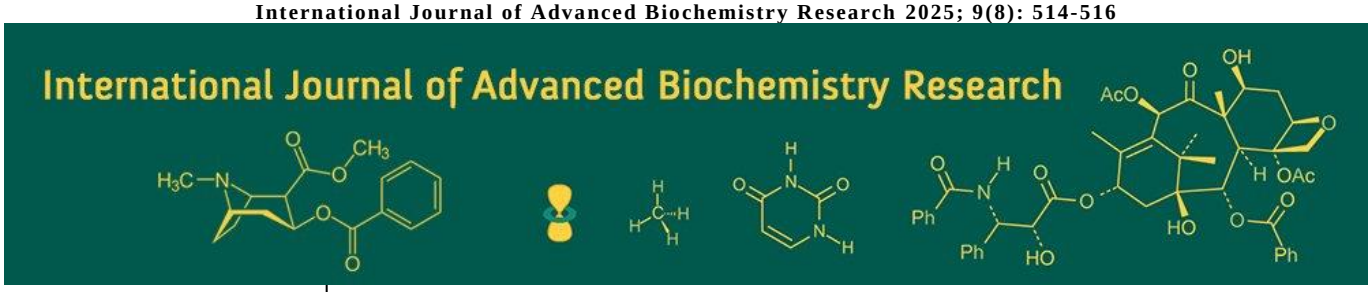

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; 9(8): 514-516
www.biochemjournal.com
Received: 12-05-2025
Accepted: 17-06-2025

Rambabu D
Associate Professor & Head, Department of Poultry Science, CVSc, PV Narsimha Rao Telangana Veterinary University, Mamnoor, Warangal, Telangana State, India

Rama Rao SV
Principal Scientist, ICAR-Directorate of Poultry Research, Rajendranagar, Hyderabad, Telangana, India

Narasimha J
Professor & Head, Department of Animal Nutrition, College of Veterinary Science, Rajendranagar, Hyderabad, Telangana, India

Alexander G
Professor, Department of Animal Nutrition, College of Veterinary Science, Rajendranagar, Hyderabad, Telangana, India

Corresponding Author:
Rambabu D
Associate Professor & Head, Department of Poultry Science, CVSc, PV Narsimha Rao Telangana Veterinary University, Mamnoor, Warangal, Telangana State, India

Effect of variable levels of digestible valine on growth performance, carcass characteristics and serum biochemical profile in commercial broilers

Rambabu D, Rama Rao SV, Narasimha J and Alexander G

DOI: https://www.doi.org/10.33545/26174693.2025.v9.i8g.5240

Abstract
A total of 250 commercial broiler chicks (Ven Cobb) have been used in current research to evaluate effect of varying levels of digestible valine (100, 75, 70, 65, 60% of the digestible lysine) on growth performance, carcass parameters, serum biochemical profile in commercial broiler diets in order to identify optimum level of valine required for maximum performance of commercial broilers without affecting carcass characteristics and health. The chicks were distributed to 5 treatments, each consisting of 10 replicates and having 5 chicks in each replicate in a completely randomized design (CRD). During the experiment, a corn-soybean meal based diet was prepared and supplemented with digestible valine at varying concentration in relation to digestible lysine. Throughout research duration, supplementing digestible valine at graded concentrations (75, 70, 65, 60% of digestible lysine) had no effect on feed intake, growth rate, FCR (feed conversion efficiency), carcass characteristics, namely breast yield, dressing percentage, abdominal fat weight (AFW). Serum biochemical substances (glucose, uric acid, HDL, LDL) were not significantly different among treatment groups. Serum triglycerides or VLDL (very low density lipoprotein) levels in commercial broilers have been significantly (p<0.05) influenced by differences in digestible valine concentrations. As compared to other treatment groups, valine supplementation at 75% digestible lysine indicated elevated VLDL concentration. This is finalized dietary digestible valine content of 0.826, 0.735, 0.665% (70% of digestible lysine) is sufficient at time of pre-starter, starter, finisher phases respectively, for optimizing performance of production in commercial broilers devoid of negative effect on carcass, serum biochemical profile.

Keywords: Digestible valine, commercial broilers, dressing percentage, growth performance, abdominal fat, serum biochemical constituents

Introduction
In order to meet the growing demand for poultry products, global poultry production has grown significantly over the past 50 years. Feed alone accounts for around 70% of the total cost of broiler production. Growing concerns with regard to the environmental impact of livestock farming such as nitrogen and phosphorus contamination as criteria in feed formulation, feeding optimum and balanced nutrients play an important role in precision nutrition. Corn and soybean meal (SBM) contribute to the majority of broiler chicken diets. Such diets' amino acid (AA) concentrations are insufficient to satisfy the needs of today's rapidly growing broilers in order for them to maximize their full genetic potential. In diets based on soybean and corn meal, valine is fourth limiting AA. If broiler diets lack this AA, growth performance would be hampered. The emphasis currently is on meeting the requirements of this AA in broiler diet as feed-grade valine became commercially available. In diets lacking animal protein ingredients, Val can be next-limiting to threonine. Its primary biological role is to aid in muscle protein synthesis, or growth performance. Val is also a limiting amino acid in broilers, and a minimum digestible Val to lysine ratio of 80% is recommended. As feed grade L-Val is now available, the feed industry has an opportunity to further lower the quantity of protein in the diet. Goals related to nutrition, economy, and the environment, such as increasing feed efficiency, lowering the quantities of protein that birds consume, which improves health and lowers digestive disorders, lowering feed costs, and lowering nitrogen excretion from birds into the environment, can all encourage use of feed grade L-Val.

However, the amount of L-Val supplementation that can replace dietary protein without impacting broiler performance is currently unknown. To evaluate performance, carcass parameters, serum biochemical contents of commercial broiler diets having optimized Val. requirements for diets with less quantities of dietary protein, current biological experiment was conducted.

Materials and Methods

A 6weeks growth trial with 5 dietary treatments was carried out "in commercial broilers using 250 day "old male broiler chicks (Ven Cobb-400)" in CRD (completely randomized design). After obtaining the chicks, their wings were banded and weighed for uniform body weight. Later, they have been randomly separated into 5 treatments, individually of which comprised 10 replicates and total 5 chicks in each replicate. Chicks have been kept in battery brooders which have been heated electrically to provide the perfect brooding atmosphere.

Experimental diets

A control diet based on corn and soybean was generated in accordance with Cobb breeder's recommendations. Other experimental diets have been developed by lowering crude protein levels by 2, 1, 1% respectively at time of pre-starter, starter, finisher phases. Crystalline L-Valine was graded at a rate of 75, 70, 65, 60% of digestible Lysine during the pre-starter (0 to 14 days); (0.885, 0.826, 0.767, 0.708); during the starter (15 to 28 days); (0.787, 0.735, 0.682, 0.630); finisher period (29 to 42 days); (0.712, 0.665, 0.617, 0.570).

Collection of data

Each bird's body weight was measured once a week until it was 6 weeks old, and feed intake has been computed replication wise. Feed intake per unit body weight gain or FCR, was calculated weekly from 0-6 weeks of age. Utilizing diagnostic test kit (Arkray Healthcare Pvt. Ltd., Sachin, Surat, India) serum biochemical parameters were examined. During end of experiment, 1 bird from each replication had its blood obtained. To assess carcass parameters (dressing%, breast weight, abdomen fat), that has been demonstrated as gm/kg of live body weight, 10 birds from every dietary group have been sacrificed after completion of experiment. Data was analyzed using the one-way ANOVA in the 15th version of SPSS (Statistical Package for Social Sciences). Multiple range test by Duncan (Duncan, 1955) has been utilized to examine deviation among treatment means at $p<0.05$.

Results and Discussion

Body weight gain

Cumulative body weight gain (BWG) data revealed that the group fed digestible Val 75% digestible lysine increased statistically significantly ($p<0.05$).The group fed diet containing 0.826, 0.735, 0.665% "digestible Val (70" percent digestible lysine) respectively "in pre-starter, starter, finisher phases "had a considerably ($p<0.05$) more total increase in body weight gain. Lowest BWG has been evaluated in birds fed at 0.708, 0.630, 0.570% digestible Val (60% of digestible lysine) as to compared to those fed recommended digestible Val(0.89, 0.81 and 0.73%) fed group in pre-starter, starter, finisher phases correspondingly, in commercial broilers. This is opposite to outcomes of Goodgame *et al.* (2011) [4] who described an rise in body weight gain by 0.90% and 0.84% dietary Val supplementation during 1-21d and 21-35 d in Cobb broilers.

Feed intake

Cumulative feed intake (0 to 42 days) revealed feed intake demonstrated significant ($p<0.05$) elevation in feed intake due to inclusion of digestible Val as 0.826, 0.735 0.665% (70% of digestible lysine) through" pre-starter, starter, finisher phases" correspondingly, in broilers fed diets on based of corn and soybean meal. Lowest cumulative feed intake was observed in broilers fed digestible Val at 0.708, 0.630, 0.570% (60% of digestible lysine) through "pre-starter, starter, finisher phases" correspondingly. This is as per findings of Rodehutscord *et al.* (2005) [8]. Some studies suggested that the dietary Val supplementation have significantly (P less than 0.05) elevated feed consumption in commercial broilers (Corzo *et al.*, 2007) [2].

Feed conversion ratio (FCR)

The cumulative (0-42 d) FCR displayed significantly ($p<0.05$) increased FCR in group fed digestible Val at 0.708, 0.630, 0.570% (60% of digestible lysine) through "pre-starter, starter, finisher phases" correspondingly in broilers. Nevertheless, FCR has been significantly ($p<0.05$) higher in groups fed digestible Val at 60% of the digestible lysine than other groups fed graded concentration of digestible valine in broilers during overall experimental period. This is in concurrence with outcomes of Corzo *et al.* (2004) [2] along with Rodehutscord *et al.* (2005) [8]. These studies suggested that the 0.45% and 0.67% dietary Val supplementation significantly ($p<0.05$) elevated FCR in commercial broilers.

Carcass parameters

Supplementation of graded concentration of digestible Val did not influence the dressing percentage in broiler diets. These observations are in support with outcomes of Ospina-Rojas *et al.* (2014) [7]. It is detected that supplementation of the digestible valine had no significant ($p<0.05$) influence on dressing%. Breast weight has been significantly ($p<0.05$) impacted by changes in concentration of digestible Val in broiler diets. But lower breast weight has been observed in group fed digestible Val at 60 percent of digestible lysine, in contrast to additional concentration of valine in the diet. These observations are in support with the findings of Ospina-Rojas *et al.* (2014) [7]. Possibly, Val levels showed greater influence on the diameter of the red muscle fiber (Potenca *et al.*, 2015). AFW has been significantly ($p<0.05$) impacted by changes in concentration of Val in broiler diets. Lower AFW has been determined at 100% Val concentration in broiler diet opposed to other Val concentration. However, AFW has been detected more in group (T_5) fed digestible Val at 60 percent of digestible lysine in broiler diets. These findings are in accordance with those of Ospina-Rojas *et al.* (2014) [7]. Contrary to the findings recorded in this study, Leitged *et al.* (2004) have observed no effect on slaughter performance due to dietary Val supplementation.

Serum biochemical parameters

Supplementation of digestible Val in broilers diets had no significant influence on serum biochemical constituents *viz.*, glucose, total cholesterol, uric acid, triglycerides, LDL (low density lipoprotein) as well as HDL (high density

lipoprotein) cholesterol or VLDL cholesterol among treatment groups in the present study. Such outcomes are in similar as of Ospina-Rojas *et al.* (2014) [7].

Table 1: Effect of supplementation of digestible valine on growth performance on Commercial broilers (0-42 days) if possible keep phase wise performance

Treatment	Body weight gain (gram/bird)	Feed Intake (gram/bird)	Feed conversion ratio (FCR)
T_1 (100%)	2072[a]	3522[ab]	1.698[b]
T_2 (75%)	2087[a]	3602[a]	1.729[b]
T_3 (70%)	2098[a]	3646[a]	1.743[b]
T_4 (65%)	2035[a]	3529[ab]	1.735[b]
T_5 (60%)	1845[b]	3328[b]	1.804[a]
SEM	25.32	38.58	0.009
p-Value	0.005	0.016	0.004

[ab]Means with different superscripts in a column differ significantly (p<0.05).

Table 2: Effect of supplementation of digestible valine on carcass characteristics of commercial broilers

Treatment	Dressing (%)	g/kg slaughter live weight	
		Breast weight	Abdominal fat weight
T_1 (100%)	72.39	235.9[a]	19.87[c]
T_2 (75%)	73.81	234.5[a]	21.34[bc]
T_3 (70%)	73.79	233.8[a]	22.24[abc]
T_4 (65%)	72.64	230.5[a]	25.32[ab]
T_5 (60%)	74.00	208.9[b]	26.88[a]
SEM	0.235	2.329	0.821
p-Value	0.813	0.000	0.034

[ab]Means with different superscripts in a column differ significantly (p<0.05).

Table 3: Effect of digestible valine supplementation on serum biochemical Profile in commercial broilers

Treatment	(mg / dL)						
	Uric acid	Cholesterol	Triglycerides	Glucose	HDL	LDL	VLDL
T_1 (100%)	5.137	116.0	109.1	100.6	25.21	68.93	21.82
T_2 (75%)	5.253	120.9	120.0	100.8	25.30	71.63	24.01
T_3 (70%)	5.233	117.1	108.5	101.4	25.04	70.37	21.70
T_4 (65%)	5.243	127.3	109.2	98.7	25.68	79.75	21.85
T_5 (60%)	5.358	137.5	109.7	101.4	25.34	90.22	21.93
SEM	0.041	3.611	2.548	0.957	0.199	3.741	0.510
p-Value	0.578	0.313	0.580	0.911	0.904	0.347	0.580

[ab]Means with different superscripts in a column differ significantly (p<0.05).

Conclusion

According to results of ongoing biological research, this is decided digestible Val concentrations during pre-starter, starter and finisher phases at 70% of the digestible lysine (0.826, 0.735 and 0.665% respectively) are optimum for getting good economic returns without having negative impact on growth performance, slaughter parameters and serum biochemical parameters in current fast growing commercial broilers.

Acknowledgements

Authors are thankful to M/s Evonik (SEA) Pvt. Ltd. Singapore for providing financial assistance to conduct the present experiment on commercial broilers.

References

1. Corzo A, Kidd MT, Dozier WA III, Vieira SL. Marginality and needs of dietary valine for broilers fed certain all-vegetable diets. Journal of Applied Poultry Research. 2007;16:546-554.
2. Corzo A, Moran ET Jr, Hohler D. Valine needs of male broilers from 42 to 56 days of age. Poultry Science. 2004;83:946-951.
3. Duncan DB. New multiple range and ‘F’ test. Biometrics. 1955;11:1-42.
4. Goodgame S, Coto C, Mussini F, Lu C, Karimi A, Yuan J, Waldroup P. The potential role of valine in commercial poultry diets. International Poultry Scientific Forum. 2011;Abstract 217:30.
5. Leitgeb R, Tschischej M, Hutter E, Bartelt J. Impact of protein reduction and arginine and valine supplementation in the diet on growth and slaughter performance of broilers. Bodenkultur. 2004;54:187-195.
6. Ospina-Rojas IC, Murakami AE, Eyng C, Picoli KP, Scapinello C, Duarte CRA. Threonine-lysine ratio on the requirements of digestible lysine in diets for broilers. Acta Scientiarum Animal Sciences. 2014;36(2):157-162.
7. Potença A, Murakami AE, Ospina-Rojas IC, Fernandes JIM. Digestible valine-to-lysine ratio in diets for broiler chickens. Revista Mexicana de Ciencias Pecuarias. 2015;6(1):25-37.
8. Rodehutscord M, Fatufe AA. Protein and valine gain of broilers in response to supplemental L-valine. In: Proceedings of the 15th European Symposium on Poultry Nutrition; 2005 Sep 25-29; Balatonfüred, Hungary. World's Poultry Science Association; 2005. p. 545-547.