

Full Length Research Paper

Antiparasitic effects of the water extract from *Chenopodium ambrosioides* L. (Chenopodiaceae) against some gastrointestinal nematodes in West African Long Legged goats

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An *in vivo* test was undertaken in order to evaluate the efficacy of an aqueous extract of leaves of *Chenopodium ambrosioides* against nematode parasites in goats. The study used fifteen naturally infected West African Long Legged goats (*Capra hircus*) from Northern Benin. Three levels (1, 2 or 4 ml/kg body weight/3 days treatment) of concentration of the herbal drug were administered to three experimental groups and in comparison with two control groups (one without treatment and the other treated with levamisole as a reference drug). Results showed significant ($P < 0.001$) decrease of faecal strongyle eggs in experimental groups. After three days of treatment, the reduction in the rate of egg shedding was over 70% in animals treated with herbal medicine, whereas egg shedding rates remained the same in the non treated group. The rates of reduction in faecal eggs reached almost 100% in few days (5 to 6 days) among treated animals without a significant dose-dependent effect. Moreover, helminthological autopsy performed on the study animals after treatment showed an almost total absence of worms. *C. ambrosioides* aqueous extract exerted a kind of parasite clearing effect in the abomasums and in the small intestine. This indicates the effectiveness of the herbal extract against gastrointestinal parasitic. The lowest dosage of 1 ml/kg body weight for three days treatment was found to be appropriate and prescriptive. No acute toxicity was recorded and the autopsy of internal organs revealed only rare cases of congestion and petechiae on the liver and lungs in animals treated with 4 ml/kg body weight.

Key words: Goats, gastrointestinal nematodes, controlling, herbal medicine, *Chenopodium ambrosioides*.

INTRODUCTION

In tropical regions, gastrointestinal parasites are an important impediment for livestock production. Their control is also a real economic constraint since the drugs used to control parasites infection can be costly. Benzimidazoles, avermectins, imidothiazoles and pyrimidines are the main and common anthelmintic moleculars used to protect small ruminants, but most of

them are subject to drug resistance (Chandrawanthani, 2004; Gaskin, 2006). Due to these issues, numerous farmers in poor areas are using endogenous recipes. In recent years, there has been a resurgence of interest in herbal medicine. In Africa, many farmers use plants to control animal diseases (Djoueche et al., 2011); thus, African flora may provide pharmaceuticals that are currently unknown to the scientific community and that may be cheaper and more environmentally sound. A dynamic of rationalization of endogenous practices is underway and the medicinal properties of many tropical

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Table 1. Study animal groups and corresponding treatments.

Group	Administrated treatments (oral route)	
	Medicinal drug and dosage/kg body weight	Duration of treatments
CG _{WT} : Control group (no treatment)	None	-
CG _{Lev} : Control group treated	Levamisole (50 mg)	Single dose
EG 1 ml/kg = Experiment group no. 1	Plant extract (1 ml)	One dose daily for three days
EG 2 ml/kg = Experiment group no. 2	Plant extract (2 ml)	
EG 4 ml/kg = Experiment group no. 3	Plant extract (4 ml)	

**Figure 1.** Morning faeces recovery device ↑ (diaper) from animals.

plants are being checked. This study aims at evaluating the efficacy of an aqueous extract of the leaves of *Chenopodium ambrosioides* against strongyle infection in West African Long Legged (WALL) goats. The plant is common in many parts of the world like Europe, Asia and Africa. It is used as medicinal herb (Quinlan et al., 2002; Ruffa et al., 2002; Efferth et al., 2002; MacDonald et al., 2004; Patrício et al., 2008). It is well known in rural areas of Benin as “trouzouman” (in “fongbé”, a national language) where it is deemed effective against some human parasitic diseases such as pinworms, tapeworms, roundworms and hookworms.

MATERIALS AND METHODS

Experimental design

The subjects of this study were 15 over one year old Sahelian goats naturally infested with strongyles (*Haemonchus contortus* and *Trichostrongylus* species). These study animals were selected among thirty animals purchased at Zongo livestock market in Cotonou after testing their stools. Only the animals with a faecal

eggs count (FEC) over 1000 eggs/g of faeces were used in the study. The subjects were divided into five homogeneous groups (based on body weight and future treatment) of three animals (Table 1).

The plant material consisted of powdered leaves of *C. ambrosioides*. The leaves were harvested in December 2011 at Hêvié, district of Abomey-Calavi, Department of Atlantic, Benin, where the plant grows naturally. These leaves were sun-dried, then ground, bottled and kept dry within the Applied Biology Research Laboratory (LARBA) of the Abomey-Calavi Polytechnic School. Two substances were used as drugs in the study: the herbal drug and the control drug. The herbal drug was the aqueous extract of the powder of *C. ambrosioides*. It was obtained by infusing, during 30 min, 50 mg of powder in 1000 ml of distilled and deionised hot water. The filtrate was used as the herbal drug at the latest 24 h after. Levamisole bolus® (a conventional anthelmintic) was used as a control drug.

In vivo test of the anthelmintic activities of the drugs

The *in vivo* anthelmintic activity of the leaves of *C. ambrosioides* was assessed in farm conditions. For 15 days of adaptation, the animals were fed *ad libitum* with forage and received daily 1000 g of concentrate. The experiment was undertaken from December 2011 to January 2012 at the Doguici farm, located at Atogon, district of Allada. The parasitological status of the animals was reconfirmed according to the selecting criteria (FEC ≥ 1000) first. From the beginning of the test (day 0) to the third day (day two), animals received the appropriate treatment (Table 1) and their general conditions and behaviour were carefully monitored by the booking of animal's posture, temperature, respiratory frequency, rumination, aspect and frequency of faeces; any toxicological abnormality. Each night of the experiment, each study animal was outfitted with a diaper-like collection sheet (Figure 1) in order to recover, individually and efficiently, the morning faeces of the animals. Faecal material was collected daily for each animal and was stored at 4°C in sealed labelled vials. A total of 150 samples were then taken and examined for faecal eggs counts. The parasitological examination method of Mc Master (Gaskin, 2006) was used to assess the FEC over 10 days (three adaptation days and seven experiment days). The herbal medicine's efficacy was evaluated by calculating the reduction rates of faecal eggs shedding (R_{FES}) with the following formula.

$$R_{FES} (n) = 100 \times (FEC_0 - FEC_n) / FEC_0$$

where $R_{FES} (n)$ = faecal eggs shedding rate of day “n”, FEC_n = faecal eggs count of day “n” and FEC_0 = faecal eggs count before treatment.

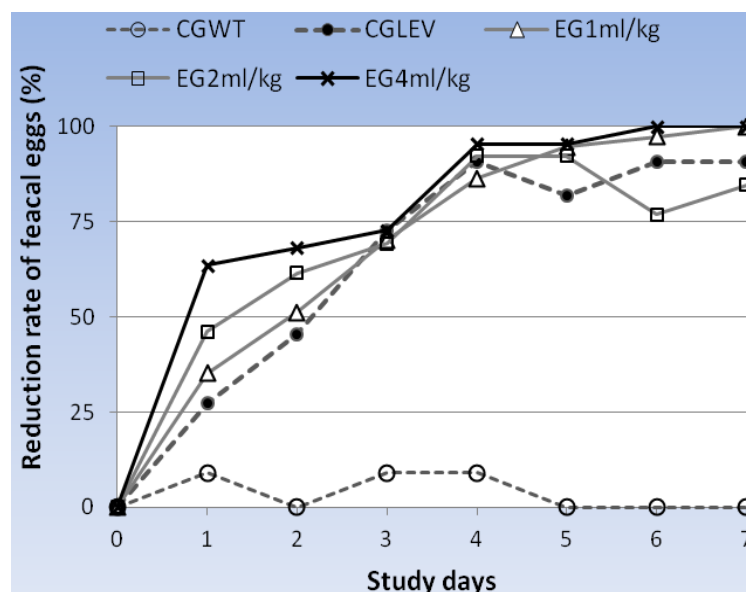


Figure 2. Effect of *C. ambrosioides* extract on the faecal eggs excretion.

Helminthological and toxicological autopsy

At the end of the experiment (day 10), the animals were slaughtered at the abattoir of Cotonou. Their digestive systems were collected and examined tracking lesions and present adult nematodes or cestodes worms. The abomasums and intestines of each gut are separately and carefully inspected after being incised along their long axis. The luminal content was recovered in a container for examination. The mucosa was also inspected for fixed worms. Worms were then collected in glass bottles containing 70° ethanol for nematodes and 5% formalin for other helminthes and were transferred to the LARBA. Identification of parasites was done later based on criteria provided by Zajac et al. (2006). The worm burden for each animal was determined for each species of parasite.

Statistical analysis

The FEC recorded data and the calculated eggs shedding reduction rates (R_{FES}) were performed under Stata 11 following a Poisson distribution model.

RESULT AND DISCUSSION

In vivo anthelmintic effects of *C. ambrosioides* aqueous extract

The daily reduction (percent) of faecal eggs excreted in each treatment condition is as shown in Figure 2. There was a significant decrease in eggs excreted with all treatment when compared with the control group ($P < 0.001$). Reduction of faecal eggs excretion (increase of R_{FES}) was seen spontaneously (72 h) at levels over 70% (required level for biological significance according

to Githiori et al., 2003) in the experimental groups (EG_1 ml/kg, EG_2 ml/kg and EG_4 ml/kg). Reduction in rates approached 100% by the sixth day in the EG_4 ml/kg group. No significant difference was found between the results for the EG_4 ml/kg and CG_{Lev} groups. With reference to the results of similar tests with other herbal plants, *C. ambrosioides* can be considered very efficient in decreasing the excretion of faecal parasites eggs. For example, roots' extracts of *Halothamus somalensis* have induced only 50% reduction within three weeks (Dawo and Tibbo, 2005). A high R_{FES} of 96.2% was recorded in sheep as maximum with a four plants formulation (Zaman et al., 2012) within two weeks. The efficacy of *C. ambrosioides* was not dose-dependent like several other cases of herbal medicines since the levels of success were not significantly different between the dosages. This means that the lower concentration could be a suitable and prescriptive one.

Acute clinical toxicity

Only the presence of pasty stools indicated a perturbation of the digestive transit in animals treated with the two highest doses of extract.

Autopsy results

At helminthological autopsy, the parasites burden in the animals was near zero with treated animals while the untreated group harboured more than 350 adult of the main gastrointestinal nematodes (*H. contortus*, *Trichostrongylus*

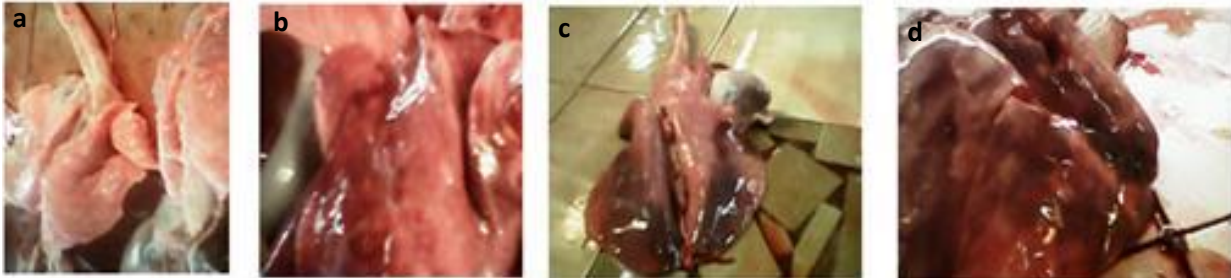


Figure 1. Pathological impact of *C. ambrosioides* extract on lungs with Wall goats.

a. Normal lungs taken from animal in group CGWT; b. Normal lungs taken from animal in group EG 1 ml/kg; c. Mild pulmonary congestion with animal group EG 2 ml/kg; d. Marked pulmonary congestion with animal in group EG 4 ml/kg.

spp, and *Trichurus* spp). The herbal extract had a potent deworming effect similar to that seen with levamisole.

The intestinal mucosa, the lung and liver's parenchyma showed a few petechial lesions (Figure 3) with animals treated with 4 ml/kg body weight dosage. This implies a dose-related toxicity, but no immediate distress or life-threatening effects were observed. These results confirm however the toxicological risks of the plants. Therefore, using a minimum dosage must be recommended.

Conclusion

This study shows that an aqueous extract of the leaves of *C. ambrosioides* is a potent anthelmintic in WALL goats. Ease of formulation and the efficacy of low dose promote its use in farmers as an alternative to synthetic molecules. Further studies are needed to clarify the active ingredients and the mode of action as well as long term dosage utilization.

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REFERENCES

Chandrawanthani P, Yusoff N, Wan LC, Ham A, Waller PJ (2004). Total anthelmintic failure to control nematode parasites of small ruminants on government breeding farms in Sabah, East Malaysia. *Vet. Res. Commun.* 28(6):479-489.

Dawo F, Tibbo M (2005). Anthelmintic effect of *Halothamus somalensis* in Arsi-Bale goats. *Livestock Res.* 17(6).

Djoueche CM, Azebaze AB, Dongmol AB (2011). Investigation of plants used for the ethnoveterinary control of gastrointestinal parasites in Bénoué Region, Cameroon. *Tropicultura* 29(4):205-211.

Efferth T, Olbrich A, Sauerbrey A, Ross DD, Gebhart E, Neugebauer M (2002). Activity of ascaridol from the anthelmintic herb *Chenopodium anthelminticum* L. against sensitive and multidrug-resistant tumor cells. *Anticancer Res.* 22(6C):4221-4224.

Gaskin JM (2006). Mastering the McMasters method of fecal helminth egg count quantification. Presented at the Annual Conference, Florida Goat Association, Gainesville, FL.

Githiori JB, Höglund J, Waller PJ, Baker RL (2003). Evaluation of anthelmintic properties of extracts from some plants used as livestock dewormers by pastoralist and smallholder farmers in Kenya against *Heligmosomoides polygyrus* infections in mice. *Vet. Parasitol.* 118(3-4):215-226.

MacDonald D, VanCrey K, Harrison P, Rangachari PK, Rosenfeld J, Warren C, Sorger G (2004). Ascaridole-less infusions of *Chenopodium ambrosioides* contain a nematocide(s) that is (are) not toxic to mammalian smooth muscle. *J. Ethnopharmacol.* 92(2-3):215-221.

Patrício FJ, Costa GC, Pereira PVS, Aragão-Filho WC, Sousa SM, Frazão JB, Pereira WS, Maciel MCG, Silva LA, Amaral FMM, Rebêlo JMM, Guerra RNM, Ribeiro MNS, Nascimento FRF (2008). Efficacy of the intralesional treatment with *Chenopodium ambrosioides* in the murine infection by *Leishmania amazonensis*. *J. Ethnopharmacol.* 115(2):313-319.

Quinlan MB, Quinlan RJ, Nolan JM (2002). Ethnophysiology and herbal treatments of intestinal worms in Dominica, West Indies. *J. Ethnopharmacol.* 80(1):75-83.

Ruffa MJ, Ferraro G, Wagner ML, Calcagno ML, Campos RH, Cavallaro L (2002). Cytotoxic effect of Argentine medicinal plant extracts on human hepatocellular carcinoma cell line. *J. Ethnopharmacol.* 79(3):335-339.

Zajac M, Conboy G (2006). *Veterinary Clinical Parasitology*, 7th ed. Black Well Publishing Company, U.K.

Zaman MA, Iqbal Z, Khan MN, Muhammad G (2012). Anthelmintic activity of an herbal formulation against gastrointestinal nematodes of sheep. *Pak. Vet. J.* 32(1):117-121.