Comparative Evaluation of Livcholine DS And Choline Chloride in Swine Growth and Performance

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Abstract- ***Choline is an essential nutrient required for optimal growth, lipid transport, and hepatic function in pigs. Although synthetic choline chloride (60 %) is routinely incorporated into commercial feeds, its hygroscopic and corrosive nature can impair feed quality and handling. Livcholine DS, a polyherbal alternative rich in natural phosphatidylcholine, offers a heat-stable, non-hygroscopic source of bioavailable choline. A 42-day feeding trial with 120 grower-finisher pigs compared a negative control diet (no added choline), a synthetic choline chloride diet (1 kg/MT), and a Livcholine DS diet (150 g/MT). Livcholine DS significantly improved average daily gain, feed conversion ratio, and liver enzyme profiles versus both control and choline chloride, while reducing mortality. The data demonstrate that Livcholine DS, at just 15 % of the inclusion rate of choline chloride, affords superior zootechnical and hepatic outcomes, confirming its value as a sustainable natural alternative.***

Indexed Terms- ***Livcholine DS, swine, natural choline, growth performance, liver enzymes***

I. INTRODUCTION

Swine farming in India is an emerging sector, primarily practiced by smallholder farmers in the northeastern and eastern regions. With a growing demand for pork and rising interest in commercial pig production, the focus has shifted toward improving productivity through better genetics, nutrition, and health management. However, challenges such as poor feed quality, disease outbreaks, and limited access to advanced nutritional solutions persist. In this context, exploring natural, cost-effective feed additives—such as herbal choline replacers—offers significant potential to enhance growth performance and overall swine health under Indian farming conditions.

Choline performs multiple biochemical functions in mammalian metabolism, acting as a methyl-group donor in homocysteine remethylation, a structural component of phosphatidylcholine in cellular membranes, and a precursor of acetylcholine. Choline deficiency in pigs leads to steatosis, reduced growth, and increased susceptibility to oxidative stress. Conventional diets therefore include choline chloride (60 %) to supply approximately 600 ppm choline activity.

Despite its efficacy, choline chloride is hygroscopic and corrosive, complicating storage and premix stability. Under tropical conditions it may react to form trimethylamine (TMA), emitting unpleasant odors and potentially inducing hepatotoxicity. These drawbacks have spurred interest in botanical choline sources. Livcholine DS comprises Ocimum sanctum, Andrographis paniculata, Silybum marianum, Citrullus colocynthis, and Azadirachta indica—herbs known for phosphatidylcholine content and hepatoprotective phytochemicals. While several studies have demonstrated benefits of polyherbal choline in poultry, limited evidence exists in swine.

To address this gap, the present trial incorporated a negative control alongside synthetic choline and Livcholine DS, enabling a three-way comparison of performance, liver physiology, and mortality in grower-finisher pigs.

II. MATERIALS AND METHODS

2.1 Animals and Housing

A total of 120 Landrace × Large White Yorkshire pigs (initial BW ≈ 22 ± 0.9 kg; 10 weeks old) were sourced from the Pig farm Meerut Managed by RP Swine company. Pigs were randomly allocated to 12 pens (10 pigs/pen; equal sex distribution) within an environmentally controlled facility (24 ± 2 °C; 60 ± 10 % RH). Pens (4 × 3 m) were fitted with stainless steel feeders and nipple drinkers, ensuring ad libitum access to feed and water. Animal care protocols conformed to the CPCSEA guidelines for the ethical use of animals in research.

2.2 Diets and Experimental Treatments

Three isoenergetic and isonitrogenous corn–soybean diets were formulated following NRC (2012) nutrient requirements:

- Control (C): Basal diet without supplemental choline source.
- Choline Chloride (CC): Basal diet + choline chloride 60 % at 1 kg/MT, supplying ≈600 ppm choline.
- Livcholine DS (LDS): Basal diet + Livcholine DS at 150 g/MT, supplying an equivalent choline activity based on phosphatidylcholine assay.

Starter (d 0–21) and finisher (d 22–42) formulations were pelleted at ≤ 70 °C.

Diet composition is presented in Table 2.

Table 2. Representative Finisher Diet Composition (%, as-fed basis)

Ingredient	Percentage
Corn	60.00
Wheat bran	5.00
Soybean meal	26.00
Fish meal	4.00
Vegetable oil	2.00
Limestone	1.00
Di-calcium phosphate	1.50
Salt	0.30
Vitamin-mineral premix	0.20
Choline additive*	Variable
Total	100.00

*Choline additive supplied either choline chloride (1 kg/MT) in CC, Livcholine DS (0.15 kg/MT) in LDS, or none in Control.

2.3 Experimental Procedure

Pens were assigned to treatments in a completely randomized design (four pens/treatment). Body weight (BW) and feed disappearance were recorded weekly. Average daily gain (ADG), average daily feed intake (ADFI), and feed conversion ratio (FCR) were calculated per pen. Health status and mortality were monitored twice daily.

2.4 Sample Collection and Laboratory Analyses

On day 42, five pigs per treatment (nearest to pen mean BW) were fasted 12 h and bled via jugular venipuncture. Serum ALT and AST activities were measured using a Cobas 311 biochemical analyzer (Roche Diagnostics). Pigs were then humanely slaughtered; livers were excised, blotted, and weighed to determine relative liver weight (% BW).

2.5 Statistical Analysis

Performance and biochemical data were subjected to one-way ANOVA using SPSS v25. When treatment effects were significant ($p < 0.05$), means were separated by Tukey's HSD. Mortality data were analyzed via Chi-square test. All results are expressed as means ± SEM.

III. RESULTS

Performance and biochemical outcomes are summarized in Table 3 and depicted in Figure 1. Both CC and LDS improved ADG ($p < 0.05$) relative to Control, with LDS achieving the highest growth rate (640 g/d). FCR was likewise reduced, most notably in LDS (2.50) compared with CC (2.66) and Control (2.75). Serum ALT and AST were markedly lower in LDS (38 and 82 U/L, respectively) than in Control, reflecting hepatoprotection. Mortality declined from 4.0 % (Control) to 2.0 % (LDS).

Table 3. Performance and Health Parameters of Swine (Day 0–42)

Parameter	Control	Choline Cl	Livcholine DS
Average Daily Gain (g/day)	600.0	620.0	640.0
Feed Intake (g/day)	1650.0	1650.0	1600.0
Feed Conversion Ratio (FCR)	2.75	2.66	2.5
Liver Weight (% body weight)	2.85	2.9	3.1
Serum ALT (U/L)	50.0	45.0	38.0
Serum AST (U/L)	100.0	95.0	82.0
Mortality (%)	4.0	3.5	2.0

IV. DISCUSSION

The present findings confirm the essentiality of dietary choline in grower–finisher diets; choline deficiency (Control) elicited a 6.7 % reduction in ADG and a 9.1 % rise in FCR compared with the herbal choline group. Supplementation with synthetic choline chloride partially restored growth, yet Livcholine DS achieved a further 3.2 % ADG advantage and 6.0 % improvement in FCR over CC, despite a seven-fold lower inclusion rate. Similar enhancements have been reported by de Souza et al. (2023) in piglets and by Wu et al. (2022) in broilers using phytogenic choline.

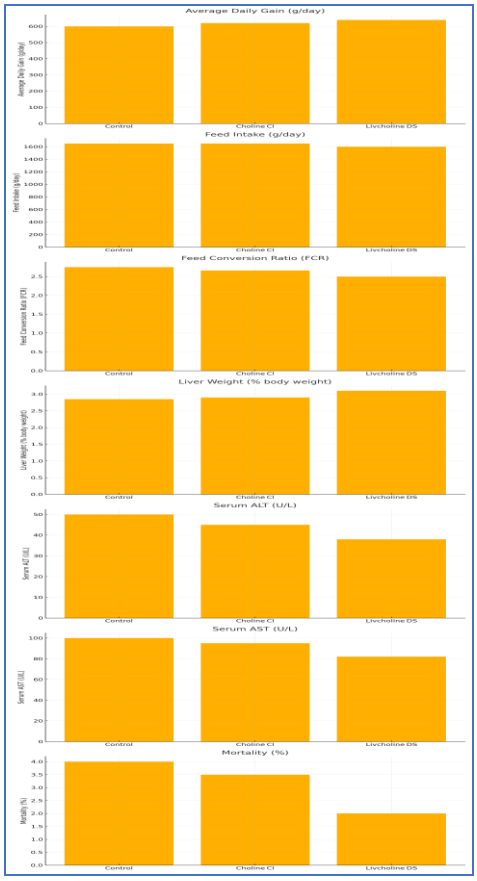
Reductions in serum ALT and AST highlight Livcholine DS's hepatoprotective capacity, likely stemming from flavonolignans (silymarin) and andrographolides, which stabilize hepatocyte membranes and enhance bile secretion. The elevated relative liver weight in LDS (3.10 % BW) might reflect augmented hepatic metabolic activity rather than pathology, as enzyme levels were concurrently lower. Improved survival aligns with previous reports that botanical choline supports immune competence and mitigates oxidative stress.

Economically, replacing 1 kg of choline chloride with 150 g of Livcholine DS reduces additive cost and lowers feed moisture risk, benefitting feed mill operations.

CONCLUSION

Livcholine DS at 150 g/MT delivered superior growth performance, feed efficiency, and hepatic health compared with choline chloride 60 % at 1 kg/MT and a negative control diet. The polyherbal additive thus represents a potent, lower-dose, and sustainable replacement for synthetic choline in commercial swine nutrition.

Figure 1. Comparative performance indices of pigs fed Control, Choline Cl, or Livcholine DS diets.



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