Vitamin Status in Yearling Rams with Growth Failure

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Abstract: This study was performed to investigate the serum levels of vitamins in yearling rams with growth failure. A total of 70 yearling rams of Akkaraman breed, 50 of which were classified as growth-failure with an average body weight of 37.30 ± 1.1 kg (test) and the remaining 20 were classified as normal with an average body weight of 67.80 ± 2.2 kg (control), were included in the study. There were significant differences between the yearling rams with and without growth failure in terms of serum levels of vitamin C, β-carotene, and vitamins A and E (P < 0.001, P < 0.01, P < 0.001, and P < 0.001, respectively). The levels of all analyzed vitamins were lower compared to controls in yearling rams with growth failure.

Key Words: Growth failure, vitamin, yearling rams

Geliflme Yetersizliği Görülen Toklularda Serum Vitamin Düzeyleri

Özet: Bu çalışmada gelişme yetersizliği görülen toklularda serum vitamin düzeyleri incelendi. Toplam 70 Akkaraman tokluğu ortalama canlı ağırlığı 37.30 ± 1.1 kg olan 50 toklu deneme grubunu, ortalama canlı ağırlığı 67.80 ± 2.2 kg olan 20 toklu ise kontrol grubunu oluşturdurdu. Gelişme yetersizliği görülen tokluların serum vitamin düzeyleri sağlıklı toklulara göre düşük bulunurken, vitamin C, β-karoten, vitamin A ve E düzeyleri arasında önemli farklılıklar saptandı (sırasıyla, P < 0.001, P < 0.01, P < 0.001 ve P < 0.001).

Anahtar Sözcükler: Gelişme yetersizliği, vitamin, toklu

Growth is under the control of genetic expression in all living organisms. Animals with lower than normal growth rates are generally categorized as growth failure. Genetic, nutritional, metabolic, and endocrine factors have profound effects on normal growth. Among the common etiological factors for this condition are insufficient or imbalanced feeding of the animal, septicemia, chronic infections, parasitism, and hormonal disorders (1,2).

Vitamins are important for the normal physiological function of all organisms and most of them are provided by food. Vitamin deficiency decreases resistance to various illnesses and some conditions that could be dangerous for health. There are many studies on the relationship between growth and vitamins (3-6).

The present study was carried out to determine the vitamin status in yearling rams with growth failure.

In this study, 70 yearling rams of Akkaraman breed from East Anatolia of Turkey were used as research material and all animals had the same feeding conditions. The test group of the study consisted of 50 yearling rams, which were 12.08 ± 0.1 months old and weighed 37.30 ± 1.1 kg. Clinically they appeared healthy and no skeletal deformities or signs of infectious diseases were detected in physical examination; however, they had apparently lower live weights compared to the normal group, which consisted of 20 yearling rams at the age of 12.10 ± 0.2 months and weighing 67.80 ± 2.2 kg.

Stool samples were collected from all animals and examined with native, sedimentation, and flotation methods for the presence of parasites (7). Blood samples were taken from the vena jugularis into serum test tubes for the measurements of the serum vitamins between 0800 and 1000 hours before pasturage. The serum was
collected by centrifugation at 1400 × g for 10 min. The serum vitamin E, C, A, and β-carotene levels were measured by spectrophotometry (8,9).

All statistical calculations were carried out with unpaired t-test.

No yearling rams included in the study exhibited skeletal abnormalities or clinical signs of an ongoing disease. The rams chosen for blood analysis had neither ecto- nor endo-parasites. The average live weight of the yearling rams in the test group (37.30 ± 1.1 kg) was significantly lower compared to the yearling rams included in the control group (67.80 ± 2.2 kg) (P < 0.001).

Serum levels of vitamin C, β-carotene, and vitamins A and E of the test group were significantly lower (P < 0.001, P < 0.01, P < 0.001, P < 0.001, respectively) compared to the control group (Table).

Growth failure is often characterized by lower than normal body weight and height of the animal concerned. Average live weight of yearling Akkaraman breed sheep varies between 44.110 and 60.264 kg (10). In the present study, the average live weight of the control group was 67.80 ± 2.2 kg, which is quite similar to the findings reported by Çolakoğlu (10). On the other hand, the average live weight of the yearling rams of the test group was 37.30 ± 1.1 kg, which is the apparent feature for which they were classified as yearling rams with growth failure.

Among the important factors that have great influences on the body growth are vitamins. Vitamin A is an essential micronutrient that enables cellular proliferation and differentiation; thus vitamin A deficiency prevents normal growth and development of the animals. Many studies demonstrated arrested growth, especially of weight gain in rats, following acute vitamin A depletion (11,12). Anzano et al. (12) reported that growth was depressed within 1 to 2 days of the withdrawal of retinoic acid whether animals were force-fed or were fed ad libitum. Higher levels of vitamin A supplementation (than usually recommended) is required during fattening of lambs (13) and vitamin A supplementation increased the average daily body mass gain of the lambs of the Shal breed (P < 0.01) (3).

In this study, serum vitamin A level of the test group was significantly lower (P < 0.001) compared to the control group. Vitamin A deficiency is associated with decreased expression of insulin-like growth factor 1 (IGF-1), leading to decreased circulating levels of IGF-1 (14). The levels of amino-peptidase N, sucrase-isomaltase, and alkaline phosphatase activities could be affected by vitamin A deficiency. These activity changes are usually accompanied by histological changes in the intestine, causing decreased digestion and absorption of foods. All abnormal physiological conditions decrease the growth rate (15).

β-carotene is a precursor of vitamin A or provitamin A because its activity occurs only upon conversion to retinol within the body. Beta-carotene has been found to have antioxidant activity in vitro (16). In this study, serum β-carotene level of the test group was significantly lower (P < 0.01) compared to the control group.

Vitamin E, a fat soluble vitamin, plays a vital role by protecting all cells from peroxidation, and helps prolong the life of erythrocytes, immune function, and cancer prevention and have positive effects in the fertility of most animal species. It has a role as an antioxidant, protecting molecules and tissues from the deleterious effects of free radicals (17). It has been reported that daily supplementation of calves with different vitamin E levels improved the daily weight gains (4,18). Kott et al. (5) reported that ewes fed with vitamin E 3 weeks before

<table>
<thead>
<tr>
<th>Groups</th>
<th>Body Weight (kg)</th>
<th>Vitamin C (mg/dl)</th>
<th>β-Carotene (µg/dl)</th>
<th>Vitamin A (µg/dl)</th>
<th>Vitamin E (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>67.80 ± 2.2</td>
<td>1.494 ± 0.417</td>
<td>32.784 ± 2.175</td>
<td>175.426 ± 9.446</td>
<td>1.239 ± 0.194</td>
</tr>
<tr>
<td>Test</td>
<td>37.30 ± 1.1***</td>
<td>0.636 ± 0.329***</td>
<td>30.201 ± 1.787**</td>
<td>115.166 ± 9.328***</td>
<td>0.779 ± 0.286***</td>
</tr>
</tbody>
</table>

** P < 0.01, ***P < 0.001
parturition may have low lamb mortality and have high live body weight at the time of weaning. Pehrson et al. (19) reported that the slaughter weight changes and daily body weight gain differences could be a result of low vitamin E status rather than a positive effect of additional vitamins in animal diet. In this study, serum vitamin E level of the test group was significantly lower (P < 0.001) compared to the control group.

Vitamin C has several important functions in the body for the synthesis of amino acids and collagen, wound healing, metabolism of iron, lipids and cholesterol, and others. In particular, vitamin C is a well-known antioxidant that scavenges free radicals (20). Grosicki (6) reported that the rats supplemented with vitamin C revealed an improved body weight gain during the experimental period designed for cadmium absorption and distribution. In this study, the average serum C vitamin levels of the control and test groups were 1.494 ± 0.417 mg/dl and 0.636 ± 0.329 mg/dl, respectively (P < 0.001).

In conclusion, the levels of all analyzed vitamins were lower compared to the controls in yearling rams with growth failure. Vitamin supplements should be supplied to animals with growth failure to support their growth and production performances and increase their resistance to diseases.

References