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Effects of Chickling Vetch (*Lathyrus sativus* L.) Grain as Feed on Certain Blood Parameters in Lambs

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Abstract: In the present study, effects of use of Chickling Vetch grain feed (CV), 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 weeks 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 (CVI) was fed with chickling 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 (CVII) was fed with chickling 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 aspartate Aminotransferase (AST) level decreased in all groups including control groups, while Blood Urea Nitrogen (BUN) levels increased of in CVI and CVII groups depending on CV diet ($p<0.05$). However, blood Triglyceride (TG), Very Low Density Lipoprotein (VLDL), Blood Albumin (ALB), blood Globulin (GLO), blood alanine Aminotransferase (ALT) and Lactate Dehydrogenasis (LDH) levels in the bloods of the lambs were not affected by CV-type diet. The fact that use of CV, which is a good protein and energy feed, increased BUN suggested that a pore protein metabolism was formed in the animals. High-ratio use of CV containing anti-nutrient materials like all leguminous grain feeds, was expected to increase ALT, AST and LDH levels; however, it were not caused any changes in ALT and LDH parameters also it decreased AST levels. This evidenced positive effect of CV on liver.

Key words: Ruminant, biochemical parameters, chickling vetch, dry trefoil, Turkey

INTRODUCTION

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. Chickling vetch is one of the mostly emphasized leguminous grain feed as an alternative. Chickling vetch seeds as other leguminous grain have high protein content but their oil content is low (Sayan and Polat, 2001; Budag, 2003; Aksoy, 2007).

Investigating blood parameters is an important method to determine diet status in animals. 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). Caldeira *et al*. (2007) reported according to their study that the best metabolic indicator for energy balance in sheep is blood glucose and non-essential free oil acids and the best metabolic protein indicator is blood albumin and urea values.

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, 2008a). Low oil content rations with high content of essential oil acids like chickling vetch grain should be consumed to decrease triglyceride level (Anonymous, 2008a).

There is an adverse relationship between level of HDL-cholesterol known as good cholesterol and

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triglyceride level (Anonymous, 2008b). 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 weeks 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 Chickling Vetch grain feed (CV). 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) (Table 1).

Daily feed amount (ration) supplied for the animals was kept as 2% of animal weigh (Table 2). 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 chickling vetch in an amount of 0.75% of animal weight and dry trefoil in an amount of 1.25% of animal weight (CVI) and the third group was fed with chickling vetch in an amount of 1.5% of animal weight and dry trefoil in an amount of 0.5% of animal weight (CVII). 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**	L***	ASH	ADF****	NDF*****
	(%)					
CV	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

Table 2: The ratio of the foods in the groups

Groups	Feeds			
	DT**	CV**	DT***	CV***
Control*	2.00	0.00	723	0.00
CVI*	1.25	0.75	448	273
CVII*	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)

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, CVI, CVII) 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 analyses were conducted via STATISTICA statistics packet program (SAS, 1985).

RESULTS AND DISCUSSION

The blood parameters of the lambs have been given in the Table 3. It was seen that nutrient values of the basic feed of the study, trefoil and the experimental feed of the study, chickling vetch are within the limits specified in the literature (Ergul, 1993).

BUN level increases in case of high protein consumption, renal malfunctions and gastrointestinal blooding (Anonymous, 2008e).

The increase in BUN level, which was observed after chickling vetch diet in the group of CVI and CVII was considered as significant ($p<0.05$). However, the levels of ALB and GLB were not different in the groups. This increase occurred in BUN level is a result of high protein content of the experimental feed, CV. This indicates that

Table 3: Blood parameters in the groups (Mean±SE)

Blood parameters	Period	N	Control $\bar{X}\pm S_{\bar{x}}$	CVI $\bar{X}\pm S_{\bar{x}}$	CVII $\bar{X}\pm S_{\bar{x}}$
GLB (g dL^{-1})	BR	8	4.24±0.163	4.20 ±0.998	4.50±0.177
	AR	8	4.10±0.135	3.70 ±0.542	4.48±0.170
ALB (g dL^{-1})	BR	8	3.02±0.135	2.60±0.462	3.19±0.106
	AR	8	3.04±0.058	2.79±0.401	3.01±0.081
BUN (g dL^{-1})	BR	8	20.86 ±0.462a A	17.64 ± 2.642b B	19.24 ±0.741ab B
	AR	8	20.01±0.788c A	23.69 ± 3.437b A	29.15 ±1.045a A
TG (mg dL^{-1})	BR	8	23.94±2.311	23.30 ±4.419	19.11±2.005
	AR	8	24.68±3.429	17.60 ±2.869	22.00±1.603
VLDL (mg dL^{-1})	BR	8	4.75±0.453	4.75 ±0.921	3.75±0.453
	AR	8	5.00±0.627	3.50 ±0.567	4.50±0.327
AST (U L^{-1})	BR	8	104.00±4.084a A	107.50±22.718a A	112.38± 7.562a A
	AR	8	87.13± 3.801a B	73.50± 11.034a B	84.88 ± 4.654a B
ALT (U L^{-1})	BR	8	22.88±0.666a A	16.38 ± 3.145b A	23.50 ±2.712a A
	AR	8	23.88 ±1.043a A	15.25± 2.877b A	20.38 ±1.511a A
LDH (U L^{-1})	BR	8	1121.63±144.216	1216.25±224.383	1004.50±152.663
	AR	8	999.38±141.309	1056.00±164.477	1039.88±27.166

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

CV protein consumed was not converted into body proteins effectively. Because ALB level is body metabolic protein indicator in sheep as reported by 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 CV consumption indicates that high intensive-CV ratio in feed ration does not bear a risk from the point of view of cholesterol (Anonymous, 2008b).

In this study, in CV, 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). This indicated that the amount of CV energy is not sufficient to make blood TG level up in this study.

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 decreased in all three groups, while ALT values not effected in groups. This suggested that liver had no any troubles during metabolism after CV consumption.

According to the findings of the study, CV consumption did not cause increase in blood LDH level. Consumption of CV, whose β-N-oxalyl-L-α, β-diaminopimelik acid, which is a neural toxin, content is high, in high amounts causes various neural lathyrism in horse, pig, cow, duck, mouse, elephant, chicken (Roy, 1981; Ergul, 1993). The fact that the ration did not cause any increase in blood LDH level although it contains CV at 75% evidences that β-N-oxalyl-L-α, β-diaminopimelik acid becomes inert in ruminants. This indicates that anti-nutrient factor existing in CV does not affect sheep negatively from the point of view of neural lathyrism.

CONCLUSION

In this study, in which effects of consumption of the rations in which chickling vetch grain, whose β-N-oxalyl-L-α, β-diaminopimelik acid, which is a neural toxin, feed accounts for 37.5 and 75% of the total ration on certain blood parameters of lambs, blood AST level decreased while ALT levels not effected.

Also, chickling vetch grain feed, which is a protein and energy-rich feed, did not cause any difference in blood ALB, GLB, TG and VLDL levels but only BUN levels.

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

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