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Effects of Vetch (*Vicia sativa* L.) Grain as Feed on Certain Blood Parameters in Lambs

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Abstract: In the present study, effects of use of vetch grain feed (V), which is one of leguminous grain feeds, at different levels on certain blood parameters in lamb rations were investigated. Twenty four of weaned female lambs, which are approximately, 16 week old, were used for the test. Three feeding groups were established for the test. According to it, feed amount, which accounts for 2% of Body Weight (BW), consists of completely dry trefoil for the Control group (C). The second group (VI) was fed with vetch in an amount of 0.75% of BW and Dry Trefoil (DT) in an amount of 1.25% of BW and the third group (VII) was fed with vetch in an amount of 1.5% of BW and dry trefoil in an amount of 0.5% of BW. Two blood samples were collected from the lambs, one was collected at the beginning of the study and the other was collected on the 25th day of the study. According to the analyses conducted, it was observed that blood Triglyceride (TG), Very Low Density Lipoprotein (VLDL) and Lactate Dehydrogenasis (LDH) levels in the bloods of the lambs were not affected by V-type diet. However, blood Aspartate Aminotransferase (AST) level increased in all groups including control, while blood Albumin (ALB) level increased in VII depending on Vetch (V) diet ($p<0.05$). It was also, seen that blood alanine Aminotransferase (ALT) and Blood Urea Nitrogen (BUN) levels decreased as a result of V diet ($p<0.05$). The fact that use of V, which is a good protein and energy feed, increased ALB level and decreased BUN suggested that a positive protein metabolism was formed in the animals. High-ratio use of V containing anti-nutrient materials like all leguminous grain feeds, was expected to increase ALT and LDH levels; however, it caused decrease in these parameters. This evidenced positive effect of V on liver.

Key words: Ruminant, biochemical parameters, vetch, body weight, dry trefoil

INTRODUCTION

Investigating blood parameters is an important method to determine diet status in animals just like in humans. Blood is important to examine tissues and to obtain data about the organism's general metabolic status, physiological efficiency, health and diet. Data related to blood parameters may be good indicators for observing effects of different diet practices (Yurtman *et al*., 1997).

Countries having high ratio animal protein resources used a significant part of these resources for satisfying raw protein needs of ruminants until recent years. Feeds of animal origin were banned after the BSE disease caused by use of animal-origin feeds had appeared in ruminant rations.

Furthermore, feeding ruminants with vegetable materials as required by organic agriculture became a must and as a result, protein deficit has increased. Leguminous grain feeds are important options due to their high protein contents among other alternative resources suggested for settling this protein deficit occurred in feeding ruminants. Vetch is one of the mostly emphasized leguminous grain feed as an alternative. Vetch seeds have high protein content but their oil content is low (Sayan and Polat, 2001; Budag, 2003; Aksoy, 2007).

Caldeira *et al*. (2007) reported according to their study that the best metabolic indicator for energy balance in sheep is glucose and non-essential free oil acids and the best metabolic protein indicator is blood albumin and urea values (Caldeira *et al*., 2007). Low oil content rations with high content of essential oil acids should be consumed to decrease triglyceride level (Anonymous, 2008a).

The increased fat acid level increases triglyceride, apo B and VLDL production in liver. When, VLDL increases in the circulation, HDL and VLDL begin to interact via Cholesteryl Ester Transfer Protein (CETP). In this process, CETP transfers cholesterol in HDL to VLDL and triglyceride in VLDL to LDL (rich lipoprotein in cholesterol). Therefore, VLDL is enriched in cholesterol and its atherogenity also increases (Anonymous, 2008b).

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There is an adverse relationship between level of HDL-cholesterol known as good cholesterol and triglyceride level (Anonymous, 2008a). The absorbed triglycerides after consumption of high-oil content ration are transferred to chylomicron and VLDL and released to the circulation (Anonymous, 2008c).

Blood ALT level is increased due to cell degeneration in liver. When cell degeneration reach until mitochondria, AST level in blood is increased. In cirrhosis disease and malignant tumor mass formation, serum transaminases, mainly AST, increase 4-5 folds. Exteremely high serum LDH activities occur in acute liver damages. However, moderate changes may occur in LDH activity in case of chronic liver diseases. Extremely increased LDH activity implies existence of a carcinoma spread to especially liver, however, the reason for this increase may be pernicious anemia (Aminlari *et al*., 1994; Turgut, 2000; Anonymous, 2008d).

BUN is a matter having tubular re-absorption. However, BUN level may increase, if renal malfunction is not experienced because it is synthesized in liver. The actual reasons for these increases are excessive protein intake, amino acid infusion and gastrointestinal system blooding (for example stomach blooding). However, low BUN levels may be seen in case of insufficient protein consumption and severe acute and chronic liver diseases occurred due to any reason (Turgut, 2000; Anonymous, 2008e).

MATERIALS AND METHODS

Twenty four of weaned female lambs, which are approximately 16 week old, were used for the test. Their weighs are approximately 36 kg. Basic feed used in the study is Dry Trefoil (DT) and experimental feed is vetch grain feed (V) The compositions of the rations of the DT and V are given in Table 1. Nutrient contents of the feeds were determined by analyzing them at the beginning of the study (Bulgurlu and Ergul, 1978; Goering and Van Soest, 1970).

Daily feed amount (ration) supplied for the animals was kept as 2% of animal weigh. Feed amount, which accounts for 2% of animal weight, consists of completely dry trefoil for the Control group (K). The second group was fed with vetch in an amount of 0.75% of animal weight and dry trefoil in an amount of 1.25% of animal weight (VI) and the third group was fed with vetch in an amount of 1.5% of animal weight and dry trefoil in an amount of 0.5% of animal weight (VII). Daily feed amount was supplied in two parts at 08:00 am and 18:00 pm. Feeding was conducted in groups. Fresh and clean water was always made available for the animals. The study lasted totally 30 days. Five days of the period were for exercise and the rest 25 days were used for essential feeding period.

Table 1: The compositions of the rations that used in research (Bulgurlu and Ergul, 1978; Goering and Van Soest, 1970)

Food	DM*	CP**	CL***	ASH	ADF****	NDF*****
	(%)					
V	94.01	25.68	0.48	10.39	8.83	47.51
DT	92.89	11.43	0.86	16.97	47.44	66.69

*Dray matter; **Crude protein; ***Crude lipids; ****Acid detergent fiber; *****Neutral detergent fiber

Ten milliliter of blood sample was taken from vena jugularis of each animal at the same time of the day before and after the study to determine on BUN, GLB, TG, VLDL, AST, ALT, LDH and ALB values. These samples were analyzed by Tokyo/Japan originated modular type Hitachi Automatic Analyzer and Roche kits after their serum was removed.

Two-way ANOVA Variance Analysis (with repeated measurement on one factor levels) was conducted to determine, whether or not a variation exists between the application groups according to their features (control, VI, VII) and times (before and after the test). As a result of this variance analysis, Tukey multi-comparison test was used to determine different group means. All statistical analysis were conducted via STATISTICA statistics packet program (SAS, 1985).

RESULTS AND DISCUSSION

The blood parameters of the lambs have been given in the Table 2. The compositions of the rations of the DT and V are given in Table 1. The proportions of DT and V in the rations of the groups are given in Table 3. Nutrients content of rations were within normal limits.

It was seen that nutrient values of the basic feed of the study, trefoil and the experimental feed of the study, vetch are within the limits specified in the literature. There are no extreme food stuff values in DM, CP, L, ASH, ADF and NDF of both dry trefoil and vetch grain. But, vetch grain has anti nutrient factor in it (Ergul, 1993).

The increase in ALB level, which was observed after vetch diet in the group of VII, was considered as significant ($p<0.05$). This increase occurred in ALB level is a result of high protein content of the experimental feed, V. This indicates that V protein consumed was converted into body proteins effectively. Otherwise, ALB level is expected to decrease. Any variation was not observed in the groups for blood GLB, which is another parameter under study. The fact that no variation occurred in GLB level despite the increase in ALB level evidences that ALB level is body metabolic protein indicator in sheep as reported by Caldeira *et al*. (2007).

Table 2: Blood parameters in the groups (Mean±SE)

Blood parameters	Period	N	Control $X \pm S_{\bar{x}}$	VI $X \pm S_{\bar{x}}$	VII $X \pm S_{\bar{x}}$
GLB (g dL^{-1})	BR	8	4.10±0.13	4.49±0.30	4.55±0.18
	AR	8	4.29±0.16	4.41±0.19	4.31±0.23
ALB (g dL^{-1})	BR	8	3.04±0.06a B	2.96±0.08a B	3.03±0.09 a B
	AR	8	3.02±0.13a B	3.25±0.09a A	3.35±0.17a A
BUN (g dL^{-1})	BR	8	20.01±0.79c A	26.35±1.06b A	29.80±0.86a A
	AR	8	20.86±0.46a A	19.16±1.06a B	19.27±1.03a B
TG (mg dL^{-1})	BR	8	24.67±3.43	21.52±1.52	24.24±3.06
	AR	8	23.99±2.31	25.40±2.14	26.44±4.83
VLDL (mg dL^{-1})	BR	8	5.00±0.63	4.37±0.37	4.87±0.61
	AR	8	4.75±0.45	4.87±0.44	5.12±1.01
AST (U L^{-1})	BR	8	87.12±3.80a B	78.62±5.42 ab B	72.87±3.29b B
	AR	8	104.00±4.08a A	101.87±6.89ab A	92.37±3.69b A
ALT (U L^{-1})	BR	8	23.87±1.04a A	20.12±1.75ab A	17.75±1.35b A
	AR	8	22.87±0.67a A	19.12±1.34a A	19.75±1.86a A
LDH (U L^{-1})	BR	8	1111.87±63.29	1063.00±62.67	1250.87±128,05
	AR	8	1234.12±54.14	1273.75±76.64	1250.75±75.47

BR: Before Research; AR: After Researc; A, B: Values with different letters in column a differ significantly ($p<0.05$); a, b: Values with different letters in a line differ significantly ($p<0.05$)

Table 3: The ratio of the foods in the groups

	Feeds			
Groups	DT**	V**	DT***	V***
Control*	2.00	0.00	723	0.00
VI*	1.25	0.75	448	273
VII*	0.50	1.50	180	543

*Vitamin and minerals supplements have been added with 0.01% levels in rations. (Faskovit). 1,000,000 IU Vitamin A, 200,000 IU Vitamin D_3, 400 mg Vitamin E, 500 mg Vitamin B_1, 500 mg Vitamin B_2, 304 mg Vitamin B_6, 5,000 mg Fe, 1,000 mg Cu, 5,000 mg Zn, 80 mg Mn, 20 mg Co, 21 mg Se, 9.180 mg Mg, 12,750 mg P and 18,750 mg Ca were in per kilograms of Faskovit. **Feeds were given in terms of percent of body weight. ***Foods weight of rations in a day (g)

In the study, in which vetch V, which is rich in energy beside protein, was employed (37.5 and 75% of the ration) (Ergul, 1993), any significant variation in TG level was not observed in the groups. An energy-rich feed use in high ratio in the ration indicates that this parameter is not affected by diet also (Payne and Cope, 1991; Caldeira *et al*., 2007).

If liver glycogen level is high, when energy-rich feeds are consumed, the consumed carbohydrates are synthesized into TG in liver. Thus, blood TG level increases. VLDL synthesized in liver moves TG synthesized here and cholesterol to extra hepatic tissues. VLDL level is raise as triglyceride level increases in liver.

If free fat acids, which are energy indicators, increases in the organism, blood VLDL level is increased. The fact that there is no increase in TG and VLDL levels in sheep after V consumption indicates that high intensive-V ratio in feed ration does not bear a risk from the point of view of cholesterol (Anonymous, 2008b).

Blood ALT and AST values increase, when degenerative or toxic changes occur in liver (Turgut, 2000; Anonymous, 2008d). According to the obtained ALT and AST values, AST values increased in all 3 groups, while ALT values were not increased. This suggested that liver had more troubles during metabolism in VI and VII groups compared with the control groups.

BUN level increases in case of high protein consumption, renal malfunctions and gastrointestinal blooding (Anonymous, 2008e). It was observed that V consumption reduced BUN level in this study ($p<0.05$). This decrease in BUN level was accompanied by the increased in blood ALB level after V consumption although its protein content is high. This suggests that V protein is assessed in high rates in sheep (Anonymous, 2008e).

According to the findings of the study, V consumption did not cause increase in blood LDH level. Consumption of V, whose vicine, which is a cyanoglycoside, content is high, in high amounts causes various anemia including anemia caused by liver diseases (hemolytic anemia) in single-stomach animals (Ergul, 1993). The fact that the ration did not cause any increase in blood LDH level although, it contains V at 75% evidences that vicine becomes inert in ruminants. This indicates that anti-nutrient factor existing in V does not affect liver negatively from the point of view of anemia.

CONCLUSION

In this study, in which effects of consumption of the rations, in which vetch grain feed accounts for 37.5 and 75% of the total ration on certain blood parameters of lambs, blood ALB level increased while, AST levels increased and LDH levels decreased. Also, vetch grain feed, which is an energy-rich feed, did not cause any increase in blood TG and VLDL levels.

It was concluded that vetch grain is a good alternative for satisfying protein deficit in lambs because it was observed that V consumption created a positive protein metabolism, vicine did not affect liver negatively and did not cause high TG risk in blood serum.

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