In vitro inhibitory activities of two browse extracts on larval exsheathment of goat nematodes

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Background

Economic losses due to infections with gastrointestinal nematodes (GINs) represent a major challenge for small ruminant producers in outdoor grazing systems[1]. *Haemonchus contortus* and *Trichostrongylus colubriformis* are the most widely distributed GINs in the tropics and sub-tropics. Forages possessing plant secondary metabolites (PSM) have potential use as alternative natural treatments, either as herbal drugs or nutraceuticals[2]. Such approach provides a practical, sustainable[3,4] and affordable[5] alternative for control of GINs. The anthelmintic properties of tannins have been extensively studied[6], but these properties depend on the source and type of tannins, and on the presence of other PSM.

Objectives

The present study aimed at examining anthelmintic properties of two tannin-containing browse against *H. contortus* and *T. colubriformis* infective larval stage (L_3), and to compare larval susceptibility to extracts.

Materials and Methods

Leaves of *Capparis tomentosa* (CT) and *Dodonea angustifolia* (DA) extracted with 70/30% acetone/water

Determination of condensed tannins was by the modified Butanol-HCl method[7]; and total phenols using Folin Ciocalteu method[8]

Condensed tannins: (6.8, CT); (9.3, DA) Abs_{550}nm/g DM
Total phenols : (10.2, CT); (66.2, DA) mg TA eq./g DM

Larval Exsheathment Inhibition Assay (LEIA)

L_3 (*ca*. 1000 L_3/ml) from monospecifically infected goats

Treatments: 1200, 600, 300, 150 and 0 (control) µg extract/ml Phosphate Buffered Saline (PBS)

L_3 treated for 3hrs, then centrifuged, washed 3× with PBS and artificial exsheathment induced using 40 µl exsheathment fluid

L_3 exsheathment recorded microscopically at 0, 20, 40, and 60 min

$$\%\ \text{Exsheathed} = \frac{\text{Exsheathed}}{\text{Ensheathed}+\text{Exsheathed}} \times 100$$

Fig. (A) Ensheathed L_3 , 100×; (B) Exsheathed L_3, 400×; (C) L_3 sheath, 100×

Results

Table 1
Dose dependent effect of browse extracts on *H. contortus* (HC) and *T. colubriformis* (TC) exsheathment (%)

Nematode species	Browse species	Dose (µg/ml PBS)					SEM	P-value
		0	150	300	600	1200		
HC	*C. tomentosa*	97	89	72	8	0	4.07	<0.0001
	D. angustifolia	100	70	57	10	0	10.39	<0.0001
TC	*C. tomentosa*	95	70	62	5	0	5.43	<0.0001
	D. angustifolia	80	64	56	16	0	9.79	<0.0001

Table 2
EC_{50} (Effective concentration at 50% inhibition, µg/ml PBS) values for *H. contortus* (HC) and *T. colubriformis* (TC) from browse extracts

Nematode species	Browse species	EC_{50}	Confidence interval (95%)	
			Upper	Lower
HC	*C. tomentosa*	333	383	289
	D. angustifolia	276	425	132
TC	*C. tomentosa*	360	500	260
	D. angustifolia	387	491	217

Conclusions

The two browse extracts exhibited anthelmintic properties against both nematode species and the EC_{50} values showed higher susceptibility of *H. contortus*. These *in vitro* Results suggest the possible use of both browse species for simultaneous control of *H. contortus* and *T. colubriformis*. There is ,however, a need to confirm results *in vivo*.

References

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