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Anthelminthic potential of *Phytolaccadodecandra* and *Albizia antihelmintica*in calves

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Abstract

Using herbal de-wormers in livestock has attracted much research attention in the recent past. Considerable research has been done in developed countries but there is paucity of information in Sub Sahara Africa (SSA) countries including Uganda. This study aimed at establishing the potential of Phytolaccadodecandra (pd) and *Albizia antihelmintica* (zia) on reducing egg count per gram (EPG) for Fasciola, Strongyles and Monezia species in calves. Body weights of seventy six calves purposefully selected from 5 farms were measured. Twenty six calves were treated with pd, 24 with zia and 26 with Albendazole 10% (zole) as a control. The calves were left to graze in their respective farms in controlled paddocks. Single dose treatment was given to each calf and rectal samples were collected after every week for a period of four weeks. The samples were preserved in 10% formal saline and EPG analysis was done using Telemman's sedimentation method. Both the numbers and types of gastrointestinal worms eggs present in the dung of calves were determined before and after drug administration. Results show significant differences in Fasciola EPGfor calves treated with Albendazole 10% and those treated with pd ($p = .044$); Strongyles EPG for calves treated with Albendazole 10% and those treated with zia ($p = .007$). No significant differences were observed in Monezia EPG for the three treatments used. This suggests that Albendazole 10% is more effective than zia and pd on Fasciola, Strongyles and Monezia species while pd and zia extracts have almost the same effectiveness on all the three species of parasites studied.

Keywords: Phytolaccadodecandra, Albizia antihelmintica, Albendazole, Fasciola, Strongyles, Monezia

Introduction

The use of herbal de-wormers for treatment of gastrointestinal parasites in domestic animals has been of increasing research interest in the recent past. This is attributed to the rejuvenated knowledge about the value of herbal plants and their contribution to the livestock industry over the years. Plant remedies are being used to improve the health for both humans and livestock in most parts of the world. Studies show that plant extracts are the primary source of veterinary synthetic drugs (Daniell*et al.*, 2001)[6]. Similarly, the *world health organization* (WHO) estimatedthat 80% of the population from developing countries depend on herbal remedies for their primary health care (Danøe R &Bøgh, 1999)[7] and recorded more than 20,000 medical plants across the globe (Akerele*et al.*, 1991)[1]. Herbal extracts have been reported to be effective in treatment of *Fasciolagigantica* in livestock (Jeyathilakan*et al.*, 2011)[17]while plant cysteine proteinases from papaya, pineapple and figs were found to have anthelminthic properties (Stepek*et al.*, 2004)[45]. *Acacia* and *Terminalia* species have been reported to have antitryponosomal effects (Mann *et al.*, 2011)[26] in livestock. In the US, *Chenopodium ambrosioides* has been reported to have anthelminthic properties (Kliks, 1985)[22] and *Mallotusphilippinensis* powder and its extracts in ethanol were found to have the same efficacy with Nilzan in India (Akhtar & Ahmad, 1992)[2]. Various scholars in Nordic countries have reported the re-discovery of veterinary plant de-wormers (Waller *et al.*, 2001)[55] and the increased trend regarding their re-use in the livestock sector. Although the contribution of herbal de-wormers to livestock sector has been overshadowed by the advent of the modern chemotherapeutic era for many years (Gibson, 1980)[10], in the recent past, the trend seem to be changing. A resurgence of interest in the use of traditional medicine has been reported across the world (Waller *et al.*, 2001)[55] accruing from several factors. In the first instance, there has been increased resistance of gastrointestinal parasites to the veterinary drugs (Peter, 2006; Waller *et al.*,

2001; Waller &Thamsborg, 2004)[40, 55, 56]. Similarly, herbal de-wormers are cheap, less toxic and environmental friendly compared to theircounterpart anthelminthic veterinary drugs present on the current market (Ma *et al.*, 2005)[25]. Studies recommend sustainable use of anthelmintics being mindful of the environment and the profitability of the farmers (Waller, 1993)[53]and this aspect has not been well addressed especially in SSA.

In SSA countries, herbal plants have been also been reported to be essential in treatment of both humans and livestock over the years. Preliminary phytochemical screenings of medicinal plants from Cameroon and Ghana were found to contain anthelminthic compounds such as flavonoids, alkaloids, saponins, carbohydrates and tannins (Ndjonka*et al.*, 2011)[31]. In East Africa, scholars report heavy dependency on traditional medicinal plants for disease treatment (Fabry*et al.*, 1998)[9] due to a rich plant species diversity in the region. Similarly, the study conducted in Kenya on rat feaces reported that *Myrsine Africana* significantly reduced the number of worms (Githiori*et al.*, 2006)[11]. Hundreds of medicinal plants in Rwanda and central Kenya were found to have antimicrobial and antiviral activities (Vlietinck*et al.*, 1995; Njoroge & Bussmann, 2006)[51, 33]. In Uganda,5000 species of higher plants are present (Davis *et al.*, 1986)[8] of which 37 are of medicinal value found in the cattle corridor (Nalule*et al.*, 2010)[28] and 104 are used for medicinal purposes by herbalists in the southern part of the country (Hamill *et al.*, 2000)[14]. In the same country, some plants are used to treat human diseases such as impotence (Kamatenesi-Mugisha*et al.*, 2011)[20,29], malaria (Stangeland*et al.*, 2011)[44], physical illness and psycho-spiritual sicknesses (Namukobe*et al.*, 2011; Tabuti*et al.*, 2003)[29, 46]. Similarly, *Cissus adenocaulis* water extracts have been reported to have potential in treatment of gastrointestinal worms in cattle (Tumwesigye, 2011)[49]. Similar studies show that theKaramajong in the northern Uganda are known to have a vast knowledge in herbal medicine (Gradé*et al.*, 2009). The major challenge associated with the study of herbal medicinehas not only been lack of human resource to identify the medicinal plants but also the limited technology required to isolate the active ingredients and to standardize the dosage used for treatment of both humans and livestock. Documentation, standardization and validation of herbal products is required if the herbal medicine industry is to be promoted and supplement the veterinary drugs industry (Githiori*et al.*, 2005)[12]. There is limited knowledge about the right dosage and proper use of herbal remedies (Smidt&Brimer, 2005)[41] hence the need for this study to provide more insight in the herbal industry. Although several medicinal plants have been identified in Uganda, little has been documented about their efficacy (Ssegawa&Kasenene, 2007)[43]. This paucity of information has limited the use of herbal de-wormers in Mbarara District resulting into increased expenditure on veterinary drugs. The aim of this study was to establish the anthelminthic potential of *Phytolaccadodecandra*and *Albizia antihelmintica*in calves from Mbarara District, South Western Uganda.

Materials and Methods

Study area

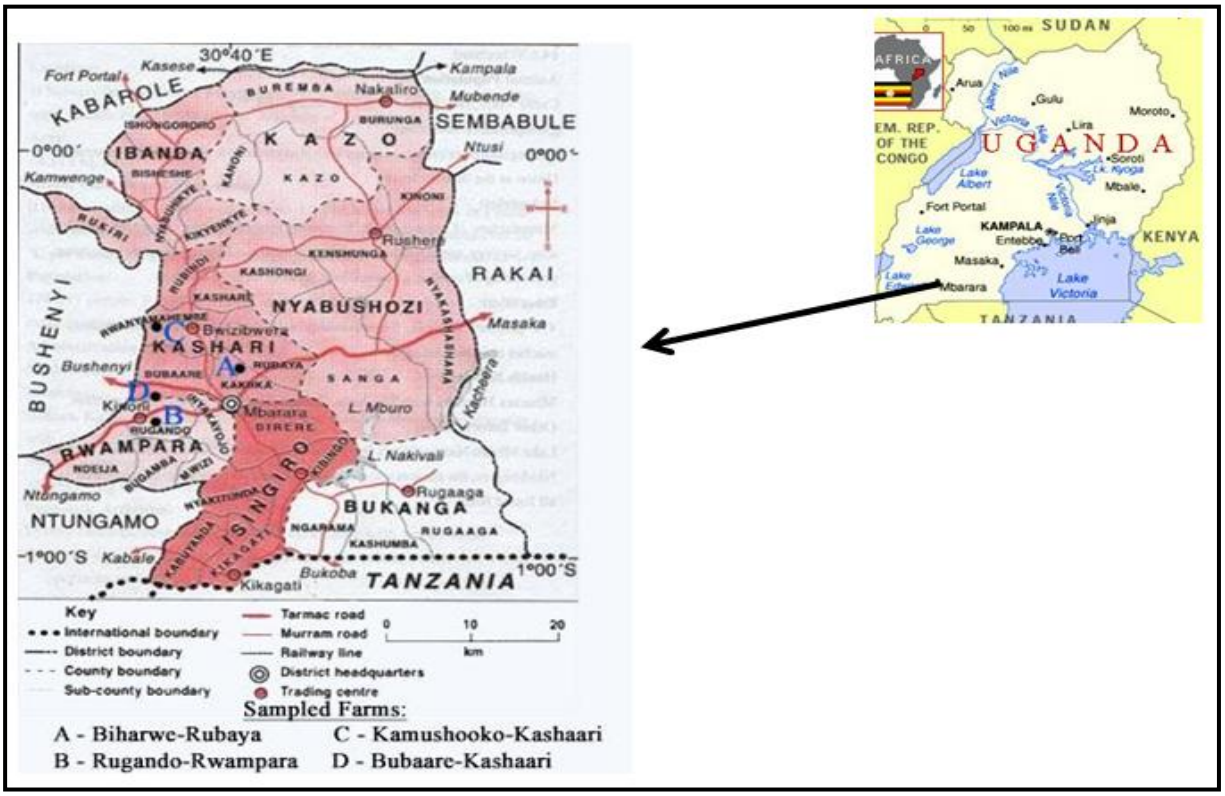

Fig 1: Map showing location of cattle farms from which calves' rectal samples were collected

The study was conducted from the former Greater Mbarara District located between latitude $0^0$00' and 1^0 00'S and longitude 30^0 40' E in South western Uganda. Calves for this study were selected from five cattle farms in the counties of Kashari, Rwampara and Rubaya (Figure.1).Two farms were selected from the County of Kashari in the sub counties of Kamushookoand Bubaare. All the cows from these farms depend on the nearby River Rwizi for drinking water. These farms were selected because of the existence of many cattle keepers with limited knowledge on veterinary herbal de-wormers in this area. One farm was selected from the County of Rwampara in Rugando Sub County where also the cattle depended on water from River Rwizi. The last two farms were selected form the sub counties of Biharwe and Buhaama found in Rubaya County. The cattle from these farms depend on water from the man-made ponds dug in the farms or from tap water

and rain water. Both of these farms were on up lands (on short hills) with no nearby flowing rivers. The humidity in the selected farms is generally dry in most of the months of the year.

Selection of study calves

Seventy six Frisian calves of 1-2 years of age and of different sexes from five farms were used for this study. The caves were purposefully selected based on length of time before drenching was done (at least 4 months) and the initial egg count per gram (EPG) of gastrointestinal worms present in their rectal samples was done. The study calves were ear-tagged and categorized into three groups (A, B &C) for different treatments. Group A consisted of 26 calves, group B 24 calves and group C 26 calves.The body weights of the selected calves were estimated using a standard veterinary tape measure (NAPA, 2011)[30] and rectal samples were obtained using hands dressed with surgical gloves.

Preparation of drugs

Albendazole 10% was purchased from the veterinary drug shop in Mbarara municipality while *Albizia antihelmintica* and *Phytolaccadodecandra* extracts were made from MUST biochemistry laboratory by the researcher. *Albizia anthelmintic* extract was made by removing the living back, which was dried and grounded into powder. *Phytolaccadodecandra*extract was made by harvesting and indoor drying of the ready-to ripe fruits. These were then grounded using a motor and pestle to make powder. The solubility of both *Phytolaccadodecandra* and *Albizia antihelmintica* were calculated and found out to be 4.7g/100ml and 3.2g/100ml respectively. Based on the standard dosage of Albendazole 10% (7.5mg/kg of body weight), the dosage of *Albizia antihelmintica*and *Phytolaccadodecandra*were determined to be 10mg/kg of body weight and 14.24mg/kg of body weight respectively. One hundred grams of each plant powder was separately dissolved in 1000ml of water and left to stand for 12 hours to make an extract. Theextracts were filtered using a double layer of gauze and the filtrates were used to drench the calves in different study groups.

Treatment of calves, collection and analysis of rectal samples

Treatment dosage for each cow was calculated based on its body mass. The drugs were administered once based on recommendations from previous studies (Christine, 2006)[5]. The calves in each category were treated with the appropriate dosage of a different drug calculated based on each calf's body weight. The 26 calves in group A were treated with *Phytolaccadodecandra* extract, 24 calves in group B were treated with *Albizia antihelmentica* while 26 calves in group C were treated withthe correct prescribed dosage of Albendazole 10%. All the cows were left to graze on their respective farms and in enclosed paddocks with similar environmental conditions on each farm. Rectal samples were collected before treatment and after every one week following treatment for a period of 4 weeks. The samples were preserved in 10% formal saline (v/v) and taken to the laboratory for analysis as recommended by previous studies (Jeanne *et al.*, 2007)[16]. The numbers and species of parasite eggs per gram (EPG) found in rectal samples were identified and recorded accordingly. This analysis was done using Telemman's standard sedimentation method (Thienpont*et al.*, 1986)[47] and microscopic examination was conducted using the low power magnification of a CARL ZEISS JENA binocular light microscope.

Data preparation and Statistical analysis

Explanatory Data Analysis (EDA) was done to understand the distribution characteristics of the dataset. Normal distribution was tested using scatter and quartile-quartile (Q-Q) plots. Homogeneity of variances was tested using Levene test (L). The data was analyzed using Statistical Package for Social Scientists (SPSS) version 17 and Microsoft Excel 2010 software. The variation of mean EPG for all types of worms studied (total worm burden) and EPG means for different gastrointestinal worms pre-treatment and post treatment was inspected for each treatment type. Comparison of effectiveness of different treatments on different species of worms was done by using unpaired two-tailed Student's t-test allowing for unequal variance. Data was considered significant with a significant level of 0.05 (Jeanne *et al.*, 2007)[16].

Results

The means for egg count per gram of gastrointestinal parasites were calculated and tabulated as below:

Table 1: Mean EPG remaining with time in weeks during treatment period

Mean *Fasciola* eggs remaining with time					
	Wk0	Wk1	Wk2	Wk3	Wk4
zole	1.07	2.11	1.43	2.46	1.54
pd	2.69	2.00	2.31	4.08	2.81
zia	2.58	3.17	1.50	1.63	3.21
Mean *Strongyles*' eggs remaining					
	Wk0	Wk1	Wk2	Wk3	Wk4
zole	0.82	0.64	0.75	0.32	0.25
pd	1.77	1.69	1.38	2.92	1.50
Zia	0.79	2.00	1.79	1.46	2.08
Mean *Monezia* eggs remaining					
	Wk0	Wk1	Wk2	Wk3	Wk4
zole	0.71	3.11	2.50	2.04	2.04
pd	0.88	1.50	2.19	2.38	3.00
zia	0.88	2.75	2.75	2.38	2.75

Table 1 presents the variation of EPG for three types of selected worms (*Fasciola*, *Strongyles*and *Monezia*) with time under different treatments (Albendazole 10%, *Phytolaccadodecandra*and *Albizia antihelmentica*). Graphically the variation of egg count per gram (EPG) with time for the three worms investigates is show below:

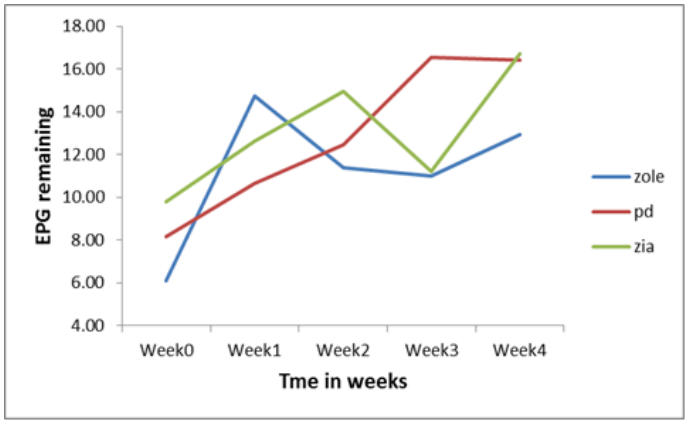

Fig 2: Variation of total worm burden (three types: F*asciola*, *strogyles* and *Monezia*) with time for different treatments: zole stands for Albendazole 10%, pd for *Phytolaccadodecandra* and zia for *Albizia anthelmintica*

Between week0 and week1 EPG increases sharply for all treatments but the gradient for the calves treated with Albendazole overtakes that of those treated with *Phytolacca* and *Albizia* by mid of the first week. After mid first week both the EPG for calves treated with *Albizia* and *Phytolacca* continue to increase while that for the calves treated with Albendazole reduces sharply below that for the calves treated with other two drugs. From here the EPG for calves treated with Albendazole slightly decreases in week3 and slightly increases as it approaches end of week4. PG for calves treated with *Phytolacca* continues to increase between week2 and week3 and almost stabilizes after week3. EPG for calves treated with *Albizia* decreases sharply between mid week2 and mid week3 after which it increases sharply. EPG for both calves treated with Albendazole and those treated with *Albizia* show a remarkable increase after mid week3.

Table 2: Statistical analysis showing response of EPG of different types of worms per treatment pair; zole represents Albendazole 10%; pd*Phytolaccadodecandra* and zia*Albizia antihelmintica*

Type of worm	Treatments	N	t	df	p(2-tail)	L	Mean Difference	Std. Error Difference
Fasciola	zolevspd	5	-2.433	7.17	.044*	.762	-1.05549	.43389
	zolevszia	5	-1.569	7.05	.160	.208	-.69524	.44314
	pdvszia	5	.706	7.99	.500	.591	.36026	.51019
Strongyles	zolevspd	5	-4.339	5.35	.006**	.272	-1.29670	.29885
	zolevszia	5	-4.088	5.82	.007**	.192	-1.06786	.26125
	pdvszia	5	.632	7.79	.545	.632	.22885	.36212
Monezia	zolevspd	5	.160	7.96	.876	.856	.08626	.53755
	zolevszia	5	-.413	7.95	.690	.978	-.22143	.53592
	pdvszia	5	-.596	8	.567	.814	-.30769	.51587

$\alpha = 0.05$; *statistically significant and ** statistically highly significant

Fasciola

There was a significant difference in EPG for calves treated with Albendazole 10% (M = 1.7, SD=.56 ± .24) and calves treated with *Phytolaccadodecandra* (M = 2.8, SD =.79 ±.36) conditions; t (7.1) = -2.433, p = 0.044. On the other hand, there was no significant difference in EPG for calves treated with Albendazole 10% (M= 1.7, SD=.56 ± .24) and calves treated with *Albiziaanthelmenthica* (M=2.4, SD=.82 ± .37) conditions; t (7.05) = -1.569, p = .16. Similarly, there was no significant difference in EPG for calves treated with *Phytolaccadodecandra* (M=2.8, SD=.79 ±.36) and calves treated with *Albiziaanthelmenthica* (M=2.4, SD=.82 ± .37) conditions; t (7.99) = .706, p = .500.

Strongyles

There was a significant difference in EPG for calves treated with Albendazole 10% (M = .56, SD=.26 ± .11) and calves treated with *Phytolaccadodecandra* (M=1.8, SD=.62 ±.28) conditions; t (5.3) = -4.339, p = 0.006. At the same time a significant difference was observed in EPG for calves treated with Albendazole 10% (M = .56, SD=.26 ± .11) and calves treated with *Albiziaanthelmenthica* (M=1.63, SD=.52 ±.23) conditions; t (5.8) = 4.088, p = 0.007. There was no significant difference in EPG for calves treated with *Phytolaccadodecandra* (M=1.85, SD=.62 ±. 28) and calves treated with *Albiziaanthelmenthica* (M = 1.62, SD=.52 ± .23) conditions; t (7.8) = .632, p = .545.

Monezia

For all calves treated, there was no significant difference in EPG for all pairs of treatments compared.There was no significant difference in EPG for calves treated with Albendazole 10% (M = 2.08, SD=.88 ± .39) and calves treated with *Phytolaccadodecandra* (M=1.99, SD=.82 ±.37) conditions; t (7.9) =.160, p = .877.Similarly there was no significant difference in EPG for calves treated with Albendazole 10% (M =2.08, SD=.88 ± .39) and calves treated with *Albiziaanthelmenthica* (M=2.3, SD=.82 ±.36) conditions; t (7.95) = -.413, p = .690. At the same time there was no significant difference in EPG for calves treated with *Phytolaccadodecandra* (M=1.99, SD=.82 ±. 37) and calves treated with *Albiziaantihelmintica* (M = 2.30, SD=.81 ± .36) conditions; t (8) = .596, p = .567.

Discussion

This study found a significant difference in EPG of *Fasciola* species for calves treated with Albendazole 10% (M = 1.7) and those treated with *Phytolaccadodecandra* (M =2.8) (Table 2). This suggests that Albendazole 10% is more effective on *Fasciola*species than *Phytolaccadodecandra.* This study agrees with the previous research done on sheep by Campbell & Hall (1979)[4] which found that Albendazole 10% is 71.5% effective against *Fasciola hepatica* in sheep. Theirfindings established that a single intra-rumenal treatment of dose rates of 3.8 and 7.6 mg/kg was found tobe ineffective against immature (six weeks old) *F. hepatica* while dose rates of 5.7 and 7.6mg/kg reducedthe number of mature (12 weeks old) *F. hepatica* by 70 and 91 per cent respectively.Similar studies conducted on calves using Albendazole as a 4.55% (w/v) drench suspension found that its efficacies against mature *Fasciola hepatica* were 77.5% with the dose of 7.5 mg/kg; 92.3%, with 10 mg/kg; and 85.9%, with 15 mg/kg (Smith *et al.*,1982)[42]. These studies also confirm that Albendazole reduces *Fasciola* species infection in calves but its efficacy depends on the dosage administered to the calves.Since there was no significant difference in EGP for the calves treated with Albendazole (M=1.7) and those treated with *Albizia antihelmintica* (M =2.4) for the five weeks of the study, the study suggests that both Albendazole 10% and *Albiziaantihelmintica* have almost the same effectiveness on *Fasciola* species eggs. After the second week of treatment EPG for calves treated with*Albizia antihelmintica* show a considerable reduction in worm (three types burden) (Figure 1) suggesting the potential of the herb to reduce the worm burden in cattle.

The effectiveness of *Albizia antihelmintica* on *Fasciola* specieswould contribute to the improved cattle yields and boost the economy of livestock farmers. *Fasciola* parasites are economically important in animals (Perry & Randolph, 1999)[37]. These may be the worst enemies of ruminants and cause too much loss to the farmers. The economic loss by Kenya farmers for 10 years due to condemnation of infected livers from cattle, sheep and goats by the abattoirs was estimated to be US$ 2.6 million, US$ 61,955 and US$ 48,889 respectively (Ombui&Nyarongi, 2004)[34].The same studies reported that fasciolosis is prevalent in cattle, sheep and goats in Kenya and is a major cause of economic loss, as a result of condemnation of infected livers. Ogurinade&Ogurinade (2007)[35] estimated an annual loss due to

fascioliasis of N5 million (US$ 26903) in Nigeria. Similar studies show that helminth parasiteslimit sheep production due to their blood-feeding nature (Neil, 2011)[32] and small ruminantsin the tropics are most affected livestock (Peter,1997a)[38]. Since *Fasciola*species are considered by the farmers to be one of the most economically important parasites of ruminants, *Phytolacca*and *Albizia* extracts may be considered as part of the remedy for de-worming ruminants in order to minimize these economic losses. These drugs may not be used exclusively because effective management of cattle parasites requires both biological control and integration of different approaches to reduce resistance of parasite to anthelmintics (Waller, 1990; Williams, 1997)[52, 57]. This is because the new synthetic drugs invented do not solve the problem of parasite resistance (Waller, 1999)[54]. Similar studies show theneed for integrated pest management concomitant with appropriateresearch is essential for sustainable parasite control in developing countries (Peter, 1997b)[39].

This study found that *Albizia* extract has almost the same effectiveness as Albendazole 10% on Fasciola EPG. The findings from this study agree with previous studies done in Uganda which established that *Albizia* species are able to reduce nematode EPG in sheep (Gradé*et al.*, 2008). This plant species is one of the previouslyidentified plants in South Western Uganda with medicinal value (Hamill *et al.*, 2000)[14] Similarly, studies done in South Africa also found that *Albizia* species have potential to treat tape worm infestation and other stomach ailments (Van Wyk*et al.*, 2002)[50] and its water extract has the ability to inhibit hatching of the nematode eggs as well as development of larvae in sheep (Kibwage, 2002)[21]. This study also found that *Albizia antihelmintica* has potential to reduce EPG for *Strongyles* (Table 2). A significant difference in EPG was found between calve treated with Albendazole (M = .56) and those treated with *Albizia antihelmintica* (M = 1.63) suggesting that Albendazole is more effective on *Strongyles* than *Albizia* extract.At the same time the study found a significant difference in EPG between calves treated with Albendazole (M = .56) and those treated with *Phytolaccadodecandra* (M = 1.85) indicating that Albendazole is more effective that *Phytolacca* extracts.On the other hand, no significant difference was found in EPG for calves treated with *Albizia antihelmintica* (M = 1.63) and those treated with *Phytolaccadodecandra* (M = 1.85). This implies that both *Albizia* and *Phytolacca* extracts have almost the same effectiveness on *Strongyle* species.

No significant differences were found in EPG of *Monezia* when calve treated with Albendazole 10% were compared with those treated with all the tree plant extracts (Table 2). These findings suggest that Albendazole 10%, *Albizia antihelmintica*and *Phytolaccadodecandra* all have almost the same effectiveness on *Monezia*. This study agrees with previous studies which reported that Albendazole is a broad spectrum compound and is effective against nematodes and cestodes (Onar, 1982)[36] and has some effect against *Fasciola hepatica* (Blood *et al.*, 1989)[3]. Since *P. dodecandra* and *Albizia antihelmintica* show almost equal effectiveness with Albendazole 10%, the herbal extract is likely to contain similar or closely related active ingredients as those found in Albendazole 10%. *Albizia* was found to have potential to reduce nematode EPG in sheep in Uganda (Gradé*et al.*, 2008). Studies reported that ability of *Albizia* species to reduce worm burden is attributed to the active ingredients such as histamine, saponins and sapogenins identified in its extracts (Van Wyk*et al.*, 2002)[50]. Similarly, the active ingredients of *Phytolaccadodecandra* have been identified as monodesmosidic glycosides and derivatives of oleanolic acid, especially saponigen (Lemma &Wolde-yohannes, 1998)[24]. The active compounds are released after hydrolysis by soaking the crushed berries in water. During this procedure the active compounds are formed from the saponins in the pericarp after contact with the seed stored enzyme. These active compounds are likely to be responsible for anthelminthic behavior of*Phytolaccadodecandra*. The advantage of using *Phytolaccadodecandra* is that its extract is less poisonous compared to that of *Albizia* species (Minja*et al.*, 1997). Proper dosage of Albizia are required or else the animals may die due to overdosing (Githiori*et al.*, 2003)[13].

This study established that three weeks after treatment, the worm-burden increased especially for the calves that were treated with Albendazole and *Albizia* (Figure 1). This suggests that the calves were re-infected with parasites following three weeks of treatment.This has been one of the major challenges facing livestock farms for years. No single one time treatment completely removes all types of worms from cattle for several weeks. This has been attributed to the complicated life cycle of gastrointestinal parasites (Jean, 1994)[15] where at any one time about 10% is found inside the calfand the rest of the 90% on pasture as juveniles (Mike, 2002)[27]. After de-worming, the juveniles from the pasture are ingested by calves during grazing after two or three weeks, especially during the rainy seasons. Inside the calves, the juveniles mature and start lying eggs that pass out within the calf dung back to the pasture thus completing their life cycle. The life cycle of gastrointestinal parasites becomes even more complicated with increased climate change associated with varying temperatures.Increased environmental change has been reported to increase parasitic infestation in livestock and this can be minimized by use of broad-spectrum de-wormers, biological control of livestock parasites and integrated pasture management techniques (Waller, 1993; Jorge, 2006)[53, 18].

Conclusion

A single dosage treatment using*Phytolaccadodecandra* and *Albizia antihelmintica*reveals the potential for the two herbal extracts to reduce EPG in calves. This is especially so within the first three weeks after treatment before much re-infestation takes place from the grazing pastures. The plant extracts have potential to particularly reduce the burden of *Fasciola* and *Stongyle* species from calves. Both plant extracts are less effect on *Monezia*species compared to *Fasciola* species and *Strogyle* species. Albendazole 10% is more effective than both *Albizia* and *Phytolacca*on all the three species of gastrointestinal parasites studied. The three drugs have almost the same effectiveness when used to treat *Monezia* species. The increased effectiveness of Albendazole 10% on the three species of gastrointestinal parasites is attributed to its broad spectrum nature in livestock de-worming. The effectiveness of both *Phytolaccadodecandra* and *Albizia anthelmenthica* on gastrointestinal parasites is attributed to the presence of the active components in the herbal extracts similar to those found in Albendazole 10%. Further studies to identify the active ingredients in *Phytolaccadodecandra* and *Albizia antihelmintica* and standardization of the dosage for the two plant extracts are recommended.

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