

# Effect of Supplementation of Organic Acids on Nutrient Metabolizability and Economics of Quail Production

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**How to cite this paper:** Bansod, A., Wankhede, S., waghe, S., Shilwant, S., Bhosale, S. and Surjagade, S., (2021). **Effect of Supplementation of Organic Acids on Nutrient Metabolizability and Economics of Quail Production.** *International Journal of Livestock Research*, 11(5), 24-27. doi:

<http://dx.doi.org/10.5455/ijlr.20210104031729>

**Received** : Jan 04, 2021

**Accepted** : Feb 12, 2021

**Published** : May 31, 2021

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## Abstract

*The present study was undertaken to assess the effect of supplementation of organic acids on Nutrient metabolizability trial and economics production of 300 Japanese quail divided into 5 treatment groups and each of 4 replicates with 15 birds in each replicate. The groups were T0- Control group, T1- T0 +0.20 % Acetic acid, T2- T0 +0.20 % Butyric acid, T3- T0 +0.20 % Propionic acid and T4 - T0 +0.20 % (Acetic acid, Butyric acid and Propionic acid). Metabolic trial of five days duration was conducted on 8 birds from each treatment at the end of experimental trial to study the dry matter digestibility and N- retention. The economics of production of Japanese quails was also calculated at the end of the experimental period. It is concluded that 0.2 % acetic acid is economically beneficial and also improve the retention of nutrient.*

**Keywords:** Nutrient Digestibility Organic Acid, Quail

## Introduction

Introduction of quail is one of the critical milestones to fulfill the nutritional requirement by means of eggs and meat along with the broilers and the layers. Dietary organic acids and their salts are able to inhibit the growth of detrimental microbes in the feed and subsequently maintains the level of beneficial bacteria in the gastrointestinal tract. In addition, they not only decrease the pH of the gastro-intestinal tract but also increases the solubility, digestion and absorption of the nutrients (Vogt *et al.*, 1981; Patten and Waldroup, 1988 and Skinner *et al.*, 1991). Gut health is one of the major factor upsetting the performance of birds and thus the economics of poultry production and hence the profitability of an enterprise (Samik *et al.*, 2007). Acetic acid is being used extensively as anti-coccidial agent in the poultry industry. Due to this property, the nutrient bio-availability is enhanced and in turns the production performance of the birds which ultimately results in increased profitability of an enterprise (Das *et al.*, 2012). Butyrate seems to play a vital role in the intestinal epithelium development of bird by provoking the duodenal mucosa growth (Hu and Guo, 2007). It is well established that Propionic acid is used as a growth promoter which improves the rate of utilization of all nutrients especially protein that results in better dressing percentage. (Haque *et al.*, 2009). Therefore, the present research work was undertaken to determine the effect of incorporation of organic acids (acetic, butyric and propionic) on quail production.

## Materials and Method

The research was conducted on a 300-day-old quail for a span of 35 days. Day old chicks were procured from Jay Rushikesh Hatcheries and Poultry Service, Khadka, Tal district, Akola. These chicks were randomly and equally distributed into 5 treatments with 60 birds in each group having 4 replicates of 15 birds each. T<sub>0</sub> - Standard broiler quail diet as per ICAR, (2013), T<sub>1</sub>-T<sub>0</sub> + 0.2% Acetic acid, T<sub>2</sub> -T<sub>0</sub> + 0.2% Butyric acid, T<sub>3</sub> - T<sub>0</sub> + 0.2% Propionic acid and T<sub>4</sub>- T<sub>0</sub> + 0.2% Acetic acid + 0.2% Butyric acid + 0.2% Propionic acid. Feed and water were provided *ad-libitum*. The basal diet was formulated to meet the nutrient needs suggested by the ICAR (2013). The birds were fed as Table 1.

**Table 1:** Percent Ingredient Composition of Diet

Ingredient (%)	Starter					Finisher				
	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
Maize	42	42	42	42	42	50.4	50.4	50.4	50.4	50.4
Soybean (DOC)	48.07	48.07	48.07	48.07	48.07	38.8	38.8	38.8	38.8	38.8
Palm oil	4	4	4	4	4	4	4	4	4	4
L-Lysine	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.13
DL- Methionine	0.14	0.14	0.14	0.14	0.14	0.25	0.25	0.25	0.25	0.25
Arginine	1.20	1.20	1.20	1.20	1.20	1.42	1.42	1.42	1.42	1.42
Threonine	1.00	1.00	1.00	1.00	1.00	0.70	0.70	0.70	0.70	0.70
Limestone Powder	1	1	1	1	1	1.12	1.12	1.12	1.12	1.12
Dicalcium Phosphate	1.65	1.65	1.65	1.65	1.65	1.9	1.35	1.35	1.35	1.35
Trace-mineral mix	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Vitamin mixture	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1
Salt	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4
Choline chloride	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.13
Coccidiostat*	0.05	0.05	0.05	0.05	0.05	0.45	0.45	0.45	0.45	0.45
Toxin binder*	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Acetic acid	-	0.2	-	-	0.2	-	0.2	-	-	0.2
Butyric acid	-	-	0.2	-	0.2	-	-	0.2	-	0.2
Propionic acid	-	-	-	0.2	0.2	-	-	-	0.2	0.2
Total	100	100	100	100	100	100	100	100	100	100
CP(%)	25.0	25.0	25.0	25.0	25.0	21.5	21.5	21.5	21.5	21.5
ME (Kcal/kg)	2900	2900	2900	2900	2900	2950	2950	2950	2950	2950

\*Indicates over and above the hundred

Metabolic trial was conducted at the end of experimental period i.e., 35 days selecting 8 birds in each group. In this trial, eight exploratory birds from each treatment group (two birds from each replicate) of close to the body weight of treatment group body weight were randomly selected and housed in a metabolic cage confined with

the arrangement of discrete feeders and drinkers. The feed and faeces collected during the trial were analyzed for proximate composition. As per A.O.A.C. (2012). The economics of quail production due to supplementation of organic acids. The net profit was calculated at the end of experiment and data collected during the study was analysed as per SPSS (2009).

## Result and Discussions

Dry matter digestibility (Table 2) for T<sub>0</sub> to T<sub>4</sub> were; 64.20±0.18, 64.78±0.19, 64.15±0.22, 64.42±0.19 and 64.72±0.03 percent respectively. T<sub>1</sub> group showed significantly higher dry matter digestibility. Nitrogen retention percentage for treatment T<sub>0</sub> to T<sub>4</sub> were 68.23±2.39, 71.74±0.20, 72.19±0.10, 72.63±0.15 and 72.14±0.18 % respectively nitrogen retention was higher in T<sub>3</sub> group. Whereas group T<sub>0</sub> show less nitrogen retention. The findings corroborating with the Tomar *et al.* (2017) who evaluated the effect of organic acid supplementation on nutrient digestibility and reported significant difference among all treatment groups. Garcia *et al.* (2007) also found the similar results. Thirumeignanam *et al.* (2006) also reported higher dry matter digestibility in organic acid fed groups as compared to other groups. The observation may be due to reduces pH in the upper part of the GIT, digestibility of the nutrients may increase. Due to reduced pH in the stomach, pepsinogen and other zymogens get activated by adjusting gastric acidity closer to that required for optimal activity resulting in increased enzyme activity and improves the digestion of dry matter (Jongbloed *et al.* 2000). The net profit (Table 3) per bird was highest in treatment group T<sub>1</sub> (Rs. 41.17). Total feed intake (g/bird) were T<sub>0</sub>-602.21, T<sub>1</sub>-574.52, T<sub>2</sub>-594.05, T<sub>3</sub>-582.03, T<sub>4</sub>-584.94. Average body weight at the end of 5<sup>th</sup> week, T<sub>0</sub>- 122 177.84, T<sub>1</sub>-177.15, T<sub>2</sub> -182.43, T<sub>3</sub>-178.35 and T<sub>4</sub>-184.57. The findings of the present study are in accordance with the Chimote *et al.* (2009) who evaluated the effect of supplementation of various feed additives (enzyme, probiotic, yeast and acidifier) on economics of Japanese quail production and found more net profit in the acidifier (Novacid) supplemented group.

**Table 2:** Apparent nutrient metabolizability (% DM) as influenced by dietary Treatments

Treatment	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
Dry matter metabolizability%	64.20±0.18 <sup>ab</sup>	64.78±0.19 <sup>c</sup>	64.15±0.22 <sup>a</sup>	64.42±0.19 <sup>abc</sup>	64.72±0.03 <sup>bc</sup>
N retention %	68.23±2.39 <sup>a</sup>	71.74±0.20 <sup>b</sup>	72.19±0.10 <sup>b</sup>	72.63±0.15 <sup>b</sup>	72.14±0.18 <sup>b</sup>

**Table 3:** Economics of quail production

Economics parameters	Treatments				
	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
Chick cost (Rs. /bird)	10	10	10	10	10
Total Feed intake (g/bird)	602.21	574.52	594.05	582.03	584.94
Feed cost (Rs/Kg)	32.17	32.82	32.47	32.60	33.55
Feed cost (Rs/bird)	19.36	18.83	19.28	18.97	19.59
Miscellaneous cost (Rs/bird)	5	5	5	5	5
Cost of production (Rs/bird)	34.36	33.83	34.28	33.97	34.59
Average body weight (g) at the end of 5 <sup>th</sup> week	177.84	177.15	182.43	178.35	184.57
Sale of bird@ Rs 75 /bird	75	75	75	75	75
Profit (Rs.) per bird	40.50	41.17	40.42	41.03	40.41

## Conclusion

It is concluded that the performance in Japanese quail fed with blends of organic acids exhibited a positive impact on nutrient digestibility and however, supplementation of 0.2 % acetic acid is economically beneficial.

## Acknowledgement

The authors gratefully acknowledged to Director of Research, MAFSU, Nagpur and Associate Dean, Post Graduate Institute of Veterinary and Animal Sciences, Akola for providing necessary research facilities.

## Conflict of Interests

There is no conflict of interest.

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