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EFFECT OF FEEDING SEQUENCES OF SHEEP ON FEED UTILIZATION, FEEDING VALUES, SOME NUTRITIONAL BALANCES AND BLOOD MINERALS PROFILE.

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ABSTRACT

Six metabolism trials using eighteen mature Ossimi rams (3 rams in each trial) were conducted. Animals were fed concentrate feed mixture (CFM) at a rate of 1% from live body weight (LBW) and berseem (B), (T*rifolium Alexandrinum L.) ad lib* in different sequences at different times to determine feeding values, voluntary feed intake, nitrogen, water and minerals balance. The feeding sequences were as follows:
Tr1: fed 100 % CFM (8.00 a.m), B (11.00 a.m.) and water (1.30 p.m.).
Tr2: fed 50% CFM (8.00 a.m), B (11.00.a.m.), water (1.30 p.m.) and 50% CFM (2.00 p.m).
Tr3: fed B (8.00 a.m.), water (10.00 a.m) and 100 % CFM (11.00 a.m.).
Tr4: fed 100 % CFM (8.00 a.m.), water (10.30 a.m.) and B (11.00 a.m.).
Tr5: fed 50% CFM (8.00 a.m), water (10.30 a.m), B (11.00 a.m.) and 50% CFM (2.00 p.m).
Tr6: drinking water (7.30 a.m.), B (8.00 a.m.) and 100% CFM (11.00 a.m).

Results showed that all nutrients digestibility and feeding values had no significant differences among treatments. The feeding sequences showed that the Tr5 in general had high values for all nutrient digestibility and feeding values than the others and the lowest values were with Tr3. The systematic feeding was not affecting on daily intakes of DM, TDN, SV and DCP. Nitrogen balance was positive with some differences among treatments. The N-retention in Tr5 was higher (27.65% of intake) than Tr2, which was clear from the low N-output in feces. The water balance had significant differences among treatments due to either time of watering or different feeding system in relation to water intake, excretion and balance (%). On the other hand, water balance based on metabolic body size was non-significant differences among treatments. All treatments were in positive mineral balance except Co. Daily intake of TDN, SV, DCP and minerals in all treatments were adequate for sheep. However, addition of Cu and Co are recommended when berseem and CFM fed for high producing animals. Concentration of Mg, K, Zn, Mn and Fe in blood plasma was affected significantly with feeding system. However, Ca, P, Na and Cu in plasma fluctuated around the narrow figures without significant differences among treatments.
Keywords: Sheep - feeding values – feeding sequence – blood – mineral balance.

INTRODUCTION

Several efforts were undertaken in Egypt to increase and improve animal feeds to alleviate their improper distribution during the year as a partial solution for the huge shortage in animal feeds. Berseem clover (*Trifolium Alexandrinum L.)* is the main forage crop supplies animals with the most of their nutritive requirements. However, such studies are lacking concerning major and trace minerals content and their availability of berseem fed alone or mixed with grasses or with concentrate. On the other hand, many attempts were done to study the different factors affecting frequencies of feeding animals forages and concentrates on voluntary intake, nutrients digestibility, water consumption, salivary production, daily gain, feed efficiency and rumen parameters (Gill and Castle 1983; Coleman *et al.* 1984, French and Kennelly 1990 and Charmley *et al.* 1991 and Gabra *et al.* 1993 a, b and c).

The objective of this study was to investigated the effect of feeding constant level of concentrate with berseem in different sequences at different times on digestibility, feeding values, voluntary feed intake, and nitrogen, water and minerals balance in metabolism trials with sheep.

MATERIALS AND METHODS

Six metabolism trials (3 Ossimi rams in each trial) were conducted at the Animal house, head quarter of Animal Production Research Institute, Dokki in the year 1997 according to Van Soest (1980). The animals were shifted to metabolic cages for each trial, which lasted for 21 days. The last 7 days were considered as a collection period for feces and urine. Daily dry matter (DMI) and drinking water were recorded. The animals were fed CFM (at the rate of 1% from their LBW) containing wheat bran 40%, yellow corn 16%, undecorticated cotton seed cake 30.8%, vinass 5%, soy bean meal (44% protein) 4%, limestone 3% and common salt 1.2%. Berseem of the 2 nd cut was offered to animals *ad-lib* after have been wilting for 14 hrs before feeding to prevent bloat. Water was allowed for free choice once daily before or after roughage. Animals with an average of 45kg live body weight were randomly distributed as follows:

Time	Tr1	Tr2	Tr3	Tr4	Tr5	Tr6
07:30 am	---	---	---	---	----	Water
08:00	100%CFM	50% CFM	(B)	100%CFM	50% CFM	(B)
09:00	---	----	---	---	---	---
10.30	---	----	Water	Water	Water	---
11:00	(B)	(B)	100% CFM	(B)	(B)	100% CFM
12:00	----	----	----	----	----	----
01:00 pm	----	----	----	----	----	----
01:30	Water	Water	----	----	----	----
02:00	----	50% CFM	----	----	50% CFM	----

At the end of the experimental period, blood samples were obtained from. Jugular vein at 07:00 am, from each animal in clean heparinized test tube, then centrifuged to obtained plasma and kept at –5Cº for analysis. Proximate analysis of feeds, feces and urine were done according to A. O. A. C. (1990). The composite samples of feeds, feces, urine and blood samples were prepared according to Fick *et al.* (1979) to determine Ca, Mg, K, Na, Zn, Cu, Mn, Fe and Co using Shimatzu Atomic Absorption-Flame Spectrophotometer (model AA-640-13). However, P was determined according to Taussky and Shorr, (1953) using Perkin Elmer Spectro-photometer (model Lambda-1). All the possible precautions were taken to avoid metals contamination. Data were statistically analyzed using general liner modle procedure (GLM) according SAS, (1988) and Duncan's multiple range test (1955) was applied whenever possible.

RESULTS AND DISCUSSION

Chemical analysis

Offering CFM with berseem improved the content of some nutrients of eaten ration compared to berseem alone (Table 1). The CFM contained high Ca, P, Mg, Zn, Mn and Co and low Na, K, Cu and Fe contents. Calcium, Mg, Zn and Co contents in berseem were in agreement with those recorded by Shalaby *et al.* (1984), Sherif and Gabra (1985) and Gabra *et al.* (1993 a). However, the levels of P, Na, Cu and Fe were higher and K and Mn were lower than those obtained by the previous reviews. These variation could be attributed to some agronomic factors such as maturity, order of cuts, interval between cuts, soil pH, fertilization, season of the year (Underwood 1977 and Gabra *et al.* 1993 a).

Table 1:Chemical analysis and minerals content of erseem, concentrate and eaten ration fed to sheep during intake trials .

Item	Berseem	CFM	Eaten rations
Chemical analysis % on DM basis			
OM	87.94	93.08	90.26
CP	15.11	16.07	15.54
CF	28.56	13.09	21.60
EE	4.03	4.01	4.01
NFE	40.24	59.91	49.11
Ash	12.06	6.92	9.74
Major elements (%)			
Ca	0.808	0.950	0.860
P	0.391	0.726	0.530
Mg	0.324	0.449	0.380
Na	1.587	0.769	1.220
K	0.902	0.778	0.850
Trace elements (mg/kg)			
Zn	26.90	50.90	37.70
Cu	50.70	12.70	33.59
Mn	37.20	55.90	45.61
Fe	306.70	291.80	300.00
Co	18.40	23.00	20.47

Digestibility and feeding values

The digestibility of all nutrients for different treatments showed significant ($P<0.05$) differences. Treatment 5 showed the highest significant values, but Tr3 had the lowest significant values, except for NFE with Tr6 (Table 2).

The systematic feeding of Tr3 decreased most of nutrient digestibility and the Tr5 showed, in general, highly digestibility values compared with other treatments (Table 2). Better digestion of most nutrients of Tr5 could be attributed to introduce half of CFM and less water consumption before roughage intake (Table 4). The differences obtained among nutrient digestibility of feeding system might be due to less degradation of roughage than CFM by sheep when berseem plus CFM were offered in different sequences. These results agree with those reported by Antoniou and Hadjipanayiotou (1985) who found poorer digestibility of most nutrients of lucerne hay plus concentrate fed to sheep than lucerne hay alone. These results could be related to the sequence of water, when it followed berseem feeding, which affects in the rate of passage of berseem, in turn CF digestion was lower and other nutrients digestibility was less also. The findings of Hungate (1966) confirmed such results, where, he reported that the digestibility of fiber increased when water intake was reduced. Table (2) showed significantly differences in TDN and SV values among treatments. The decrease of TDN and SV % of Tr3 may be due to offering water to sheep after roughage, which increased the rate of passage and decreased the absorbed of digestive nutrients of roughage. These results are consistent with Antoniou and Hadjipanayiotou (1985) who found that the poorer digestibility of most nutrients of lucerne hay plus concentrate fed to sheep could be attributed to a depressed fermentation of roughage portion of diet. The animals fed the Tr5 had the highest values of DCP% than in Tr3.

These differences might be due to poor utilization of dietary protein by microbes, the same differences were also reported by Antoniou and Hadjipanayiotou (1985) who found poorer protein digestibility and poorer utilization of nitrogen for microbial protein synthesis when sheep fed lucerne hay plus concentrate.

Daily voluntary intake

Data in Table (2) showed that daily DM, TDN, SV and DCP intakes were high with Tr2 when the sheep fed 50% CFM, berseem *ad libitum*, water then 50% CFM. The lowest values were given by the animals which watering before berseem and 100% CFM (Tr6). However, the values of daily intake for the other treatments fluctuated among narrow figures, the average daily intakes g/kg metabolic body weight ($W^{0.75}$) were higher in Tr2 and Tr5 as affected by the high feeding values of these treatments as TDN, SV and DCP. These results are higher than those obtained by Antoniou and Hadjipanayiotou (1985) and in harmony with those found by Gabra *et al.* (1993 c). The daily intake for maintenance requirements are 25 g SV and 2-4 g DCP/ kg $W^{0.75}$ as recommended by NRC (1966) and Abou-Raya *et al.* (1980). Therefore the intake from all treatments by sheep (31.43-35.38 g SV and 5.84-6.44 g DCP/kg $W^{0.75}$) could cover energy and protein requirements for maintenance beside surplus for production either for growth or wool.

Table 2: Digestion coefficients and feeding values (%), daily DM

and

feed unit intakes of different treatments.

Items	Tr1	Tr2	Tr3	Tr4	Tr5	Tr6
Digestion coefficients (%)						
DM	74.86 ^{ab}	72.88 ^{ab}	69.62 ^{b}	73.53 ^{ab}	76.02 ^{a}	70.17 ^{b}
OM	74.64 ^{ab}	74.08 ^{ab}	71.51 ^{b}	73.50 ^{ab}	77.05 ^{a}	71.92 ^{b}
CP	73.28 ^{a}	72.06 ^{ab}	70.82 ^{b}	73.37 ^{ab}	77.60 ^{a}	71.40 ^{ab}
CF	60.62 ^{a}	58.67 ^{ab}	54.92 ^{b}	60.01 ^{ab}	64.07 ^{a}	55.82 ^{ab}
EE	76.63 ^{ab}	78.02 ^{a}	70.77 ^{b}	75.61 ^{ab}	78.12 ^{a}	71.18 ^{ab}
NFE	81.35 ^{a}	80.06 ^{ab}	79.12 ^{b}	80.72 ^{ab}	82.18 ^{a}	78.73 ^{b}
Feeding values (%)						
TDN	71.34 ^{ab}	70.23 ^{abc}	68.11 ^{c}	70.82 ^{abc}	73.30 ^{a}	68.23 ^{bc}
SV	62.62 ^{ab}	61.49 ^{abc}	59.37 ^{c}	62.08 ^{abc}	64.56 ^{a}	59.49 ^{c}
DCP	11.39 ^{ab}	11.20 ^{ab}	11.00 ^{b}	11.40 ^{ab}	12.06 ^{a}	11.06 ^{ab}
LBW, kg	45.0	46.0	46.0	44.0	44.0	45.0
Daily intake (g/h/d)						
DM	918.0 ^{b}	1018.0 ^{a}	1018.0 ^{a}	918.0 ^{b}	918.0 ^{b}	918.0 ^{b}
TDN	655.0 ^{b}	715.0 ^{a}	693.0 ^{b}	650.0 ^{b}	673.0 ^{b}	626.1 ^{c}
SV	575.0 ^{b}	626.0 ^{a}	604.0 ^{b}	570.0 ^{b}	593.0 ^{b}	546.0 ^{c}
DCP	104.6 ^{b}	114.0 ^{a}	112.0 ^{a}	107.6 ^{ab}	110.7 ^{a}	101.5 ^{c}
Daily intake g/ kg $W^{0.75}$						
DM	52.84	57.54	57.54	53.83	53.83	52.84
TDN	37.70	40.41	39.17	38.11	39.46	36.03
SV	33.09	35.38	34.14	33.42	34.77	31.43
DCP	6.02	6.44	6.33	6.13	6.49	5.84

a, b and c : Means not followed by the same letter are significantly different ($P<0.05$).

Nitrogen and water balances

Nitrogen utilization data by sheep (Table 3) showed that the N-intake was nearly the same. The differences were observed among N-output in feces. All animals were in positive N-balance. The N-retention in Tr5 and T2 was higher than the other treatments, which is clear from low N-output in feces. This might be associated with endogenous N in feces as mention by Koyama *et al.* (1985).

Concerning water balance (%),Table (4) showed significant differences among experimental treatments due to time of watering in different feeding system, but not significantly for daily water balance, whether as ml/h/d, based on DMI and metabolic body size ($W^{0.75}$).

The water needed for one g DMI was nearly the same to those found by Adebowale (1988) who recorded 2.3 ml/g DMI for sheep fed aquatic marophyta. It is found that water intake and fecal moisture decreased with increasing roughage portion and water more lost in urine than in feces as mentioned by Khattab *et al.* (1999). The daily water intake was similar to those found by Aganga *et al.* (1988) for all treatments, except Tr6. The authors recorded 395-805 ml daily water consumption by male goat (1-2 year old) fed Andopogon gayanus hay and a maize cottonseed meal concentrate mixture for 50 days. It could be concluded that the daily water consumption is affected by different factors such as type of feed, ambient temperature, season of the year, metal water and frequency of drinking (NRC, 1985 and Khattab *et al.* 1999).

Table 3: Nitrogen balances (g/h/d) of rams fed different treatments.

Item	Tr1	Tr2	Tr3	Tr4	Tr5	Tr6
N-intake	22.82	25.31	25.31	22.82	22.82	22.82
Fecal-N	6.75 [a]	6.58 [b]	8.32 [a]	6.96 [b]	5.62 [c]	6.32 [b]
Urinary-N	10.85	12.04	11.80	10.80	10.89	11.84
N-retention	5.22 [b]	6.69 [a]	5.19 [b]	5.06 [b]	6.31 [a]	4.66 [b]
% of intake	22.87 [b]	26.43 [a]	20.51 [b]	22.17 [b]	27.65 [a]	20.42 [b]

a, b and c: Means not followed by the same letter are significantly different (P<0.05).

Table 4: Water balance (ml/h/d) of rams fed different treatments.

Item	Tr1	Tr2	Tr3	Tr4	Tr5	Tr6
Water intake (ml/h/d) from:						
Berseem	2674.4	3254.5	3254.5	2674.4	2674.4	2674.4
CFM	32.5	32.5	32.5	32.5	32.5	32.5
Drinking	940.0 [b]	885.0 [b]	751.7 [c]	933.3 [b]	680.0 [c]	1146.7 [a]
Metabolic *	396.2	430.7	408.0	389.9	403.0	373.1
Total intake	4043.1 [b]	4602.7 [a]	4446.7 [a]	4030.0 [b]	3789.9 [c]	4226.7 [b]
Water excretion (ml/h/d) in:						
Feces	271.2 [c]	585.2 [a]	431.1 [b]	339.9 [b]	271.7 [c]	284.2 [c]
Urine	1633.3 [b]	1846.7 [a]	1876.0 [a]	1590.0 [b]	1386.7 [c]	1846.3 [a]
Total excreta	1904.5 [b]	2431.9 [a]	2307.1 [a]	1929.9 [b]	1658.4 [c]	2130.5 [b]
Retention						
(ml/h/d)	2138.6	2170.8	2139.6	2100.1	2131.5	2096.2
Retention %	52.9 [b]	47.2 [c]	48.1 [c]	52.1 [b]	56.2 [a]	49.6 [b]
ml/g DMI	2.3	2.1	2.1	2.3	2.3	2.3
ml/kg $W^{0.75}$	123.1	122.9	121.2	123.0	124.0	120.7

a, b and c: Means not followed by the same letter are significantly differ at (P<0.05).
*** Metabolic water: One g TDNI = 0.6 g metabolic water, according to English (1966).**

Minerals balance

Table (5) shows positive minerals balance with sheep (except Co) for all treatments. The minerals balance precentage of intake are affected with feeding system in each trial. Balance (%) of Ca, P, Mg, Na, K, Cu and Mn was higher in Tr5 when sheep fed 50% CFM, water, berseem and 50% CFM (Tr5). The assimilation of Ca is impaired by K, Mg and high concentration of Co. (Georgievskii *et al.* 1979).

Supplementation of CFM with berseem for feeding sheep in this study improved and increased the daily minerals balance than those recorded by Gabra *et al.* (1993 b and c) when sheep fed berseem alone. The negative Co balance observed in this study may be due to imbalance ratio between Mn and Co. Lodochkina (1983) found that feeding ration supplemented with 67.70 mg Mn and 0.8-12 mg Co/ kg DMI increased the daily balance of both elements. The same results were obtained by Kumar and Kaur (1987) with goats supplemented daily with 14.04 mg Mn and 3.39 mg Co, they were in positive mineral balance. Data in this study indicated that excessive Co (18.79-20.83 mg) and less Mn (41.86-46.43 g/kg DMI) in the sequences diets led to negative Co balance. Moreover, Georgievskii *et al.* (1979) stated that there is an interaction between both elements, which affected the absorption of each element separately. Although positive apparent balance was obtained for all mineral elements (except Co), yet Cu and Co contents in berseem with CFM fed to sheep were adequate compared to the recommended maintenance requirements of NRC, (1985). However, addition of Cu and Co are recommended when berseem and CFM are fed for high producing animals.

Table 5: The daily major and trace elements balance of sheep fed the tested rations comparing to NRC, (1985) requirements.

Item	Tr1	Tr2	Tr3	Tr4	Tr5	Tr6	NRC,1985 requirements
Ca			**Major elements balance (g/h/d)**				(g/kg diet)
Eaten	7.85	8.75	8.75	7.85	7.85	7.85	2.60 – 3.70
Retention	5.51	5.99	5.69	5.62	5.86	5.33	
% of intake	70.26	68.43	65.05	71.62	74.60	67.91	
P							
Eaten	4.86	5.35	5.35	4.86	4.86	4.66	1.60 – 2.30
Retention	1.56	1.95	1.58	1.65	1.80	1.53	
% of intake	32.30	36.58	29.62	34.05	37.16	31.52	
Mg							
Eaten	3.45	3.87	3.87	3.45	3.45	3.45	0.40 – 0.80
Retention	0.80	0.57	0.48	0.99	1.06	1.03	
% of intake	23.60	14.81	12.36	28.65	30.62	29.77	
Na							
Eaten	11.16	12.41	12.41	11.16	11.16	11.16	0.40 – 1.00
Retention	1.44	1.31	1.50	1.13	1.53	0.98	
% of intake	12.95	10.53	12.12	10.16	13.70	8.76	
K							
Eaten	7.60	8.65	8.65	7.60	7.60	7.60	5.00
Retention	2.71	2.41	3.28	2.93	3.03	2.00	
% of intake	35.71	27.91	37.92	38.57	40.13	26.36	
Zn			**Trace elements balance (mg/h/d)**				(mg/kg diet)
Eaten	34.61	38.37	38.37	34.61	34.61	34.61	20.0 – 30.0
Retention	14.98	16.79	14.30	12.60	13.27	10.36	
% of intake	40.29	43.77	37.26	36.86	38.84	30.32	
Cu							
Eaten	30.83	34.19	34.19	30.83	30.83	30.83	35.0 – 50.0
Retention	18.73	21.54	19.10	19.42	21.74	21.56	
% of intake	60.74	63.02	55.68	62.96	70.52	69.93	
Mn							
Eaten	41.86	46.43	46.43	41.86	41.86	41.86	20.0 – 40.0
Retention	12.32	10.87	9.77	12.05	13.68	12.50	
% of intake	29.44	23.42	21.04	28.79	32.70	29.86	
Fe							
Eaten	275.4	305.4	305.4	275.4	275.4	275.4	30.0 – 50.0
Retention	5.41	9.79	0.77	3.98	5.41	9.51	
% of intake	16.49	13.03	13.35	15.97	16.50	17.96	
Co							
Eaten	18.79	20.83	20.83	18.97	18.97	18.97	0.10 - 0.20
Retention	-20.37	-21.14	-25.15	-22.68	-23.78	-22.75	
% of intake	-108.4	-101.5	-120.2	-119.5	-125.4	-119.9	

Blood minerals profile

Concerning minerals content of blood plasma (Table 6), data showed that the levels of Mg, K, Zn, Mn and Fe were affected significantly ($P<0.05$) with feeding system. Incomplete assimilation of Mg from diet decreased the concentration of Mg in blood plasma as shown with Tr2 and Tr3 (Tables 5 and 6). These results may be due to high dietary K intake, which had adverse effect on assimilation of Mg from diet. This result agrees with those found by Georgievskii *et al.* (1979). While, increased dietary Zn or Fe increased those elements in blood plasma, there was a consistent interaction between Zn and Fe as reported by Rosa *et al.* (1986). However, Ca, P, Na and Cu contents in plasma fluctuated around the narrow figures without significant differences among the experimental treatments (Table 6). Georgievskii *et al.* (1979) mentioned that dietary Ca led to increase Ca in blood plasma. Meanwhile, Perge *et al.* (1982) found that P in plasma positively influenced by dietary Ca and P. Feeding system did not affected Cu in plasma. But, this result not agreed with Georgievskii *et al.* (1979) who found that dietary Cu increased Cu in blood plasma. Inadequate supply of Ca, Mg and Cu in feed was reflected in low concentration of these elements in blood plasma (Bilkawski, 1988).

Table 6: Minerals content of blood plasma.

Item	Tr1	Tr2	Tr3	Tr4	Tr5	Tr6
Macroelements (mg/100 ml)						
Ca (10-12) *	9.0	9.8	9.9	9.3	9.2	9.5
P (4-6)	7.0	7.7	7.6	7.5	7.3	6.1
Mg (1.8-2.5)	1.5 ^{c}	1.4 ^{c}	1.4 ^{c}	1.7 ^{a}	1.6 ^{b}	1.8 ^{a}
Na (320-340)	364.0	385.0	386.3	379.3	379.7	351.7
K (18-20)	19.9 ^{b}	26.5 ^{a}	25.1 ^{a}	26.6 ^{a}	27.0 ^{a}	18.3 ^{b}
Microelements (ug/100 ml)						
Zn (100-120)	167.0 ^{b}	203.0 ^{a}	196.0 ^{a}	110.0 ^{c}	153.0 ^{b}	103.0 ^{c}
Cu (60-100)	170.0	177.0	173.0	169.0	166.0	167.0
Mn (4-5)	7.2 ^{b}	9.6 ^{a}	9.5 ^{a}	7.1 ^{b}	7.2 ^{b}	6.7 ^{b}
Fe (100-150)	247.0 ^{b}	287.0 ^{a}	297.0 ^{a}	263.0 ^{b}	240.0 ^{b}	210.0 ^{c}

***: Values between parentheses are the normal levels of mineral elements in blood plasma (Georgievskii *et al.* 1979).**
a, b and c: Means not followed by the same letter are significantly different ($P<0.05$).

Concentration of minerals in plasma, with some exception, increased with increasing DM intake /kg $W^{0.75}$ (Tables 2 and 6). These increases were connected with increasing animal body weight and feeding system, specially, in Tr2 and Tr3. The average levels of Ca and Mg in plasma for all treatments were lower and the average of P, Na, K, Zn, Cu, Mn and Fe were higher than those recorded as a normal level (Georgievskii *et al.* 1979).

Finally, it should be noted that the organization of mineral feeding of sheep must be made according to the interaction between organic substances and minerals, as well as the interrelationship between the various macro-and microelements. It could be concluded from this study that feeding sheep 50% CFM, water, berseem and 50% CFM resulted in better feeding utilization and consequently feeding values and improved N-utilization and minerals balance. Further studies of mineral balances are needed using other categories of animals to determine their mineral requirements.

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تـأثير تتـــابع تغــذية الاغنـام علىالاستفادة مـن الغذاء والقيم الغذائيـة وبعض مـوازين الغـذاء وصورة الاملاح بالدم .

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اجريت ستة تجارب تمثيل غذائى على ١٨ كبش أوسيمى مغذاة على البرسيم المصرى للشبع ومخلوط علف مركز بمعدل ١% من وزن الجسم فى تتابعات مختلفة استخدم فيها ٣ كباش لكل معاملة لتقدير القيمة الغذائية وميزانى الازوت والماء والمأكول اليومى من العناصر المعدنية الكبرى والصغرى ، وكان النظام الغذائى لكل مجموعة كالآتى:-

المعاملة الاولى : ١٠٠% علف مركز (٨ ص) ثم البرسيم (١١ ص) ثم الماء (٣٠ر١ م) .

المعاملة الثانية: ٥٠% علف مركز (٨ ص) ثم البرسيم (١١ ص) ثم الماء (٣٠ر١ م) ثم ٥٠ % علف مركز (٢ م).

المعاملة الثالثة : برسيم (٨ ص) ثم الماء (١٠ ص) ثم ١٠٠% علف مركز (١١ ص) .

المعاملة الرابعة : ١٠٠% علف مركز (٨ ص) ثم الماء (٣٠ز١٠ ص) ثم البرسيم (١١ ص).

المعاملة الخامسة:٥٠% علف مركز (٨ ص) ثم الماء (٣٠ر١٠ص) ثم البرسيم (١١ ص) ثم٥٠% علف مركز (٢ م).

المعاملة السادسة : تناول ماء (٣٠ر٧) ثم البرسيم (٨ ص) ثم ١٠٠% علف مركز (١١ ص) .

أظهرت نتائج التغذية عدم وجود اختلافات معنوية فى معاملات الهضم والقيم الغذائية بين المعاملات المختلفة. وكانت أقل القيم مع المعاملة الثالثة واعلاها مع المعاملة الخامسة وذلك نتيجة قلة تحلل المادة الخشنة عن العلف المركز فى الأغنام التى قدم اليها البرسيم والعلف المركز فى تتابعات مختلفة . كان ميزان الازوت موجبا لجميع المعاملات مع وجود فروق معنوية فى ازوت الروث ، كانت المعاملة الخامسة أعلى احتجازا للآزوت المأكول (٢٧,٦٥%) ، ولم يتاثر ميزان الماء مع المعاملات المختلفة بينما كان للنظام الغذائى تأثيرا معنويا على الماء المتناول و المفرز فى البول والروث وكذلك ميزان الماء % وكان التاثير غير معنوبعلى الماء المتناول منسوبا الى المادة الجافة المأكولة أو منسوبا الى حيز الجسم التمثيلى . وكان ميزان العناصر المعدنية لجميع المعاملات موجبا فيما عدا الكوبلت كان سالبا . وكان الماكول اليومى من المادة الجافة والمركبات المهضومة الكلية ومعادل النشا والبروتين الخام المهضوم والعناصر المعدنية تكفى لتغطية الاحتياجات الحافظة للاغنام إلا أنة يستلزم اضافة النحاس والكوبلت عند تغذية الحيوانات عالية الانتاج على البرسيم والعلف المركز . تأثر تركيز كل من الماغنسيوم ، البوتاسيوم ، الزنك ، المنجنيز ، الحديد فى بلازما الدم بالنظام الغذائى بينما لم يتاثر تركيز الكالسيوم ، الفوسفور، الصوديوم ، النحاس فى بلازما الدم بين المعاملات المختلفة .

من هذه الدراسة يتضح أن التغذية المتتابعة للأغنام على ٥٠% علف مركز ، الماء ، البرسيم ثم ٥٠% من العلف المركز أدى ألي تحسين القيمة الغذائية والهضمية كما تحسنت موازين المعادن والآزوت.