Research Paper

Volume : 2 | Issue : 7 | July 2013 • ISSN No 2277 - 8179

Effect of *Tinospora cordifolia* supplementation on certain biochemical parameters in lactating Murrah buffaloes during winter season

Veterinary

KEYWORDS : Tinospora cordifolia, Murrah buffaloes, biochemical parameters, winter season

Nazir Ahmad Mir	Ph.D Scholar, DCP division, National Dairy Research Institute Karnal Haryana India
Parveen Kumar	Principal Scientist, DCP division, National Dairy Research Institute Karnal Haryana India
Shahid Ahmad Shergojry	Ph.D Scholar, DCB division, National Dairy Research Institute Karnal Haryana India
Ovais Arif	Ph.D Scholar, DCP division, National Dairy Research Institute Karnal Haryana India

ABSTRACT

The present study was conducted to study certain biochemical parameters of lactating Murrah buffaloes supplemented with Tinospora cordifolia. Twelve lactating Murrah buffaloes in early stage of lactation were selected from the herd of National Dairy Research Institute Karnal, Haryana. The buffaloes were divided into two groups of six animals each. One group was taken as control and the other group supplemented with Tinospora cardifolia @ 120g/animal/day from day 3 to day 75 of lactation was taken as treatment group. Blood sampling was done on days 3, 11, 19, 27, 35, 43, 51, 59, 67 and 75 by jugular vein puncture in EDTA vacutainer. Plasma was analyzed for glucose, NEFA, GH, cortisol, catalase. Overall plasma catalase activity and GH concentration was significantly (P<0.05) higher in treatment as compared to control group during the winter season. No significant difference was observed in Cortisol, NEFA and glucose concentration of control and treatment buffaloes.

Introduction

The buffaloes are homeotherms and can maintain their body temperature within a relatively narrow range and both physiological and behavioral responses help in thermoregulation. Under stressful conditions, physiological, biochemical and behavioral responses vary with respect to the animal's genetic make-up and environmental conditions. Seasons have a marked effect on the production parameters and circulatory levels of the biochemical parameters as well as on plasma hormones.

Guduchi (*Tinospora cordifolia*) is a large glabrous deciduous climbing shrub belonging to family Menispermaceae. It is one of the most versatile rejuvenating herbs found throughout tropical Indian subcontinent. Commonly known as a rasayan plant, it is widely used in veterinary folk, ayurveda and other systems of medicine for its general tonic, immunomodulatory, antioxidant, antibacterial, hepatoprotective and anti-inflammatory properties (Krishna *et al*., 2009). Guduchi itself means the "one which protects our body" and Amrita means "the nectar that confers immortality". In Hindi the plant is commonly known as 'giloya', which is a Hindu mythological term that refers to the heavenly elixir that has saved celestial beings from old age and keeps them eternally young. Though every part of plant has therapeutic value the stem is used in most of the medicinal preparations. It is claimed that the plant climbing up the Neem tree is said to be the best as synergy between these two bitter plants enhances guduchi's efficacy. A variety of constituents belonging to different classes such as alkaloids, diterpenoid lactones, glycosides, ecdysteroids, sesquiterpenoids, phenolics, aliphatic compounds and polysaccharides have been isolated from *Tinospora cordifolia* (Singh *et al*., 2003). Little is known about the toxicology of *Tinospora cordifolia.* However no adverse reaction were noted when stem extract of *Tinospora cordifolia* was administered to rabbits up to the highest oral doses of 1.6 g/kg (Ikram et al., 1987; Jagetia *et al*., 1998).

Materials and methods

The experiment was conducted in cattle yard of National Dairy Research Institute, Karnal, Haryana, India. Twelve early lactating murrah buffaloes were selected from institute herd.. The experiment was conducted during the months of November to January. Animal experimentation was performed in compliance with regulations set by the cattle yard, NDRI and approved by the Institutional Animal Ethics committee.

The nutrient requirements of animals were met by feeding concentrate mixture and green fodders as per NRC 1989. Animals had round the clock access to ad libitum fresh water. The dried cylindrical stem pieces of Tinospora cordifolia were collected from the local ayurvedic shop. Authentication of the stem was performed by the ayurvedic doctor in the institute health complex. The stems were ground to powder form in a medicinal herb grinding machine, weighed and packed in polythene. The animals under treatment group were fed dried guduchi stem powder by mixing it in small amount of concentrate @ 120g/day for a period of 72 days after calving(from day 3rd postpartum upto 75th day postpartum). The control animals were fed equal amount of concentrate without guduchi powder for similar period. Blood sampling was done on days 3, 11, 19, 27, 35, 43, 51, 59, 67 and 75 by jugular vein puncture in EDTA vacutainer. Glucose was determined in plasma of buffaloes by "Glucose 96 well assay kit" (Item No.10009582) from Cayman Chemical Company, 1180 East Ellsworth Road Ann Arbour, MI 48108, USA. NEFA was determined in plasma of buffaloes by "Bovine NEFA ELISA kit" (Catalog No. CSB-E13165B) from Cusabio Biotech Co., Ltd. China. Catalase was determined in erythrocyte lysate of buffaloes by "Catalase Assay kit" (Catalog No.707002) from Cayman Chemical Company, 1180 East Ellsworth Road Ann Arbour, MI 48108, USA. Cortisol was determined in plasma of buffaloes by "Cortisol EIA kit" (Catalog No.582121) from Cayman Chemical Company, 1180 East Ellsworth Road Ann Arbour, MI 48108, USA. GH was determined in plasma of buffaloes by "Bovine GH ELISA Test kit" (Catalog No. ERK-B1008) from Endocrine Technologies, 35325 Fircrest Street, Newark, USA. Data was analyzed by SAS 9 software licensed to institute.

Results

The average plasma catalase activity of control and treatment group was 50.24±2.21 and 45.41±1.69 nmol/min/ml respectively. The overall average of cortisol levels in control and treatment group of during the experimental period was 4.88±0.16 and 4.85±0.16 ng/ml, respectively. There was no significant difference in cortisol levels of control and treatment group. The overall average of growth hormone in control and treatment groups during the experimental period was 14.04±0.59 and 15.41±0.85 ng/ml respectively. The growth hormone concentration increased from day 3 of lactation and reached to its peak on day 35 of lactation in both control and treatment groups, however the peak level of treatment (17.06±0.75 ng/ml) was significantly (P<0.05) higher as compared to control

group (15.25±0.91 ng/ml). The blood glucose level of control and treatment group did not differ significantly. Average plasma NEFA concentration was 260.73± 9.59 and 103.51 ± 8.18 µmol/L respectively, on 3rd and 75th day of lactation in control lactating Murrah buffaloes and the corresponding values for treatment group were 259.93±8.76 and 102.72±7.54 µmol/L respectively .However, the average NEFA Levels of control and treatment groups did not differ significantly.

Discussion

The lower catalase activity in treatment groups can be associated with high level of antioxidants (vitamin C and vitamin E) in guduchi. There is no study available for comparison of our study in large animals regarding effect of guduchi on catalase activity. However it has been reported that *Tinospora cordifolia* treatment decreased the concentrations of glutathione reductase (GSH) and activities of superoxide dismutase (SOD), catalase and glutathione peroxidase (GPx) in the tissues of diabetic rats. The extract of *T. cordifolia* has demonstrated antioxidant action in the alloxan induced diabetes model as well (Stanely and menon, 2001). The higher level of growth hormone in treatment group compared to control groups in our study is also supported by (Mallick and Prakesh, 2012), They reported higher level of growth hormone in guduchi fed group of cows as compared to untreated control group of cows. Although it has been reported that Tinospora cordifolia has hypoglycemic effect in laboratory animals and most of studies have been done on diabetic rats only. The alcoholic root extract significantly reduces the blood and urine glucose, and lipids in serum and tissues in alloxan induced diabetic rats (Stanely et al, 2003).

Conclusion

Supplementation of Tinospora cordifolia increased growth hormone concentration and reduced catalase activity of lactating murrah buffaloes during winter season.

Table 1 : Plasma glucose, NEFA and catalase(Mean±SE) in control and treatment lactating Murrah buffaloes.

Parameter	Groups	Days in lactation										Overall average
		3	11	19	27	35	43	51	59	67	75	
Glucose (mg/dl)	Control	43.5 ±1.4	43.9 ±1.2	47.6 ±0.6	49.8 ±4.1	51.5 ±2.6	54.6 ±0.6	56.0 ±1.2	56.6 ±1.1	57.3 ±1.0	57.5 ±1.1	51.8 ±1.5
	Treatment	43.4 ±1.3	44.7 ±1.7	50.4 ±1.6	53.6 ±4.5	56.4 ±2.1	57.4 ±2.8	58.3 ±1.9	59.1 ±1.6	61.4 ±1.4	62.9 ±1.5	54.8 ±2.0
NEFA (µM/ml)	Control	260.7 ±9.5	225.1 ±26.5	205.8 ±10.4	165.7 ±7.5	149.4 ±7.5	128.1 ±8.9	119.8 ±9.1	106.9 ±8.4	104.7 ±6.6	103.5 ±8.2	156.9 ±10.3
	Treatment	259.9 ±8.8	224.2 ±25.9	204.9 ±9.5	164.9 ±7.1	148.6 ±7.1	127.3 ±8.3	118.9 ±8.4	106.2 ±7.7	104.1 ±5.9	102.7 ±7.5	156.2 ±9.6
Catalase (nmol/min/ml)	Control	51.2 ±5.2	54.3 ±1.4	60.5 ±2.2	55.8 ±1.7	53.1 ±1.9	48.5 ±2.1	46.4 ±2.6	46.5 ±1.7	43.1 ±1.8	42.8 ±1.3	50.2^{a} ±2.2
	Treatment	49.7 ±1.4	55.2 ±1.0	50.4 ±1.3	48.2 ±1.1	45.3 ±1.5	43.0 ±2.0	42.3 ±2.1	41.2 ±2.4	39.9 ±1.9	38.4 ±1.8	45.4^{b} ±1.6

Overall averages with different superscripts (a and b) differ significantly.

Table 2 : Plasma cortisol and Growth hormone(Mean±SE) in control and treatment lactating Murrah buffaloes.

Parameter	Groups	Days in lactation										Overall average
		3	11	19	27	35	43	51	59	67	75	
Cortisol (ng/ml)	Control	5.5 ±0.2	4.9 ±0.3	4.8 ±0.2	4.9 ±0.1	4.8 ±0.1	4.8 ±0.1	4.7 ±0.1	4.8 ±0.1	4.6 ±0.1	4.7 ±0.1	4.8 ±0.1
	Treatment	5.5 ±0.1	4.8 ±0.2	4.7 ±0.2	4.8 ±0.1	4.8 ±0.1	4.7 ±0.1	4.6 ±0.1	4.8 ±0.1	4.6 ±0.1	4.6 ±0.1	4.8 ±0.1
Growth hormone (ng/ml)	Control	11.2 ±0.6	13.1 ±1.1	14.3 ±1.1	15.8 ±0.6	15.5 ±0.6	15.2 ±0.9	14.7 ±1.0	14.4 ±1.1	13.9 ±1.2	12.0 ±0.4	14.0^{a} ±0.5
	Treatment	11.0 ±0.4	14.9 ±1.3	16.6 ±3.3	17.5 ±2.1	17.5 ±0.8	17.0 ±0.7	16.6 ±0.7	15.7 ±1.0	14.4 ±2.5	12.4 ±1.7	15.4^{b} ±0.8

Overall averages with different superscripts (a and b) differ significantly.

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