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EFFECT OF ZERANOL IMPLANTATION ON PERFORMANCE OF RAHMANY LAMBS. 2-MINERAL UTILIZATION AND WOOL PHYSICAL CHARACTERISTICS.

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SUMMARY

Sixteen growing Rahmany male lambs about 7 months old and 19.82 ± 0.22 kg body weight were assigned randomly into equal four groups to study the effect of different doses and consecutive implantation of zeranol on mineral utilization and wool properties. All groups were fed the basal diet which consisted of concentrate feed mixture and rice straw. Different groups were treated with zeranol as follows: First group (G_1) was served as untreated control group. Second group (G_2) was implanted with 12 mg per animal at the beginning of the experiment only. Third group (G_3) was implanted with 12 mg per animal, at the beginning and at day 91th of the experiment. Fourth group (G_4) was implanted with 24 mg per animal at the beginning of the experiment only.

The main results showed that implantation with high level of zeranol (G_3 and G_4) improved macro (Ca, P, Na, K and Mg) and micro (Zn and Fe) elements retention compared with control group. Moreover, Cu absorption in both G_3 and G_4 increased significantly ($p<0.05$) than control group. Moreover, zeranol implantation in lambs tended to slightly increase the mineral concentration of blood plasma. Also, animals treated with zeranol decline ($p<0.05$) the fiber diameter, interrupted medullation, coarse wool and improve the true wool and grade of wool. While, no significance differences on the other properties.

Keywards: zeranol, Lambs, Minerals, Absorption, Retention, wool

INTRODUCTION

Extensive research activities have been conducted throughout the last forty years to illustrate the possibility of increasing meat production, using anabolic growth promoter. Zeranol (Ralgro) is a non-hormonal, anabolic growth promoter that has been proven in research trials to increase body weight gain and feed efficiency (Abdel-raouf *et al.*, 2000 in lambs, Mohsen *et al.*, 1993 in calves and Abou-Akkada *et al.*, 1976 and Horn *et al.*, 1976 in buffaloes). However, few investigators study the effect of zeranol on mineral utilization and wool production in lambs. Turner (1995) suggested that dietary mineral requirements may be increased in animals subjected to greater endogenous concentrations of growth hormone. Because growth hormone levels increased with zeranol treatment (Wiggins *et al.*, 1976; Phelps *et al.*, 1988), it is conceivable that mineral availability will be altered in zeranol treated animals. Therefore, the main objective of the present investigation is to determine the effect of different doses and consecutive implantation of zeranol on mineral utilization and wool physical properties of growing Rahmany lambs.

MATERIALS AND METHODS

The experiments were carried out at the Experimental Farm of the Department of Animal Production, Faculty of Agriculture, Kafr El-Sheikh, Tanta University in cooperation with Sakha Laboratories Kafr El-Sheikh, Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture. Sixteen growing male Rahmany lambs were blocked by age and weight (about 7 months of age and 19.82 ± 0.22 kg body weight) and assigned randomly into four groups of four lambs each. All groups were fed the basal diet which consisted of concentrate feed mixture and rice straw. Feed ingredients and minerals content of the experimental CFM and rice straw fed to growing lambs are shown in Table 1. Different groups were treated with zeranol as follows: First group (G_1) was served as untreated control group. Second group (G_2) was implanted with 12 mg per animal at the beginning of the experiment only. Third group (G_3) was implanted with 12 mg per animal, at the beginning and at 91 days of the experiment. Fourth group (G_4) was implanted with 24 mg per animal at the beginning of the experiment only. The treated groups were implanted subcutaneously on the base of the left ear. Animals in each group were housed in semi-opened pens and received their daily allowances in-group feeding. The experimental ration fed was according to (NRC, 1988). Animals were

fed rice straw as the sole source of roughage (1% from the body weight). Amounts of concentrate mixture were adjusted biweekly according to body weight changes. Daily feed allowances were offered in almost two equal parts at 8.00 a.m and 3.00 p.m. and water was available all the day during the experimental period (180 days).

Four digestibility trials were carried out using three growing male Rahmany lambs in each. It was conducted six weeks after the second implantation of group 3. The diet was sampled daily and composed for future feed composition analysis. Fecal excretion was collected twice daily, weighed and freezed to maintain sample integrity. Samples of feed and feces were dried in a forced-draft oven and ground through a 2-mm screen (AOAC, 1990). Urine was collected twice daily then mixed and filtered to remove foreign material, followed by sub-sampling. Filtrated urine was centrifuged at 1,000 rpm for 20 min. Feed and fecal sub-samples were wet-digested using dry ashing with Hcl acid (10%) and diluted to 100 ml with double-distilled de-ionized water. Blood samples were withdrawn at the end of each digestibility trial before the morning feeding from the jagular vein of each animal. Blood plasma was separated within one hour by centrifugation and stored at –20° C pending mineral estimates.

Table 1. Feed ingredients and mineral compositions of experimental diets

Items	G_1	G_2	G_3	G_4
Ingredients (%)				
CFM	83.57	79.91	84.37	78.90
Rice straw	16.43	20.09	15.63	21.10
Mineral concentration on DM basis*				
Ca (g/kg)	8.79	10.91	7.92	9.41
P (g/kg)	4.94	6.13	4.32	5.47
Na (g/kg)	4.71	5.85	3.97	5.45
K (g/kg)	21.90	27.15	19.26	24.14
Mg (g/kg)	4.80	5.95	4.07	5.51
Cu (ppm)	3.55	4.40	3.09	3.95
Zn (ppm)	71.05	88.08	61.35	79.97
Fe (ppm)	87.19	108.11	76.52	96.35

* Mineral concentrations were determined in homogeneous mixture from CFM and rice straw according to roughage/CFM ratio within each group.

G_1= control group, G_2= 12 mg zeranol / head at the beginning. G_3= 12 mg zeranol / head at the beginning and at 91 days. G_4= 24 mg zeranol / head at the beginning.

Urine, feed, fecal and blood plasma samples were analyzed for Ca, P, Mg, Cu, Zn and Fe using Atomic absorption spectrophotometer 2380 Parken-Elmer while Na and K were estimated by photometric method. Moreover, Phosphorus was determined using reagent calorimetric method.

Wool samples were collected from all the experimental animals at the end of the experiment. The samples (about 100g) were clipped close to the skin using Oster electric clipper. Each sample was immediately kept in a plastic bag for testing fiber length (Schwartz and Fox, 1974), staple length (ASTM, 1961, designation 2142), number of crimps/one cm^2 (Ryder and Stephanson, 1968), and fiber diameter using a Lanometer apparatus (ASTM 1971, designation 1230). The clean wool (%) (ASTM, 1957), percentage of moisture regain (Von Bergen, 1976). Kemp, continuous and interrupted medullation (McMahon, 1937), fine and coarse wool fiber percent (Marai and Abd-El-Salam, 1971) and the grades of wool (ASTM 1985, designation 2130).

The obtained data were statistically analyzed by one way analysis of variance as a randomized block design using least square analysis of the General Linear Models procedures of the Statistical Analysis System (SAS, 1996). The differences among treatments means were tested using Duncan test.

RESULTS AND DISCUSSION

Average consumption of concentrate feed mixture and rice straws jointly were 747.47, 757.37, 798.21 and 730.75g/day for G_1, G_2, G_3, and G_4 groups, respectively. Minerals balance data (Tables 2 and 3) indicated that lambs implanted with high levels of zeranol (G_3 and G_4) improved macro (Ca, P, Na, K and Mg) and micro (Cu, Zn and Fe) elements absorption or retention compared with control group, but the differences were not significant. These results were similar to that found by Spears *et al.* (1989) who found that the percent apparent absorption of Ca, K, Mg and P improved in steers fed lysocellin than in control. In addition, Reffett *et al.* (1989) suggested that Ca absorption or retention was slightly higher for steers fed lasalocid growth promoter than control.

Table 2. Macro mineral balances in lambs treated with zeranol

Items	G_1	G_2	G_3	G_4	SEM	Sig.
Calcium						
Intake (g/d)	6.57	8.26	6.32	6.88	0.2448	
Absorption (%)	29.8	27.69	40.89	33.13	3.1852	NS
Retention (%)	26.96	25.99	39.30	31.68	3.2271	NS
Phosphorus						
Intake (g/d)	3.69	4.64	3.45	4.00	0.1573	
Absorption (%)	25.35	28.11	41.98	33.55	2.3276	NS
Retention (%)	22.08	23.80	37.94	28.63	2.4439	NS
Sodium						
Intake (g/d)	3.52	4.43	3.11	3.98	0.1788	
Absorption (%)	69.11	71.55	73.20	72.36	2.4633	NS
Retention (%)	17.95	18.07	26.77	20.25	4.0280	NS
Potassium						
Intake (g/d)	16.37	20.56	15.37	17.64	0.6822	
Absorption (%)	95.77	95.72	95.98	95.69	0.3783	NS
Retention (%)	7.76	10.27	14.58	11.58	3.4026	NS
Magnesium						
Intake (g/d)	3.59	4.51	3.25	4.03	0.1766	
Absorption (%)	68.79	79.66	71.75	72.34	1.1884	NS
Retention (%)	11.03	19.97	21.17	20.11	3.4976	NS

* SEM = Stander error of mean * P<0.05, NS=not significant

Figures 1 and 2 indicated that the improvement retention (%) of Ca, p and Mg of G_4 was 145.77, 171.83 and 191.93% respectively. While, Cu and Zn absorption was 150.79 and 143.96%. These results are in accordance with those of Hufstedler and Green (1995) who found that Ca, P and Mg absorption increased by 187, 290 and 110% also, retention of Cu and Zn increased by 128 and 165% in implanted lambs compared with non- implanted lambs. The mode of action of zeranol was explicated by Bryan (1984) who stated that this growth promoter acting on receptors in the hypothalamus increased the rate of secretion of growth hormone (GH) by pituitary, insulin, thyroid hormone and glucocorticoids synthesis by adrenal gland. These hormones may be directly or indirectly affect various metabolic functions within cells.

Table 3. Micro mineral balances in lambs treated with zeranol

Items	G_1	G_2	G_3	G_4	SEM	Sig.
Copper						
Intake (ppm)	2.65	3.33	2.47	2.89	0.1152	
Absorption (%)	38.14	37.28	57.51	43.21	1.9831	*
Retention (%)	35.03	34.58	54.48	40.55	2.0800	*
Zinc						
Intake (ppm)	53.11	66.71	48.97	58.44	2.4121	
Absorption (%)	25.68	25.52	36.97	28.53	2.5172	NS
Retention (%)	15.77	17.72	29.87	22.23	2.8529	NS
Iron						
Intake (ppm)	65.17	81.87	61.08	70.41	2.7449	
Absorption (%)	11.95	14.17	15.39	14.07	2.7880	NS
Retention (%)	3.46	4.99	5.33	5.62	3.2264	NS

+ SEM=Stander error of mean, * P<0.05, NS=not significant

a,b : mean in the same raw not followed by the same letter are significantly different at (P<0.0).

Table 4. Effect of zeranol on some macro (mg/100ml) and micro (µg/100ml) mineral concentrations in plasma of lambs

Items	G_1	G_2	G_3	G_4	SEM	Sig.
Calcium	8.1	8.70	9.28	9.09	0.4462	NS
Phosphorus	4.68	4.78	4.70	4.91	0.9980	NS
Sodium	260	275	290	310	15.9160	NS
Potassium	16.69	17.27	19.82	19.40	1.3132	NS
Magnesium	2.39	2.65	2.87	2.59	0.1711	NS
Copper	82	84	98	94	4.2060	NS
Zinc	93	95	107	100	4.7637	NS
Iron	188	188	206	193	8.5012	NS

+ SEM=Stander error of mean, * P<0.05, NS=not significant

Fig.1. Effect of zeranol implantation on apparent mineral absorption (%) from control group.

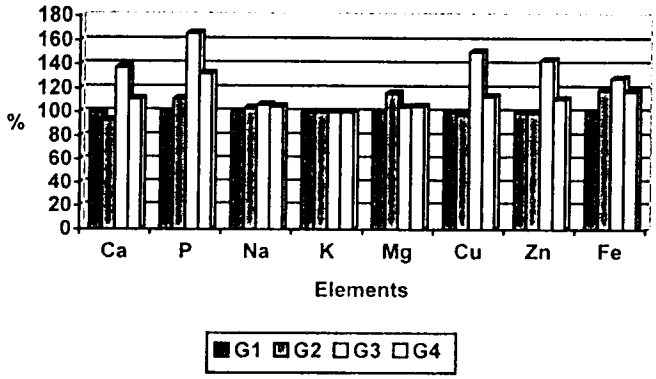
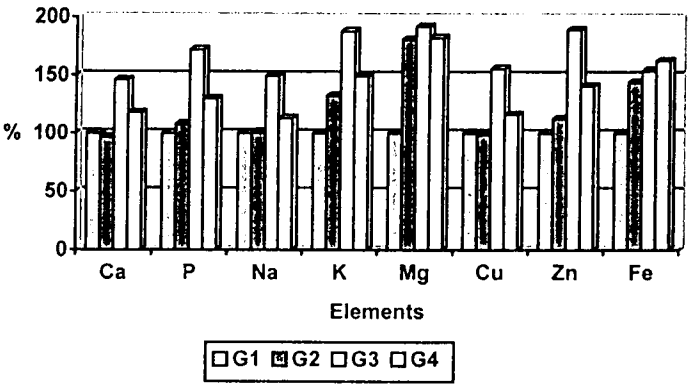


Fig.2. Effect of zeranol implantation on mineral retention (%) from control group.



Zeranol implantation in lambs tended to cause slight increase in mineral concentration of blood plasma (Table 4). These results are in agreement with Harvey *et al.* (1988) and Badway (1992) who found that growth promoters such as monensin had not significantly affected calcium and potassium concentration in blood plasma of cattle. Moreover, changes in mineral concentration of blood plasma were within the normal range.

Table 5.Efect of zeranol implantation on some wool characteristics and statistical variance at the end of six months

Items	G_1	G_2	G_3	G_4	SEM$^+$	Sig.
Stable length (cm)	4.75	4.67	3.84	3.25	0.1462	NS
Fiber length (cm)	5.21	5.18	4.85	4.87	0.1288	NS
	5.17	5.33	4.67	4.17	1.5864	NS
Fiber diameter (micron)	20.24^b	18.24^a	18.07^a	18.35^{ab}	0.2731	*
Interrupted medalltion (%)	32.10^b	23.59^{ab}	10.70^a	16.52^a	2.5161	*
Continuous medalltion (%)	1.11	109	1.18	1.22	0.7070	NS
Impurities	48.62	50.10	55.62	51.99	2.9053	NS
Kemp (%)	0.00	0.00	0.00	0.00	0.00	NS
Clean wool (%)	49.88	49.90	44.39	48.01	2.9083	NS
Moisture regain (%)	8.49	6.72	8.30	7.99	0.3084	NS
Coarse wool (%)	33.20^b	27.68^{ab}	11.88^a	17.74^{ab}	3.0247	*
True wool (%)	66.70^a	72.32^{ab}	88.14^b	79.34^{ab}	3.2078	*
Grade wool (S)	31.67^a	33.50^a	40.33^b	38.17^b	.5381	*

+ SEM=Stander error of mean, * P<0.05, NS=not significant

a,b : mean in the same raw not followed by the same letter are significantly different at (P<0.05).

Data in Table 5 indicate that there are significant effects of zeranol on some of the studied wool physical properties. Implanting lambs declines in the average values of fiber diameter, interrupted medullation, coarse wool, and improve the true wool and grade wool. But the differences were not significant on the other physical characteristics. The results reported here is confirmed by the data obtained by Bortoluss and Bird (1998) stated that, there was no effect of Ralgro (zeranol) or Revalor-S on fleece characteristics of mature wethers grazing dry season pastures. It could be concluded that. zeranol implantation increases minerals apparent absorption and retention and regard reevaluation of mineral requirements of animals treated with growth promoters including zeranol. Moreover higher doses of zeranol improved grade wool.

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