Comparative assessment of in-vitro anthelmintic effects of the aqueous extracts of the seeds and leaves of the African locust bean (Parkia biglobosa) on bovine nematode eggs

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The effects of the aqueous extracts of seeds and leaves of the African locust bean (Parkia biglobosa) on the viability of the eggs of cattle gastrointestinal helminthes was evaluated in cattle in vitro. The faecal egg counts (FEC) was determined using the modified McMaster technique. The seed extracts produced maximum inhibition of the hatchability of the helminth eggs at 0.3, 0.7 and 1.2 ml while the leave extracts produced maximum inhibition at 0.3 and 2.0 ml. The study concluded that the seed extracts has a better potential for use as an anthelmintic agent than the leaf extract.

Key words: Parkia biglobosa, anthelmintic, cattle, helminth eggs.

INTRODUCTION

Helminthosis is a disease of animals caused by gastrointestinal nematodes and has been recognized as constituting a major constraint to profitable production of ruminants in Nigeria (Chiejina, 2001). In recent times, some strains of parasites developed resistance to the commonly available anthelmintics (Rolfe, 1997) and this has led to screening of plants for possible anthelmintic activities. Helminthosis in ruminants is caused by different nematode worms such as Haemonchus contortus, Trichostrongylus colubriformis, Ostertagia circumcincta, Oesophagostomum, Bunostomum and Cooperia spp (Soulsby, 1982). Conventional drugs have become expensive and therefore unaffordable to poor and low income farmers and this has led to the use of other cheaper alternatives such as medicinal plants (Maphosa and Masika, 2010). The use of indigenous plant preparations for deworming livestock is becoming popular as one of the alternative and sustainable methods readily adaptable to rural farming communities (Dano and Bogh, 1999).

Research on medicinal plants is one of the leading areas of research globally (Soetan and Aiyelaagbe, 2009). The use of herbal products for medicinal purposes has played an important role in nearly every culture on earth, and knowledge of plants, herbs and spices and their respective and collective roles in promoting health is increasing. If the safety and efficacy of these medicinal plants could be ascertained, they could be an alternative and effectively cheaper approach to the control of helminthosis in animals. Soetan and Aiyelaagbe (2009) reviewed the need for bioactivity-safety evaluation and conservation of medicinal plants. Parkia biglobosa is a multipurpose tree of West Africa and is used for nutritional and medicinal purposes (Sabiti and Cobbina, 1992; Mertz et al., 2001). Ibrahim and Nwude (1983) also reported the use of garlic (Allium sativum) as a vermifuge, used to inhibit the activity of Ascarida galli in chickens and also the hatching of the eggs of Necator americanus. Elgamal et al. (1999) reported the anthelmintic effect of saponins extracted from Zygophylum species used in traditional medicine. Lasisi et al. (2003) reported the inhibitory effects of condensed saponins on hatching of eggs of bovine gastrointestinal nematodes in vitro. Adedapo et al. (2007) also reported the anthelmintic efficacy of the aqueous crude extract of Vernonia amygdalina, which significantly reduced the faecal egg count of Toxocara canis (ascarids) and Ancylostoma caninum (hookworm).
Nweze and Ngongeh (2007) reported the in vitro anthelmintic activity of Anthocephista djalonensis root ethanolic extract against the infective larvae stage (L3) of Heligmosomoides polygyrus, a parasitic nematode of mice. Other studies have reported the anthelmintic effects of different plant extracts against different helminthes of animals (Bizimenyera et al., 2006; Al-Shaibani et al., 2008; Maphosa and Masika, 2010; Maphosa et al., 2010). There is an increasing desire to reduce the resistance to anthelmintics and this has led to investigation into the possible use of non-chemical means for the control of the nematodes which focuses on preventing the build up of infective larvae on pasture rather than treating the infection (Soetan and Lasisi, 2008). Several reports have been given on the medicinal uses of P. biglobosa. Agunu et al. (2005) reported its anti-diarrhoeal properties in mice. Kouadio et al. (2000) showed that the hexane extract from the bark of P. biglobosa had some analgesic and anti-inflammatory effects.

Asuzu and Harvey (2003) reported that the methanolic extract of P. biglobosa shows significant protection against the neurotoxic and cytotoxic effects of venoms of poisonous snakes. Gronhaug et al. (2008) conducted a survey which reported that P. biglobosa is used as a remedy to treat different types of wounds and pain from fungal infection and that the stem bark was used most frequently (56.8%) followed by the leaves of the plant (21.6%). This study was necessitated by the fact that literatures are scarce on the use of P. biglobosa as an anthelmintic agent and also that the seed is not usually used for medicinal purposes. Therefore, this study was carried out to investigate the anthelmintic effects of the seeds and leaves of the African locust bean (P. biglobosa).

MATERIALS AND METHODS

Fresh seeds and leaves of P. biglobosa were collected from Ajibode in Ibadan, a human settlement in Akinyele Local Government area of Oyo State, located South West of Nigeria, and about 2 km from the University of Ibadan, Ibadan, Oyo State, and were identified at the herbarium of the Department of Botany and Microbiology, University of Ibadan, Nigeria. The seeds and leaves were sun dried and later ground into powder form.

Aqueous extraction of P. biglobosa seeds and leaves

200 g of the ground seeds of P. biglobosa was weighed using a sensitive weighing balance and was poured inside a bowl, then 2 L of distilled water was added and stirred immediately. Stirring was done every 30 min and after 20 h, the supernatant was filtered and stored in capped bottle and preserved inside the refrigerator at 4°C. The same procedure was done for the leaves of P. biglobosa.

Phytochemical analyses of P. biglobosa seeds and leaves

The phytochemical analysis was done according to the method of Trease and Evans (1989).

Screening of helminth eggs in faecal samples

Faecal samples were collected directly from the rectum of 10 different cattle and were screened for the presence of helminthes by the modified McMaster technique (Roesploff and Nansen, 1998). Faecal samples with the highest number of eggs per gram (800 epg) were selected. Some of the bovine nematode eggs encountered were Haemonchus, Trichostrongylus, Oesophagostomum and Bunostomum species. 1 g of each of the faecal samples was placed into 9 Petri dishes. To these were added different volumes of the seeds and leaf extracts of P. biglobosa. The different volumes used were 0.3, 0.7, 1.2, 2.0 ml and to the 9th Petri dish which served as the control, was added 5.0 ml of distilled water. The faecal culture and the extracts were left for 7 days inside the Petri dishes at room temperature, and examined for the presence or absence of larvae using a light microscope at X40 magnification.

RESULTS

Phytochemical screening of the seeds of P. biglobosa shows presence of alkaloids, cardenolides and saponins while the leaves of P. biglobosa shows presence of alkaloids, cardenolides, saponins and tannins. The 4 Petri dishes containing the extract of the leaves of P. biglobosa all recorded deaths of mature larvae of the helminthes at the different volumes used while only 2 of the Petri dishes containing the extract of the seeds of P. biglobosa recorded the deaths of mature larvae of the helminthes at higher volumes of 1.2 and 2.0 ml (Table 1).

DISCUSSION

The results show that almost all the volumes of the seed extract of P. biglobosa inhibited the hatching of the bovine nematode eggs (+++). This observation is quite similar to the earlier study of Soetan and Lasisi (2008), in which Pearl millet (Pennisetum glaucum) saponin extract was shown to inhibit bovine nematode eggs in vitro at concentrations of 25 to 500 µg/ml. Bizimenyera et al. (2006) also reported the in vitro activity of Peltophorum africanum Sond (Fabaceae) extracts on the egg hatching and larval development of the parasitic nematode (T. colubriformis). The results show that the seed extract of P. biglobosa has more anthelmintic potential than the leaf extract of P. biglobosa. These anthelmintic effects could probably be due to the presence of saponins. The seed extracts of P. biglobosa exhibited maximum inhibition of the bovine helminth eggs (+++) at 0.3, 0.7 and 1.2 ml, while the leaf extract exhibited maximum inhibition of the bovine helminth eggs (+++) at volumes of 0.3 and 2.0 ml (Table 1). The presence of tannins in the leaves of P. biglobosa could also be responsible for the seeming anthelmintic effects. Molan et al. (2000a, b, 2002) reported the inhibitory effects of tannins against gastrointestinal nematodes and deer lungworms.
They reported that condensed tannins (CT) extracted from different forages have the ability to inhibit the development of *T. colubriformis* eggs at larva stage 1 (L1) to larva stage 3 (L3) and to reduce larva motility. They suggested that these CT present in forages may have the ability to break the life cycle of sheep nematodes and reduce the contamination of pasture with infective larva and this may reduce dependence on anthelmintic drugs as the main method of controlling helminthes and reduce the contamination of pasture with nematodes. The mechanism of action (Clarence et al., 1986). Niezen et al. (2002) reported that the diet of the host can have a significant impact on egg hatching and the subsequent development of *T. colubriformis* larvae in the laboratory and in the field. They observed that *Dorycnium rectum*, a herbaceous having moderate to high concentrations of condensed tannin consistently reduced the development of *T. colubriformis* larvae.

In conclusion, the seed extracts of *P. biglobosa* has a better anthelmintic potential more than the leaf extracts and so it could be recommended to animals as an anthelmintic agent as the seed is consumed by humans. More study is required on the anthelmintic effects of *P. biglobosa* in vivo and to also evaluate its biosafety and clinical potentials. Further research is also required to isolate and structurally characterize the active anthelmintic compounds and to elucidate its mechanism of action. There is also a need to discover the cheapest methods of extraction for the effective anthelmintic components that will be easily adaptable for use by rural communities against helminthosis.

### REFERENCES


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**Table 1.** Comparative inhibitory effects of different volumes of seed and leave extracts of *P. biglobosa* on bovine nematode eggs.

<table>
<thead>
<tr>
<th>Seed extract (0.3 ml)</th>
<th>Leave extract (0.3 ml)</th>
<th>Seed extract (0.7 ml)</th>
<th>Leave extract (0.7 ml)</th>
<th>Seed extract (1.2 ml)</th>
<th>Leave extract (1.2 ml)</th>
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E +++: Presence of several helminth eggs; L +++: presence of several helminth larvae; L +: presence of one helminth larva; E - : absence of helminth eggs; L -: absence of helminth larva.


