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 administrated 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.

<table>
<thead>
<tr>
<th>Group</th>
<th>Administrated treatments (oral route)</th>
<th>Medicinal drug and dosage/kg body weight</th>
<th>Duration of treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGWT: Control group (no treatment)</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CGLev: Control group treated</td>
<td>Levamisole (50 mg)</td>
<td></td>
<td>Single dose</td>
</tr>
<tr>
<td>EG 1 ml/kg = Experiment group no. 1</td>
<td>Plant extract (1 ml)</td>
<td></td>
<td>One dose daily for three days</td>
</tr>
<tr>
<td>EG 2 ml/kg = Experiment group no. 2</td>
<td>Plant extract (2 ml)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EG 4 ml/kg = Experiment group no. 3</td>
<td>Plant extract (4 ml)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 Attogon, 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\textsubscript{FES}) with the following formula.

\[
R_{\text{FES}} (n) = 100 \times \frac{(\text{FEC}_n - \text{FEC}_0)}{\text{FEC}_0}
\]

where \(R_{\text{FES}} (n)\) = faecal eggs shedding rate of day “n”, \(\text{FEC}_n\) = faecal eggs count of day “n” and \(\text{FEC}_0\) = faecal eggs count before treatment.
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...
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 lifethreatening 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**


**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.