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Research Article

EFFECT OF HOLISTIC REMEDIAL THERAPIES ON BIOCHEMICAL MILIEU IN HYPOGALACTIC CROSSBRED COWS

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ABSTRACT

Comparative evaluation of three different holistic neutraceutical regimens on some metabolic indices in hypogalactic crossbred cows was made. These comprised selected herbal galactagoue-cum-therapeutic agents: Chandrasur (*Lepidium sativum*, Linn.), Shatavari (*Asparagus racemosus*) and Methi (*Trigonella foenum-graecum*), the area-specific mineral mixture 'Jawahar'and probiotics. Significant increases in blood glucose concentration on day 30 and day 60 post-treatment pointed to sustained restoration of positive energy balance. Improved protein profile appeared to be a consequence of augmented functional status of the hepatocytes. No significant increase in the circulatory level of globulin with narrowing of the A/ G ratio or the circulatory titre of alanine transaminase attested to patency of histo-architecture and functional status of the hepatocytes, despite continuous exposure to a variety of phytochemicals present in herbal galactagogues.

Key words: Hypogalactia, cows, neutraceuticals, biochemical milieu

The lactating cow has a special need for glucose (Annison and Linzel, 1988); ~1.1 kg d^{-1} in high producers (McDonald *et al*., 2002). In functional hypogalactia, blood glucose level may decrease to ≤40 mg/dl or 2.2 mmol/l, compared to the normal range of 45-75 mg/dl or 2.5-4.2 mmol/l (Radostits *et al*., 2007). Of the three volatile fatty acids, only propionate can be used as the major precursor of glucose and glycogen *via* gluconeogenesis in the liver. Propionate flux to the hepatic parenchyma (Allen *et al*., 2009) greatly influences lactogenesis. Lowered pH (<6.0) of semi-solid rumen contents reduces the population of beneficial resident cellulolytic bacteria concurrent with rapid multiplication of deleterious lactate-producing species such as *Streptococcus bovis* (Philipsson, 2004). Activated lactobacilli produce more lactic acid. Further, propiogenic species like *Megasphera elsdenii* are suppressed. Thus, subclinical acidosis-related problems contribute to bovine hypogalactia.

A number of herbal/herbo-mineral galactagogue formulations, with or without probiotics, are now commercially available. However, controlled therapeutic trials of ingredients are urgently needed to corroborate the reported observations with direct experimental evidences. The basic postulate of the present study is that restoration of biochemical homeostasis through judicious composite neutraceutical regimens with improved digestive functions would promote crucial dry matter intake (DMI) and enhanced propionate flux to the liver parenchyma. This would be evidenced by sustained increase in blood sugar level concomitant with augmented hepatic function.

MATERIALS AND METHODS

After obtaining permission from the Institute's Animal Ethics Committee, the study was conducted at the University's Livestock Farm, Adhartal and in part, in a privately owned periurban dairy farm in Jabalpur, (M.P.). A total of 150 crossbred cows, irrespective of genotype, parity status, and free from any detectable clinical signs of disease: mastitis and production disorders were short-listed following extensive epidemiological studies. These comprised animals in advanced gestation, and cows at freshening, and at different stages of lactation. Hypogalactic cows were carefully identified on the basis of data obtained through a well-structured questionnaire in Hindi and personal observations, and spot modified California mastitis test (MCMT) was conducted on aseptically collected, coded milk samples to rule out mastitis. Further, Rothera's test for detection of ketone bodies in urine samples (Oser, 1979) was done to eliminate ketoacidosis.

A total of 42 hypogalactic cows were randomized into seven equal treatment groups, each comprising six animals. Control group T_1-without herbal galactagogue(s)

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received adequate amount of the standard basal ration [BR; DCP 15, TDN 70, area-specific mineral mixture‘Jawahar’, formulated by the Institute 25 g, and probiotics (live yeast culture) 15g/animal/d, uniformly mixed in the concentrate mixture every morning] as per ICAR recommendations (1998). The treatment groups comprised T_2: BR+Chandrasur 100g, T_3: BR+Shatavari 100g, T_4: BR+Methi 100g, T_5: BR+Chandrasur 70g+Methi 30g, T_6: BR+Shatavari 70g+Methi 30g and T_7: BR+ Chandrasur 70g+Shatavari 30g.

Biochemical profiles of hypogalactic cows, before and after the remedial therapies were evaluated quantitatively with the selected metabolic indices: blood glucose concentration (g/dl), plasma total protein (TP), albumin and globulin concentrations (g/dl), A/G ratio, and plasma alanine transaminase, ALT (U/L) as a dependable liver function test (Oser, 1979) using Erba diagnostic kits. About 12 ml blood was aseptically collected from each cow in the morning hours on day 0 (pre-treatment), and on day 30 and day 60 (post-treatment). Blood was quantitatively transferred into clean, dry heparinized glass vials (20 U β-heparin/ml blood). Ten ml aliquot of bloodwas centrifuged (3000 rpm, 5 min.), and the clear plasma was carefully pipetted off into clean dry labeled screw-capped glass tubes. The remaining whole blood was used in blood glucose estimates with Automatic Biochemical Analyzer (Erba Chem-5 Plus, India).

ANOVA test was done to partition the sources of variation (Snedecor and Cochran, 1994). Then, Duncan’s Multiple Range Test (Steel and Torrie, 1980) was applied to identify the significant differences between the mean values of a given parameter under the different treatments, uniformly at 5% level of probability.

RESULTS AND DISCUSSION

In all treated groups, significant increases in blood glucose concentration were observed, compared to the corresponding control values. Thus, in group T_7 (Chandrasur 70g+ Shatavari 30g), the mean value (mg/dl) averaged 44.53 and 45.73 on day 30 and day 60, respectively, compared to the corresponding value of 35.2 and 36.0 in the untreated group T_1 (Table 1).

The data on circulatory TP concentration revealed significant differences because of the treatments/intervals; a perceptible rising trend was recorded on day 30 in group T_4 (Methi, 100g) with further increase on day 60. Plasma albumin concentration showed significant differences

Table 1
Changes in the blood biochemical profile in hypogalactic crossbred cows following different neutraceutical regimens

Treatment	Intervals (d)		
	Pre-treatment	Post-treatment	
	0	30	60
Blood glucose concentration (mg/dl)			
T_1	34.9 ± 1.48^{e}	35.2 ± 1.48^{e}	36.0 ± 1.25^{e}
T_2	42.0 ± 0.26^{cd}	43.3 ± 0.26^{cd}	44.2 ± 0.54^{ab}
T_3	42.4 ± 0.57^{bc}	43.5 ± 0.54^{bc}	44.3 ± 0.51^{ab}
T_4	40.3 ± 0.54^{d}	41.8 ± 0.48^{cd}	43.1 ± 0.47^{bc}
T_5	41.6 ± 0.19^{cd}	42.5 ± 0.48^{bc}	43.5 ± 0.43^{bc}
T_6	42.4 ± 0.23^{bc}	43.4 ± 0.24^{bc}	44.4 ± 0.27^{ab}
T_7	43.0 ± 0.32^{bc}	44.5 ± 0.43^{ab}	45.7 ± 0.43^{ab}
Total protein concentration (g/dl)			
T_1	8.1 ± 0.26^{bc}	7.9 ± 0.34^{cd}	8.0 ± 0.35^{bcd}
T_2	6.2 ± 0.11^{jk}	6.8 ± 0.29^{efghij}	7.1 ± 0.25^{efg}
T_3	6.4 ± 0.11^{jijk}	6.8 ± 0.11^{efghij}	7.1 ± 0.37^{efg}
T_4	8.1 ± 0.21^{bc}	8.6 ± 0.27^{ab}	9.0 ± 0.31^{a}
T_5	6.0 ± 0.14^{k}	6.5 ± 0.13^{ghijk}	6.9 ± 0.08^{efghi}
T_6	6.7 ± 0.12^{fghij}	6.9 ± 0.11^{efghi}	7.0 ± 0.11^{efgh}
T_7	6.3 ± 0.08^{ijk}	7.2 ± 0.23^{ef}	7.4 ± 0.22^{de}
Alanine transaminase titre (U/L)			
T_1	40.6 ± 1.56^{b}	43.8 ± 1.30^{ab}	45.4 ± 1.39^{a}
T_2	34.1 ± 0.30^{c}	34.9 ± 0.27^{c}	35.1 ± 0.42^{c}
T_3	11.7 ± 2.79^{de}	12.4 ± 3.05^{d}	12.9 ± 3.21^{d}
T_4	34.4 ± 0.24^{c}	35.1 ± 0.32^{d}	35.3 ± 0.42^{c}
T_5	33.7 ± 0.30^{c}	34.5 ± 0.23^{c}	35.6 ± 0.31^{c}
T_6	7.8 ± 0.36^{e}	8.8 ± 0.85^{de}	13.1 ± 0.45^{c}
T_7	34.0 ± 0.45^{c}	35.0 ± 0.45^{c}	36.0 ± 0.18^{c}

T_1=Basal ration, BR; T_2=BR+Chandrasur 100g; T_3=BR+ Shatavari 100g; T_4=BR+Methi 100g; T_5=BR+Chandrasur 70g+Methi 30g; T_6=BR+Shatavari 70g+Methi 30g; T_7=BR+ Chandrasur 70g+Shatavari 30g. Area specific mineral mixture ‘Jawahar’ @ 25g+Probiotics (YC) @15 g/ animal/d offered uniformly in all seven groups. Means with the same superscripts do not differ significantly ($P<0.05$).

because of treatments. Perusal of the data showed noteworthy increases in the value on day 30 in treatments T_3, T_6 and T_7. The response was augmented on day 60 in treatment T_4. Further, it is noteworthy that different treatments (T_2-T_7) elicited significant increases in the plasma albumin concentration.

Circulatory levels of metabolic indices are commonly employed to monitor the nutritional status of dairy cows (Ronalds *et al*., 1980). Energy balance is closely linked to productive and reproductive performance and dramatic changes in haemato-biochemical variables in the critical periparturient phase lead to enhanced susceptibility to production disorders (Roy, 2010a,b). Blood glucose concentration reflects the net energy balance in lactating cows (Underwood and Suttle, 2001). Restoration of positive energy balance through composite neutraceutical regimens (in the present study) assumes pertinence in the light of the reported early post-partum sharp decrease in circulatory glucose level, suggestive of negative energy balance (NEB) in Thai Holstein cows (Rukkwamsuk *et al*., 2010), and Indian buffaloes (Hagawane *et al.*, 2009). Circulatory protein profile faithfully reflects the nutritional status of lactating dairy cows. In the periurban areas of middle Gangetic plains in North India, serum TP concentration (g/dl) in lactating cows, without any herbal galactagogue feed supplement, averaged 7.6 (Singh *et al*., 2009), which is close to the control value recorded in the present study. Different treatments (T_2-T_7) in the present study produced significant increases in the values of circulatory albumin concentration, presumably because of enhanced biosynthetic activity in the hepatocytes. Absence of any significant increase in circulatory titre of globulin with narrowing of the A/G ratio attests to freedom from infection/ inflammatory condition.

Enhanced titres of ALT serve as a dependable blood biochemical marker of damaged plasma membranes in hepatocytes. Therapeutic trial (present study) involved continuous oral exposure to a large variety of phytochemicals: steroidal saponins, isoflavins, asparagamine (polycyclic alkaloid), racemosol (cyclic hydrocarbon) etc. present in the herbal agent, Shatavari (Kumar *et al*., 2008). However, absence of any significant increase in the circulatory titre of ALT clearly indicated absence of any structural alterations/ functional impairment in the liver parenchyma.

It is concluded that different holistic neutraceutical regimensresulted in restoration of positive energy balance, concurrent with improved circulatory protein profile in hypogalactic crossbred cows.

REFERENCES

Allen, M.S., Bradford, B.J. and Oba, M. (2009). The hepatic theory of control of feed intake. *J. Anim. Sci.* **87**: 3317-3334.

Annison, E.F.and Linzel, J.L. (1988). Oxidation of glucose and acetate by the mammary gland. *J. Physiol.* **185**: 352-372.

Hagawane, S.D., Shinde, S.B. and Rajguru, D.N. (2009). Haematological and blood biochemical profile in lactating buffaloes in and around Parbani city. *Vet. World* **2**: 467- 469.

Kumar, S., Mehla, R.K. and Dang, A.K. (2008). Use of shatavari (*Asparagus racemosus*) as a galactopoietics and therapeutic herb - A review. *Agric. Rev*. **29**: 132-138.

McDonald, P., Edwards, R.A., Greenhalg, J.F.P. and Morgan, C.A. (2002). Microbial digestion in ruminants and other herbivores. In: Animal Nutrition (6th edn.), Pearson Education, Singapore.

Oser, B.L. (1979). Blood Analysis. In: Hawk's Physiological Chemistry. (14th edn.), Tata McGraw Hill Publishing Company Ltd., New Delhi.

Philipsson, A.T. (2004). Ruminant Digestion. In: Duke's Physiology of Domestic Animals. (12th edn.). Swensen, M.J. (ed.), Cornel Univ. Press, Ithaca and London.

Radostits, O.M., Gay, C.C., Blood, D.C., Arundale, J.A. and Done, S.H. (2007). Veterinary Medicine: A Textbook of the Diseases of Cattle, Sheep, Pigs, Goats and Horses. (10th edn.), Elsevier Saunders, New York.

Ronalds, G.L., Manston, R., Stark, A.J., Russel, A.M., Collis, K.A. and Collis, S.C. (1980). Changes in albumin, globulin, glucose and cholesterol concentration in the blood of dairy cows in late pregnancy and early lactation and the relationships with subsequent fertility. *J. Agric. Sci.* **94**: 517-527.

Roy, K. (2010a). Production diseases of dairy animals. I. *Pashudhan* **36**: 7-9.

Roy, K. (2010b). Production diseases of dairy animals. II. *Pashudhan* **36**: 3-4.

Rukkwamsuk, T., Rungruang, S., Choothesa, A. and Wensingh, T. (2010). Performance of peri-parturient dairy cows fed either alfalfa hay or peanut hay in total mixed ration: A field trial in Thailand. *Afr. J. Agric. Res*. **5**: 1430-1438.

Singh, V.K., Singh, P., Verma, A.K. and Mehla, U.R. (2009). On-farm assessment of nutritional status of lactating cattle and buffaloes in urban, peri-urban and rural areas of middle Gangetic plains. *Livestock Res. Rural Dev.* **20**: Article # 130. http:// www.lrrd.org/lrrd20/8/singh 20130.htm.

Snedecor, G.W. and Cochran W.A. (1994). Statistical Methods. (8th edn.), Oxford and IBH Publishing Company, Kolkata.

Steel, R.G.D. and Torrie, J.H. (1980). Principles and Procedures of Statistics: A Biometric Approach. International Student edn., McGraw Hill Kogakusha Ltd., Tokyo.

Underwood, E.J. and Suttle, N.F. (1999). Nutrition of Livestock. (3rd edn.), Commonwealth Agricultural Bureaux of Publications International, Wallingford, U.K.