Indian Journal of Animal Sciences **76** (1): 29–31, January 2006

Physicochemical analysis and efficacy of extract residues of *Scindapsus officinalis* against *Haemonchus contortus*

SAURABH SINGH[1] and MAHESH KUMAR[2]

Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttaranchal 263 145 India

Received: 20 December 2004; Accepted: 14 September 2005

Key words: Anthelmintic activity, Extract residues, *Haemonchus contortus*, *In vitro* anthelmintic activity, *Scindapsus officinalis*

Parasitic diseases, especially haemonchoses, are of great economic significance in sheep and goat husbandry. As landless or marginal farmers are mostly engaged in sheep and goat husbandry, they cannot afford chemical anthelmintics for control of the parasitic diseases. Also considering the rising number of instances of anthelmintic resistance, the indigenous herbal anthelmintics are of great relevance in providing cheap and cost effective means of controlling parasitic diseases. The search for suitable herbal anthelmintic against *Haemonchus contortus* has lead to screening of a wide variety of plants in India (Jangde *et al.* 2001, Sharma *et al.* 2003 and Muraleedharan *et al.* 2003) and abroad (Githiori *et al.* 2003 and Alawa *et al.* 2003).

Scindapsus officinalis, which is reported to possess anthelmintic property, is also a potent candidate for use as anthelmintic against *Haemonchus contortus* as its extracts have shown good activity against the parasite (Chopra *et al.* 1980 and Kumar and Singh 2002). This paper evaluates the efficacy of *S. officinalis* to be a cost effective, less toxic and eco-friendly anthelmintic

The fruits of *Scindapsus officinalis* Schott. (Syn. *Pothos officinalis* Roxb.) belonging to family Araceae locally known as *gajapipal* or *gajapipli*, were identified and collected. The fruits were dried in shade and grinded in Willey mill using sieves of 2 mm size. Six extracts including hot and cold aqueous extracts and cold methanol, diethyl ether, chloroform and hexane extracts were prepared from powdered seeds.

Cold (decoction at room temperature of 30° C) aqueous and organic solvent extracts were prepared as per Singh (2001) by soaking 50 g of powdered seeds in 400 ml of solvent for 24 h in glass beaker. The contents were filtered through several layers of muslin cloth placed in separating funnel. The recovered extracts were evaporated under reduced pressure at 50°C in rotary vacuum evaporator to concentrate the contents.

Present address: [1]Teaching Associate, [2]Professor and Head, Department of Epidemiology and Preventive Medicine, College of Veterinary and Animal Sciences.

The hot aqueous extract was prepared as per Marie *et al.* (1991). Total 50 g of powdered material was poured in 400 ml boiling distilled water and then macerated for 24 h at 44°C, and evaporated (vide supra).

Qualitative chemical analysis of the extract residues was done to detect phytochemical groups, viz. alkaloids, anthraquinones, flavonoids, saponins, tannins, sterols, reducing sugars, glycosides, resins, triterpenes, proteins and coumarins by standard methods (Das *et al.* 1964, Peach and Tracey 1956, Harborne 1973 and Sofowara 1982).

For evaluating *in vitro* efficacy of different extract residues, mature and actively motile *Haemonchus contortus* worms were used as per Sharma *et al.* (1971). Dilutions of the extract residues were prepared (Bhatnagar *et al.* 1961) @ 10 mg/ml (1%) and 20 mg/ml (2%) in 20 ml lock's solution in petri-dishes and fenbendazole at 1% and 2% concentrations, respectively, was used as positive control whereas lock's solution was used as negative control. In each of the petri-dishes, 5 live and motile *Haemonchus contortus* worms were placed and all the petri-dishes were maintained at room temperature of 30° C only and visually observed. To determine the viability of motionless worms, pinch technique (Neogi *et al.* 1961) was used. The motility of live worms was recorded up to 24 h. Thus the minimal lethal time for all the 5 worms in an extract residue was recorded and corrected mortality for each extract residue was calculated by taking into account the mortality of worms, if any, in lock's solution i.e., the negative control as per formula given by Sangwan and Sangwan (1998).

Various extract residues revealed different physical characteristics. The per cent yield, colour and consistency varied depending on the type of solvent used. Both cold and hot aqueous and methanol extract residues appeared black brown and semisolid consistency in cold aqueous as well as in methanol extract while oily in hot aqueous extract residue. Its diethyl ether, hexane and chloroform extract residues were brown with solid or powder like consistency on concentration. In different extracts, minimum yield of 1.48% was obtained from diethyl ether extract and maximum yield

Table 1. Efficacy of *Scindapsus officinalis* extracts @ 10 mg/ml and 20 mg/ml against *Haemonchus contortus* worms

Treatment	No of worms exposed	No of worms found dead after 24 Hrs	% M	% CM (x)
Cold aqueous	5	5 (4)	100 (80)	80 (75)
Hot aqueous	5	0 (5)	0 (100)	0 (80)
Methanol	5	3 (4)	60 (80)	50 (75)
Diethyl ether	5	2 (2)	40 (40)	25 (25)
Chloroform	5	1 (4)	20 (80)	0 (75)
Hexane	5	3 (5)	60 (100)	50 (80)
Fenbendazole (positive control)	5	5 (5)	100 (100)	80 (80)
Lock's solution (negative control)	5	1 (1)	20 (20)	0 (0)

% M – Per cent mortality;% CM, per cent corrected mortality; (x) Figures in parentheses indicate efficacy at 2% concentration.

(15.06%) by cold aqueous extract. Yield from its hot aqueous extract was 14% followed by 3.74% from methanol, 2.90% from hexane and 2.30% from chloroform extracts.

Qualitative phytochemical analyses showed presence of saponins, reducing sugars and tannins in cold and hot aqueous extract residues. Cold aqueous extract residue had anthraquinones and hot aqueous extract residue had proteins, in addition. Its methanol extract residue was positive for triterpenes, saponins, tannins and flavonoids whereas chloroform extract residue had sterols, glycosides, tannins and coumarins. Both diethyl ether and hexane extract residues showed presence of sterols, glycosides, tannins, resins and coumarins.

At 1% concentration, hot aqueous and chloroform extract residues, revealed no efficacy but cold aqueous extract residue gave 80% efficacy with the first worm losing motility after 12 h of immersion. Methanol and hexane extract residues showed 50% corrected mortality; with the first worm losing motility after 6 and 12 h of immersion in the reconstituted extract residues, respectively. Diethyl ether extract residue caused 25% corrected mortality where first worm lost motility after 3 h (Table 1). At 2% concentration, cold aqueous, methanol and chloroform extract residues showed 75% corrected mortality with the first worm losing motility at 6, 3 and 6 h of immersion, respectively. Hot aqueous and hexane extract residues revealed 80% efficacy while diethyl ether extract residues caused 25% corrected mortality only and the worm lost motility after 12 h of immersion. Chopra *et al.* (1980) found that dried fruits of *S. officinalis* had potent anthelmintic activity. Our findings were in agreement with those of Sharma *et al.* (1971) that aqueous extract of *Scindapsus officinalis* was significantly effective against *Haemonchus contortus*. Similarly Kumar and Singh (2002) noticed that the aqueous, chloroform, diethyl ether and methanol extract residues of *S. officinalis* were quite effective against *A. galli* in poultry.

Thus, *Scindapsus officinalis* gave an overall average% corrected mortality of 34.17% at 1% and 72.50% at 2% concentration. Among various extract residues, cold aqueous revealed maximum efficacy followed by methanol and hexane extract residues at 1% concentration while at 2% concentration, hot aqueous and hexane extract residues revealed maximum efficacy followed by cold aqueous, methanol and chloroform extract residues.

The anthelmintic activity inherent in the plants may be attributed to a particular set of phytochemicals like Waghorn and Mc Nabb (2003) reported that plant phenolic compounds were helpful in improving health status of ruminants due to their antiparasitic effect. Whereas Sood *et al.* (2004) evaluated the effect of tannin containing feeds on gastrointestinal parasites and found that the initial load of parasite in calves which were fed tannin containing feed (oak leaves) decreased significantly. We also found that the extracts of *S. officinalis* namely cold aqueous, methanol and hexane extracts had tannin as revealed by the qualitative phytochemical analysis of the extracts hence the greater efficacy of these extracts may be attributed to the tannins present in them.

Singh *et al.* (2004) evaluated *in vitro* anthelmintic efficacy of 11 medicinal plants against *Haemonchus contortus* and found activity mainly in methanolic, aqueous and chloroform extracts of various plants, whereas Singh *et al.* (2005) reported that *Embelia ribes* possessed respectable degree of *in vitro* activity against the *H. contortus*, and they also reported presence of tannins in the most efficacious extract residues namely methanol and hexane, which was in agreement with our findings i.e. we also found maximum efficacy in the aqueous, methanol and hexane extracts of *S. officinalis* and these extracts also had tannins in them.

ACKNOWLEDGEMENT

The authors thank the NATP, for financial support and to

the Dean, College of Veterinary and Animal Sciences and Director, Experiment Station, Pantnagar, for the necessary facilities.

SUMMARY

Efficacy of *Scindapsus officinalis* as a cost effective, less toxic and eco-frienly anthelmintic was evaluated. The maximum efficacy of *S. officinalis* was observed in aqueous, methanal and hexane extract.

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