University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 2 (2025) PP 143-153

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

The effect of Different Levels of Probiotics and Demavate Vitamin Mixture on the product traits and rumen environment of Local Goat Kids

Ali Naser Muhsen AL-Ali , **Maithem K, Ali AL-Galiby**

[1,2] Department of animal production .College of Agriculture and marshes / University of Thi-Qar. 64001. Iraq.

[1]*E-mail:* Alinasser.post2024@utq.edu.iq
[2]*E-mail:*maitham@utq.edu.iq

Abstract

This experiment was conducted at the animal field belonging to the College of Agriculture and Marshes/ University of Thi-Qar during the period from 15/9/2024 to 22/12/2025 to study the effect of different inclusion levels of a probiotic supplement and the vitamin mixture Demavate (AD3E) on the product traits of local goat kids, The experimental animals were assigned to five treatments, The results of the current study indicated a significant increase in body weight in T3 and T4 compared to the control group by the eighth week of the trial, reaching 25.13 and 26.30 kg, respectively. By the tenth week, T2, T4, and T5 showed superior final body weights, recording 29.16, 29.93, and 29.73 kg, respectively. In terms of total weight gain, T2 and T5 demonstrated the highest values at 11.90 and 11.29 kg, respectively, compared to the control. Daily weight gain was significantly higher in T3, T2, and T5, which recorded 141.66, 134.52, and 130.55 grams per day, respectively. No significant differences were observed in total feed intake among the treatment groups. However, the feed conversion ratio was significantly better in the control group (T1), which recorded a value of 10.03 kg feed per kg of weight gain, outperforming T2, T3, and T5.

The treatment group T2 showed superior ruminal pH values on day 45 of the experiment before feeding compared to treatments T3 and T4, recording a value of 5.76. Additionally, T2 outperformed all other treatments three hours after feeding, with a pH of 5.95. On day 84 before feeding, treatment T4 recorded the highest ruminal pH (6.68), whereas three hours post-feeding, treatment T5 showed the highest pH value (5.86).A significant increase in the number of cellulolytic bacteria was observed in treatment T5 on day 45 before feeding, recording a value of 21.74 CUF $\times 10^8$, compared to other treatments. Three hours post-feeding, treatments T4 and T5 outperformed the others with values of 7.75 and 7.64 CUF $\times 10^8$, respectively. On day 84 before feeding, T5 again showed superiority with a value of 3.38 CUF $\times 10^8$, and after three hours, both T4 and T5 recorded the highest values: 8.53 and 8.42 CUF $\times 10^8$, respectively.

Key Words: Probiotics, Demavate Vitamin Mixture, rumen environment

I. Introduction

Local goat farming constitutes a fundamental pillar of food production in rural areas yet it faces significant challenges that hinder productivity improvement The main challenges include limited feed resources and their low nutritional value in addition to modest genetic makeup (Hegde, 2019) Reports indicate that nutrition accounts for more than 60% of the total operational costs in animal production (Al-Galbi *et al*, 2017).

Abundant roughages such as rice straw represent strategic alternatives to improve production performance especially when subjected to preliminary treatments that enhance their nutritional value (Makkar, 2018., Salami *et al*, 2019) The use of probiotics in ruminant nutrition has emerged due to their effective role in supporting digestion and fermentation

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 2 (2025) PP 143-153

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

improving rumen health and reducing heat stress impact (Cai *et al*, 2021a,. Shah *et al*, 2020) Studies have shown that probiotics improve growth increase weight gain and enhance digestion efficiency along with physiological performance indicators (Sivadasan and Subramannian, 2020., Al-Ghazi,2022., Salim *et al*, 2017)

Goats are considered one of the most efficient ruminants in converting low-quality feeds into high-value food products due to their high reproductive capacity which may reach twinning rates ranging from 150% to 400% (Haenlein, 2004) However vitamin imbalances especially in dried feeds represent critical nutritional problems affecting physiological performance There is a pronounced need for regular external supplementation of essential vitamins such as A , D3 and E since these vitamins cannot be synthesized internally unlike water-soluble vitamins (Hafez, 2012).

Several studies have confirmed that the use of the vitamin mixture AD3E enhances immune response and increases antibody production particularly when combined with veterinary vaccines (Rashid and Yüksek 2019., Salarvand *et al*, 2022).

The present study aims to investigate the effects of probiotic supplementation and AD3E vitamin drenching on key productive traits in goat kids, including final body weight, total and daily weight gain, feed intake, and feed conversion efficiency.

II. Materials and Methods

Experimental Design:

This study was conducted at the Animal Field of the College of Agriculture and Marshlands, University of Thi-Qar, from 25/9/2024, to 15/1/2025. The study included 15 local male goat kids, selected post-weaning at the age of 4 months, with weights ranging between 17.50 and 20.00 kg. The animals were purchased from local markets and examined by a veterinarian to ensure their health and absence of diseases.

The animals were randomly divided into five groups based on weight and age, with each group consisting of 3 animals, allocated as follows:

1. T1 (Control)
2. T2 (3% concentrate feed + 0.75 ml AD3E + 3 g probiotic)
3. T3 (3% concentrate feed + 0.75 ml AD3E + 5 g probiotic)
4. T4 (3% concentrate feed + 1.5 ml AD3E + 3 g probiotic)
5. T5 (3% concentrate feed + 1.5 ml AD3E + 5 g probiotic)

Body Weight and Daily and Total Weight Gains

Individual body weights were recorded after one week of the adaptation period using a digital scale, and then measured every two weeks until the end of the experiment. Based on these weights, daily and total weight gains were calculated as follows:

Daily weight gain (g/day) was calculated using the formula:

Daily weight gain=Subsequent weight−Previous weightNumber of days\text{Daily weight gain} = \frac{\text{Subsequent weight} - \text{Previous weight}}{\text{Number of days}}

Total weight gain (kg) was calculated as:

Total weight gain=Final weight−Initial weight\text{Total weight gain} = \text{Final weight} - \text{Initial weight}

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 2 (2025) PP 143-153

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

Feed Intake and Feed Conversion Efficiency

Daily feed intake was calculated by subtracting the amount of feed refusals from the total feed offered. Feed conversion efficiency was calculated as the ratio of the total feed consumed during the experimental period (kg) to the total weight gain during the same period (kg), using the following formula:

Feed conversion efficiency=Total feed intake during the experiment (kg)Total weight gain during the experiment (kg)\ text{Feed conversion efficiency} = \frac{\text{Total feed intake during the experiment (kg)}}{\text{Total weight gain during the experiment (kg)}}

Rumen Fluid Collection Method:

Rumen fluid was collected using a **stomach tube**, which was orally inserted into the rumen. The contents were then drained into a sterile, tightly sealed **beaker**. Samples were collected during two experimental periods (**days 45 and 84**) from each animal, **both before feeding and three hours after feeding**, for the purpose of **bacterial enumeration and pH measurement**.

Rumen Parameters Measurement:

1. pH Measurement:

Immediately after rumen fluid collection, pH was measured using a **digital pH meter (PW Philips 9909)**.

2. Enumeration of Cellulolytic Bacteria:

To determine the count of cellulolytic bacteria, **1 mL** of the rumen fluid sample was mixed with **9 mL** of sterile **0.1% peptone solution** to obtain a **1:10 dilution**. From this, a series of serial dilutions was prepared. A known volume of the final dilution was inoculated onto **Mast Diagnostica culture medium**, which was prepared according to the manufacturer's instructions. This medium contains **plant tissue extract** as a cellulose source to support the growth of cellulolytic microorganisms.

The inoculated plates were incubated at **37°C for 48 hours**. The **total number of bacteria** was calculated using the following formula (APIHA, 1992):

Total bacteria count / cm³ = Number of colonies on the plate × reciprocal of the dilution factor.

III. Results and Discussion

Body Weight

Table 1 shows that there were no significant differences in the initial body weights among the experimental groups, despite a slight numerical increase in favor of the control group (T1), which recorded an average weight of 20.87 kg compared to the other groups T3, T2, T5, and T4, which had averages of 20.86, 20.66, 20.46, and 20.26 kg, respectively.

In the second week, no significant differences were observed between the treatments. However, a numerical increase was recorded for T4, which averaged 21.63 kg, compared to T2, T1, T3, and T5, which recorded averages of 21.30, 21.26, 21.07, and 21.00 kg, respectively.

Similarly, no significant differences were found in the fourth week. Nevertheless, T5 showed a numerical increase with an average body weight of 24.66 kg, compared to T3, T1, T4, and T2, which recorded averages of 23.13, 23.06, 22.72, and 22.60 kg, respectively.

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 2 (2025) PP 143-153

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

In the sixth week, no statistically significant differences were observed, although T5 again recorded the highest numerical value of 25.93 kg. The other groups, T1, T3, T4, and T2, had averages of 24.40, 24.13, 24.10, and 23.95 kg, respectively.

By the eighth week, the results revealed significant differences (P≤0.05) between treatments. Both T4 and T5 significantly outperformed the control group (T1), recording mean body weights of 26.30 and 25.13 kg, respectively, compared to 23.72 kg for T1. Meanwhile, T3 and T2 recorded averages of 25.33 kg each, but these differences were not statistically significant compared to the other treatments.

In the tenth week, significant differences (P≤0.05) were again observed. Treatments T4, T5, and T2 showed significantly higher body weights, recording averages of 29.93, 29.73, and 29.16 kg, respectively, compared to the control group (T1), which recorded 25.25 kg. The T3 group recorded 25.73 kg and did not differ significantly from the other groups.

By the twelfth week, no significant differences were observed between treatments. However, T5 recorded the highest numerical value with an average body weight of 32.56 kg, followed by T3, T1, T4, and T2, with averages of 31.76, 30.56, 27.90, and 27.16 kg, respectively.

The observed increases in live body weights of kids supplemented with probiotics can be attributed to improvements in rumen environment, which supported the growth of the microbial population, particularly total bacteria and cellulolytic bacteria. This enhancement likely increased the efficiency of nutrient utilization and fiber digestion, thereby increasing the microbial protein available for absorption in the small intestine. Moreover, probiotics are a rich source of minerals, vitamins, and bioactive compounds that collectively promote growth and support the animal's physiological development.

Vitamin E also plays a vital role in enhancing immune function by protecting immune cells from oxidative damage, which improves their activity and increases antibody production. This contributes to the animal's resistance against pathogens. Additionally, vitamin E has been linked to appetite stimulation and improved feed intake during growth stages, which further enhances general health, accelerates tissue building, and boosts growth rates (Lewis, 2000; Federico *et al.*, 2005). The results of the current study are in agreement with the findings of(Al-Ghazi ,2022).

Table 1: Effect of Probiotic and AD3E Vitamins on Body Weight (kg)
(Mean ± Standard Deviation)

Treatment	Week 0	Week 2	Week 4	Week 6	Week 8	Week 10	Week 12
T1 (Control)	20.87 ± 1.28	21.07 ± 0.88	22.72 ± 1.72	23.95 ± 2.18	23.72 ± 0.70^{b}	25.25 ± 1.19^{b}	27.90 ± 1.76
T2	20.46 ± 0.56	21.00 ± 0.95	23.13 ± 1.70	24.40 ± 1.83	25.33 ± 1.52^{ab}	29.93 ± 1.18^{a}	31.76 ± 1.77
T3	20.26 ± 3.35	21.26 ± 3.84	22.60 ± 4.91	24.10 ± 3.89	25.33 ± 1.52^{ab}	25.73 ± 9.51^{ab}	27.16 ± 10.88
T4	20.86 ± 1.02	21.63 ± 1.88	23.06 ± 1.43	24.13 ± 1.36	25.13 ± 0.23^{a}	29.16 ± 1.53^{a}	30.56 ± 1.70
T5	20.66 ± 1.35	21.30 ± 1.25	24.66 ± 2.30	25.93 ± 2.37	26.30 ± 1.47^{a}	29.73 ± 1.85^{a}	32.56 ± 2.92

- **Significance Level:** 0.05
- **Different letters indicate the semantic difference between the treatments.** (P≤0.05)
- **NS** = Not significant
- **T1** = 0 g probiotic + 0 mL AD3E , **T2** = 3 g probiotic + 0.75 mL AD3E , **T3** = 5 g probiotic + 0.75 mL AD3E, **T4** = 3 g probiotic + 1.5 mL AD3E, **T5** = 5 g probiotic + 1.5 mL AD3E

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 2 (2025) PP 143-153

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

Total Weight Gain, Feed Intake and Feed Conversion Efficiency

The results presented in Table 3 indicate significant differences (P≤0.05) in total weight gain. Treatments T2 and T5 recorded significantly higher values of 11.90 kg and 11.29 kg, respectively, compared to the control group T1, which had an average of 7.02 kg. Treatments T4 and T3, with values of 10.90 kg and 9.70 kg respectively, did not show statistically significant differences when compared to the other groups.

Regarding daily weight gain, significant differences (P≤0.05) were also observed among treatments. Treatments T3, T2, and T5 outperformed the control group significantly, recording average gains of 141.66 g/day, 134.52 g/day, and 130.55 g/day, respectively, compared to 83.63 g/day for T1. Treatment T4 recorded an average of 115.47 g/day, which did not differ significantly from the other experimental groups.

These improvements in weight gain among animals receiving probiotic-supplemented diets may be attributed to the probiotics' ability to enhance rumen conditions, facilitating better digestion and nutrient assimilation. Specifically, probiotics promote the proliferation of beneficial microorganisms—particularly cellulolytic bacteria—and reduce the presence of lactate-producing bacteria, contributing to a more stable microbial balance within the rumen. This microbial stability improves nutrient digestion, protein synthesis, glucose absorption, and energy generation, collectively enhancing the animal's productive performance and resulting in notable weight gains (Al-Galiby, 2010; Al-Galiby, 2015). The findings of the current study are consistent with those of Al-Galiby, 2017a; Elaref *et al*., 2020; Al-Galiby *et al*., 2023; and Al-Ghazi , 2022).

As for total feed intake, Table 3 shows no significant differences (P≤0.05) among treatments. However, there was a clear numerical increase in feed consumption among kids treated with probiotics and Demavite compared to the control. The highest intake was recorded in group T2 at 73.93 kg, followed by T5, T1, T3, and T4 with values of 73.73, 72.50, 69.51, and 67.08 kg, respectively.

Concerning feed conversion efficiency (FCE), Table 3 reveals significant differences (P≤0.05) between treatments. The control group (T1) recorded the highest FCE value at 10.03 kg of feed per kg of weight gain, significantly higher than groups T5, T2, and T3, which recorded 6.68, 6.57, and 6.45 kg feed/kg gain, respectively. Treatment T4 recorded an FCE of 7.73 kg feed/kg gain, which was not significantly different from the other groups.

The improvement in feed conversion efficiency among kids treated with probiotics can be attributed to the multiple beneficial effects of these additives on rumen microbial ecology and digestion. Probiotics contribute to higher growth rates and weight gain by enhancing microbial protein synthesis and the production of essential amino acids required by ruminants. This is often accompanied by increased feed intake and improved nutrient digestibility (Antunovic *et al.*, 2006). Additionally, probiotics help create an optimal environment for the growth of beneficial microbes, increasing the population of cellulose-degrading protozoa and stabilizing ruminal pH. This enhances the digestion of carbohydrates and starch-rich compounds, meeting the energy and nutritional needs required for growth and fattening, while also reducing reliance on roughage and concentrated feed (El-Shaer, 2003). These findings are consistent with those reported by Al-Galiby *et al*,. 2023; Al-Ghazi, 2022; Al-Ghazi, 2021; Al-Galiby, 2010; Al-Galiby, 2017a and Al-Nassar, 2017).

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 2 (2025) PP 143-153

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

Table 2: Effect of Probiotic and AD3E Vitamins on Total and Daily Weight Gain, Feed Intake, and Feed Conversion Efficiency (Mean ± Standard Deviation)

Treatment	Total Weight Gain (kg)	Daily Weight Gain (g/day)	Feed Intake (kg)	Feed Conversion Efficiency (kg feed/kg gain)
T1	7.02 ± 1.09^{b}	83.63 ± 13.09^{b}	69.51 ± 3.78	10.03 ± 1.30^{a}
T2	11.29 ± 1.21^{a}	134.52 ± 14.43^{a}	73.93 ± 3.88	6.57 ± 0.43^{b}
T3	10.90 ± 2.33^{ab}	130.55 ± 27.80^{a}	72.50 ± 12.36	6.68 ± 0.84^{b}
T4	9.70 ± 1.64^{ab}	115.47 ± 19.59^{ab}	73.73 ± 3.19	7.73 ± 1.26^{ab}
T5	11.90 ± 1.77^{a}	141.66 ± 21.16^{a}	67.08 ± 5.43	6.45 ± 0.57^{b}

Significance Level: 0.05

Different letters indicate the semantic difference between the treatments. (P≤0.05)

NS = Not significant

T1 = 0 g probiotic + 0 mL AD3E , **T2** = 3 g probiotic + 0.75 mL AD3E , **T3** = 5 g probiotic + 0.75 mL AD3E, **T4** = 3 g probiotic + 1.5 mL AD3E, **T5** = 5 g probiotic + 1.5 mL AD3E

PH of Rumen liquid

Table (3) shows significant differences (P ≤ 0.05) in rumen pH values on days 45 and 84 of the experiment at 0 hours (before feeding) and 3 hours post-feeding.

On day 45 at 0 hours, treatment T2 recorded a significantly higher pH value (5.76) compared to T3 and T4 (5.54 and 5.37, respectively). Treatments T1 and T5 had values of 5.65 and 5.61, respectively, and did not differ significantly from the other treatments.

At 3 hours post-feeding, T1 showed a significantly higher pH value (5.95) compared to T4 and T3 (5.51 and 5.17, respectively). However, T2 (5.68) did not differ significantly from T1 or T3, while T5 (5.17) was also statistically similar to T3 and T4.

On **day 84 at 0 hours**, **T4** recorded the highest pH value (**6.68**), significantly exceeding the values of **T2**, **T3**, and **T5** (**6.32**, **6.06**, and **6.02**, respectively). **T1** showed a pH value of **6.25**, which was not significantly different from **T2**, **T3**, or **T5**.

At **3 hours post-feeding**, **T5** recorded a significantly higher pH (**5.86**) than **T2** and **T1** (**5.40** and **5.29**, respectively). Treatments **T3** and **T4** (**5.70** and **5.64**) did not differ significantly from either **T1** or **T5**.

This improvement in pH stability may be attributed to the **AD$_3$E vitamins**, which possibly supported rumen homeostasis by maintaining pH within a physiologically optimal range for microbial growth, particularly **beneficial cellulolytic bacteria**. Maintaining a stable ruminal pH is essential for sustaining the microbial balance, as drastic changes can negatively affect fiber-degrading bacterial activity. The abundance and composition of ruminal microbes are strongly influenced by diet composition and nutritional balance, underscoring the importance of **AD$_3$E supplementation** in enhancing digestive efficiency through modulation of the rumen environment Wei *et al.* (2015)

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 2 (2025) PP 143-153

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

Table (3): Effect of Probiotic and AD₃E Vitamins on Rumen pH (± Standard Deviation)

Treatment	Day 450 h	Day 453 h	Day 840 h	Day 843 h
T1 (0 g probiotic + 0 mL AD₃E)	5.61 ± 0.08 ab	5.95 ± 0.29 a	6.25 ± 0.05 bc	5.40 ± 0.08 b
T2 (3 g probiotic + 0.75 mL AD₃E)	5.76 ± 0.08 a	5.68 ± 0.18 ab	6.02 ± 0.07 c	5.29 ± 0.02 c
T3 (5 g probiotic + 0.75 mL AD₃E)	5.37 ± 0.10 b	5.51 ± 0.10 b	6.06 ± 0.05 c	5.64 ± 0.29 ab
T4 (3 g probiotic + 1.5 mL AD₃E)	5.54 ± 0.14 b	5.17 ± 0.05 c	6.68 ± 0.19 a	5.70 ± 0.27 ab
T5 (5 g probiotic + 1.5 mL AD₃E)	5.65 ± 0.15 ab	5.17 ± 0.60 bc	6.32 ± 0.11 b	5.86 ± 0.38 a
Significance	0.05	0.05	0.05	0.05

- Different superscript letters vertically indicate statistically significant differences at **P ≤ 0.05**.
- NS: No significant difference.
- Treatments:
  T1 = 0 g probiotic + 0 mL AD₃E
  T2 = 3 g probiotic + 0.75 mL AD₃E
  T3 = 5 g probiotic + 0.75 mL AD₃E
  T4 = 3 g probiotic + 1.5 mL AD₃E
  T5 = 5 g probiotic + 1.5 mL AD₃E

Bacteria Count

Table (4) presents statistically significant differences ($P \leq 0.05$) in the average counts of cellulolytic bacteria among treatment groups during the first rumen fluid sampling (day 45) at both time points: before feeding (0 hour) and 3 hours post-feeding.

At 0 hour on day 45, treatment T5 showed the highest bacterial count (2.74×10^8 CFU/mL), significantly higher than treatments T3, T2, T1, and T4, which recorded values of 1.08, 0.69, 0.54, and 0.43 $\times 10^8$ CFU/mL, respectively.

Treatment T4 (1.08×10^8 CFU/mL) also showed a significant increase compared to T3 and T1, while T3 was significantly higher than T1.

T2 (0.54×10^8 CFU/mL) did not differ significantly from T1 or T3. At 3 hours post-feeding, T5 and T4 had significantly higher bacterial counts (7.75 and 7.64 $\times 10^8$ CFU/mL, respectively) than T2 and T1 (5.46 and 2.30 $\times 10^8$ CFU/mL). T2 also showed a significant increase over T1, while T3 (5.63×10^8 CFU/mL) did not differ significantly from T2 or T4.

During the second sampling (day 84), prior to feeding (0 hour), T5 again recorded the highest bacterial count (3.38×10^8 CFU/mL), significantly higher than all other treatments (T1, T3, T2, and T4, with values of 1.62, 0.60, 0.51, and 0.81 $\times 10^8$ CFU/mL, respectively). T4 was significantly higher than T3, while T2 did not differ significantly from T1 or T3.

At 3 hours post-feeding, both T4 and T5 had significantly higher bacterial counts (8.53 and 8.42 $\times 10^8$ CFU/mL) than T2 and T1 (6.16 and 2.96 $\times 10^8$ CFU/mL). T2 was significantly higher than T1, while T3 (6.77×10^8 CFU/mL) did not differ significantly from T2 or T5.

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 2 (2025) PP 143-153

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

These increases can be attributed to the positive role of probiotics in creating a favorable environment for microbial growth in the rumen, enhancing the proliferation of cellulolytic bacteria by promoting efficient fermentation and maintaining rumen pH within the optimal physiological range. Probiotics improve fiber and organic matter degradation, resulting in greater energy availability for microbial growth, which leads to higher microbial protein production (Tripathi et al., 2008; Al-Galiby, 2010).

Moreover, AD₃E vitamins contribute to improving rumen conditions by stabilizing pH and supporting the growth of cellulolytic bacteria, which are sensitive to low acidity. This regulation is crucial in ruminants like goats, as increased cellulolytic activity leads to enhanced fermentation of carbohydrates, improved nutrient digestibility, and better microbial energy and nitrogen utilization.

These findings are in agreement with those reported by Al-Galiby et al. (2017), Abu Salwa (2016), and Al-Taie & Al-Tayeb (2020). They also align with more recent studies by Al-Galiby et al. (2023), Shateeb (2022), and Al-Ghazi (2021), but contradict the findings of Al-Ghazi (2022).

Table (4): Effect of Probiotic and AD₃E Vitamins on Cellulolytic Bacteria Count (CFU × 10^8/mL ± SD)

Treatment	Day 450 h	Day 453 h	Day 840 h	Day 843 h
T1 (Control)	0.69 ± 0.12 c	2.30 ± 0.64 c	0.81 ± 0.12 c	2.96 ± 0.58 c
T2	0.54 ± 0.09 cd	5.46 ± 0.81 b	0.60 ± 0.10 cd	6.16 ± 0.89 b
T3	0.43 ± 0.06 d	5.63 ± 0.96 ab	0.51 ± 0.07 d	6.77 ± 0.62 ab
T4	1.08 ± 0.10 b	7.75 ± 1.17 a	1.62 ± 0.12 b	8.42 ± 1.04 a
T5	2.74 ± 0.88 a	7.64 ± 0.93 a	3.38 ± 0.74 a	8.53 ± 1.00 a
Significance	0.05	0.05	0.05	0.05

- • Different superscript letters within the same column indicate significant differences at **P ≤ 0.05**.
  • NS = No significant difference.
  • Treatment definitions:
  T1 = 0 g probiotic + 0 mL AD₃E
  T2 = 3 g probiotic + 0.75 mL AD₃E
  T3 = 5 g probiotic + 0.75 mL AD₃E
  T4 = 3 g probiotic + 1.5 mL AD₃E
  T5 = 5 g probiotic + 1.5 mL AD₃E

IV. Conclusions

Significant increase in weight, total and daily weight gain, with improved feed conversion efficiency. Increase in total, cellulose-degrading, and lactic acid bacteria numbers in the rumen.

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 2 (2025) PP 143-153

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

V. Reference

Abu Salwa, Karim Hamadi Mahna (2016). The effect of substituting different percentages of crushed date pits for barley, with or without the addition of baker's yeast (Saccharomyces cerevisiae), on the performance of male Arabian lambs. Master's Thesis. University of Basra

Al- Taie ,Omar S. Altayeb and Muthanna A.(2020). Effect Of Addition Dry Bread Yeast (Saccharomyces Cerevisiae) And Probiotic On Growth, Carcass Characteristics And Some Rumen And Blood Parameters In Awassi Lambs. Mesopotamia J. of Agric. Vol. (48) No. (2) 59-67.

Al-Galbi, H. A. J., Al-Galbi, M. K. A., Shwaa, I. A. and Nahi, F. (2017). Effect of using Saccharomyces cerevisiae and baggaz on Arabi lambs performance. J. Thi-Qar Univ. Agric. Res. 6: 361-370.

Al-Galiby, Maithem K. A., Al-Hassnawi, Ihsan A., Al-Hassnawi, Mazen M.(2023).Impact of different levels of probiotics on blood and biochemical parameters of local goat kids. Iran. J. Ichthyol. (Special Issue 2023): 202-208.

Al-Ghalbi, Hanaa Ali Jabbar (2010). The effect of different proportions of probiotics and corn cobs on the digestion and performance of Arabian lambs. PhD thesis - College of Agriculture / University of Basra.

Al-Ghalbi, Maytham Khalaf Ali. (2015). Using molecular genetics methods to identify Trichoderma viride and Trichoderma harzianum fungi and their use in improving the nutritional value of straw and measuring the effectiveness of the cellulase enzyme they produce. PhD thesis, College of Agriculture, University of Basra.

Al-Ghazi, N. K. J. (2022). Effect of adding celery seeds as a probiotic to local goat diets in some productive characteristics. Thesis, University of Thi-Qar.

Al-Nassar, Mustafa Risan Kazim (2017). The effect of different levels of kefir milk as a probiotic on the performance of male lambs of Arabi sheep. Master's thesis, College of Agriculture, University of Basra.

Antunović Z, Šperanda M, Amidžić D, Šerić V, Stainer Z, Domačinović M, Boli F. (2006). Probiotic application in lambs nutrition. Krmiva. 48:175–180.

APHA (1992). (American Public Health Association) Compendium of Methods for Microbiological Examination of Food. 3rd, ed. Edwards Brothers, Washington, D. C.

Cai, L., Hartanto, R., Zhang, J. and Qi, D. (2021a). Clostridium butyricum improves rumen fermentation and growth performance of heat-stressed goats in vitro and in vivo. Animals 11: 3261-3270. http:// dx.doi.org/ 10.3390/ani11113261. PMid:34827993.

Elaref, M.Y.; Hamdon, H.A.M.; Nayel, U.A.; Salem, A.Z.M.; Anele, U.Y. (2020). Influence of dietary supplementation of yeast on milk composition and lactation curve behavior of Sohagi ewes, and the growth performance of their newborn lambs. Small Ruminant Research, (), 106176–. doi:10.1016/j.smallrumres.2020.106176.

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 2 (2025) PP 143-153

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

El-Shaer, E. K. H. (2003). Nutritional studies in ruminants Effect of yeast culture supplementation and concentratc: roughage ratio on performance of growing lambs". Ph. D. Thesis, Faculty of Agriculture, Mansoura University– Egypt .

Federico I. , Giuseppe M. , Monica I.C. and Fulvia B. , (2005) . Vitamin and water requirements of dairy sheep . Ital . J. Anim , Sci . 4 (suppl . 1) , p : 75-83 , ISSN 1828-051X . Article .

Haenlein , G.F.W . (2004) .Goat milk in human nutrition . Small Ruminant Res . , 51 : 155-163Holick, M. F., Chen, T. C., Lu, Z., & Sauter, E. (2007). Vitamin D and skin physiology: AD-lightful story. Journal of Bone and Mineral Research, 22(S2), V28-V3

Lewis , C.J. (2000).Clostridial Diseases of sheep Ed: Martin,W.B. and Aitken,I.D.Blackwell Science .3rd ed .Blackwell science Ltd. UK.131-136.

Makkar, H. P. S. (2018). Feed demand landscape and implications of food-not feed strategy for food security and climate change. Animals 12: 1744-1754.

Rashid, B. M., & Yüksek, N. (2019). The Effects of Immunostimulants (Zinc, Levamisole, Vitamin AD3E) Use Together With Enterotoxemia Vaccine on Immunoglobulins in Sheep. Turkish Journal of Veterinary Research, 3(2), 57-65.

Salami, S. A., Luciano, G., O'Grady, M. N., Biondi, L., Newbold, C. J., Kerry, J. P. and Priolo, A. (2019). Sustainability of feeding plant by-products: A review of the implications for ruminant meat production. Animal Feed Sci. Tech. 251: 37-55.

Salami, S. A., Luciano, G., O'Grady, M. N., Biondi, L., Newbold, C. J., Kerry, J. P. and Priolo, A. (2019). Sustainability of feeding plant by-products: A review of the implications for ruminant meat production. Animal Feed Sci. Tech. 251: 37-55.

Salarvand, F., Nowrouzian, I., & Sasan, V. (2022). The outbreak of Contagious Ecthyma in Hengam Island Goats. Scientific Reports in Life Sciences, 3(1).

Shah, M., Zaneb, H., Masood, S., Khan, R. U., Mobashar, M., Khan, I., Din, S., Khan, M. S., Rehman, H. U. and Tinelli, A. (2020). Single or combined applications of zinc and multi-strain probiotic on intestinal histomorphology of broilers under cyclic heat stress. Probiotics Antimicro. 12: 473 480.

Shatib, Huda Yahya (2022). The effect of different levels of AD3E on the performance of local goats. Master's Thesis / University of Dhi Qar / College of Agriculture and Marshlands

Sivadasan, K. S. and Subramannian, S. (2020). Comparison of growth performance of goat kids under supplementation with different probiotics. J. Anim. Res. 10: 1063-1065.

Tripathi, M. K., Karim, S. A., Chaturvedi, O. H. and Verma, D. L. (2008). Effect of different liquid cultures of live yeast strains on performance, ruminal fermentation and microbial protein synthesis in lambs. J. Anim. Physio. & Anim. Nutrition, 92(6):631-639.

University of Thi-Qar Journal of agricultural research

Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 14, Issue 2 (2025) PP 143-153

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/utjagr.v13i1.323*

Wei, C., Lin, S. X., Wu, J. L., Zhao, G. Y., Zhang, T. T., & Zheng, W. S. (2015). Effects of supplementing vitamin E on in vitro rumen gas production, volatile fatty acid production, dry matter 88 disappearance rate, and utilizable crude protein. Czech Journal of Animal Science, 60(8), 335-341.