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Effect of formaldehyde treated protein on blood hematology in Surti buffalo heifers

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Abstract
With an aim of' ascertaining the effect of feeding formaldehyde (HCHO) treated (bypass) protein on blood metabolites. A total of 20 Surti buffalo heifers of 19-21 month of age with mean body weight (165±5.43) were divided into 4 homogenous groups. Individual feeding of all the animals was followed with basal diet containing 5 kg green roughage, dry roughages *ad lib* along with required quantity of compounded concentrate mixture (CCM). The animals were offered with the concentrate mixture containing different level of HCHO treated protein and designated as CON (control; CCM), FT-25 (CCM containing HCHO treated bypass protein @ 25%), FT-50 (CCM containing HCHO treated bypass protein @ 50%) and FT-100 (CCM containing HCHO treated bypass protein @100%). Among blood metabolites, level of urea nitrogen and thyroid hormones showed an improvement ($P<0.05$), while aspartate aminotransferase exhibited a tendency ($P=0.072$) towards the reduction, due to HCHO treatment of dietary protein. Overall it is concluded that feeding of formaldehyde treated (bypass) protein in buffalo heifers could favorable impact on blood metabolites.

Keywords: surti buffalo heifers, bypass protein, blood biochemical

Introduction
Protein rich oil seed cakes when ingested by ruminants, a significant part of this protein is broken down to ammonia in rumen. A fraction of this ammonia is utilized by rumen microbes for their protein synthesis, while rest diffuses to circulation and converted to urea (at the cost of energy) in liver and excreted via urine (McDonald *et al*., 2010) [2]. To prevent such losses of protein, the concept of protecting the dietary protein from ruminal degradation has come up (Roy *et al*., 1977) [3]. Such protein sources are subjected to suitable treatment and termed as bypass protein. Keeping these points in view, a feeding trial is conducted to study the effect of bypass protein on the Blood metabolites.

Materials and Methods
A total of twenty, Surti buffalo heifers of 19-21 month of age with mean body weight 165±5.43 kg were selected. Experimental heifers were divided into fourhomogenous groups (five animal per group) based on their individual body weight using complete randomized design. Individual feeding of all the animals was followed with basal diet containing green roughage (5 kg), dry roughages (*ad lib)* along with required quantity of compounded concentrate mixture (CCM) to meet their protein and energy needs for growth as per ICAR (1998) [1].

The main protein source of CMM (rapeseed) was treated with HCHO @1.0/kg of crude protein (CP) with aim to protect its ruminal degradation and replaced with untreated rapeseed @ 25, 50 and 100% in FT-25, FT-50 and FT-100 CMM, respectively. The respective CMM was prepared and procured from Dudhsagar District Cooperative Milk Producers' Union Limited (Dudhsagar Dairy), Mehsana, Gujarat. The animals were offered with these CMM containing different level of HCHO treated protein and designated as CON (control; CCM), FT-25 (CCM containing formaldehyde treated bypass protein @ 25%), FT-50 (CCM containing formaldehyde treated bypass protein @ 50%) and FT-100 (CCM containing formaldehyde treated bypass protein @100%). Composition of concentrate mixtures were shown in the table no.1.

Blood samples collected from each animal by puncturing the jugular vein on day zero and subsequently at 90th and 180th day of experiment and stored at -40ºC till further analysis of their biochemical profile. The serum concentration of glucose, total protein, albumin, globulin, A:G ratio, triglycerides, total cholesterol, urea nitrogen (SUN) and aminotransferases *viz.* alanine aminotransferase (ALT) and aspartate aminotransferase (AST)were estimated by colorimetric method using spectrophotometer at appropriate wavelength using respective

analytical kits. Hormonal profile of thyroid gland *viz.* triiodothyronine (T3) and thyroxine (T4) was also assessed to have an idea of metabolic rate in animals by using the analytical kits.

Statistical analysis

The data generated were analyzed for their statistical significance using statistical package for the social sciences [5].

Results and Discussion

Serum concentration of glucose, total protein, albumin, globulin, and total triglycerides exhibited comparable (P>0.05) values due to different dietary treatments indicating no response of HCHO on these attributes. Periodic alterations in serum cholesterol level have been depicted in Fig. 1. The treatment of dietary protein with HCHO at variable levels exhibited an alteration (P<0.05) in the mean serum cholesterol level. This could be charged to the genetic makeup of animals in the respective groups as they maintained their serum cholesterol throughout the period, thus it can be implicated that HCHO dietary treatment had no effect on serum cholesterol alteration.

Serum level of urea nitrogen revealed lower (P<0.05) values in groups fed with either 50 or 100% formaldehyde treated protein (FT-50 and FT-100) as compared to untreated (CON) group indicating positive effect of HCHO treatment. HCHO treatment of dietary protein proved to be effective in modification of thyroid hormone level in buffalo heifers as evident by the higher (P>0.05) T3 concentration in FT-50 and FT-100. Formaldehyde treatment is not only effective in protein protection, but also binds with glucosinolate which otherwise gets degraded to thiocynate in rumen and then disturbs the animal's thyroid metabolism (Sahoo *et al*., 2002) [4]. In the present study, the HCHO treatment has shown its obvious potential to improve (P>0.05) the level of serum thyroid in buffalo heifers.

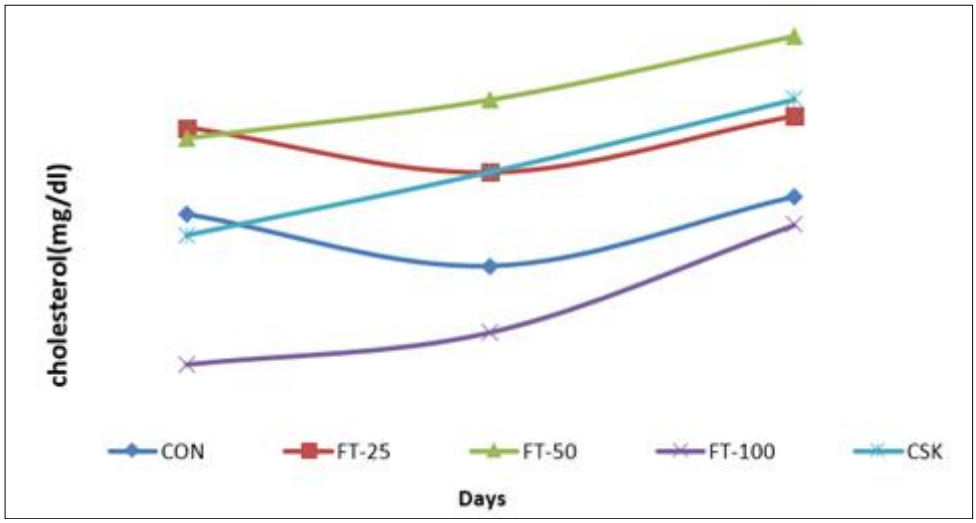

Fig 1: Cholesterol

Table 1: Blood parameters in buffalo heifers fed on formaldehyde treated protein

Attribution	Treatments				P value
	CON	FT-25	FT-50	FT-100	
Blood Glucose (mg/dl)	56.19±0.47	57.09±0.50	56.66±0.49	56.70±0.63	0.58
BUN (mg/dl)	16.78±1.00	16.37±0.85	15.94±0.57	14.50±0.70	0.17
Cholesterol (mg/dl)	74.68^{x}±0.42	76.40^{xy}±0.72	77.33^{y}±0.82	73.06^{xy}±0.84	0.08
Triglycerides (mg/dl)	84.23±1.51	84.75±1.09	86.02±0.70	84.29±0.64	0.49
Protein fraction (mg/dl)					
TP	6.83±0.12	6.75±0.09	6.64±0.10	6.61±0.09	0.41
Albumin	3.02±0.05	3.04±0.03	3.01±0.04	3.05±0.03	0.89
Globulin	3.81±0.13	3.72±0.08	3.63±0.10	3.56±0.08	0.34
A/G	0.79±0.03	0.82±0.02	0.83±0.03	0.86±0.02	0.43
Hepatic enzyme action (U/l)					
ALT	57.0±1.93	60.3±1.97	58.8±1.85	59.6±1.76	0.63
AST	90.75±3.86	93.08±5.78	84.56±3.79	85.79±2.75	0.19
Thyroid Hormone (nmol/l)					
T3	1.79^{x}±0.08	1.80^{x}±0.06	2.19^{y}±0.09	2.07^{y}±0.05	0.05
T4	35.62^{xy}±1.46	36.61^{y}±1.38	38.21^{y}±1.46	37.99^{y}±1.67	0.58

^{xyz} Values in a row bearing different superscript differ significantly (P<0.05)

Conclusion

From the overall evaluation of the results obtained in the present study, it was observed that Serum T3 Level was increase FT-50 AND FT-100 group (P> 0.05) and serum cholesterol was increase in FT-50 groups (P> 0.05). These results suggest that there was no any adverse effect of 0.25%., 0.5% and 1% formaldehyde treated protein on any metabolic indices. Hence it can be recommended that uses formaldehyde for protection of dietary protein in ruminant is safe.

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