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Efficacy of Renonic™ on Growth Parameters and Organ Weights of Broiler Birds Reared on High-protein Diets

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ABSTRACT

This 5-week study evaluated the efficacy of a renal product (Renonic™, Carus Laboratories Pvt. Ltd., Karnal, Haryana) on performance and organ weights in 240 day-old Vencobb-430 broiler chicks. Birds were randomly allotted to four treatments (4 replicates/15 birds each): A (Control; basal diet), E (Negative control; high-protein diet from days 3–21 + restricted water), F (As E + Renonic @ 1 ml/L water), and G (As E + standard gout solution @ 5–15 ml/100 birds). All birds were floor-reared with ad libitum basal feed (BIS 2007) and routine vaccinations. The statistical analysis of results showed that high-protein, water-restricted stress significantly reduced body weight gain (BWG) and increased the feed conversion ratio (FCR) in group E compared with control A. However, Renonic supplementation (Group F) significantly alleviated these detrimental effects, resulting in improved BWG and FCR compared to group E. Feed intake and relative liver weight showed no significant differences ($p > 0.05$) among treatments. At the end of week 2, relative kidney weight was significantly higher ($p < 0.05$) in group E than in groups A and F. By week 3, control group A had significantly lower relative kidney weight than all stress-exposed groups. Overall, Renonic™ effectively mitigated high-protein and water restriction induced renal and growth stress in broilers.[1]

INTRODUCTION

In modern commercial poultry production, maximizing growth performance while preserving physiological integrity remains a core objective. Optimal production efficiency relies heavily on balanced dietary formulation, with crude protein serving as a vital macronutrient for muscle deposition, tissue synthesis, and enzymatic function. However, offering dietary protein concentrations above recommended specifications disrupts the energy-to-protein ratio and imposes severe metabolic demands on birds. Excess protein cannot be stored in the body and must undergo hepatic catabolism and

renal excretion as uric acid — a process that incurs a high metabolic energy cost, alters digestive dynamics, impairs intestinal nutrient absorption and can lead to uric acid deposition on organs, leading to gout, a well-known condition in poultry. There are numerous factors associated with avian gout, such as high protein content in feed, excessive salt, dietary calcium, phosphorus imbalance, insufficient vitamin A uptake and lack of drinking water which all take a toll on kidney function. In addition, genetic and disease factors, viral infection, and improper use of drugs and feeding can also lead to avian gout (Bulbule et al., 2014).[1]

Furthermore, elevated dietary protein coupled with stressors like water restriction disrupts gut microbial homeostasis and enteric health, leading to suboptimal

weight gain and poor feed conversion ratios (FCR). Beyond intestinal dynamics, the metabolic load of handling excess dietary nitrogen directly impacts organ development and morphology. The liver catabolizes surplus amino acids, while the kidneys filter and excrete elevated levels of nitrogenous waste, frequently altering relative organ weights and inducing physiological strain.

To counter these diet-induced metabolic and gastrointestinal stresses, bioactive phyto-genic or therapeutic feed additive preparations (such as Renonic™) have gained interest for their ability to protect gut architecture, enhance nutrient digestion, and alleviate visceral organ burden. The objective of this study was to evaluate the impact of high-protein diets and water restriction on weekly live body weight, cumulative weight gain, feed conversion efficiency, and relative liver and kidney weights in broilers, while assessing the potential mitigating effects of dietary therapeutic supplementation.^[2]

MATERIALS AND METHODS

A trial was conducted on 240, day old Vencobb-430 broiler birds for 5 weeks at broiler unit (deep litter system) of Department of Poultry Science, College of Veterinary & Animal Sciences, MAFSU, Parbhani, Maharashtra to assess the effect of Renonic™ (procured from M/s. Carus Laboratories Pvt. Ltd., Sector 3, HSI-IDC, Karnal, Haryana, India) on the growth performance and liver & kidney relative weights. The birds were distributed into 4 treatment groups (A; control with basal diet only, E; negative control with high protein diet (3rd -21st days) and restricted water supply, F; high protein diet (3rd -21st days) with restricted water supply + Renonic @ 1ml/L water, and G; high

* **Trace Mineral Mixture:** Each 1kg contains: Copper-15g, Iron-80g, Manganese-100g, Zinc-80g, Iodine-2g, Cobalt-0.5g, Selenium-0.5g, Chromium 10mg and Molybdenum 50mg.

Vitamin Premix: Each 500g contains: Vit. A-12.50MIU, Vit. D3-2.50 MIU, Vit. E-12g, Vit. K-1.50g, Thiamine (B1)-1.50g, Riboflavin (B2)-5g, Pyridoxine (B6)-2g, Cyanocobalamin (B12)- 0.015g, Niacin-15g, Cal D Pantothenate-10g and Folic acid-0.50g

protein diet (3rd-21st days) with restricted water supply + standard solution for gout @ 5 ml/100 birds (3-10 days), 10 ml/100 birds (11-21 days), and 15 ml/100 birds (21-28 days) with 4 replicates per treatment having 15 birds in each. All the birds were provided with standard and uniform managerial con-

ditions throughout the experimental period. All the birds were vaccinated as per routine vaccination schedule. The control group was fed with basal diet which was prepared as per Bureau of Indian Standards (BIS 2007). However, other treatment groups were fed high-protein diet (30% CP) during days 3rd to 21st of age and after 21st day of age normal basal diet as per BIS 2007 was fed. The feed formulation and composition for control and other treatment groups are shown in Table 1.^{[2] [3]}

The body weight and feed intake were recorded weekly for the calculation of feed conversion efficiency of broiler birds. At the end of 2nd and 3rd week, two birds from each replicate were selected and slaughtered using the standard procedure in the department of pathology for necropsy examination and weight recording of liver and kidney were taken relative to live body weight of broilers. The results of the trial were statistically analyzed for any significant differences as per methods described by Snedecor and Cochran (1994). The treatment means were compared by critical differences (CD) and analysis of variance.^{[4] [5] [6] [7]}

Results and Discussion

Growth parameters

a) Weekly body weight and cumulative weekly weight gain The statistical analysis revealed that dietary treatments significantly affected

The statistical analysis revealed that dietary treatments significantly affected both mean weekly live body weights and cumulative weight gains in broilers from the 2nd to the 5th week of age (Tables 2 and 3). At 2 weeks of age, control group A recorded significantly higher ($p < 0.05$) body weight and cumulative weight gain compared to all high-protein treatment groups (E, F, and G), which showed no significant differences among themselves. By the 3rd week, group A remained significantly higher ($p < 0.01$) than groups E, F, and G; however, group F (high-protein diet with Renonic @ 1 mL/L drinking water) achieved significantly higher ($p < 0.01$) body weight and cumulative weight gain compared to the negative control group E, with non-significant differences between groups F and G. [1]

*Means bearing different superscripts in a row differ significantly ($p < 0.05$).

At the 4th week, live body weights and cumulative weight gains for groups A and F were significantly higher ($P > 0.05$) observed among groups A, F, and G.

*Means bearing different superscripts in a row differ significantly ($p < 0.05$).

Table 1: Ingredients and nutrient composition of pre-starter, starter, and finisher of control group and treatment groups

Sr. No. [1]	Ingredients (%)	Control: Pre-starter	Control: Starter	Control: Finisher	Treatment: Pre-starter	Treatment: Starter	Treatment: Finisher
1	Maize	53.00	54.00	58.22	39.10	37.10	58.22
2	Soybean meal	40.20	37.80	32.60	46.50	46.55	32.60
3	Maize gluten	0.00	0.00	0.00	8.00	8.00	0.00
4	Vegetable oil	2.77	4.15	5.10	2.50	4.50	5.10
5	Dicalcium phosphate (DCP)	1.80	1.80	1.90	1.80	1.80	1.90
6	Limestone powder (LSP)	1.20	1.20	1.20	1.20	1.20	1.20
7	Salt (NaCl)	0.25	0.25	0.25	0.25	0.25	0.25
8	Trace mineral premix*	0.10	0.10	0.10	0.10	0.10	0.10
9	Vitamin premix**	0.05	0.05	0.05	0.05	0.05	0.05
10	DL-Methionine	0.16	0.19	0.15	0.10	0.05	0.15
11	L-Lysine	0.07	0.06	0.03	0.00	0.00	0.03
12	Choline chloride 60%	0.10	0.10	0.10	0.10	0.10	0.10
13	Toxin binder	0.10	0.10	0.10	0.10	0.10	0.10
14	Coccidiostat	0.05	0.05	0.05	0.05	0.05	0.05
15	Sodium bicarbonate	0.15	0.15	0.15	0.15	0.15	0.15
	Total	100.00	100.00	100.00	100.00	100.00	100.00
Nutrient composition (Calculated basis)							
Sr. No.	Parameters	Control: Pre-starter	Control: Starter	Control: Finisher	Treatment: Pre-starter	Treatment: Starter	Treatment: Finisher
1	ME (Kcal/kg)	3000.33	3101.54	3200.44	2947.85	3059.55	3200.44
2	Crude Protein (%)	23.02	22.04	20.03	29.30	29.12	20.03
3	Ether Extract (%)	5.18	6.57	7.64	4.57	6.47	7.64
4	Crude Fiber (%)	4.20	4.08	3.87	4.40	4.34	3.87
5	Calcium (%)	1.01	1.00	1.01	1.04	1.04	1.01
6	Total Phosphorus (%)	0.70	0.69	0.68	0.76	0.75	0.68
7	Available Phosphorus (%)	0.42	0.42	0.43	0.42	0.42	0.43
8	Total Lysine (%)	1.30	1.23	1.08	1.47	1.47	1.08

Table 2: Weekly live body weights (g/bird) of broilers supplemented with Renonic through drinking water

Treatments	Day-old	1st Week	2nd Week	3rd Week	4th Week	5th Week
A	43.80 ± 0.38	158.15 ± 3.26	478.00 ^a ± 6.75	974.52 ^a ± 8.30	1569.89 ^a ± 15.81	2233.06 ^a ± 37.97
E	43.13 ± 0.16	152.48 ± 1.85	433.58 ^b ± 12.81	881.64 ^c ± 22.16	1479.58 ^c ± 20.18	2114.77 ^b ± 25.16
F	43.53 ± 0.28	153.08 ± 0.63	449.17 ^b ± 5.96	929.96 ^b ± 10.59	1539.42 ^{ab} ± 10.41	2211.36 ^a ± 15.17
G	43.40 ± 0.25	153.25 ± 2.98	444.25 ^b ± 7.07	906.92 ^{bc} ± 9.21	1517.05 ^{bc} ± 9.04	2171.36 ^{ab} ± 11.56

Table 3: Cumulative weekly weight gain of broiler birds supplemented with Renonic through drinking water [2]

Treatments	1st Week	2nd Week	3rd Week	4th Week	5th Week
A	114.35 ± 3.26	434.20 ^a ± 6.97	930.72 ^a ± 8.03	1526.09 ^a ± 15.46	2189.26 ^a ± 37.72
E	109.35 ± 1.74	390.45 ^b ± 12.79	838.51 ^c ± 22.15	1436.45 ^c ± 20.23	2071.64 ^b ± 25.22
F	109.55 ± 0.83	405.63 ^b ± 5.95	886.42 ^b ± 10.63	1495.88 ^{ab} ± 10.35	2167.83 ^a ± 15.21
G	109.85 ± 3.18	400.85 ^b ± 6.88	863.52 ^{bc} ± 9.39	1473.65 ^{bc} ± 9.16	2127.96 ^{ab} ± 11.62

Table 4: Cumulative weekly feed intake (g/bird) of broiler birds supplemented with Renonic through drinking water

Treatments	1st Week	2nd Week	3rd Week	4th Week	5th Week
A	136.02 ± 3.74	555.98 ± 13.39	1212.79 ± 13.74	2190.72 ± 15.13	3302.16 ± 41.01
E	140.05 ± 2.30	549.93 ± 9.26	1237.44 ± 25.48	2240.30 ± 12.82	3339.45 ± 30.75
F	135.75 ± 1.20	553.47 ± 4.56	1246.73 ± 25.63	2249.35 ± 24.24	3383.41 ± 27.40
G	136.87 ± 2.82	549.43 ± 6.10	1236.80 ± 21.44	2251.31 ± 23.74	3371.86 ± 47.36

Table 5: Cumulative weekly feed conversion ratios of broilers supplemented with Renonic through drinking water

Treatments	1st Week	2nd Week	3rd Week	4th Week	5th Week
A	1.19 ^b ± 0.01	1.28 ^b ± 0.01	1.30 ^b ± 0.02	1.44 ^c ± 0.02	1.51 ^c ± 0.01
E	1.28 ^a ± 0.00	1.41 ^a ± 0.02	1.48 ^a ± 0.03	1.56 ^a ± 0.02	1.61 ^a ± 0.01
F	1.24 ^a ± 0.01	1.36 ^a ± 0.01	1.41 ^a ± 0.02	1.50 ^b ± 0.01	1.56 ^b ± 0.01
G	1.25 ^a ± 0.02	1.37 ^a ± 0.01	1.43 ^a ± 0.03	1.53 ^{ab} ± 0.02	1.58 ^{ab} ± 0.02

Cumulative weekly feed intake

The mean cumulative weekly feed intake (g/bird) values across all treatment groups were comparable ($p > 0.05$) from the 1st to the 5th week of age. However, the groups supplemented with high protein diets (E, F and G) showed numerically higher feed consumption in comparison to control group A (Table 4).

Cumulative feed conversion ratio

The mean values of cumulative feed conversion ratio of different treatment groups from 1st to 5th week of age are depicted in Table 5. Statistical analysis revealed significant differences for cumulative FCR in all treatment groups during all the weeks of trial. From 1st to 3rd week of age the control group A showed better ($p < 0.01$) FCR values than groups E, F and G which were having non-significant differences among them. During the 4th and 5th weeks of age, the birds of control group A still had lower FCR values than all other treatment groups. The F and G groups showed no significant differences. However, F group had the numerically lowest FCR values among high protein diet supplemented groups. [1]

*Means bearing different superscripts in a row differ significantly ($p < 0.05$).

The results related to feed intake, body weight, body weight gain and feed conversion ratio indicated that high-protein diets in groups E, F, and G negatively affected the growth of broiler birds in comparison to control group A birds. In commercial poultry operations, maintaining optimal gastrointestinal health is fundamental to achieving maximum performance potential. Environmental and nutritional stressors frequently disrupt gut microbial homeostasis, leading to dysbiosis and subsequent performance losses. The gastrointestinal microbiome is heavily modulated by dietary composition, particularly crude protein concentration. Ex-

cessive protein levels can impair gut architecture and integrity, ultimately compromising body weight gain, feed consumption, and feed utilization efficiency.[2]

Furthermore, surplus dietary protein coupled with water restriction imposes significant metabolic stress on renal function. The elevated accumulation of nitrogenous metabolites resulting from high-protein diets likely disrupted normal nutrient digestion, intestinal absorption, and hepatic and renal detoxification pathways. These physiological disruptions jointly contributed to reduced body weight and cumulative gain across the stress-induced treatment groups. Nevertheless, administration of the evaluated test products in groups F and G successfully alleviated these adverse physiological impacts, as demonstrated by the improved growth and efficiency metrics recorded in comparison to negative control group E.

The control group (Group A) exhibited a superior cumulative FCR compared to the high-protein treatment groups (E, F, and G), likely due to an optimal calorie-to-protein ratio and balanced nutrient profile. In contrast, the poorer feed conversion observed in birds fed high-protein diets can be attributed to a combination of restricted water intake, nutrient imbalances, elevated uric acid synthesis, and impaired nutrient absorption.

ORGAN WEIGHT

The mean values of liver and kidney weight percent relative to the live body weight at the end of 2nd and 3rd week are presented in Table 6. The statistical analysis revealed that all treatment groups showed significant variations in organ weight proportions at the end of 2nd and 3rd week of age. The E group supplemented with high protein diet with restricted water supply showed significantly higher ($p < 0.05$) relative kidney weight at the end of 2nd week in comparison to control group A

Table 6: Mean kidney and liver weight as a percentage of live body weight of broilers supplemented with Renonic through drinking water at the end of weeks 2 and 3

Treatments	At the end of 2nd week: Avg. body weight (g)	At the end of 2nd week: Kidney (%)	At the end of 2nd week: Liver (%)	At the end of 3rd week: Avg. body weight (g)	At the end of 3rd week: Kidney (%)	At the end of 3rd week: Liver (%)
A	453.88 ± 13.41	0.82 ^b ± 0.03	3.48 ± 0.03	974.38 ± 35.46	0.72 ^b ± 0.01	2.71 ± 0.15
E	435.88 ± 13.47	0.92 ^a ± 0.02	3.55 ± 0.15	912.50 ± 50.21	0.76 ^a ± 0.01	2.64 ± 0.16
F	479.63 ± 15.02	0.83 ^b ± 0.01	3.52 ± 0.06	926.00 ± 34.89	0.74 ^{ab} ± 0.01	2.53 ± 0.05
G	461.75 ± 8.86	0.85 ^{ab} ± 0.02	3.54 ± 0.07	966.25 ± 46.24	0.74 ^{ab} ± 0.01	2.62 ± 0.06

and group F supplemented with high protein diet with restricted water supply and Renonic at 1 ml/L. However, the statistical difference was non-significant in groups A, F and G.[1]

*Means bearing different superscripts in a row differ significantly ($p < 0.05$).

At the end of 3rd week, the E group had the significantly higher relative weight percent of kidney than control group A. The relative kidney weight in groups supplemented with high protein diet with renonic and antigout solution (Groups F and G, respectively) numerically decreased ($p > 0.05$) in comparison to group E fed high protein diet with restricted water supply. The relative weight of the liver was comparable and did not show any significant variation ($p > 0.05$) among all experimental groups during both the 2nd and 3rd weeks of age. The increased relative weight of organs in groups E, F and G in comparison to control group A might be due to digestive and nephropathic alterations caused by high protein diet along with restricted water supply. However, the treatment group F supplemented with Renonic in water might have protected the renal function on high protein diet as evident by significantly and numerically lower mean values of kidney weight during 2nd and 3rd week end, respectively, in comparison to negative control group E.

Despite extensive research on protein sources in poultry diets, limited studies have examined their specific effects in combination with therapeutic agents on body growth, organ weight, uric acid metabolism, renal function, and inflammatory responses. Therefore, due to the lack of prior research, the effect of phyto-genic preparations for renal health problems needs to be studied further in depth. [2]

CONCLUSION

The study demonstrates that high-protein diets with water restriction impair broiler performance and renal health, while the administration of Renonic effectively acts as a protective intervention by maintaining weight gain and reducing renal hypertrophy.

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