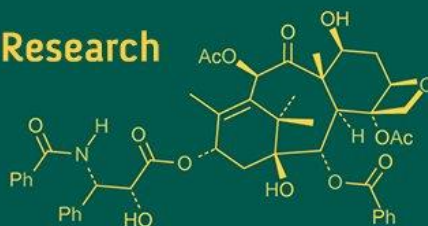


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Effect of turmeric (*Curcuma longa*) powder on blood biochemical parameters in weaner crossbred pigs

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Abstract

The present study was conducted to evaluate the effect of dietary turmeric (*Curcuma longa*) supplementation on blood biochemical parameters in weaner crossbred pigs. Twenty-four healthy weaner crossbred pigs (50% Large White Yorkshire), approximately 40 days of age, were randomly allotted to four treatment groups (n = 6) under a completely randomized design and fed for 90 days. The treatment groups consisted of T₀ (basal diet), T₁ (basal diet + 200 mg turmeric powder/kg feed), T₂ (basal diet + 300 mg turmeric powder/kg feed), and T₃ (basal diet + 400 mg turmeric powder/kg feed). Blood samples were collected on days 0, 30, 60, and 90 for estimation of serum alanine aminotransferase (ALT), total protein, albumin, blood urea nitrogen (BUN), and creatinine. The results revealed that turmeric supplementation significantly ($p < 0.05$) improved the biochemical profile of weaner pigs. Serum ALT, BUN, and creatinine concentrations decreased significantly in turmeric-supplemented groups compared to the control, indicating improved liver and kidney function. Conversely, serum total protein and albumin concentrations increased significantly, reflecting enhanced protein metabolism and nutritional status. The most favourable responses were observed in pigs receiving 300 mg/kg (T₂) and 400 mg/kg (T₃) turmeric supplementation, with T₂ showing the highest total protein (7.29 ± 0.14 g/dL) and albumin (3.79 ± 0.14 g/dL) concentrations and markedly lower ALT, BUN, and creatinine values. The findings demonstrate that dietary turmeric supplementation at 300-400 mg/kg feed effectively improves blood biochemical parameters and metabolic health in weaner crossbred pigs. Therefore, turmeric at the rate 300-400 mg/kg feed may be recommended as a safe and natural phytochemical feed additive for enhancing the health and physiological status of weaner pigs.

Keywords: Turmeric powder, *Curcuma longa*, biochemical parameters, weaner crossbred pigs

Introduction

Livestock plays a vital role in the socio-economic development of rural households by generating income, employment, and livelihood opportunities. Among livestock species, pigs are highly valued for their rapid growth, efficient feed conversion, and high reproductive potential (Ali, 2007) [1]. However, the post-weaning period is associated with stress, digestive disorders, and diarrhoea, leading to poor growth performance and health challenges. With increasing restrictions on the use of antibiotic growth promoters, phytochemical feed additives have emerged as promising alternatives. Turmeric (*Curcuma longa*), rich in curcuminoids and other bioactive compounds, possesses antioxidant, antimicrobial, anti-inflammatory, and immunomodulatory properties that may improve animal health and productivity. Nevertheless, information regarding its effects in weaner pigs remains limited. Therefore, the present study was undertaken to evaluate the effect of dietary turmeric supplementation on blood biochemical parameters in weaner crossbred pigs.

Materials and Methods

The experiment was conducted at the All India Coordinated Research Project (AICRP) on Pigs, Livestock Farm, Adhartal, Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh, India. Twenty-four healthy weaner crossbred pigs (50% Large White Yorkshire), approximately 40 days of age and irrespective of sex, were randomly selected and allotted to four dietary treatment groups (n = 6) in a completely randomized design. The feeding trial was conducted for 90 days following the approval of the Institutional Animal Ethics Committee.

All pigs were fed a standard weaner basal diet formulated according to BIS (2024) [2] recommendations. The treatment groups consisted of: T₀ (basal diet only), T₁ (basal diet supplemented with 200 mg turmeric powder/kg feed), T₂ (basal diet supplemented with 300 mg turmeric powder/kg feed), and T₃ (basal diet supplemented with 400 mg turmeric powder/kg feed).

Blood samples were collected from two randomly selected pigs per treatment on days 0, 30, 60, and 90 by ear vein puncture into clot-activating vacutainer tubes. Serum was separated by centrifugation at 3000 rpm for 10 min and stored at -20 °C until analysis. Serum biochemical parameters, including total protein, albumin, alanine aminotransferase (ALT), creatinine, and blood urea nitrogen (BUN), were estimated using standard commercial diagnostic kits according to the manufacturers' instructions

and standard laboratory protocols.

Statistical analysis

The data obtained were subjected to analysis of variance (ANOVA) under a completely randomized design as described by Snedecor and Cochran (1989) [11]. Differences among treatment means were tested for significance at $p < 0.05$.

Results and Discussion

The effect of dietary supplementation of turmeric powder on biochemical parameters in weaner crossbred pigs from 0 to 3 months of age is presented in Table 1. The parameters evaluated included serum ALT (IU/L), total protein (g/dL), albumin (g/dL), blood urea nitrogen (BUN, mg/dL) and creatinine (mg/dL).

Table 1: Effect of turmeric (*Curcuma longa*) powder supplementation on serum blood biochemical concentration (Mean $\pm$ SE) in weaner crossbred pigs

Parameter	Day	T ₀	T ₁	T ₂	T ₃
SGPT (U/L)	0	44.45 $\pm$ 0.87	44.47 $\pm$ 0.69	44.50 $\pm$ 0.25	44.42 $\pm$ 0.57
	30	44.54 ^a $\pm$ 0.19	42.94 ^b $\pm$ 0.27	41.60 ^c $\pm$ 0.41	41.53 ^c $\pm$ 0.25
	60	44.58 ^a $\pm$ 0.13	41.71 ^b $\pm$ 0.40	39.98 ^c $\pm$ 0.23	39.79 ^c $\pm$ 0.48
	90	44.80 ^a $\pm$ 0.44	40.04 ^b $\pm$ 0.24	36.14 ^c $\pm$ 0.31	36.08 ^c $\pm$ 0.36
Total Protein (g/dL)	0	6.48 $\pm$ 0.07	6.57 $\pm$ 0.06	6.52 $\pm$ 0.12	6.50 $\pm$ 0.05
	30	6.59 $\pm$ 0.14	6.77 $\pm$ 0.10	6.83 $\pm$ 0.09	6.82 $\pm$ 0.09
	60	6.63 $\pm$ 0.22	6.92 $\pm$ 0.04	7.03 $\pm$ 0.07	7.04 $\pm$ 0.11
	90	6.54 ^b $\pm$ 0.08	7.01 ^a $\pm$ 0.09	7.29 ^a $\pm$ 0.14	7.19 ^a $\pm$ 0.08
Albumin (g/dL)	0	2.98 $\pm$ 0.07	3.07 $\pm$ 0.06	3.02 $\pm$ 0.12	3.00 $\pm$ 0.05
	30	3.09 $\pm$ 0.14	3.27 $\pm$ 0.10	3.33 $\pm$ 0.09	3.32 $\pm$ 0.09
	60	3.13 $\pm$ 0.22	3.42 $\pm$ 0.04	3.53 $\pm$ 0.07	3.54 $\pm$ 0.11
	90	3.04 ^b $\pm$ 0.08	3.51 ^a $\pm$ 0.09	3.79 ^a $\pm$ 0.14	3.69 ^a $\pm$ 0.08
BUN (mg/dL)	0	15.90 $\pm$ 0.47	15.80 $\pm$ 0.23	15.97 $\pm$ 0.17	15.78 $\pm$ 0.23
	30	15.98 ^a $\pm$ 0.11	14.37 ^b $\pm$ 0.21	13.04 ^c $\pm$ 0.12	13.15 ^c $\pm$ 0.19
	60	15.97 ^a $\pm$ 0.07	12.98 ^b $\pm$ 0.27	11.23 ^c $\pm$ 0.11	11.15 ^c $\pm$ 0.14
	90	15.89 ^a $\pm$ 0.1	11.29 ^b $\pm$ 0.12	9.95 ^c $\pm$ 0.08	9.90 ^c $\pm$ 0.09
Creatine (mg/dL)	0	1.55 $\pm$ 0.03	1.53 $\pm$ 0.01	1.53 $\pm$ 0.02	1.53 $\pm$ 0.02
	30	1.51 ^a $\pm$ 0.02	1.32 ^b $\pm$ 0.02	1.17 ^c $\pm$ 0.02	1.20 ^c $\pm$ 0.02
	60	1.53 ^a $\pm$ 0.02	1.17 ^b $\pm$ 0.01	1.03 ^c $\pm$ 0.01	1.02 ^c $\pm$ 0.01
	90	1.55 ^a $\pm$ 0.03	1.05 ^b $\pm$ 0.01	0.88 ^c $\pm$ 0.02	0.89 ^c $\pm$ 0.01

a, b, c Means with different superscripts within rows differ significantly ($p < 0.05$)

(A) SGPT (Alanine Aminotransferase) (IU/L)

Serum Alanine Aminotransferase (ALT) showed significant ($p < 0.05$) reduction in turmeric-supplemented groups compared to the control. At day 0, all groups exhibited similar ALT values, indicating uniform baseline conditions. However, from day 30 onwards, a declining trend was observed in T₁, T₂ and T₃ compared to T₀. At day 30, T₀ recorded the highest ALT value (44.54 $\pm$ 0.19), whereas T₂ and T₃ showed significantly lower values (41.60 $\pm$ 0.41 and 41.53 $\pm$ 0.25, respectively). This trend continued throughout the experiment, and at day 90, the lowest ALT value was observed in T₃ (36.08 $\pm$ 0.36), which was statistically at par with T₂ but significantly lower than T₁ and T₀. The reduction in ALT indicates improved liver function and suggests hepato-protective effect of turmeric supplementation in weaner pigs.

(B) Total Protein (g/dL)

Serum total protein level did not significantly ($p > 0.05$) differ among groups up to day 60; however, a significant ($p < 0.05$) increase was observed at day 90 in turmeric fed groups. At the end of the experiment, T₂ recorded highest total protein level (7.29 $\pm$ 0.14), followed by T₃ (7.19 $\pm$

0.08) and T₁ (7.01 $\pm$ 0.09), all of which were significantly higher than the control group T₀ (6.54 $\pm$ 0.08). The increase in total protein reflects improved protein metabolism and enhanced nutrient utilization due to turmeric supplementation.

(C) Albumin (g/dL)

Serum albumin followed a similar trend to total protein. No significant differences observed initially; however, at day 90, a significant ($p < 0.05$) increase was recorded in turmeric-treated groups. T₂ showed the highest albumin value (3.79 $\pm$ 0.14), followed by T₃ (3.69 $\pm$ 0.08) and T₁ (3.51 $\pm$ 0.09), while lowest value was found in T₀ (3.04 $\pm$ 0.08). There was significantly higher albumin value in supplemented groups compared to control group. This suggests enhanced hepatic synthetic activity and better nutritional status in supplemented pigs.

(D) Blood Urea Nitrogen (BUN, mg/dL)

Serum BUN level showed a significant ($p < 0.05$) decreasing trend in turmeric-supplemented groups compared to control. At day 0, BUN level was similar across all groups. From day 30 onwards, T₀ exhibited higher BUN

levels, while T_2 and T_3 showed significantly lower values. At day 90, the lowest BUN values were recorded in T_3 (9.90 ± 0.09) and T_2 (9.95 ± 0.08), followed by T_1 and T_0 . There was significantly lower BUN level in all supplemented groups compared to control group. The reduction in BUN indicates improved protein utilization efficiency and reduced nitrogen excretion.

(E) Creatinine (mg/dL)

Serum creatinine level was significantly ($p < 0.05$) influenced by turmeric supplementation. Initial values were similar across treatments; however, from day 30 onwards, a significant decline was observed in supplemented groups. At day 90, T_2 (0.88 ± 0.02) and T_3 (0.89 ± 0.01) recorded the lowest creatinine levels, followed by T_1 (1.05 ± 0.01), whereas highest value was observed in T_0 (1.55 ± 0.03). There was significantly lower creatinine level in all the supplemented groups compared to control group. The reduction in creatinine indicates improved renal function and better metabolic health in turmeric-fed pigs.

Overall, the results demonstrate that dietary supplementation of turmeric (*Curcuma longa*) positively influenced biochemical parameters in weaner crossbred pigs. It significantly reduced serum ALT, BUN and creatinine levels while improving total protein and albumin concentrations. Among the treatment groups, T_2 (optimal inclusion level) consistently showed the most favourable biochemical profile.

The results are in agreement with Durrani *et al.* (2006) [3] who reported turmeric powder supplementation at levels of 0.5% and 1.0% in the diet resulted in significantly higher Total protein concentration in turmeric supplemented groups, whereas serum creatinine level was not significantly affected by dietary treatments. Mehala and Moorthy (2008) [6] also reported that turmeric supplementation significantly increased ($p < 0.05$) serum total protein and albumin concentration and blood urea nitrogen levels were significantly reduced compared to the control group. Liver enzyme activities (ALT) remained within the normal physiological range, indicating no adverse effect of turmeric on liver function. Similar to this study, Rajput *et al.* (2013) [9] in weaned pigs reported that serum total protein and albumin levels were significantly higher ($p < 0.05$) in turmeric supplemented groups compared to the control. Blood urea nitrogen level was significantly reduced. The activities of AST and ALT did not differ significantly among treatments and remained within the normal physiological range. Singh *et al.* (2014) [10] also reported that turmeric supplementation significantly increased ($p < 0.05$) Total protein and globulin levels in turmeric fed groups, while blood urea nitrogen and creatinine levels were not significantly affected by dietary treatments. Similarly, Kumar *et al.* (2015) [5] reported that total protein concentration was significantly higher ($p < 0.05$) in turmeric supplemented groups. Liver enzyme activities (AST and ALT) were not significantly different among treatments, suggesting that turmeric supplementation did not exert any hepatotoxic effect. Similar findings were reported by Srinivasan *et al.* (2017) [12], Niu *et al.* (2019) [7] and Patra *et al.* (2020) [8].

However, Kalita *et al.* (2025) [4] conducted a study on crossbred Hampshire pigs supplemented with 0.5%, 1.0%, and 1.5% turmeric powder and reported that serum biochemical parameters such as total protein, albumin,

alanine aminotransferase, creatinine, and blood urea nitrogen were found to be non-significant ($p > 0.05$) across all treatment groups compared to the control. The values remained within the normal physiological range, indicating that turmeric supplementation at these levels did not adversely affect metabolic functions, while still supporting overall health status in weaner crossbred pigs.

Conclusion

Dietary supplementation of turmeric powder significantly improved the blood biochemical profile of weaner crossbred pigs by increasing serum total protein and albumin levels while reducing serum ALT, blood urea nitrogen, and creatinine concentrations. The beneficial effects were more pronounced at supplementation levels of 300 and 400 mg/kg feed; indicating improved liver and kidney function as well as better protein metabolism. These findings suggest that turmeric supplementation at 300 and 400 mg/kg of feed can be used as a safe and effective natural feed additive to enhance the health status of weaner pigs.

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