



EFFECT OF POUNDED DAWADAWA (*PARKIA BIGLOBOSA*) POD HUSK EXTRACT ON STRONGYLE IN WEST AFRICAN DWARF (WAD) GOATS

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Abstract

*A preliminary study was conducted to assess residual effect of Dawadawa (*Parkia biglobosa*) Pod Husk Extract (DPHE) on strongyle ova counts in West African Dwarf (WAD) goats. Eight nanny WAD goats (four per treatment) were used. The study lasted for eighteen days between the month of December 2011 and January 2012. DPHE was prepared by pounding and soaking (1kg/1.5litres of water) and mixture was allowed to stand for 12hours. The filtrate (DPHE solution) was administered orally, 0.6ml/kg of body weight (BW) to the 4 goats (treated goats) as against no DPHE in the 4 control goats (non-treated goats). Faecal samples were taken from the treated goats before administration of DPHE and every three days thereafter up to the 18th day for laboratory analysis of strongyle ova. A two-tail t test was used to analyze the data. Eggs per gram of faeces from the treated goats showed no significant difference ($p>0.05$) from day 3 to 9 but decreased significantly ($p<0.05$) from day 12 to 18. The dosage of 0.6ml/kg BW of DPHE resulted in 26% reduction in ova count of treated goats compared with a 13% increase in control goats with reference to the base counts for the given period of the study. What about residual effect?*

Key words: Dawadawa (*Parkia biglobosa*), Pod husk extract, Strongyle ova loads, WAD goats.

Introduction

According to the Ghana Statistical Service, GSS (2008) Report, the majority of the working population of Ghana is employed in agricultural activities (55.8%), followed by trading (15.2%) and then manufacturing (10.9%). Furthermore, the GSS (2008) estimates for households engaged in raising livestock show that chicken is the most commonly reared animal with about 1,652,820 households involved. About 1,038,167 households raise goats, a little over half a million (607,174) households raise sheep, and 201,538 households keep other poultry including duck, turkey and guinea fowl. Much smaller numbers of households raise, pigs, draught animals (such as donkeys, horses and bullocks) and rabbits. These statistics amply demonstrate the

importance of livestock in Ghana's economy. 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). 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. Apart from resistances to antihelmintics, poor availability and affordability of antihelmintics by resource-poor farmers in developing countries have compounded the problem (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.

A trial of *Parkia biglobosa* pod extracts as a dewormer proved positive because ova levels of strongyle and strongyliodes fell in djallonke sheep with a dosage of 0.4ml/kg live body weight (Iddrisu, 2009). Hamidu (2010) therefore went ahead to examine *Parkia*'s effect further on strongyle in sheep and found that repeated doses of 0.6ml/kg live body weight of pods extract at intervals of 28 days could clear almost all strongyle by the third administration. However, likely residual effects were not investigated. Also, of the helminthes affecting small ruminants in the west African sub-region, strongyles have been identified as one of the most prevalent worms (Agyei *et al.*, 2004). Given that goats and sheep are similar in many respects, this study therefore sought to, first ascertain the chance of DPHE having an effect on strongyle (a most prevalent helminth) in West African Dwarf (WAD) goats and also to examine whether DPHE had any residual effect.

Materials and methods

Study location

This study was undertaken on the livestock production farm of the Animal Science Department, University for Development Studies, Nyankpala in the Tolon/Kunbungu District of the Northern Region of Ghana. It was carried out in December 2011. The study area lies within the Guinea Savanna zone, characterized by large area of low

grassland interspersed with trees. The area has single rainfall pattern 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 50% (SARI, 2009).

Procedure used for the preparation of the Dawadawa Pod Husk Extract (DPHE)

- ✚ Clean matured dry dawadawa pod husk were collected from farmers in Nyankpala.
- ✚ Husks were well dried in the sun for easy pounding.
- ✚ About 3kg of dried dawadawa pod husk were pounded using well clean mortar and pestle.
- ✚ Pounded husks were soaked in distilled water (1kg of the pounded husks were put into 1.5liters of distilled water).
- ✚ Mixture was left overnight (12hours) for maximum extraction of the water soluble active ingredient.
- ✚ Mixture was then decanted and filtered to obtain a clean extract.
- ✚ The extract was stored in a clean plastic container for use.

Experimental animals and design

Eight (8) nanny West African Dwarf (WAD) goats aged between 1-2 years with mean weights of 15.3kg for T1(non-treated goats) and 15.4kg for T2(treated goats) were used in the experiment. Animals were tagged for purposes of clear identification. A Completely Randomized Design (CRD) was used in the experiment. There were 2 treatments and each treatment replicated four times.

Administration of Dawadawa Pod Husks Extract (DPHE)

There were two treatments viz;

- ✚ Treatment one (T1): 4 nanny goats under this treatment received no dawadawa pod husk extract or any conventional dewormer during the period of study.
- ✚ Treatment two (T2): 4 Nanny goats under this treatment received 0.6mls/kg live body weight of the dawadawa pod husk extract.

Management system of goats

The goats were housed semi – intensively, where animals were provided with a structured pen and were allowed to graze freely during the day on their own outside the pen. Supplementary feed such as cassava peels, yam peels, cotton seeds and water were provided after grazing.

Faecal samples collection

Faecal samples were taken from the animals directly from the rectum through the anus by fingers covered with gloves. These samples were used as a baseline to know the total worm ova counts of the experimental animals before administering the dawadawa pod husk extract. Baseline faecal samples were taken by restraining the animals and 3 grams of faeces taken before administering the dawadawa pod husk extract. The gloves were changed after each faecal sample was collected to avoid contamination. Faecal samples were put in a clean container, sealed and sent to the Veterinary College at Pong Tamale for laboratory analysis. Seventy two (72) hours later and subsequently on a

3-day basis until 18days after the administration of the dawadawa pod husk extract, faecal samples were similarly collected for analysis.

Storage of samples

Faecal samples were stored in a refrigerator at 5°C when it was not possible to carry out analysis immediately.

Laboratory procedure for the examination of the faecal samples

The McMaster Egg Counting Technique espoused by the University Of Pennsylvania School of Veterinary Medicine (2006) was used.

Identification of helminthes eggs

The strongyle ova were identified by the morphology (colour, shape and size) of eggs with aid of microscope and with a guide from a helminthological chart.

Data analysis: A two-tail t test was used for the analysis.

Results and Discussion

Mean worm load during the study period

Table 1: Mean strongyle ova counts

Day	Control (epg)	Treatment (epg)	SED	Significance
0	3033	2467	430.8	NS
3	3500	2633	837.3	NS
6	3667	2667	903.1	NS
9	3000	1967	841.3	NS
12	3600	1267	397.2	*
15	3367	1267	495.5	*
18	3367	1633	481.9	*

NS- Not significant ($p>0.05$) *($p<0.05$) SED- Standard Error of Difference

Mean worm ova collected initially before administration of DPHE were 3033epg and 2467epg, for control and treated goats, respectively (Table 1). This finding agrees with work by Iddrisu (2009) who recorded ova counts in the ranges similar to those above in sheep in the same locality and about the same time of the year. It was

observed that the mean ova counts from day 0 to day 9 were not significantly different ($p>0.05$)(Table 1), possibly because, when the DPHE was administered it took some time before it became effective.

Mean ova count observed in the faecal sample from day 12 to 18 were significantly different ($p < 0.05$) between treatments after the administration of the DPHE i.e. the DPHE appeared more effective after day 9 to day 18. However, whereas DPHE showed some activity as registered in the mean ova count for treatment by 18th day, this activity in absolute terms seemed to be on the decline as ova count for day 18 was greater than day 15 (Table 1), suggesting that DPHE as a drug may be acting over a reasonable number of days and confirming the statement by (Birkett, 1995) that after a single dose, drug concentration falls in an exponential manner with time. Wink (2007) has noted that the evolutionary solution of plants to defend themselves was the production of a wide variety of secondary

metabolites which can interfere with the biochemistry and physiology of herbivores on one hand and some with bacteria, fungi, viruses and even competing plants on the other hand. This surely does not preclude nematodes living in the ruminant herbivore. The increase in the worm ova count by day 18 might be due to the fact that the active ingredient (tannins), lost their potency with an increasing time as a secondary metabolite, which led to the build-up of the worms.

The trend in mean ova count over time in experimental animals is shown in Fig. 1. It is clear from the figure that the treated goats had lower worm loads than the control group.

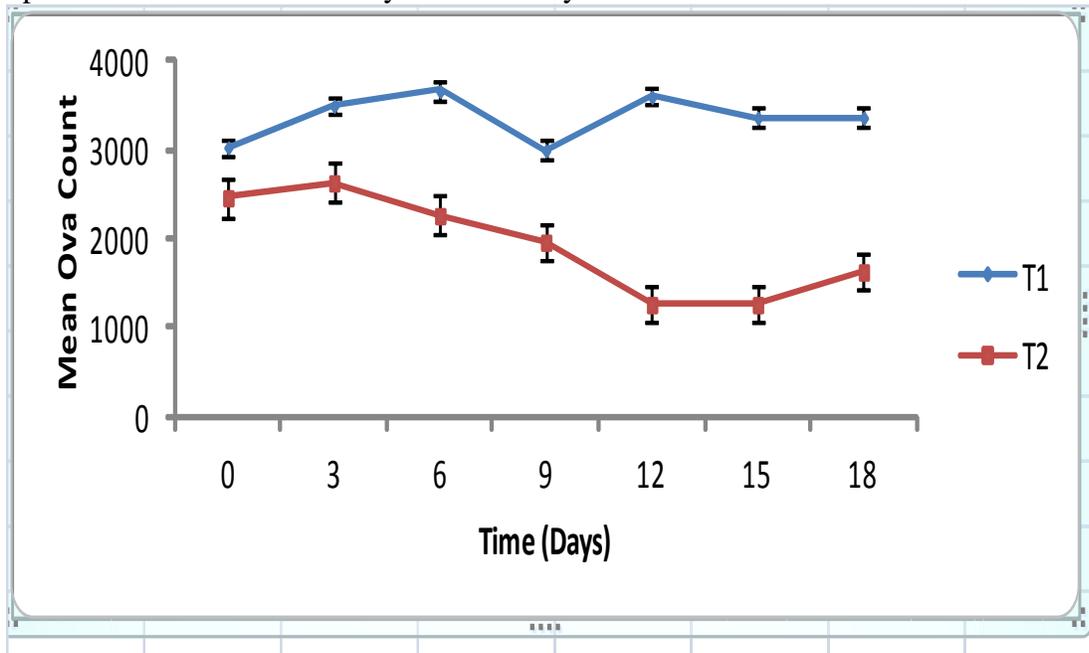


Fig.1: Mean ova counts of control and DPHE treated nanny goats

Given that heterogeneity in factors like body weight and composition, age and sex were reduced to the barest minimum as possible for the treatment groups, other factors that could possibly have affected individual DPHE response and cause variation, still remained a complex array including variability in absorption, bioavailability, physiological condition, starvation, feeding status and pharmacogenetics (Franconi *et al*, 2006; Galbraith *et al*, 2007; Severino & Del Zompo, 2004; & Wilkinson, 2005). Thus the random source of error in the control group (Fig. 1) may also be found in the treatment group. But in addition, the

treatment group had a second source of error due to individual DPHE response variation which translated into the longer error bars for the treatment group (Fig. 1). Ova counts in the treatment group began to decline after administration of the DPHE while that of the control continued to rise (Fig.1). The result of the reducing number of ova count in the treatment could be due to the fact that the DPHE started to work now. A number of researchers (Mutschler *et al.*, 2008; Wink & van Wyk, 2008) have noted that toxins and poisons are classified in four categories according to their oral toxicity determined in rat experiments: class Ia: extremely

hazardous (5 mg or less per kg body weight); Ib: highly hazardous (5 to 50 mg/kg body weight); class II: moderately hazardous (50 to 500 mg/kg body weight) and class III: slightly hazardous (500 mg and more per kg body weight). The authors think it is important to recall that the dose is very important; already Paracelsus (1493 – 1541) had postulated in 1537 “*sola dosis facit venenum*” (it is the dose that makes a poison) besides inherent toxic properties. They further stated that toxins, which fall into the classes Ia, Ib and II interfere with central functions in an animal. The most poisonous substances are neurotoxins which affect the nervous system, followed by cytotoxins and metabolic poisons that disturb liver, heart, kidneys, respiration, muscles and reproduction. In this study

the concentration of the active ingredient was not determined, but given the procedure that was used, it may be postulated that the DPHE could probably be taken as a class III toxin i.e. slightly hazardous, to the extent that the nematodes could be affected but not the host. The mode of action on the nematodes may however require some further investigation.

It was generally observed that the treatment (0.6mls/kg BW) of DPHE had an effect of reducing strongyle worm ova count over time. The percent change in mean strongyle ova count is shown in table 2.

Table 2: Percent change in mean strongyle ova count over time

Treatment	Before treatment (epg)	After treatment (epg)	% change
T1	3033	3362	(10.8)
T2	2467	1986	19.5

T1 – Control goats T2- Treated goats

There was a decrease in the ova count in the treatment group of approximately 20% over the entire study period (Table 2). This could probably be in consonance with what some researchers have alluded to as being the result of the presence of tannins in the bark and husk which killed some of the worms.

Condensed tannins-containing forages have the potential to help control anthelmintics resistant gastrointestinal parasites. They have been shown to decrease faecal egg counts in sheep and goats and may decrease hatching rate and larval development in faeces (Min & Hart, 2003). This is also in line with Max *et al.* (2007), who showed that there is an effect of tanniferous browsers meal on faecal egg counts and internal worm burdens.

Conclusion and recommendation

Parkia biglobosa (dawadawa) pod husk extract can be used to control strongyle in goats to some appreciable level. Maximum effectiveness was shown 12-15 days after administration, suggesting

some possible residual effect of about two weeks. Dosage of 0.6ml/kg BW is indicative for current trial as no mortality or adverse finding were recorded. Farmers may use dawadawa pod husk extract every two weeks to keep a sustained low worm load. Further research may need to be carried out in the rainy season to compare with the above findings.

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