EFFECT OF *Parkia biglobosa* (DAWADAWA) POD EXTRACTS ON STRONGYLE OVA IN SHEEP

NAANDAM, Jakper and IDDRISU, R
Department of Animal Science, University for Development Studies, Tamale, Ghana.

Corresponding Author: Naandam, J. Department of Animal Science, University for Development Studies, Tamale, Ghana. **Email:** jaknaan@yahoo.com **Phone:** +233(0)205162657

ABSTRACT

A preliminary study was conducted to evaluate the efficacy of two forms of dawadawa pods extracts against strongyle worm ova loads in sheep from November, 2008 to January, 2009 at the Animal Science Farm, University for Development Studies. Twenty Djanlloke sheep were used for the study. A completely randomized design was employed. Three levels of dawadawa pods extracts; boiled pod extracts (T1), pounded and soaked pod extracts (T2) and control (T3) were used as treatments. Strongyle ova levels were monitored monthly after treatment. Ova counts of Strongyle tended to decrease in the sheep through out the study period. There was significant difference (P<0.05) in mean monthly ova counts of Strongyle between November and December for T2 but not for T1 or the control. No significant differences (P>0.05) were recorded between or within treatments for the months of December and January.

Keywords: *Parkia biglobosa,* Dawadawa pods extracts, Djanlloke sheep, Strongyle ova loads

INTRODUCTION

Livestock production is a source of employment and livelihood in Ghanaian agriculture (FAO, 1996). However the menace of ill-health is a threat to animal production and development in rural and peri-urban communities (Martin, 1996). Germs and worms and other low forms of life pick close to a billion dollars a year from the pockets of livestock producers, often so expertly that the producer does not even realize his loss (Gove, 2004). Cole (1986) reported that worms cost the Australian sheep industry $369M/yr which could increase to $700M by 2010. The case of sub-Saharan Africa including Ghana is no exception.

Control of gastrointestinal nematode infections has traditionally been done using antihelmintics (chemotherapy) with the best results being obtained when this approach is integrated with grazing management and resistant animals. However, in the last 2 – 3 decades, there has been over-dependency and even misuse of the chemotherapeutic approach with consequent evolution of resistance to antihelmintics (Ngomuo *et al*., 1990; Prichard, 1994). Apart from resistances to antihelmintic, poor availability and affordability of antihelmintics by resource-poor farmers in developing countries have compounded the problem (Hammond *et al*., 1997; Schoenian, 2005). Additionally, there is growing concern over drug residues in the food chain and the environment. Search for novel antihelmintics that are both more sustainable and environmentally friendly is undoubtedly a sensible approach to the control of parasitic infections in animals. One such alternative could be harnessing of the available ethnoveterinary knowledge (Hammond *et al.,* 1997).

Ethnoveterinary medicines are available for the treatment of internal parasites but are often neglected in favour of conventional dewormers. Plants such as *Parkia* which grow naturally in West Africa are one of the most important economic trees in the northern part of Ghana and have been reported to be growing in 18 sub-Saharan African countries including

Ghana and Nigeria (Abbiw, 1990). *Parkia biglobosa* plays numerous roles in the treatment of many diseases (Campbell-Platt, 1980; Abbiw, 1990). Extracts from this plant are used in treating diseases such as diarrhoea, bronchitis and pneumonia (Campbell-Platt, 1980; Sina and Traoré, 2002). Additionally, Naandam and Turkson (2003) noted that small ruminant farmers in East Mamprusi District of Ghana alluded to its use as a dewormer but its efficacy needed further investigation. This research seeks to introduce new ethnoveterinary alternative means of dealing with helminth infestation in sheep that is locally available at reduce cost by ascertaining the efficacy of two preparations of *Parkia biglobosa* (*Dawadawa*) pods extracts as potential candidates for deworming sheep. The specific objectives were: to determine the effect of different forms of *Parkia biglobosa* pods extracts on strongyle ova count and examine the effect of different preparation methods of *Parkia biglobosa* pods extracts on strongyle ova worm load in sheep.

MATERIALS AND METHODS

Study Location: The study was undertaken on the livestock production farm of the Animal Science Department of the University for Development Studies at Nyankpala in the Tolon Kunbungu District of Ghana. It started from November 2008 to January 2009. The study area lies within the Guinea Savanna Zone, characterized by large areas of low grass land interspersed with trees. The area has a single pattern of rainfall which starts from May and ends in October. Nyankpala lies on altitude 183m, latitude 09°25″N and longitude 00°58″W, with a mean annual rainfall of 1043.60mm and temperature of 28.30°C. Mean annual day time relative humidity is 54%.

Parkia biglobosa: The seed pods collected for the study were identified *as Parkia biglobosa* seed pods (McAllan *et al.,* 1996; Hall *et al.,* 1996) using the following morphological characteristics. *Parkia biglobosa* is a long lived deciduous tree growing up to 20 m tall (Figure 1), although it can grow taller in good soils (McAllan *et al*., 1996). The bark is greyish to brownish in colour. The trunk is thick and rough deeply tissued longitudinally. Between these tissues are often small regular scales that may be shaded (Hall *et al.,* 1996).

Figure 1: Picture of the *Parkia biglobosa* commonly called *Dawadawa* tree in Ghana (Source: FAO, 1996).

The leaves alternate bipinnately compound with dark green colouration. *Parkia* has very distinct flowers which appear as balls with red and pink colouration (Figure 2). The reproductive axis is woody and leafless, bearing up to four pedunculate inflorescence in an alternate arrangement. The fruits are brown pods which are produced in bunches (McAllan *et al.,* 1996).

Figure 2: Picture of the *Parkia biglobosa* floret (Source: FAO, 1996)

Sheep Management: Twelve (12) West African Dwarf (WAD) sheep were selected from the University farm for the study. Animals were randomly selected for both sexes (6 males and 6 females), with an average weight of 18.7kg. The animals were identified by their tag numbers and also a small red rope was attached to their necks for clear identification of experimental animals.

The main system of production was semi-intensive where the animals were housed in pens. The flocks were released during the day

into the pasture to graze. The sheep were watered and provided with supplementary feed comprising of cassava peels. A completely randomized design was used with four animals per treatment (T1 – T3).

Parkia biglobosa Pod Extracts Preparation

Boiled extract: 2 kg of matured pods of *Parkia biglobosa (Dawadawa)* was collected from farmers in Nyankpala. 1 kg of pods was put in a metal pot and boiled for 1 hour with 1.5 litres of water. The solution was allowed to cool and filtered using Whatman filter paper number 1. The solution was poured into a clean plastics container for cool storage in refrigerator at -4^{o}C pending used. The extra 0.5 litre was meet, in part as evaporative loses during boiling.

Pounded and soaked extract: 1 kg of pods were pounded in a clean mortar and soaked in a litre of water overnight. The solution was filtered and stored as in the boiled extract.

Extracts Administration: Treatment one (T1) animals were given 4 ml of boiled pod extract per 10 kg body weight of sheep, while treatment two (T2) animals were given 4 ml of pounded and soaked pod extract per 10 kg body weight of sheep and treatment three (T3) animals given 2 ml of albendazole per 10 kg body weight of sheep as control treatment.

The animals were weighed before the administration of the drugs. A syringe was used to draw a required quantity of the extract and the animal was drenched with the appropriate dose. This was done every month during the experimental period before faecal samples were then taken from the experimental animals.

Strongyle Ova Sampling, Identity and Interpretation: Faecal samples was collected from the sheep by gently restraining the animal and collecting five grams of faecal sample directly from the rectum through the anus by the use of fingers covered with gloves.

The first baseline faecal samples were collected at the end of the month of November. Animals were then dewormed immediately with appropriate dose of *Parkia biglobosa* extracts and albendazole preparations and after 72 hours of administering the dewormer (i.e. early December) faecal samples were collected for the month of December. The process was repeated at the end of December with no baseline data collection. Furthermore, faecal samples were collected in early January for the month of January after a second drenching was carried out at the end of December. After the collection of each sample, the gloves were changed or washed to avoid contamination. The samples were then taken to the University's Laboratory in cleaned and labeled plastic containers for analysis. All samples were usually taken within the early hours of 6: 00 - 8:00 in the morning. In situations where faecal analysis was not immediately possible, samples were kept in a refrigerator (- 4^{0} C).

Three grams of faecal samples taken was gently emulsified in 10 ml distilled water with the aid of the laboratory pestle and mortar. The emulsion was poured into a labeled 20 ml test tube and centrifuged for 5 minutes at 3000 rpm. The supernatant was decanted and another 10 ml of distilled water was added to the residue and centrifuged for 5 minutes at 3000 rpm to wash the out residue. 10 ml of saturated solution of sodium chloride (270 g of sodium chloride dissolved in one litre of distilled water) was added to sediment and mixed. The test tubes containing the mixture of sediment and floatation fluid were centrifuged for 5 minutes at 3000 rpm to deposit the debris and allow the ova to float to the surface. One milliliter of the supernatant was drawn with a pipette from the surface of the solution to fill a McMaster Counting Chamber and examined using X10 objective lens of a microscope. The worm ova were identified, counted and recorded. Strongyle ova were identified using the egg morphology (colour, shape and size) the aid of a microscope and helminthological chart.

Table 1: Mean monthly strongyle ova counts in sheep treated with *Parkia biglobosa* (dawadawa) pods extracts

Treatments	November	December	January
T1	2294 ± 113^{b}	450 ± 124^{b}	625 ± 153^{b}
T2	7463 ± 215^{a}	463 ± 153^{b}	387 ± 103^{b}
T3	2744± 123$^{b\ b}$	2369± 183^{b}	954 ± 159^{b}

Means with different superscripts in the same row are significantly different (P< 0.05)

Table 2: Mean strongyle ova counts before and after treatments

Treatments	Ova Count Before treatment (November)	Ova Count After treatment (December) (4 weeks later)	% reduction in ova count	Ova Count After treatment (January) (8weeks later)	Total % reduction in ova count.
T1(Boiled pods)	2294	450	80.4%	625	72.8%
T2(Pounded and Soaked Pods)	7463	463	93.8%	387	94.8%
T3 (control)	2743	2369	13.6%	954	65.2%

Egg per gram (epg) of faecal sample was estimated by multiplying the total number of eggs per McMaster Counter Chamber with a factor (100).

Analysis of Data: Data was analyzed using GenStat (Edition 3). Two way ANOVA with blocking of treatments and months as factors was used to separate means at $P < 0.05$.

RESULTS AND DISCUSSION

Monthly Ova Count of Strongyle: Mean monthly ova counts showed a generally decreasing trend from November to January (Table 1) for all treatments. The decrease in ova count between the months of November and December was significant ($P<0.05$) for the pounded and soaked pods (T2) (Figure 3) but was not significant ($P>0.05$) from the boiled and the control treatments. However, the boiled treatment tended to produced superior percentage reduction in strongyle ova (Table 2) when compared to the control during the same period. Sina and Traoré (2002) had noted that the bark, leaves and pod husks of dawadawa was rich in tannins, which Max *et al.* (2003) suggested had direct toxicity action on worms in drench sheep. Again the variation in the results of these dawadawa base treatments during the period in question seem to suggest a preparation-method-specific for action which appears to contradict McNabbb *et al.* (1998) that the chemical structure of condensed tannins may be more important than concentration, in that the pounded and soaked pods are suggestive of a treatment that ought to be associated with a higher concentration of the tannins probably because pounding which provides larger surface area for extraction of active ingredients.

With the control (T3), there was a steady reduction in ova count over the period of the study with a noticeable superior reduction between December and January (Figure 3).

Djang-Fordjour (2001) report that, in sheep and goats, gastrointestinal parasites burden increased with the onset of rains and reaches a peak in September and October in Ghana. Temperature and moisture are critical for the survival of worms, eggs and larvae (Cole, 1986) with strongyle ova requiring average daily temperature of 10ºC and 50% humidity (50 – 75 mm) to hatch and also given a pasture life-cycle of 25 days. The worm load or ova counts thus decreases as the weather becomes drier, which is exactly what, happened between the months of November through January in Nyankpala, Tolon Kunbungu District of Ghana.

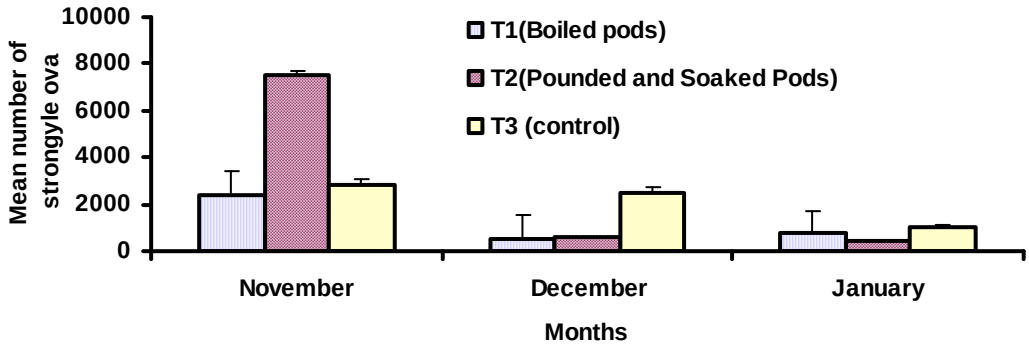

Figure 3: Mean monthly number of strongyle ova in sheep treated with *Parkia biglobosa* (Dawadawa) pods extracts

Dawadawa base treatments did not show any significant differences (P>0.05) in treatment between the ova count of December and that in January (Table 1) after the administration of the second doses in January, consequently percentage reduction/increase in ova counts were minimal (Table 2). Drug resistance may be implicated here as the treatment was given monthly. It has been suggested that drug resistance could occur once worms can survive a dosage of a drench that would have previously killed them. Cole (1986) reported that, resistance may be due to molecular components of drug, persistency of the product, frequency of treatments, worm species specificity and environmental factors. Skerman and Hillord (1966) reported that worms in sheep are evolving resistance to even new drenches. Roos (1997) stated that gastrointestinal parasites are developing molecular mechanisms to drug resistance and action.

Cole (1986) has observed 500 eggs per gram was generally considered high enough to require treatment in order to minimized pasture contamination and spread of subclinical disease. The 4 ml of pounded and soaked pods extract per 10kg body weight administered was reasonably effective, recording an overall 94.8% reduction in worm ova count (Figure 3) with a consistency of less than 500 epg even after the first drenching, proposing same as a good candidate for deworming using Cole's standards.

Whereas the boiled pods showed a reasonably good percentage reduction (80.4%) in worm ova count (Table 2), this consistency was not maintained because ova count actually tended to increase even after the second ministration to over above Cole's suggested levels. It may thus be necessary to give higher dosages of the boiled pods treatment to probably achieve similar levels of consistency in results for the pounded and soaked pods treatment, as there may possibly be lower concentration of tannins in the boiled pods extracts compared the pounded and soaked one. However this has to be trodden with caution as Campbell-Platt (1980) has reported that *Parkia* pods contain as much as 27 – 44% tannins which interact with some sensitive receptors in sheep. Boiled dawadawa pods as applicants for deworming may therefore not be overruled completely.

Worm ova count in the control treatment, though showing a decreasing trend during the study probably as result of the weather conditions prevailing at that the time were still high enough (954 epg) (Table 2) to warrant an intervention so as to limit pasture contamination and subclinical disease (Cole, 1986). The weather by itself alone may therefore not be sufficient to contain worm loads if productivity is critical within the given environmental conditions. Conclusively, pounded and boiled dawadawa pods extracts were found to be effective against strongyle in sheep as single or monthly repeated dose lead to reduction in worm load.

REFERENCES

ABBIW, D. (1990). *Useful plants of Ghana.* IT Publications and Royal Botanic Gardens, London.

CAMPBELL-PLATT, G. (1980). Africa locust bean (*Parkia* species) and its west Africa fermented food product, dawadawa. *Ecology of Food and Nutrition,* 9: 123 – 132.

COLE, V. G. (1986). *Animal Health in Australia Volume 8, Helminth Parasites of Sheep and Cattle*. Australian Agricultural Health and Quarantine Service, Department of Primary Industries, AGPS, Canberra.

DJANG-FORDJOUR, K. T. (2001). *Effect of cotton seed supplementation and deworming on some biochemical parameters of Djallonke in the northern zone of Ghana*. Ph.D. Thesis, Kumasi National University of Science and Technology, Kumasi.

FAO (1996). *International export on non wood forest Products*. Food and Agriculture Organization Rome.

GOVE, H. (2004). *Fundamentals of Disease and Insect Control*. Biotech Books, India.

HALL, J. B., AEBISCHER, D. P., TOMLINSON, H. F., OSEI-AMANING, E. and HINDLE, J. R. (1996). *Vitelleria Paradoxa, a Monograph*. School of Agriculture and Forest Science, Publication Number 8, University of Wales, Bangor.

HAMMOND, J. A., FEELDING, D. and BISHOP, S. C. (1997). Prospects for plant antihelmintics in tropical veterinary medicine. *Veterinary Research Communications,* 21: 213 – 228.

MAX, R. A., BUTTERY, P. J., WAKELIN, D., KIMAMBO, A. E., KASSUKU, A. A. and MTENGA, L. A. (2003). The potential of controlling gastrointestinal parasitic infections in tropical small ruminants using plants high in tannins or extracts from them. *In: Proceedings of the Third DFID Livestock Production Programme Link Project (R7798) Workshop for Small Ruminant Keepers.* Izaak Walton Inn, Embu, Kenya, 4 – 7 February 2003

MARTIN, G. J. (1996). *Ethnobotany; People and Plant Conservation Manuals*. Worldwide Fund for Nature International, Chapman and Hall, London.

MCALLAN, A., AEBISCHER, D. and TOMLINSON H. (1996). *Parkia biglobosa – The Dawadawa Tree (Nere) and Vitellaria paradoxa – The Shea Butter Tree (Karate). A Hand Book for Extension Workers.* School of Agricultural and Forestry Sciences, University of Wales, Bangor, United Kingdom.

MCNABB, W. C., PETERS, J. S., WAGHORN, G. C., FOO, L. Y. and JACKSON, F. S. (1998). Effect of CT prepared from several forage on the *in vitro* precipitations of Rubisco protein and its digestion by trypsin (EC 2.4.21.4) and chymotrysin (EC 2.4.21.1.). *Journal of Science of Food and Agriculture* 77: 201 – 212.

NAANDAM, J. and TURKSON, P. K. (2003). Understanding the perceptions of small ruminant farmers: A key to harnessing the potential of the small ruminant industry. *Savanna Farmer,* 4(2): 19 – 20.

NGOMUO, A. J., KASSUKU, A. A. and RUHETA, M. R. (1990). Critical controlled test to evaluate resistance of field strains of *Haemonchus contortus* to thiophanate. *Veterinary Parasitology,* 36: 21 – 26.

PRICHARD, R. K. (1994). Antihelmintic resistance. *Veterinary Parasitology*, 54: 259 – 268.

ROOS, M. H. (1997). The role of drugs in the control of parasitic nematode infection; must we do without? *Parasitology,* 114(Supplement): 137 – 144.

SCHOENIAN, S. (2005). *Maryland Small Ruminant; Internal Parasites of Sheep and Goats.* www.sheep and goats.com/articles/sheep goat parasites. html-19k. Date accessed: September 12, 2009.

SINA, S. and TRAORÉ, S. A. (2002). *Parkia biglobosa* (Jacq.) R. Br. ex G. Don. *In:* OYEN, L. P. A. and LEMMENS, R. H. M. J. (Editors), PROTA (Plant Resources of Tropical Africa / Ressources végétales

de l'Afrique tropicale), Wageningen, The Netherlands.

SKERMAN, K. D. and HILLORD, J. J. (1966). *A Handbook for Studies of Helminth Parasites of Ruminants.* Near East Animal Health Institute, Iran Unit, UNDP, FAO, Rome.