



IN- VITRO ANTIHELMINTIC EVALUATION OF *DESMODIUM SCORPIURUS* (SW.) DESV. – A MEDICINAL PLANT

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ABSTRACT

The present study was planned to assess the *in vitro* antihelmintic properties of *Desmodium scorpiurus* leaf extracts in comparison with antihelmintic drug Piperazine citrate. The study on *in vitro* anthelmintic properties of different solvent extracts viz. hexane, chloroform, ethyl acetate and methanol were carried out against mature *Pheretima posthuma*. Anthelmintic activity of the plant extract revealed that all the solvent extracts offered a significant anthelmintic activity except hexane extract in a dose dependent manner. The methanol extract of the plant had a maximum effect on *P. posthuma* as it required 24.33 min to paralyse and 30.66 min to cause death at 10 mg mL⁻¹ concentration. The negative control DMF was ineffectual to *P. posthuma*, while piperazine citrate standard caused paralysis at 11.33 min and death at 13.33 min. Further, studies on *D. scorpiurus* are required to identify the active principle responsible for the anthelmintic property of the plant.

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INTRODUCTION

The gastrointestinal parasitic worms (helminths) are of global importance as it is one of the serious problems for humans and livestock. Infection with these helminths has resulted in serious economic loss and their by also threatening the food security (Keiser and Utzinger, 2008; Fitzpatrick, 2013; Charlier *et al.*, 2014). According to World Health Organization (WHO), two billion people are suffering from parasitic worm infections of which, 450 million have significant morbidity to their infection, the majority of them being children (Wen *et al.*, 2008). Upon infection with these helminths several symptoms such as nausea-vomiting, dysentery, loss of appetite and weight, dermatological consequences, etc. will appear (Tripathi, 2008; Hossain *et al.*, 2012) and in grazing animals it leads to chronic infections, mortality, reduced productivity, fertility growth and affects milk and meat production (Lone *et al.*, 2013).

The present day control methods for infection to helminths are mostly dependent on synthetic drugs and it is also associated with many side effects (Piyush and Rupali, 2011). It has been further noted that, in developing countries, for some helminths, there is lack of current available drugs¹. Herbal medicine has gained importance as it is the main source of medicine to about 80% of the population in developing countries.

Numerous studies have been carried out on medicinal plants and are found to be safe for use and ingest apart from anthelmintic properties (Kane *et al.*, 2009; Aremu *et al.*, 2010; Majeed *et al.*, 2011; Gavalapu *et al.*, 2013; Jayaramu and Prathibha, 2016).

Desmodium scorpiurus (Sw.) Desv. is a perennial herb of the family Leguminosae. The plant is known to be originated from tropical America and now found throughout the tropical regions of the world (Smith, 1996). The plant is a climber or a procumbent herb bearing small blue flowers. The fresh leaves or a paste made of them is applied to indolent sores and ulcers. A decoction of the leaves is galactagogue (Miller and Blair, 1963). It has also been noted that species of *Desmodium* consists of a wide group of phytoconstituents and are known to possess many biological properties. The plant extracts of *Desmodium* species are used to cure bone fracture, antispasmodic, sympathomimetic, central nervous system stimulation, the decoction is used as expectorant, antiseptic properties (Samvatsar, 2004; Prusti and Behera, 2007). It is evident from the literature that, there are no reports on antihelmintic properties of *D. scorpiurus*. Thus, the current study was planned in order to evaluate the anthelmintic properties of different solvent extracts of *D. scorpiurus* against *P. posthuma*.

MATERIALS AND METHODS

Plant Material

Fresh leaves of *Desmodium scorpiurus* (Sw.) Desv. were collected from Kozhikkode, Kerala, India and authenticated at

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Preparation of Plant Extract

The collected fresh leaves of *Desmodium scorpiurus* were brought to the laboratory and shade dried. The dried leaves were powdered using a hand mill. Powdered leaf material (50 g) was placed in a porous thimble and extracted using Soxhlet extraction apparatus. The extraction was carried out sequentially based on polarity i.e., hexane, chloroform, ethyl acetate and methanol. The collected extracts were concentrated with a rotary flash evaporator and stored in air tight vials at 4° C and used for further studies (Harborne, 1973).

Anthelmintic activity

The anthelmintic properties of plant extract were carried out according to the method of Ghosh and Bhattachary (2005). Adult earthworm (*P. posthuma*) similar to anatomical and physiological resemblance to intestinal roundworm parasites of human beings were used to evaluate anthelmintic activity. All the solvent extracts of *D. scorpiurus* were dissolved in dimethylformamide (DMF) at 2.5, 5, 7.5 and 10 mg mL⁻¹ and tested for its efficacy against *P. posthuma*. Six worms of *P. posthuma*, with approximately equal size (about 3-5 cm length and 2-4 mm in width) were placed in each Petri dish containing 25 ml of above extract solutions (Mali and Mehta, 2008). Piperazine citrate (5 mg mL⁻¹) and DMF served as positive and negative control, respectively.

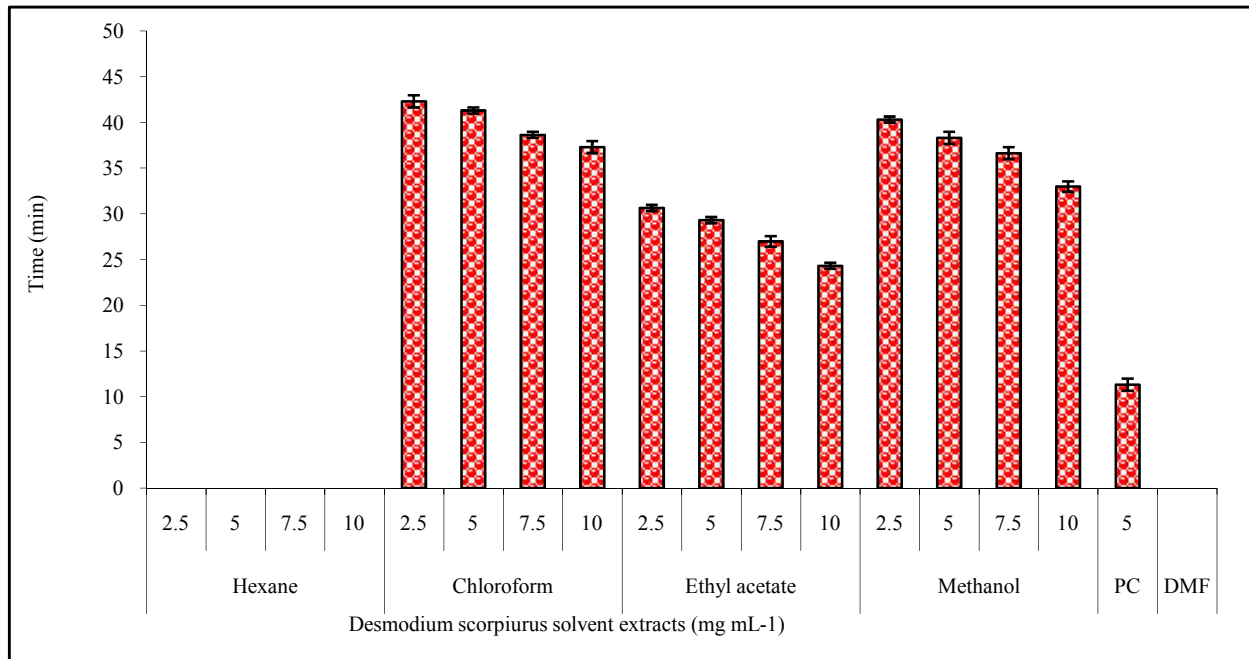


Figure 1 Paralyzing effect of extracts of *Desmodium scorpiurus* against *P. posthuma*

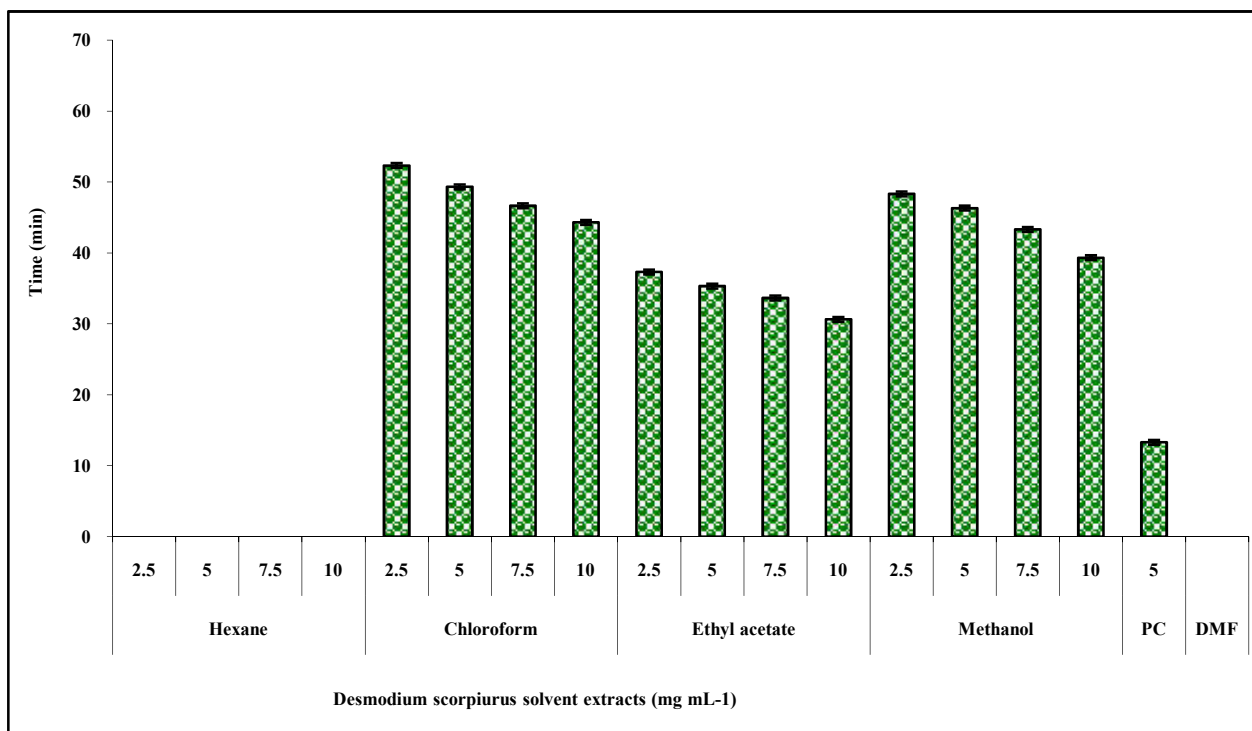


Figure 2 Anthelmintic activity of extracts of *Desmodium scorpiurus* against *P. posthuma*

Observations were made for the time taken to set paralysis and death of the individual worms. Paralysis was confirmed when no sort of movement could be observed even after vigorous shaking, while death was recorded when worms neither moved after vigorous shaking nor when dipped in warm water (50 °C).

RESULTS

Anthelmintic activity of Desmodium scorpiurus

The extracts of *Desmodium scorpiurus* showed anthelmintic activity in a dose dependent manner. Among the solvent extracts tested, methanol extract offered minimum time (24.33 min at 10 mg mL⁻¹) for paralysis of *P. posthuma* (Fig. 1) which finally lead to the death of the organism at 30.66 min (Fig. 2) followed by ethyl acetate and chloroform extract at the same concentration. It was also observed that except hexane extract all the other plant extracts offered anthelmintic activity which was lesser compared to methanol extract. The negative control dimethylformamide did not affect the organism tested, while standard piperazine citrate recorded paralysis and death of *P. posthuma* at 11 and 13 min, respectively when treated at 5 mg mL⁻¹ concentration.

DISCUSSION

According to World Health Organization (WHO), gastrointestinal nematodes cause chronic pervasive infections that contribute to widespread morbidity and mortality worldwide and estimated to infect more than one quarter of the world's population. Among the infectious human gastrointestinal worms *Trichuris trichiura*, *Ascaris lumbricoides*, *Ancylostoma duodenale* and *Nectar americana* are the most infectious ones causing disability or mortality to about 18,000 people per annum (WHO, 1999). Apart from infecting humans, these gastrointestinal nematodes are known to cause morbidity and mortality in livestock their by deteriorating the economic value of the same. Due to heavy loss in livestock, producers have used many anthelmintic drugs worth of million dollars in counter the infection which has finally led to the resistance in parasites (Ross, 1997).

In the past two decades, many parasitic nematodes which offer anatomical and physiological similarity with intestinal round worm of human beings have been used to test the anthelmintic properties *in vitro* (Molgaard *et al.*, 2001; Okpekon *et al.*, 2004). Likewise, Indian earthworm *Pheretima posthuma* and *Eisema fetida* have also been used as parasitic model in order to test the efficacy of anthelmintic drugs (Kushwaha *et al.*, 2011; Adate *et al.*, 2012), as they fall in similarity with the gastrointestinal worms infecting humans. Due to resistance gained by the parasitic worms to the present day drugs available to cure them, many plant based drugs have been evaluated to combat the gastrointestinal worms. However, many scientific studies have been carried out to test the plant extracts for its anthelmintic properties to combat gastrointestinal worms using *Pheretima posthuma* as a model organism. In the present study, we have evaluated different solvent extracts of *Desmodium scorpiurus* against *P. posthuma*. The results of the present study revealed that extracts of *D. scorpiurus* were effective against *P. posthuma* in a dose dependent way. As the concentration of the plant extracts increased the time required to paralyse the organism leading to death decreased. The results are in accordance with the finding of Gavalapu *et al.* (2013), wherein leaf and root

extracts of *Desmodium triflorum* offered anthelmintic activity against *P. posthuma* at 10 mg/ ml. It was also noted that among the extracts tested, methanol showed a highest inhibitory effect against the test parasite. Likewise, many plant extracts have been tested for their efficacy for anthelmintic properties *in vitro* (Lone *et al.*, 2013; Kane *et al.*, 2009; Majeed *et al.*, 2011). The results of the study also revealed that, except for the hexane extract, all the other solvents offered anthelmintic properties with methanol being the effective one. The results of the studies are in line with the findings of Jayaramu and Prathibha (2016), wherein methanol extract of *R. equisetifolia* offered maximum inhibitory effects against *P. posthuma* compared to other solvent extracts. The results report for the first time the anthelmintic activity potentiality of *D. scorpiurus* against *P. posthuma*. Despite ample evidence on many secondary metabolites in *D. scorpiurus*, there is a need to identify the active compounds present in the plant.

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