

## Review

# The efficacy of *Elephantorrhiza elephantina* in the ethno-veterinary medicine for gastrointestinal parasites on goats: A review

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The main objective of this review was to find out how much has been done to validate the efficacy of *Elephantorrhiza elephantina* in the ethno-veterinary medicine for gastrointestinal parasites on goats. Gastrointestinal parasites reduce goat's production and most of the communal farmers cannot afford buying the commercial drugs to reduce worm burden on goats. This result the communal farmer to use ethno-veterinary remedies like *E. elephantina* to control gastrointestinal parasites that reduce goats' productivity, but *E. elephantina* effectiveness is not well known by farmers for gastrointestinal parasites. The hypothesis of this review was that the use *E. elephantina* in the ethno-veterinary medicine is not effective for gastrointestinal parasites on goats. This review assists to maintain the local knowledge of *E. elephantina* on controlling gastrointestinal parasites on goats.

**Keywords:** Ethno-veterinary medicine, goats, gastrointestinal parasites, *Elephantorrhiza elephantina*

## INTRODUCTION

There are medicinal plants used for controlling gastrointestinal parasites, among these is *Elephantorrhiza elephantina*, which is known as intololwane in Xhosa and Zulu (Maphosa et al., 2010a; Dold and Cocks, 2001). It is one of the medicinal plants that frequently used by resource-limited farmers in the Eastern Cape Province of South Africa to control gastrointestinal worms in goats (Maphosa et al., 2010b). Some medicinal plant have been tested for their anthelmintic property, for instance the bark of the tropical leguminous tree, *Albizia anthelmintica*, has been found to have anthelmintic properties against various nematodes (Ninja, 2004). *E. elephantina* was also tested *in vitro* and results showed that it has the potential to reduce and control the gastrointestinal worms (Dold and Cocks, 2001). However, the results *in vitro* do not

automatically translate to results *in vivo* due to other biological and physiological factors in the body of an animal. Gastrointestinal parasites on goats are commonly controlled using commercial drugs, which are very expensive and unaffordable to the resource-limited farmers. However, the main objective of this review was to find out how much has been done to validate the efficacy of *E. elephantina* in the ethno-veterinary medicine (EVM) for gastrointestinal parasites on goats.

## Goats of Communal Farms

### General

Goat numbers have also increased much quicker than other red meat species in the past three decades (Max,

2010). These goats are reared under poor management conditions resulting in low productivity (Masika and Mafu, 2004). Goats play a major role in many communal areas, prerequisite of meat, manure, milk, mohair and cash from sales of the goats and their by-products (Thornton et al., 2002). The productivity of these goats is, however, impaired by parasites infection among other constraints, resource-limited farmers report that the major constraints to goats production in South Africa is predation and gastrointestinal parasites (Mathias, 2007), However, the resource-limited farmers try numerous practices to reduce the gastrointestinal parasites on goats but fail to eliminate them.

The resource-limited farmers use many medicinal plants according to their trust, however, the efficacy of these medicinal plants have not been evaluated. According to Masika et al. (2000), the knowledge of EVM use is oral transmitted from generation to generation. In some cases, however, the resource-limited farmers use management practices, commercial drugs or use of Ethno-veterinary medicine for controlling gastrointestinal parasites.

### **Importance of goats**

Goat commonly known as poor man's cow is widely distributed and clearly connected with poor people (AbouZeid et al., 2010), they make a large contribution to food security and income of many resource-poor families in most developing countries (Max, 2010). However, goats play a vital role in food production systems in developing countries and they are especially important in developing countries and in the year of 2000, 96% of the world's goat population of 496 million goats was to be found in developing countries and goats make up 20% of the ruminants which are kept as livestock (Max, 2010). Goats are the foremost small ruminants in Zimbabwe (Ranvig and Hansen, 2000). However, according to Sebata and Ndlovu (2010), goats' production in Zimbabwe is the major source of income and they contribute directly and indirectly to food security, education and social welfare.

Farmers in Zimbabwe concur that goats are a viable vehicle for rural development, since they are small and have low land requirements (Hargreaves et al., 2004). In South Africa, goats play an important role in human nutrition, food security, and household income, social and educational functions (Ayalew et al., 2003). They also provide useful products like milk, meat and skins as well as manure for crop and fish production (Ranvig and Hansen, 2000). In communal areas goat farming mainly takes place on a survival level where a number of

families produce milk and meat from their backyards, mostly for ceremonial purposes (Ayalew et al., 2003). Indigenous goats are the most dominating genotypes in Eastern Cape and the Province is good for goat production because of its thorn-bush vegetation and they reproduce better (Moyo, et al., 2000). However, the goat's number decreases slowly since the gastrointestinal parasites increase the mortality rate and even reduce the productivity of goats.

### **General life cycle of gastrointestinal worm parasites**

Although there are many gastrointestinal parasites found in goats (Gadahi et al., 2008) only the main and usually the most common gastrointestinal parasites will be discussed. However, before control measures can be considered, it is important to understand some aspects of the lifecycle of the gastrointestinal parasites. The lifecycle consists of a part of their life being spent inside the goat and part of their life on the pasture (figure 1 below) (Silvestre et al., 2000).

Gastrointestinal parasites mate in the host lay eggs that pass out in the feces (Gadahi et al., 2008), then the eggs hatch and develop to infective larvae while remaining in the feces, the infective larvae then move out of the feces onto the surrounding forage where they are consumed during grazing thus completing the cycle (Waller, 2006).

The time from ingestion of infective larvae to egg laying adults is about three weeks and the time for development from egg to infective larvae can be as short as seven to ten days (Silvestre et al., 2002), therefore, transmission and continual pasture contamination can be quite rapid (Silvestre et al., 2000). However, during the colder months, however, larval development on pasture is delayed and may take up to a month to reach the infective larvae stage (Vallade et al., 2000). The infective larvae have a protective sheath making them relatively resistant to adverse environmental conditions and can survive for months, thus extending transmission potential (Ngwaze et al., 2009). However, transmission of parasites can be reduced by implementing control measures to eliminate the gastrointestinal from the goats.

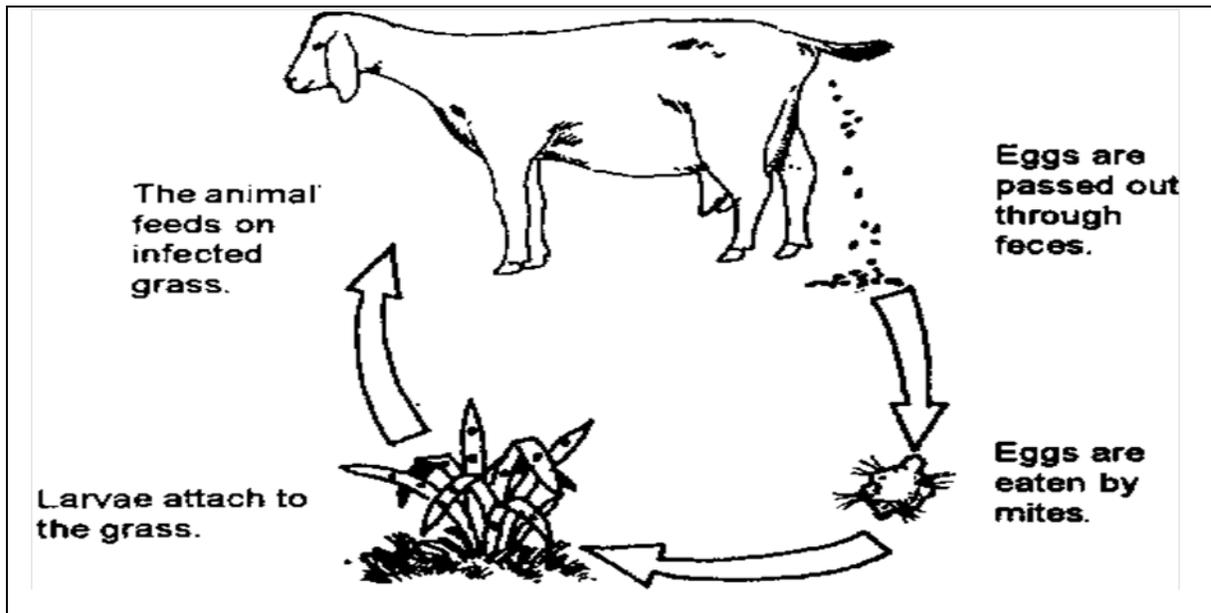


Figure 1: General life cycle of gastrointestinal worm parasites.

### Common gastro-intestinal parasites affecting goats in South Africa

The frequency and the type of parasites that are affecting goats usually vary by regions (Fikru et al., 2006) because of different factors that are available for a specific environment (Krecek and Waller, 2006). However, in most cases parasites that are common to goat herds are influenced by the factors such as climate, season, and also rainfall (Ngwaze et al., 2009). Five parasites, barber pole worm, coccidia, tapeworm, intestinal threadworm and intestinal thread neck worm are the common parasites that have been observed in fecal samples taken from goats (Athanasiadou et al., 2001). These internal worms may seriously damage the digestive track, thus affecting the health of goats ((Krecek and Waller, 2006); they also reduce the weight of animals, less meat and fiber production (Ngwaze et al., 2009).

Gastrointestinal parasite also lowers vitality of breeding animals and cause considerable rises in cost of production (Fikru et al., 2006). Many gastrointestinal parasites that commonly affect goats fall into four categories: nematodes (roundworms), cestodes (tapeworms), trematodes (flukes), and protozoa (coccidia). The parasites that cause the most problems on a farm or to an animal depending upon the geographic location of the farm, weather conditions, and season. However, this study focused on the nematodes or roundworms such as *Haemonchus contortus*,

*Trichostrongylus* and *strongyloides*, focused on cestodes and protozoa such as *coccidia*.

### Control of gastro-intestinal parasites of goats in communal areas of South Africa

In communal areas, little is done to control gastrointestinal parasites on livestock (Masika and Mafu, 2008). The communal areas are characterized by ownership of small erodible land size and farmers have open access to natural resources such as rangelands (Moyo et al., 2008), however communal farmers share common resources because land residence is not distinct (Ngwaze et al., 2009). In some cases, the resource-limited farmers use management practices, commercial drugs or ethno-veterinary for controlling gastrointestinal parasites.

### Management practices in South Africa

These are the methods that are found to be the most effective and practical in achieving an objective or preventing and control gastrointestinal parasites in goats (Waller, 2006). However, practices assist in broking the life cycle of parasites thereby preventing the goats from coming in contact with the intermediate host and reducing contact with sources of contamination (Molento, 2009). The practice include proper sanitation,

such as removal of dead goat from the kraal or keeping goats separate from other small ruminants like sheep (Krecek and Waller, 2006), providing goats with housing that is cleaned and disinfected regularly, separating young from older goats as older goats can serve as reservoirs of infection for younger goats (Waller, 2006) and provide the goats with a clean and safe pastures (Molento, 2009). Nonetheless, some of these management practices are impractical to most resource-limited farmers and most goats end up being infected. Thus, some resource-limited farmers tend to control the parasites through the use of commercial drugs and ethno-veterinary medicine.

#### ***The use of commercial drugs in South Africa***

Many diverse commercial products are available to remove gastrointestinal parasites from small ruminants (Papadopoulos et al., 2007); however, these drugs are produced in several different physical forms and sold in various brand names (Githiori et al., 2003). There are three families of anthelmintic drugs which are used to treat internal parasites in livestock: Benzimidazoles - Fenbendazole, Albendazole, Oxybendazole, Thiabendazole; Nicotinics - Levamisole, Pyrantel, Mora and Macrolytic Lactones - Ivermectin, Doramectin, Moxidectin. However, when first introduced, these drugs affordable and effective (Kaplan, 2004) and these drugs are associated with a number of limitations that include residual effects in goat meat and goat products and excessive use of the drugs by the farmers who in most cases are not cautious to label directions and withdrawal times (Githiori et al., 2003).

The Benzimidazoles also called white dewormers are broad spectrum and safe to use, however, they are effective against tapeworms. Albendazole is effective against adult liver flukes, but should not be used in pregnant or lactating females. Levamisole also called a clear de-wormer is broad spectrum and effective against arrested larvae. However, it has a narrower margin of safety, especially in the injectable form. Pyrantel is only effective against adult worms; Moratel is an oral feed additive and is only effective against adult worms. The Macrolytic lactones are the newest family of drugs; they are broad spectrum and have a wide margin of safety. They are also effective against external parasites, including nose bots. Moxidectin is a persistent-activity de-wormer that continues to kill worms after it is administered. Since the commercial drugs are costly, resource-limited farmers have no choice, or no option left, save to use the readily available, accessible and

affordable alternative such as Ethno-veterinary medicine.

#### ***The use of *E. elephantina* in the ethno-veterinary medicine***

Ethno-veterinary medicine (EVM) is the use of medicinal plants, surgical techniques and traditional management practices to prevent (Nguyen et al., 2005) and treat spectrum of livestock diseases. EVM is of specific value in developing countries where commercial drugs are often beyond the reach of livestock products (Iqbal et al., 2005). The practice covers people's knowledge, skills, methods and beliefs about care of livestock (Mwale and Masika, 2009). However, use of medicinal plants is becoming the mainstream in developing countries where most resources-limited farmers are found (Iqbal et al., 2005) and artificial drugs are increasingly becoming unavailable and expensive, and veterinary services scarcely available (Dold and Cocks, 2001).

The information on use of medicinal plants is rarely written down (Masika et al., 2000); yet it is indispensable information. According to Masika et al. (2000) and Dold and Cocks (2001), numerous medicinal plants are used by small-scale farmers to treat diseases and parasites of livestock. This is because among other factors, South Africa is endowed with invaluable medicinal plant resource that is cheaply and easily accessible to the resource-limited farmers (McGaw et al., 2007 and Chulayo et al., 2011). Considering that commercial drugs used to control gastrointestinal parasites in goats are expensive, unavailable in some developing countries and lack of knowledge on the use of commercial drugs, resource-limited farmers are widely using medicinal plants exclusively.

One medicinal plant which is called *E. elephantina* which is known as intololwane in Xhosa and Zulu (Maphosa et al., 2010a and Dold and Cocks, 2001) is frequently used by resource-limited farmers to treat and control gastrointestinal parasites in goats (Maphosa et al., 2010b). However, *E. elephantina* has long been used in control of helminthes in livestock in South Africa (Naidoo, 2006). Therefore, it is important to evaluate its effectiveness and establish the correct dosage that resource-limited farmers should use. Little has been done on the efficacy of *E. elephantina* used in controlling helminthes in livestock in South Africa, however, a survey conducted by Maphosa et al. (2010a) revealed that toxicity of *E. elephantina* in livestock is possible due to low doses in the treatments which are tested 25mg per ml and concluded that a single dose of 1600mg per

kg body weight of *E. elephantina* does not cause toxic effect so the correct dose levels of *E. elephantina* can be 1600mg per kg body weight and according to Maphosa et al. (2010b), reported that in-vitro anthelmintic activity of crude aqueous extract of *E. elephantina* against *Haemonchus contortus* and concluded that *E. elephantina* is one of the plants used by resource-limited farmers in Eastern Cape Province to control gastrointestinal parasites in goats.

*E. elephantina* rhizomes extracts were effective at the 100mg per ml ( Naidoo et al., 2005) and according to Naidoo, (2005), reported that out of four traditional plants that are used by communal farmers as ethno-veterinary medicine for antimicrobial, antiprotozoal and anti-oxidant activity an *E. elephantina* showed the antimicrobial, antiprotozoal and anti-oxidant activity without providing any quantitative data and has been stated that this plant has a tannin content which help to remove gastrointestinal parasites on goats.

## CONCLUSION AND RECOMMENDATIONS

*E. elephantina* in the ethno-veterinary medicine has a significant influence in controlling and treating of gastrointestinal parasites. Therefore, a use of ethno-veterinary medicine on the communal farmers can be ideal due to the fact that they have limited resources and require no sophisticated preparation. There are some reports on the efficacy of *E. elephantina*, this therefore give credence to its use by resource limited farmers. It is therefore recommended that communal farmers be given more support on the use of this plant due to their limited resources and inability to buy veterinary medicine to control gastro-internal parasites in order to improve their production.

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