
	Goat	Young leaf/ direct feeding	Diarrhea	7	2.3
	Dogs	Boiled leaf	Vomiting	8	2.6
				30.	
Total				94	4
Banana	Dogs	Young leaf/ poultice	Skin disease	5	1.6
	Pigs	Young leaf/ direct feeding	Diarrhea	22	7.1
	Dogs	Young leaf/ boiled	Vomiting	6	1.9
				10.	
Total				33	6
Lima Bean	Dogs	Young leaf/ poultice	Skin disease	19	6.1
Avocado	Dogs	Young leaf/ poultice	Skin disease	4	1.3
	Dogs	Boiled dried leaves	Diarrhea	3	1
	Dogs	Boiled dried leaf	Vomiting	8	2.6
Total				16	4.9
Tobacco	Dogs	Young leaf/poultice	Skin disease	13	4.2
Kakawate	Pig	Young leaf/ poultice	Skin disease	10	3.2
Oregano	Dogs	Leaf/ poultice	Skin disease	2	0.6
			Respiratory Disease	7	2.3
Total				9	2.9
Guyabano	Dogs	Leaf/ poultice	Skin disease	2	0.6
	Pigs	Leaf/ direct feeding	Diarrhea	3	1
		Leaf/ boiled dry leaf for drinking	Vomiting	4	1.3
				2.9	
Total				9	
Andadasi	Dogs	Leaf extract/ poultice	Skin disease	5	1.6
Samania	Dogs	Leaf extract/ poultice	Skin disease	4	1.3
Kalamansi	Dogs	Leaf/ boiled for bathing	Skin disease	4	

<b>EVB-M Material</b>	<b>Animal</b>	<b>Plant Portion &amp; Method</b>	<b>Indications</b>	<b># of Users</b>	<b>%</b>
Neem	Dogs	Leaf extract/ poultice	Skin disease	3	1
Tangerine or.	Dogs	Leaf/ boiled for bathing	Skin disease	3	1
Kamias	Dogs	Fruit extract/ topical	Skin disease	2	0.6
Pomelo	Dogs	Boiled leaf for bathing	Skin disease	2	0.6
	Dogs	Boild leaf for drinking	Vomiting	1	0.3
Total				3	0.9
Malunggay	Dogs	Leaf/ poultice	Skin disease	2	0.6
Lemon grass	Pigs	Leaf/ direct feeding	Diarrhea	9	2.9
Ipil-ipil	Pigs	Leaf/ direct feeding	Diarrhea	9	2.9
	Pig	Seeds	Anthelminthic	4	1.3
Total				13	4.2
Star Apple	Pigs	Leaves/ direct feeding	Diarrhea	7	2.3
Anonas	Pigs	Leaves/ direct feeding	Diarrhea	6	1.9
Chili	Chicke n	Ripe fruit/ poultice	Chicken Pox	11	3.5
Black pepper	Chicke n	Dried fruit/ poultice	Chicken Pox	10	3.2
	Turkey	Dried fruit/ poultice	Chicken Pox	5	1.6
Bua	Pigs	Fruit/ powderized mixed with feed	Anthelminthic	8	2.6
Kutsay	Dogs	Leaf/ poultice	Anti-inflammatory	7	2.3
Papait	Dogs	Leaf/ Direct feeding	Diabetes Respiratory	2	0.6
Lagundi	Dogs	Leaf/ boiled for drinking	Disease	4	1.3
<b>TOTAL</b>				<b>310</b>	<b>100</b>

Although few of the identified EVB-M materials were used by the people, the reported usage is a clear indication that the practice of using EVB-M materials in the municipality is still evident.

### ***Respondents Perception of the Effectiveness of the EVB-M Materials***

Table 2 below, presents the respondents' perception of the effectiveness of the E-VBM materials when used in various animal ailments. Regardless of the preparation and indications, results revealed that based on the respondents observation of treating animal ailments, 20 out of 26 plant materials had 100% effectiveness. While only 89.4%, 88.9%, 77.8%, 69.2%, 66.7% and 57.6 of the guava, lemon grass, Guyabano, ipil-ipil , malunggay, pomelo and banana users

respectively had proved the effectiveness of the said materials in treating other various animal ailments.

**Table 2.** Respondent's perception on the effectiveness of the plant materials commonly used based on observation

<b>EVB-M Material</b>	<b>No. of EVB-M Users</b>	<b>Perceived Effectiveness</b>	<b>Freq. (%)</b>
Guava	94	84	89.4
Lemon Grass	9	8	88.9
Guyabano	9	9	77.8
Pomelo	3	2	66.7
Ipil-ipil	13	9	69.2
Banana	33	19	57.6
20 other Identified EVB-M Materials	149	149	100
<b>TOTAL</b>	<b>310</b>	<b>280</b>	

Such variation in the effectiveness of the result could possibly be attributed to the type of ailment where the plant materials were utilized, species of animals and the part of plant being used. Table 3 below presents the respondents observed ineffectiveness due utilization of the same plant materials in other animals at different treatment indications and preparations. Such result clearly shows that the use of some plant materials may not possibly provide the same result from species to species with the utilization of the same material for the same disease conditions. One possible reason for such differences in the effectiveness of the plant materials could be attributed to the species physiological differences in responding to the different medications provided. Some may also be attributed to the lack of knowledge of the people using it as according to some of the respondents, some of the materials were only used due observed effectiveness in humans and other animals and some have tried the use of the materials through trial and error means.

As per observation of the respondents in the succeeding table (Table 3), few claimed ineffectiveness of some of the plant materials on specific conditions. One typical example in the result above is the ineffectiveness of guava leaf poultice in cats (4/7), banana leaf poultice (3/5) and guayabano leaf poultice (1/2) in dogs. Direct feeding of young guava leaf in pigs (1/13), goat (5/7) and young banana leaf in pigs (7/22) and lemon grass leaves in pigs (1/9) were also found to be ineffective for diarrhea cases. While few of the respondents claimed ineffectiveness in vomiting for dogs fed with boiled young banana leaf (4/6), dogs fed with boiled dry leaf of guyabano (1/4) and dogs fed with boiled leaf of pomelo (1/1).

**Table 3.** Respondents observed ineffectiveness of some EVB-M materials according to the type of animal, plant portion and method used and indication of treatment

<b>EVB-M Material</b>	<b>Animal</b>	<b>Plant portion &amp; Method</b>	<b>Indication</b>	<b>IE/ # of users per indication</b>	<b>Freq (%)</b>
Guava	Cat	Leaf poultice	Skin disease	4/7	57.14
	Pig	Direct feeding of young leaf	Diarrhea	1/13	7.69
	Goat	Direct feeding of young leaf	Diarrhea	5/7	71.43
Lemon Grass	Pig	Direct feeding of leaf	Diarrhea	1/9	11.1
Guyabano	Dogs	Leaf poultice	Skin disease	½	50
	Dogs	Boiled dried leaf	Vomiting	¼	25
Ipil-ipil	Pigs	Direct feeding of leaf	Diarrhea	4/9	44.4
Pomelo	Dogs	Boiled young leaf	Vomiting	1/1	100
Banana	Dogs	Leaf poultice	Skin disease	3/5	60
	Pig	Direct feeding of young leaf	Diarrhea	7/22	31.8
	Dogs	Boiled young leaf	Vomiting	4/6	66.7

Note: IE- Ineffective

### ***Non-experimental Validation of Ethno-Veterinary Botanical Medicine Efficacy***

As reflected in Table 4 below, non-experimental validation of the effectiveness of the different Ethno-Veterinary Botanical materials resulted to high degree of efficacy for almost all of the plant materials identified except for few plant materials used at different disease conditions.

Some of the plant materials identified were ineffective and minimal level of efficacy. Banana for vomiting, Chili and black pepper for chicken pox, Guyabano for vomiting, ipil-ipil for diarrhea, Samania for skin disease, Tangerine orange for skin disease, pomelo for skin disease and vomiting were identified to be under such category signifying inactiveness of the plant materials in the said conditions.

Although inactive, the continuous use of the above plant materials on specified disease conditions may be detrimental to the health of animals being treated due possible unidentified cumulative effect. Banana for instance which ranked second for alleviating vomiting in the municipality as attested by majority of the respondents was found out to be inactive for the said condition upon validation hence, is requiring further analysis.

**Table 4.** Non-experimental validation of the EVB-M materials identified in the municipality of Echague

Plant Material	Condition	Degrees of confidence	Effectiveness
Guava	Skin disease	High level	Efficacious
	Diarrhea	High level	Efficacious
	Vomiting	High level	Efficacious
Banana	Diarrhea	High level	Efficacious
	Skin disease	Low level	Low efficacy
	Vomiting	Minimal level	Inactive
Lima Bean	Skin disease	High level	Efficacious
Avocado	Diarrhea	High level	Efficacious
	Skin disease	High level	Efficacious
	Vomiting	High level	Efficacious
Tobacco	Skin disease	High level	Efficacious
Chili	Chicken pox	Minimal Level	Inactive
Kakawate	Skin disease	High level	Efficacious
Black pepper	Chicken pox	Minimal Level	Inactive
Oregano	Cough/ colds	High level	Efficacious
	Skin disease	High level	Efficacious
Guyabano	Diarrhea	Low Level	Low Efficacy
	Skin disease	High level	Efficacious
	Vomiting	Minimal Level	Inactive
Lemon Grass	Diarrhea	Low level	Low efficacy
Ipil-ipil	Diarrhea	Minimal level	Inactive
	Anti-heminthic	High level	Efficacious
Bua	Anti-helminthic	High level	Efficacious
Kutsai	Anti-inflammatory	High level	Efficacious
Caimito	Diarrhea	High level	Efficacious
Anonas	Diarrhea	High level	Efficacious
Andadasi	Skin disease	High level	Efficacious
Samania	Skin disease	Minimal level	Inactive
Lagundi	Cough/ colds	High level	Efficacious
Kalamansi	Skin disease	High level	Efficacious
Neem	Skin disease	High level	Efficacious
Tangerine Or.	Skin disease	Minimal Level	Inactive
Kamias	Skin disease	High level	Efficacious
Pomelo	Skin disease	Minimal Level	Inactive
	Vomiting	Minimal level	Inactive
Papait	Diabetes	Mid- Level	Plant may exert physiological action
Malunggay	Skin disease	High Level	Efficacious

Other plants identified with low level of efficacy upon validation includes banana for skin disease, Guyabano for diarrhea, lemon grass for diarrhea. Such indicates that the plants were continuously used by the people without proven validity on the effectiveness of the said plant materials on the specified conditions. Finally, papait was found out to be at mid- level of

efficacy which may possibly indicate that the plant may exert physiological action when taken as medicinal material for diabetes meaning the use of the plant material as anti-diabetic agent is still not yet fully established and is yet to be investigated further.

### **Conclusion and Recommendation**

Based from the findings of the study, the following conclusions were drawn: (1)The unrestricted use of some of the EVB-M materials recorded in the municipality clearly indicates that the use of the materials for treating animal ailments is obviously practiced in the area; (2) EVB-M practitioners perform a trial and error basis of medication without considering its possible adverse effect; (3) Non-experimental validation of some of the EVB-M materials claimed to be effective by the people of Echague are lacking information on the effectiveness proving inactiveness of the plant materials yet, are continuously used by the people of Echague (4) Some of the E-VBM materials commonly used by the people may be effective only for certain disease conditions, species of animals being treated and the preparation method.

As per findings of the study and from the conclusions made, the following are recommended; (1) Some of the plants may have specific beneficial properties hence, could be adapted or use in the absence of standard veterinary drugs while some plant materials needs yet to be investigated further; (2) Usage of some plants is recommendable only on specific disease conditions, species of animal being treated and the plant portion to be utilized and (3) To strengthen conclusive results of this study, it is suggested that further experimental studies should be conducted for enriching the peoples claim of the use of the plant materials for certain disease condition.

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## References

- Kadetz, P. (2010). World Health Organization-Western Pacific Region Office, 2010. Technical Report for the Western Pacific Region of the World Health Organization on the State of Traditional, Complementary, and Alternative Medicine in the Philippines.
- Kohler-Rollefson, I. and Rathore, H.S. (1998). Raikas of Rajasthan. LEISA:ILEIA Newsletter 13(2):36.
- Lans, C., Turner, N., Khan, T., Brauer, G. and Boepple, W. (2007). Ethnoveterinary medicines used for ruminants in British Columbia, Canada. In: Journal of Ethnobiology and Ethnomedicine 2007, 3:11 doi:10.1186/1746-4269-11. <http://www.ethnobiomed.com/content/3/1/11>;©2007 Lans et al; licensee BioMed Central Ltd. or (<http://creativecommons.org/licenses/by/2.0>)
- Mathias, E. (2013). Recognizing ethnoveterinary medicine and community rights an Investment in our future. SIVtro VSF Italia: Ethnoveterinary medicine: Tradition, science, cultural richness, Bologna, 29 October 2010.
- Mathias, E. (2004). Ethnoveterinary medicine: harnessing its potential. Veterinary Bulletin, 2004, 74, 8, 27N ([ethnovet ref/Ethnoveterinary medicine harnessing its potential.htm](http://ethnovetref.com/Ethnoveterinary%20medicine%20harnessing%20its%20potential.htm))
- Morilla, L.J.G., Sumaya, N.H.N., Rivero, H.I., and Madamba, R.S.B. (2014). Medicinal Plants of the Subanans in Dumingag, Zamboaga Del Sur, Philippines. International Conference on Food, Biological and Medical Sciences.
- Phondani, P.C., Maikhuri, R.K., and Kala, C.P., (2010). Ethnoveterinary Uses of Medicinal Plants Among Traditional Herbal Healers in Alaknanda Catchment of Uttarakhand, India. African Journal of Traditional, Complementary and Alternative Medicines; vol. 7(3), pp195-206
- Toyang, N.J., Wanyama, J. and Django, M.N. (2007). Agrodok 44: Ethnoveterinary medicine a practical approach to the treatment of cattle diseases in sub-Saharan Africa, 2<sup>nd</sup> Edition, Copyright Agromisa Foundation and CTA, Wageningen.