IJPSR (2018), Volume 9, Issue 2 (Research Article)

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 16 May, 2017; received in revised form, 12 September, 2017; accepted, 17 September, 2017; published 01 February, 2018

ANTHELMINTIC ACTIVITY OF WHOLE PLANT EXTRACT OF *AERVA LANATA* LINN. JUSS IN NATURALLY INFECTED SHEEP

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Keywords:

Aerva lanata; Sheep, Albendazole and Anthelmintic activity

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ABSTRACT: The anthelmintic activity of ethanolic extract of whole plant of *Aerva lanata* was studied in sheep with natural acute/sub-acute parasitic gastro-enteritis due primarily to mixed nematode species. Graded doses of the extract (100,200 and 300 mg/kg, p.o for five consecutive days) significantly reduced faecal egg counts in infected animals. The percentage reduction (96.1%) by 300 mg/kg of the extract was comparable to that of (5mg/kg) of Albendazole (94.3%).The administration of the extract resulted in improved haemoglobin and leucocytosis values in worm –infected sheep.

INTRODUCTION: India is well known source for indigenous system of medicine and extracts of many plants were used in Ayurvedas, siddha and Unani for the treating of different types of diseases[1]. *Aerva lanata* (Linn.) Juss. is one of the diverse medicinal herbs. It's an erect prostrate under shrub belonging to *Amaranthaceae* family [2]. It is known as Gorakshaganja, Satkabhedi, Adaanpaak, in Sankrit, Kapurjadi or Gorakabooti in Hindi and Mountain knot grass in English [3, 4, 5]. It grows 30-80 cm in height and is indigenous to tropical India, tropical Africa, Saudi Arabia and Srilanka [6, 7, 8] *Aerva lanata* (Linn.) Juss extract exhibit significant therapeutic effects such as Anti-hyper glycaemic, Anti-inflammatory, Nephro protective, Urolithiatic, Anthelmintic, Hyper lipidemic, Hepatoprotective, Anti-oxidant and Anti-microbial activity [9, 10].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.9(2).718-21

Article can be accessed online on: www.ijpsr.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.9(2).718-21

The whole plant of *Aerva lanata* was used as anthelmintic traditionally. The present study investigated the Anthelmintic activity of whole plant ethanolic extract of whole plant of *Aerva lanata* in sheep clinically infected with gastrointestinal nematodes.

MATERIAL AND METHODS:

Collection and Authentication of Plant Material: *Aerva lanata* Linn. Juss was collected from Ibrahimnagar village, Siddipet district in Telangana, India, during the month of September 2014 and it is identified and authenticated by taxonomist. A voucher specimen of the plant is maintained in our lab.

Extract Preparation: *Aerva lanata* Linn. Juss was collected after authentication and dried under shade and powdered. The dried plant material of the whole plant was pulverised by a mechanical grinder, sieved through 40 mesh. The powdered materials were extracted with ethanol using soxhlet extraction apparatus. This ethanol extract has then concentrated and dried under reduced pressure. The ethanol free semisolid mass thus obtained was used for the experiment.

Animals: Thirty sheep of sexes, weighing 10-15 kg and 1- 2 years old, obtained from the livestock farm were used. The animals were fed hay and while water was provided *ad libitum*. Six of the animals were healthy, while the rest were suffering from acute/subacute parasitic gastroenteritis due to mixed nematode species (*Haemonchus contortus, Trichostrongylus colubriformis, T. axei, Oesophagostomum columbianum, strongyloides papillosus,* and *trichuris ovis*). The experiment were approved by the IAEC of the college and done following the norms of CPCSEA.

Anthelmintic activity:

Group 1: (healthy animals; control group) received only distilled water, orally for 5 days. The infected sheep were randomly separated in to four groups (2-5) of six animals each.

Groups 2 - 4: were treated orally with the whole plant of extract (100, 200 and 300 mg/kg, respectively) for 5 days consecutive days.

Group 5: was treated with a single dose of albendazole (5 mg/kg, p.o.) as standard anthelmintic on day 0. Faecal samples of each group were collected daily in the morning, starting from one day before treatment to the end of the study and were evaluated for the presence of worm eggs by salt floatation technique. The eggs were counted by the modified McMaster method [11]. Egg count (EC) per cent reduction (ECR) [12, 13] was calculated using the following formula:

$$ECR(\%) = \frac{Pre\text{-}Post}{Pre} \times 100$$

Where Pre is average pre-treatment (EC/ g) and Post is average post-treatment (EC/ g).

Faecal egg counts in extract-treated, albendazole-treated and uninfected groups were compared. Identification of nematode eggs in the faeces was done using standard criteria. EDTA anticoagulated blood samples for haemoglobin (HB) concentration and leucocyte (WBC) count determination were done with blood samples withdrawn from the jugular vein of the animals prior to treatment and for five consecutive days [13, 14, 15].

Statistical analysis: Test of significance between the mean parameters were performed using the analysis of variance (ANOVA).

RESULTS: The present study were evaluated for the potential of *Aerva Lanata* extract for anthelmintic activity in sheep suffering from clinical parasitic gastroenteritis.

The extract significantly reduced counts of strogyle (**Table 1**) *S. papillosus* (**Table 2**) and *T. ovis* (**Table 3**) eggs per gram of faeces in dose related manner, the effect of the highest tested dose (300 mg /kg, p.o. 5 days) being comparable to the single dose of albendazole, (5mg/kg, p.o. on day 0).on the over all, after 5 days of treatment with 100, 200, 300 mg/kg, of *Aerva Lanata* extract the reduction in nematodes eggs count was of 69.8, 82.4 and 96.1% respectively, in comparison with 93.1% achieved with the single dose of albendazole.

The main Hb concentration (**Table 4**) was increased significantly from the pre-treated values indicating its effect on anaemic conditions in worm injected sheeps. The total leucocyte (WBC) counts (**Table 5**) decreased significantly in the extract and albendazole treated groups when compared to pre-treatment values.

TABLE 1: THE EFFECT OF ETTHANOLIC EXTRACT OF *AERVA LANATA* ON STRONGYLE (*HEMONCHUS CONTORTUS, TRYCHOSRONGYLUS COLUBRIFORMIS, T. AXEI, OESOPHAGOSTUM COLUMBIANNUM*) EGG COUNT OF FAECES IN NATURALLY INFECTED SHEEP

Treatment	Does (mg/kg,p.o.)	Number of eggs per g of faces excreted on day					
		0	1	2	3	4	5
Extract [1]	100	265±20.4	201.2±30.6*	167.9±41.5	120±20.2	90.5±20.8*	64.7±28.5**
	200	271.8±30.3	185.9±36.4*	105.8±32.3	70.8±10.8	60.8±12.8**	30.1±8.4**
	300	267.2±40.6	172.6±25.4**	93.5±20.3	38.1±10.6**	18.3±9.1**	11.5±2.1**
Albendazole [2]	5	281.1±38.3	121.4±25.4**	83.7±21.2*	70.1±19.6**	20.4±11.2**	10.2±2.2**
Control (uninfected)	-	0	0	0	0	0	0

Values are mean ± S.D; n = 6; $^{*}P < 0.05$; $^{**}P<0.01$ vs. day 0; ANOVA

[1] Extract treatment for 5 consecutive days; Albendazole [2] single dose on day 0

TABLE 2: THE EFFECT OF ETHANOLIC EXTRACT OF *AERVA LANATA* LEAF ON STRONGYLOIDES PUPILLOSUS EGG COUNT PER GRAM OF FACES IN NATURALLY INFECTED SHEEP

Treatment	Does (mg/kg,p.o.)	Number of eggs per g of faces excreted on day					
		0	1	2	3	4	5
Extract [1]	100	232.8±54.2	202.3±41.2	167.8±31.2*	134.8±39.9**	103.4±22.5**	83.6±14.9**
	200	201.8±37.7	167.3±56.1*	121.5±46.1*	93.5±20.8**	74.5±41.3**	46.8±32.3**
	300	226.6±43.5	175.2±41.2*	102.6±30.6**	56.8±19.8**	36.4±10.6**	14.4±6.8**
Albendazole [2]	5	207.2±34.8.	134.6±31.6*	85.5±16.5**	62.6±18.8**	21.5±9.7**	10.1±7.8**
Control (uninfected)	-	0	0	0	0	0	0

Values are mean ± S. D; n = 6; $^{*}P<0.05$; $^{**}P<0.01$ vs. Day 0.
[1] Extract treatment for 5 consecutive days; Albendazole [2] single dose on day 0

TABLE 3: THE EFFECT OF ETHANOLIC EXTRACT OF *AERVA LANATA* LEAF EXTRACT ON TRICHURIS EGG COUNT PER GRAM OF FAECES IN NATURALLY INFECTED SHEEP

Treatment	Does (mg/kg, p.o.)	Mean number of eggs excreted over 6 days					
		0	1	2	3	4	5
Extract [1]	100	178.6±31.8	144.2±52.3	91.6±27.9*	171.8±31.9**	46.8±26.5	26.6±6.8**
	200	151.8±49.5	132.2±12.8	102.7±22.3*	62.3±19.7**	31.6±12.2**	20.6±9.8**
	300	168.4±28.9	130.6±24.4*	72.6±18.4**	38.5±9.1**	19.2±8.1**	15.6±1.3**
Albendazole [2]	5	195.2±34.6	145.3±28.9*	83.5±30.2**	58.2±18.1**	26.1±9.6**	20.5±7.9
Control (uninfected)	-	0	0	0	0	0	0

Values are mean ± S.D; n = 6 $^{*}P<0.05$; $^{**}P<0.01$; vs. day 0; ANOVA.
[1] Extract for 5 consecutive days; Albendazole [2] single dose 0 day 0

TABLE 4: THE EFFECT OF ETHANOLIC EXTRACT OF *AERVA LANATA* LEAF EXTRACT ON HAEMOGLOBIN (HB) VALUES (g/dl) IN SHEEP NATURALLY INFECTED WITH GASTRO-INTESTINAL NEMATODES

Treatment	Does (mg/kg,p.o.)	Hb values (g/dl) obtained on day					
		0	1	2	3	4	5
Extract [1]	100	5.1±0.3	201.3±30.8	168.9±40.5	120±20.1	90.5±20.8	64.7±28.5
	200	6.1±0.5	185.9±36.4	104.8±31.3	70.8±10.8	60.6±12.7	30.1±8.6
	300	5.3±0.4	171.4±24.4	93.5±20.3	38.1±10.6	18.2±9.1	12.4±2.2
Albendazole [2]	5	5.3±0.6	120.4±26.4	84.7±21.1	70.3±19.8	20.4±10.3	10.1±2.1
Control (uninfected)	-	11.8±1.2	12.2±1.7	11.9±1.2	11.9±1.5	12.2±1.4	8.8±0.2

Values are mean ± S.D; n=6;
[1]Extract treatment for 5 consecutive days; Albendazole [2] single dose on day 0

TABLE 5: THE EFFECT OF ETHANOLIC EXTRACT OF *AERVA LANATA* ON LEUCOCYTE (WBC) COUNTS ($X10^3/mm^3$) IN SHEEP NATURALLY INFECTED WITH GASTROINTESTINAL NEMATODES

Treatment	Does (mg/kg,p.o.)	WBC Count($\times10^3 min^3$) obtained on days					
		0	1	2	3	4	5
Extract [1]	100	26.0±2.5	25.4±1.3	18.6±0.5	12.2±2.4*	11.3±0.9*	8.1±0.6**
	200	24.2±1.5	20.4±1.4	14.6±0.6	14.6±0.8*	9.5±0.5*	6.8±0.3**
	300	25.7±0.8	20.8±1.7	16.3±1.4	13.5±0.6*	9.8±0.8*	6.3±0.6**
Albendazole [2]	5	21.1±1.1	18.1±1.6	15.6±0.6	10.5±0.5*	7.3±0.7**	5.2±0.8**
Control (uninfected)	-	6.4±0.5	6.2±0.3	5.9±0.6	5.9±0.6	6.0±0.8	5.6±0.6

*Values are mean ± S.D; n=6; $^{*}P<0.05$; $^{**}P<0.01$ vs. day 0; ANOVA.
[1] Extract treatment for 5 consecutive days; Albendazole [2] single dose on 0

DISCUSSION: In the present study, the *Aerva lanata* extract significantly reduced the egg production by the helminthic dose dependently. The anthelmintic activity of the plant extract by suppressing of egg production in helminthic may be attributed to its inhibiting effect in the parasite protein synthesis. Inhibition of egg production is an important aspect of the activity of some antinematodals (Benzimidazoles and Phenothiazines). The practical significance of this inhibition is an ultimate reduction in pasture contamination by nematode eggs, which is a very important control

measure in ruminant management. The increased Hb concentration following treatment with the extract and albendazole in the present study indicates recovery from anaemia which is a characteristic in worm infestations. Leucocytosis observed in the sheep prior to treatment was due to helminth infection. The extract reversed this and produced a decrease in WBC counts to normal values indicating the anthelmintic potential of the plant through elimination of the worms in the injected sheep.

CONCLUSION: The aqueous extract of *Aerva lanata* extract produced a dose dependent inhibition of anthelmintic egg production and increased the Hb value in worm infected treated sheep providing a pharmacological basis for the folkloric medicinal application of this plant. Further studies are warranted to develop this plant medicine as a novel anthelmintic by isolation of its phytoconstituents for pharmacological screening.

ACKNOWLEDGEMENT: The author thank the management of the Surabhi Educational Society for providing the facilities to carry out this study.

CONFLICT OF INTEREST: The author declares that there is no conflict of interests.

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How to cite this article:
Jaswanth A, Suddagoni S, Chiliveri SK, Akula G and Phanindra SS: anthelmintic activity of whole plant extract of *Aerva lanata* linn. juss in naturally infected sheep. Int J Pharm Sci & Res 2018; 9(2): 718-21. doi: 10.13040/IJPSR.0975-8232.9(2).718-21.