Effect of Dietary Cumin (Cuminum cyminum) Supplementation on Growth Performance, Hematological Parameters, Growth Hormone, and Insulin-like Growth Factor-1 in Karadi Male Lambs.

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Abstract

This study examined the effect of adding cumin powder to the diets of growing Karadi male lambs on growth performance, blood traits, growth hormone (GH), and insulin-like growth factor-1 (IGF-1). Twenty lambs with an average starting weight of 24.7 ± 1.6 kg were divided randomly into four groups for 90 days. The first group received a basal diet without cumin powder, while the other groups received diets containing 1%, 2%, or 3% cumin powder.

Body weight, feed intake, and feed conversion ratio (FCR) were recorded during the experiment. At the end of the trial, blood samples were taken to measure blood parameters and serum levels of GH and IGF-1.

The results showed that cumin powder improved several blood traits, including red blood cell count, hemoglobin level, packed cell volume, and white blood cell count compared with the control group ($P < 0.05$). The lambs fed 3% cumin powder showed the highest values in most cases. However, mean corpuscular volume, mean corpuscular hemoglobin, and platelet count were not affected significantly by the treatments.

Cumin supplementation also improved growth performance. Lambs fed cumin powder had greater final body weight, higher daily weight gain, and better feed conversion efficiency than the control group. The best results were found in the lambs fed 2% cumin powder. In addition, serum GH and IGF-1 concentrations increased significantly in the supplemented groups, especially in the 2% cumin group. Feed intake was similar among all groups.

Therefor, this study was conducted to evaluate the effect of different dietary level of Cumin powder on growth performance, hematological parameters and growth-related hormones in karadi lambs.

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In conclusion, adding cumin powder to the diets of Karadi lambs, particularly at the 2% level, improved growth performance and increased hormones related to growth.

Keywords: cumin powder, Karadi lambs, growth performance, growth hormone, IGF-1, feed additive

1. Introduction

The use of phytogenic feed additives in animal nutrition has increased because of concerns about too much use of antibiotic growth promoters. Medicinal plants and spices contain natural active substances that can improve digestion, rumen fermentation, antioxidant activity, and the immune system in livestock. These additives may also help animals use nutrients better and improve productivity [1].

Cumin (Cuminum cyminum) is a medicinal plant that contains active compounds such as cumin aldehyde, terpenoids, and flavonoids. These compounds have antimicrobial and antioxidant effects, which may improve rumen microorganisms and nutrient digestion [2]. Previous studies reported that phytogenic additives can improve feed efficiency and animal growth in ruminants [3,4].

Growth and tissue development in lambs are regulated partly through the interaction between growth hormone (GH) and insulin-like growth factor-1 (IGF-1). Growth hormone stimulates protein synthesis and body development, whereas IGF-1 is responsible for many anabolic effects associated with GH activity [5]. Nutritional management may influence this hormonal system and therefore affect animal growth performance [6,7]. However, limited information is available regarding the effect of cumin supplementation on GH and IGF-1 concentrations in lambs.

Therefore, the present study aimed to evaluate the effects of dietary cumin powder on growth performance, blood characteristics, GH, and IGF-1 levels in growing Karadi male lambs.

2. Materials and Methods

2.1 Animals and Experimental Design

Twenty Karadi male lambs aged between 5 and 6 months, with an average initial body weight of 24.7 ± 1.6 kg, were used in this study. The

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experiment was carried out in Gulan Village (Dolle) from 1 March to 1 June 2026 and continued for 90 days.

The lambs were randomly assigned to four experimental treatments, with five lambs in each group:

- **Control:** basal diet without cumin
- **T1:** basal diet + 1% cumin powder
- **T2:** basal diet + 2% cumin powder
- **T3:** basal diet + 3% cumin powder

The experimental diets were formulated according to NRC [8] recommendations for growing lambs {8}. Feed and fresh water were supplied freely throughout the experimental period.

Chemical Composition of Rations

The chemical composition of the experimental diets was analyzed according to standard procedures and is presented on a dry matter basis. The basal ration consisted of concentrate feed and roughage (Straw *addlibtum*), while cumin powder was added at different levels (0%, 1%, 2%, and 3% of the diet).

Item (%)	Control (0% Cumin)	1% Cumin	2% Cumin	3% Cumin
Dry Matter (DM)	89.5	89.6	89.7	89.8
Crude Protein (CP)	15.2	15.3	15.4	15.5
Ether Extract (EE)	3.1	3.4	3.7	4.0
Crude Fiber (CF)	10.5	10.7	10.8	11.0
Ash	6.2	6.3	6.4	6.5
Nitrogen-Free Extract (NFE)	64.5	64.3	63.7	63.0
Metabolizable Energy (ME, MJ/kg DM)	10.8	10.8	10.9	10.9

2.2 Measurements and Blood Sampling

Body weight was measured regularly during the experiment to calculate average daily gain (ADG) and final body weight. Daily feed intake was also recorded, and feed conversion ratio (FCR) was calculated.

At the end of the experiment, blood samples were collected from all lambs for hematological analysis. The

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measured parameters included red blood cell count (RBC), hemoglobin concentration (Hb), packed cell volume (PCV), white blood cell count (WBC), and other blood indices. Serum GH and IGF-1 levels were measured using ELISA kits.

3.2 Statistical Analysis

The data were analyzed using one-way analysis of variance (ANOVA) in a completely randomized design(CRD). Duncan's multiple range test was used to compare treatment means when significant differences were found. Differences were considered significant at $P < 0.05$. Data are presented as mean ± standard error.

3. Results

3.1 Hematological Parameters

Adding cumin to the diet improved some blood parameters in Karadi lambs. Lambs fed 2% and 3% cumin had significantly higher RBC count, hemoglobin concentration, PCV, and WBC values than the control group ($P < 0.05$). In most measurements, the highest values were found in the 3% cumin group.

However, dietary cumin had no significant effect on MCV, MCH, MCHC, platelet count, neutrophil percentage, or lymphocyte percentage.

Table 1. Effect of Cumin Supplementation on Blood Parameters in Lambs

Parameters	Control (0%)	Cumin 1%	Cumin 2%	Cumin 3%	SEM	P-value
RBC ($\times 10^6$ /µL)	8.94	9.36	9.81	10.05	0.17	0.032
Hemoglobin (g/dL)	10.5	11.1	11.8	12.2	0.24	0.027
PCV (%)	30.8	32.7	34.6	35.9	0.71	0.021
WBC ($\times 10^3$/µL)	8.7	9.2	9.8	10.4	0.28	0.039
MCV (fL)	34.4	35.2	36.1	36.8	0.59	0.114
MCH (pg)	11.7	12.0	12.2	12.5	0.18	0.173
MCHC (%)	33.8	34.1	34.5	34.8	0.31	0.208
Platelets	405	421	439	452	8.9	0.082

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Parameters	Control (0%)	Cumin 1%	Cumin 2%	Cumin 3%	SEM	P-value
(×10³/µL)						
Neutrophils (%)	40.9	42.5	44.1	45.3	1.06	0.095
Lymphocytes (%)	53.4	51.8	50.2	48.7	1.11	0.088

3.2 Growth Performance

Initial body weight was similar in all groups at the beginning of the experiment. However, cumin supplementation significantly increased final body weight and average daily gain compared with the control group ($P < 0.05$).

The best growth performance was observed in lambs fed 2% cumin, followed by those receiving 3% cumin. Daily feed intake was not significantly different among treatments. Feed conversion ratio improved in all cumin-treated groups, and the best feed efficiency was recorded in the 2% cumin treatment.

Although the 3% cumin diet improved growth compared with the control group, its effect was slightly lower than the 2% level. This may indicate that higher cumin levels do not always give better results.

Table 2. Effect of Cumin Supplementation on Growth Performance in Lambs

Parameter	Control	T1 (1%)	T2 (2%)	T3 (3%)	SEM	P-value
Initial body weight (kg)	24.6	24.7	24.8	24.7	0.17	NS
Final body weight (kg)	36.7^{c}	40.4^{b}	44.1^{a}	42.9^{a}	0.79	<0.05
Average daily gain (g/day)	134^{c}	175^{b}	215^{a}	202^{a}	5.04	<0.05
Daily feed intake (kg/day)	1.31	1.33	1.36	1.37	0.03	NS
Feed conversion ratio	9.78^{a}	7.60^{b}	6.33^{c}	6.78^{b}	0.23	<0.05

Different superscripts within rows indicate significant differences ($P < 0.05$). NS = non-significant.

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3.3 Growth Hormone and IGF-1 Concentrations

Serum GH and IGF-1 levels increased significantly in lambs supplemented with cumin compared with the control treatment ($P < 0.05$). The highest hormone levels were recorded in the 2% cumin group.

The increase in GH and IGF-1 may explain the better growth rate and feed efficiency in supplemented lambs. Increase GH and IGF-1 maybe associated with improved nutrient utilization ,rumen fermentation and metabolic status. In addition, the antioxidant properties of cumin may help maintain hormone balance by reducing oxidative stress.

Table 3. Effect of Cumin Supplementation on Serum GH and IGF-1 Concentrations in Lambs

Treatment	Growth Hormone (ng/mL)	IGF-1 (ng/mL)	SEM	P-value
Control	3.71^{c}	141.8^{c}	0.19	<0.05
T1 (1% Cumin)	4.52^{b}	170.5^{b}	0.22	
T2 (2% Cumin)	5.84^{a}	201.3^{a}	0.26	
T3 (3% Cumin)	5.43^{a}	191.6^{a}	0.25	

Different superscripts indicate significant differences ($P < 0.05$).

4. Discussion

The improvement in blood parameters may be related to the active compounds found in cumin, such as essential oils, flavonoids, and antioxidants. These compounds may support blood production, nutrient metabolism, and immune function in growing lambs.

Cumin supplementation also improved growth performance and increased serum GH and IGF-1 levels. Since feed intake did not change between treatments, the improvement in body weight gain and feed efficiency was probably due to better nutrient utilization rather than increased feed intake.

The active components of cumin may stimulate rumen microbial activity and improve digestion. In addition, the antioxidant properties of cumin could reduce oxidative stress and

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support normal metabolic and endocrine functions. Similar results have been reported in studies using other phytogenic additives in small ruminants [4].

Among the tested inclusion levels, 2% cumin supplementation produced the best overall response. Increasing the level to 3% did not result in further improvement, suggesting that the optimum dietary level may have already been achieved under the conditions of the present study.

5. Conclusion

Dietary supplementation with cumin powder improved growth performance, feed efficiency, hematological traits, and serum GH and IGF-1 concentrations in growing Karadi lambs. The most effective results were obtained with 2% cumin supplementation. Therefore, cumin may be considered a beneficial natural feed additive for enhancing growth and metabolic performance in lambs.

6. Recommendations

1. Supplementing lamb diets with approximately 2% cumin powder may improve growth performance and feed efficiency.
2. Additional studies are needed to evaluate the effects of cumin on rumen fermentation, nutrient digestibility, and gene expression.
3. Future research should also investigate carcass quality, immune response, and reproductive performance in cumin-supplemented lambs.

7. References

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