Applied Biological Research, 13 (1): 34-37, 2011

EFFECT OF *Hygrophila spinosa* HERBAL EXTRACT ON HAEMATO-BIOCHEMICAL PROFILE OF GOATS

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(Received 10 January, 2011; accepted 12 April, 2011)

ABSTRACT

The present investigation was aimed to study the haemato-biochemical profile in grazing goats fed with the herbal extract of *Hygrophila spinosa* alone and in combination with concentrate supplement. The herbal treatment improved the haematological profile irrespective of concentrate supplementation in goats. Herbal treatment and concentrate supplementation also improved serum iron and copper concentration.

Keywords: Biochemical profile, cobalt, copper, goat, haemoglobin, *Hygrophila spinosa*, iron

INTRODUCTION

Hygrophila spinosa (Hindi name: Tal-makhana, Gokulakanta; Sanskrit name: Kokilaksha) is a semi-woody herb of Acanthacea family, an inhabitant of damp or swampy area found throughout the plains of India (Hooker, 1885). *Hygrophila spinosa* T. Anders contains various groups of phyto-constituents viz., phytosterols, fatty acids, minerals, polyphenols, pro-anthocyanins, mucilage, alkaloids, enzymes, amino acids, carbohydrates, hydrocarbons, flavonoids, terpenoids, vitamins, glycosides, etc. The ethanolic extract of aerial part reportedly increase the hemopoietic parameters in rodents (Dasgupta *et al*., 2001), so feeding *Hygrophila* leaf extract, besides supplementing nutrients, may be helpful in minimizing worm infestation problem, consequence of which is anaemia, morbidity and mortality (Asolkar *et al.*, 2005; Nadkarni, 2007). The present investigation was conducted with an objective to evaluate the efficacy of feeding *H. spinosa* herbal extract on haemato-biochemical profile and its additive effect with controlled concentrate supplementation in goats.

MATERIALS AND METHODS

Collection of plant material: Fresh leaf and aerial parts of botanically identified *H. spinosa* plants at pre-flowering stage were collected in bulk from waterlogged area of College of Veterinary Science and Animal Husbandry campus, Anjora, Durg during the month of August-September, 2009. The leaves and aerial parts of plants were cleaned properly to free it from any extraneous materials. The cleaned leaves and aerial parts were dried under shade and ground into fine powder form using domestic mixer grinder machine.

Preparation of extracts: The powdered leaves and aerial parts of *H. spinosa* were processed to obtain hot water extracts by following the standard procedure of Mandal (1998). Dried powdered leaves and aerial plant parts (80 g) were boiled in distilled water and cooled at room temperature in a closed glass container. The contents were filtered with the help of double layered muslin cloth to obtained hot water

extract. The filtrate was centrifuged at 5000 rpm for 10 minutes. The supernatant collected was concentrated in a rotary vacuum evaporator (MAC Rotary Vacuum Evaporator, BUCHI Type; MSW-191) at 60°C and low pressure, followed by complete drying at 60°C temperature in hot air oven. After complete evaporation of water the weight of extracts was noted and the recovery of extracts recorded on dry weight basis. The extract was kept in airtight container and preserved in a refrigerator for further use.

***Experimental animals and treatments**:* The experiment was started at the end of summer season. The 24 non-descript adult goats (male and female) selected for this study were of 12 to 14 months age having less than 10% haemoglobin (Hb) concentration and packed cell volume (PCV) <18. Faeces of each experimental animal was examined for worm load and found almost nil. In order to determine the optimum dose of herbal extract graded dose of *H. spinosa* herbal extract between 30 to 60 mg kg^{-1} body weight were administered to goats in a pilot study. In another experiment, the optimum dose was tested alone and in combination with concentrate supplement for one month. For this purpose, goats were randomly divided into 4 groups (n = 6). Group I was reared on grazing only (which received equal volume of distilled water instead of extract). Group II was reared on grazing and 100 g concentrate supplemented to each goat. Group III was reared on grazing and *H. spinosa* herbal extract given orally @ 40 mg of herbal extract kg^{-1} body weight, and Group IV was reared on grazing with feeding of 100 g concentrate day^{-1} and 40 mg *H. spinosa* herbal extract kg^{-1} body weight. The composition of concentrate mixture was 20% de-oiled rice bran, 42% maize, 30% de-oiled soybean cake, 2% premix and 1% common salt. The concentrate contained 7% digestible crude protein and 60% total digestible nutrients.

Collection of blood samples and haemato-biochemical analysis: Blood samples were collected from jugular vein in sterilized vials with and without anticoagulant (heparin @ 0.2 mg ml^{-1} blood). The following haematological parameters were studied using standard protocols on 0, 15^{th} and 30^{th} day of treatment. The total red blood cell, packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentrate (MCHC) were determined as per Jain (1990). Haemoglobin (Hb) concentration was estimated using Drabkins solution by cynamet hemoglobin method (Crosby and Akeroyed, 1952). Trace minerals such as iron (Fe), copper (Cu) and cobalt (Co) were measured in the serum of experimental goats by using atomic absorption spectrophotometer (ECIL-Elements AAS 4141). The accurate measured volume of serum was digested by tri-acid solution (nitric acid: sulphuric acid: perchloric acid in the ratio of 9:2:1) then adding distilled water to the digested solution made known volume. The data was statistically analyzed for variance within and between the treatment group (Snedecor and Cochran, 1967) using SPSS software (*version SPSS, 1999, SPSS 1 User's Guide; Release 10.0. Ied. SPSS Inc. USA*).

RESULTS AND DISCUSSION

In pilot study the optimum haematinic activity in goats was found at 40 mg of herbal extract of *H. spinosa* which corroborate with the findings of ED_{50} found in anaemic rats by Thakur (2008). No significant difference in haematological parameters and RBC indices were observed on 0^{th} day (before onset of treatment) except MCHC value, which was significantly ($p<0.05$) higher in goats of group III and IV compared to the value obtained in goats of group II. On different days of treatment no significant ($p<0.05$) difference in RBC count was observed between and within the groups. However, a progressive non-significant increase was observed on 15^{th} and 30^{th} days of treatment in goats of group II, III and IV. Maximum RBC count was found in goats of group IV amongst the goats of all groups on 30^{th} day of treatment. Progressive improvement was observed in goats treated with *Hygrophila* herbal extract (group III and IV) throughout the course of treatment with higher concentration of Hb as compared to the goats reared on grazing only (group I). A non-significant increase in Hb concentration on 15^{th} day and significant increase on 30^{th} day of treatment compared to that of 0^{th} day was observed in

the concentrate supplemented goats (group II). Treatment with *H. spinosa* herbal extract for 30 days increased the Hb concentration in goats in comparison to untreated concentrate supplemented and grazing goats (group I & II).

Table 1: Effect of *Hygrophila* herbal extract and concentrate supplementation on different haematological parameters in goat

Haematological parameter	Days	Group-I*	Group-II*	Group-III*	Group-IV*
RBC ($x10^6$ mm^{-3})	0	5.33 ± 0.44	5.48 ± 0.24	5.96 ± 0.23	5.71 ± 0.20
	15	5.75 ± 0.42	5.79 ± 0.20	6.02 ± 0.22	5.95 ± 0.20
	30	5.80 ± 0.24	6.10 ± 0 .26	6.10 ± 0.15	6.34 ± 0.23
HB (g 100 ml^{-1})	0	8.34 ± 0.41	8.62^{a} ± 0.49	9.20^{a} ± 0.23	8.80^{a} ± 0.32
	15	8.65^{A} ± 0.25	9.25^{ABab} ± 0.47	10.3^{Cb} ± 0.24	10.02^{BCb} ± 0.28
	30	8.54^{A} ± 0.32	10.52^{Bb} ± 0.37	12.57^{Cc} ± 0.35	13.27^{Cc} ± 0.27
PCV (%)	0	17.03^{a} ± 0.69	18.10^{a} ± 0.58	$17. 47^{a}$ ± 0.23	16.57^{a} ± 0.51
	15	19.02^{Ab} ±0.40	20.53^{Bb} ± 0.41	19.72^{ABb} ± 0.51	19.03^{Ab} ± 0.41
	30	19.38^{Ab} ± 0.49	23.20^{Bc} ± 0.65	23.23^{Bc} ± 0.45	23.22^{Bc} ± 0.85
MCV (fl)**	0	33.75 ± 2.24	33.11 ± 0 .97	29.30^{a} ± 0.91	30.26^{a} ± 1.59
	15	34.65 ± 2.14	35.68 ± 1.53	32.80^{a} ± 1.00	32.16^{a} ±1.13
	30	33.52 ± 1.39	37.96 ± 2.96	38.45^{b} ± 1.59	36.69^{b} ± 0.79
MCH (pg)**	0	17.79 ± 1.66	15.72 ± 0.82	16.00^{a} ± 0.52	15.62^{a} ± 0.22
	15	15.36 ± 0.86	15.65 ± 0.93	17.14^{a} ± 0.41	16.86^{b} ± 0.49
	30	14.88^{A} ± 0.70	17.40^{B} ± 0.80	20.87^{Cb} ± 0.67	21.08^{Cc} ± 0.46
MCHC (%)	0	48.95^{ABb} ± 1.40	46.50^{A} ± 1.83	53.16^{B} ± 1.38	53.16^{Ba} ± 1.38
	15	45.38^{Aab} ± 0.58	44.50^{A} ± 1.77	52.30^{B} ± 1.46	52.65^{Ba} ± 1.18
	30	44.10^{Aa} ± 1.59	45.33^{A} ± 1.69	49.20^{A} ± 4.83	57.15^{Bb} ± 0.50

*Group I = Reared on grazing only; Group II = Reared on grazing and 100 g concentrate supplement; Group III = Reared on grazing and *H. spinosa* herbal extract given orally @ 40 mg of herbal extract kg^{-1} body weight, and Group IV = Reared on grazing and 100 g concentrate supplement + 40 mg *H. spinosa* herbal extract kg^{-1} body weight.

**fl = femto-liter; pg = pico gram

Note: Small letter superscripts, read column-wise, differ significantly at 5% level ($p<0.05$) whereas capital letters superscripts, read row-wise, differ significantly at 5% level ($p<0.05$).

Progressive improvement in PCV was observed in all the goats of treatment groups (group III & IV) as well as in concentrate supplemented goats (group II) throughout the course of treatment. All these groups showed higher PCV as compared to the goats reared on only grazing. Significantly ($P<0.5$) higher MCV and MCH values were found in herbal extract supplemented group (group III and IV) compared to unsupplemented goats (group I & II) for 30 days. Concentrate supplementation also remarkably improved MCV and MCH but was not at par with *H. spinosa* herbal extract treatment. Higher MCHC values were observed on 30^{th} day compared to that of 0^{th} day only in goats supplemented with concentrate along with treatment. On this day of treatment the goats of this group (group IV) also showed higher MCHC as compared to the goats of other groups (group I, II and III). Treatment with *H. spinosa* herbal extract (group III) as well as concentrate supplementation (group II) increased serum Fe concentration on 30^{th} day. The concentrate supplementation + treatment with *H. spinosa* (group IV) showed an additive effect on serum Fe concentration though no significant difference ($P<0.05$) was observed between the goats received either only concentrate or treatment. Treatment (group III & IV) serum Cu and Co concentration in serum increased non-significantly ($P<0.05$) on 30^{th} day of treatment. *H. spinosa* herbal extract showed the haematinic property in goats.

Table 2: Effect of *Hygrophila* herbal extract and concentrate supplementation on serum iron, copper and cobalt in goat

Metal	Days	Group-I*	Group-II*	Group-III*	Group-IV*
Fe	0	$47.03^{a} \pm 3.63$	$50.93^{a} \pm 1.45$	$51.27^{a} \pm 1.18$	$53.98^{a} \pm 3.24$
	15	$41.21^{a} \pm 0.61$	$51.87^{b} \pm 1.42$	$53.00^{b} \pm 1.81$	$50.12^{b} \pm 2.89$
	30	$41.12^{a} \pm 0.80$	$51.24^{b} \pm 1.58$	$52.20^{b} \pm 1.18$	$55.18^{b} \pm 3.16$
Cu	0	5.54 ± 0.70	5.23 ± 0.61	6.12 ± 0.35	6.21 ± 0.37
	15	5.01 ± 0.77	5.28 ± 0.62	6.22 ± 0.36	6.35 ± 0.37
	30	5.05 ± 0.77	5.34 ± 0.62	6.29 ± 0.36	6.45 ± 0.57
Co	0	$41.17^{a} \pm 0.84$	$42.18^{ab} \pm 0.34$	$42.60^{ab} \pm 0.13$	$42.80^{b} \pm 0.32$
	15	$39.81^{a} \pm 0.83$	$42.30^{b} \pm 0.33$	$42.76^{b} \pm 0.14$	$42.96^{b} \pm 0.33$
	30	$40.26^{a} \pm 0.94$	$42.64^{b} \pm 0.20$	$43.12^{b} \pm 0.30$	$43.07^{b} \pm 0.38$

*Group I = Reared on grazing only; Group II = Reared on grazing and 100 g concentrate supplement; Group III = Reared on grazing and *H. spinosa* herbal extract given orally @ 40 mg of herbal extract kg^{-1} body weight, and Group IV = Reared on grazing and 100 g concentrate supplement + 40 mg *H. spinosa* herbal extract kg^{-1} body weight.

Note: Different superscripts read row wise, differ significantly at 5% level ($p<0.05$).

Conclusion: *H. spinosa* alone has capability to improve haematological parameters and concentrate supplementation added the improvement in terms of microelements.

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