Effect of adding some organic acids and creatine to the rations of fattening Awassi lambs in some cellular and biochemical blood parameters

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Abstract:

The experiment was carried out to investigate the effect of creatine or organic acid or their blend in the ration of Awassi lambs. A total number of 28 lambs were distributed into 4 equal treatments: T1:control ; T2: organic acid (3kg.ton^{-1} feed) ; T3: creatine (1.2 kg.ton^{-1} feed)T4: a blend of organic acid (Kg.ton^{-1}) and creatine (0.6 kg/ton). The experiment was designed according to the CRD design to demonstrate the impact of these additions on some cellular and biochemical blood parameters of fattening Awassi lambs, blood samples were drawn from the jugular vein in three periods (when the experiment started, 45 days and 90 days). The statistical analysis showed no significant differences in the means of red blood cells (RBC), hemoglobin (Hb) and Hematocrit (PCV) for the three periods of blood parameters from Awassi lambs, while significant differences ($P < 0.05$) in white blood cell (WBC) count were observed, and it was significantly increased in all lambs that were fed on a mixture of organic acids and creatine (T4) as well as in lambs fed on creatine only (T3), while the lowest values were observed in lambs with the second treatment (T2), which were fed on organic acids only. As for blood biochemistry criteria, a significant effect ($P < 0.01$) in the second drawn in the concentration of triglycerides and urea and also the total protein in the third drawn, while no such differences were found in the concentrations of glucose and cholesterol.

Keywords: Organic acids, Creatine, Awassi lambs, Fattening, Blood parameters

Introduction:

Some non-conventional, inexpensive and easy-to-use compounds are added to provender rations to improve their nutritional value as well as reaching the maximum animal production level in order to meet the shortage of high demand for meat both in local and international markets (2).

Antonio and Ciccone (4) used creatine as the first researcher and introduced it in different proportions in chicken broiler diets and obtained increases in muscles weight being the beginning for the formation of many amino acids, as well as an amino acid regulatory derived from the glycine and arginine and it is produced from the liver, pancreas and kidney Creatine is an organic nitrogenous compound obtained from red and white meat (14) and the absence of using it in provender ruminants was the basis of our research. The available organic acids in the local markets are abundant, they are produced naturally in the rumen and the intestines of the

ruminants due to fermentation of carbohydrate (11) It was used as provender for non-ruminant animals such as pigs (7)

Blood is a transport medium for different food compounds after being absorbed from the digestive system through the hepatic portal circulation to the body's organs, tissues and cells, where anabolism or catabolism is performed. Blood tests gave the scientific and diagnostic idea about the health and production of the animals. Therefore, the study aimed to demonstrate the effect of 1.2 kg.ton^{-1} of creatine feed or 3 kg.ton^{-1} of organic acids or their mixture in some cellular and biochemical blood parameters of the Awassi lambs fattening.

Materials and Methods:

Twenty-eight Awassi lambs (6-5 months old and average live weight of 26 kg) were reared in the fields of Barakat Aba al-Fadl al-Abbas of the Abbasid holy shrine, which started on 18/9/2017 and ended on 19/12/2017 , and fed on fattening concentrated rations (18% crude protein and 12 MJ of metabolisable energy.kg^{-1} dry matter) and 3 kg of organic acids.ton^{-1} of feed or 1.2 kg of creatine.ton^{-1} of feed or half both were added in T2, T3 and T4 respectively (table 2) While the first treatment (T1) was left without addition in order to obtain the control group. The lambs were randomly distributed into the treatments with 7 lambs for each treatment. The provided concentrated feed was 3% of the live weight. The straw and water were *Ad libitum* during the experiment period (95 days).

Table 1: Components and Chemical composition of experimental rations

Yellow Corn	Soyaben meat	Flour	White bran	Rice bran	Limestone	Salt	Urea	Yeast
15	**7**	**15**	**45**	**15**	**1**	**1**	**0.95**	**0.05**

Table 2: Addition and chemical composition % on Dry matter

Addition	T1Control Group	T2 Oraganic acids	T3Creatine	T4 organic acids +creatine
Creatine	0	0	0.12	0.06
Organic acids	0	0. 3	0	0.15
chemical composition %				
Dry matter [1]	92.5	92.6	92.8	92.3
Organic Matter	86.3	86.7	86.6	86
Crude Protein [1]	16.4	16.4	16.4	16.3
Ether Extract [1]	4.1	4.4	4.3	4.5
Crude fiber [1]	5.4	5.8	5.7	5.5
Ash [1]	6.2	5.9	6.2	6.3
NFE [2]	60.4	60.1	60.2	59.7
ME (MJ.Kg^{-1} DM) [3]	11.965	12.036	12.015	11.984

1. Laboratory assessment.
2. Nitrogen-free extract = 100 - (% protein +% fiber + ash% +% ether extract).
3. Calculated according to the equation , (8).
4. Organic acids (Propionic, Citric, Sorbic and butyric)

Blood samples were taken from the jugular vein before presenting the morning meal at the beginning, mid and end of the experiment with three lambs of each treatment. A 10/cm^3 tube containing the coagulation blocker (EDTA) to measure some blood cellular parameters such as red blood cells, white blood cells, Hemoglobin, Hematocrit and 10 cm^3 others were taken for blood serum from it after centrifugation (3000 cycles/ min) and was allocated to measure some blood-biochemical parameters such as glucose, total protein, cholesterol, triglycerides and urea, using the prepared and special equipment for each analysis performed in phylogeny Laboratories.

Statistical analysis was performed in Completely Randomized Design (CRD) by using the free statistical program SAS 2012 (13) to demonstrate the effect of the coefficients in the studied traits and the ratios between them were measured by (6).

Results and discussion:

Table 3 showed no significant differences of the effect of the organic acids addition or creatine or their mixture in the concentrated provender of fattening Awassi lamb in some blood cellular characteristics and parameters such as Red Blood Cells (RBC), Hemoglobin (Hb) and Hematocrit (PCV) but significant differences were found ($p<0.05$) in the second drawn (PII) and third drawn (PIII) in the creation of White Blood Cells (WBC), where the values for the second drawn were 6.066, 5.600, 7.366, and 7.800, and the third drawn were 7.000, 5200, 7500 and 7650 of T1, T2, T3 and T4 respectively. The third group (T3) and the fourth group (T4) outperformed, where they were fed with creatine or creatine mixture with organic acids, but they did not differ with the control group (T1) and the latter may also be similar to the second group (T2) and therefore it can be concluded that the addition of creatine increases the number of WBC due to the ability of creatine to attack the microbes that cause diseases and increase the resistance (3, 9) The highest WBC numbers were obtained when both organic acid and creatine were added to the concentrated provender while the lowest WBC numbers were obtained when only organic acids was added.

The number were at highest when organic acids were added with creatine and the opposite happened when the only organic acids was added.

Table 3: Effect of addition of organic acids and creatine of fattening Awassi lambs(1) on some cellular blood parameters (mean ± SE).

Characteristics trait	Time	Groups				Significant
		T_1	T_2	T_3	T_4	
RBC $x10^6.\mu L^{-1}$	PI	35.5±0.133	3.266± 0.033	3.366 ± 0.088	3.550 ± 0.050	N.S
	PII	3.533 ± 0.088	3.466± 0.033	3.700 ± 0.152	3.600 ± 0.200	N.S
	PIII	3.866±0.317	3.966± 0.218	4.133 ± 0.233	4.450 ± 0.150	N.S
WBC $x10^3.\ \mu L^{-1}$	PI	5.133± 0.466	4.666± 0.666	5.800 ± 0.916	5.000 ± 0.400	N.S
	PII	6.066± 0.581 ab	5.600± 0.416 B	7.366 ± 0.448 a	7.800 ± 0.200 a	*
	PIII	7.000 ± 0.416 ab	5.200± 0.416 B	7.500 ± 0.416 a	7.650 ± 1.150 a	*
Hb $Mg.100ml^{-1}$	PI	11.533±0.959	10.866±0.133	11.166±0.296	11.800± 0.200	N.S
	PII	10.966±0.202	10.666±0.333	11.500±0.493	10.800± 0.200	N.S
	PIII	13.300±1.153	12.533±0.742	12.500±0.493	11.100± 0.500	N.S
PCV %	PI	36.666±2.905	34.666±0.333	35.666±0.881	37.500± 0.500	N.S
	PII	35.000±0.577	34.000±1.000	36.666±1.452	34.500± 0.500	N.S
	PIII	36.000±0.577	35.000±1.000	37.666±1.452	35.500± 0.500	N.S

(PI, PII, PIII). (P) means the duration of the blood drawn of the samples (I) is the first blood drawn at the beginning of the experiment and the second blood drawn (II) in the fifth week and the third blood drawn (III) in the last week of the experiment.

N.S: There are no significant differences between the average values in each individual row.

*:The difference between the average values are significantly different ($P < 0.05$) if the characters are not the same in each individual row.

(1): Average values of 3 lambs (replicates).

Table 4 showed no significant differences were found in the effect of the addition of organic acids or creatine or their combination to the concentrated feed of lamb fattening in some of the biochemical blood parameters (glucose, total protein, cholesterol, triglycerides and urea (g or mg/100ml). No significant differences were observed in the concentrations of glucose, total protein, cholesterol, triglyceride and urea, except for significant differences ($P < 0.01$) between the mean of the second and third blood drawn of lambs in the total protein concentrations and the second drawn

for both triglycerides and urea, where the total protein significantly exceeded (P <0.01) treatment T3 (81.20 mg.100ml^{-1}) and treatment T4 (79.85 mg.100ml^{-1}) in the second drawn (45th day of experiment) and where the lambs were fed on a concentrated provender with increased creatine or creatine and organic acids added to the treatment T4 (54.10 mg.100ml^{-1}), which were fed on a concentrated provender and only organic acids were added, while all other treatments were similar to control group (69.10 mg.100ml^{-1}). In the third blood drawn (90th day of experiment) the third treatment lambs (T3) were significantly higher (P<0.01) (62.13 mg.100ml^{-1}) than all treatments, including T4 (52.55 mg.100ml^{-1}), although their concentrated food contained half the amount of added creatine than treatment T3, also the similar treatments (T4) and T1 (54.90 mg.100ml^{-1}) outperformed T2 (48.06 mg.100ml^{-1}), where its lambs were fed on a concentrated food with organic acids only. This may be due to the addition of organic acids may decreased the total protein concentrations in the blood (5). This may conclude that the energy provided by the added organic acids and energy from fermented carbohydrates have been increased from microorganisms in the rumen to be benefit from (NH3-N) for growth and reproduction. A metabolic environment in the quadriceps and intestines in lambs provided this treatment (1, 10). As for the second blood drawn, a significant superiority of (P< 0.01) was observed in the mg/dl triglyceride concentrations of the second group of T2 (63.15 mg .dl^{-1}) over all other treatments. Also the T4 (61.14) and T1 (62.00 mg.100ml^{-1}) lamb groups were superior to T3 (56.13 mg.100ml^{-1}), with similar concentrations in T4 and T1 lambs. This may be due to the fact that the addition of organic acids has increased the concentration of triglycerides in the blood of the lambs higher than other treatments (12).

Additionally the addition of organic acids caused increment in the concentrations of urea in the T2 lamb group (49.66 mg.100ml^{-1}) added to their concentrated food of organic acids and the highly significant (P <0.01) on all the treatments (T3, T4) in the second blood drawn only and the results were 35.33, 39.66, 32.00 mg.100ml^{-1}, respectively As it can be seen that in both, triglyceride and urea, the similarity was obtained between the treatments of T1 (control group) and the treatment of T4 (mixture) which may indicate the absence of the effect of adding either acids alone or creatine alone in their blood concentration to obtain the combination of a similar nature to what is in control In case of blood total protein, when creatine is added, this means that it's use and drain to build the tissues and growth was less compared to the addition of organic acids.

Table4:Effect of addition of organic acids and creatine of fattening Awassi lambs(1) on some biochemical blood parameters (mean ± SE).

Characteristics trait	Time	Groups				Significant
		T_1	T_2	T_3	T_4	
Glucose Mg.dl^{-1}	PI	76.00± 2.00	71.00 ± 5.29	70.33 ± 5.36	71.00 ± 1.00	N.S.
	PII	91.00± 4.04	85.33± 2.84	87.66 ± 4.91	98.50 ± 0.50	N.S.
	PIII	86.00± 4.35	85.33 ± 4.91	72.66 ± 8.29	79.00± 15.00	N.S.
Total Protein g.dl^{-1}	PI	61.13± 0.20	63.20 ± 0.17	61.00 ± 2.64	66.95 ± 0.05	N.S.
	PII	69.10± 0.11 ab	54.43± 8.96 B	81.20± 0.07 a	79.85 ± 0.05 a	**
	PIII	58.90± 0.11 b	48.06 ± 0.08 D	62.13± 4.40 a	52.55 ± 0.45 c	**
Cholesterol Mg.dl^{-1}	PI	69.33± 7.42	54.00 ±9.16	62.00± 7.21	61.00 ± 5.00	N.S.
	PII	82.66± 5.04	70.00 ± 5.77	80.00±10.00	87.50 ± 2.50	N.S.
	PIII	78.66± 9.93	75.33±17.37	63.66 ± 5.78	117.50±41.50	N.S.
Triglyceride Mg.dl^{-1}	PI	73.66± 7.12	73.00±12.76	70.36 ± 0.14	76.00 ± 20.00	N.S.
	PII	62.00± 0.40 b	63.15 ± 0 A	56.13± 0.17 d	61.14 ± 0.04 c	**
	PIII	50.00± 2.88	53.33± 3.33	62.13 ± 0.46	55.00 ± 5.00	N.S.
Urea Mg.dl^{-1}	PI	38.66± 3.75	39.66 ± 2.33	39.66± 1.45	39.00 ± 2.00	N.S.
	PII	35.33±0.66 c	49.66 ± 0.33 A	39.66 ± 0.33 b	32.00 ± 1.00 d	**
	PIII	75.66±1.45	63.33±14.31	79.00 ± 9.29	76.00 ± 7.00	N.S.

(PI, PII, PIII). (P) means the duration of the blood drawn of the samples (I) is the first blood drawn at the beginning of the experiment and the second blood drawn (II) in the fifth week and the third blood drawn (III) in the last week of the experiment.

N.S: There are no significant differences between the average values in each individual row.

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(1): Average values of 3 lambs (replicates).

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