

**DEVELOPMENT OF SUSTAINABLE ANIMAL FEED USING WASTE
SLUDGE FROM GHEE PRODUCTION**



FTC353

Main Library, Eastern University, Sri Lanka



By

S.N Pathirana

EU/IS/2019/BST/67

**Research Project Report is Submitted in Partial Fulfilment of the Requirements
for The Bachelor of Biosystems Technology Honours in Agricultural Technology
and Entrepreneurship**

Department of Biosystems Technology

Faculty of Technology

Eastern University, Sri Lanka

Chenkalady

ABSTRACT

The sustainable use of by-product like sludge obtained during Ghee production has gained attention due to growing concerns about the waste management of the dairy sector. By adding ghee sludge obtained from Milco (Pvt) Ltd to traditional chicken feed formulas, this study sought to create an animal diet that is both more nutritious and environmentally friendly. Three treatments were made: T2 with 5% ghee sludge, T3 with 10% ghee sludge, and the control (T1) without sludge. To ascertain the moisture, crude protein, crude fat, crude fibre, and ash content of the prepared feeds, a proximate analysis was carried out in accordance with AOAC standard protocols.

With moisture 10.24%, crude protein 22.8%, crude fat 8.53%, crude fibre 2.67%, and ash 5.81%, the T1 formulation with 5% ghee sludge showed the best nutritional content among the treatments. While keeping acceptable levels of fibre and ash, the feed's protein and fat contents were greatly increased by the moderate addition of ghee sludge. The enhanced palatability and balanced nutrient content seen in T1 suggest that feed quality and nutritional efficiency are maximized at a 5% inclusion level.

Thus, with 5% inclusion, ghee sludge can be used as a sustainable ingredient in chicken feed composition, offering a cost-effective substitute that also supports environmental sustainability and waste valorisation in the dairy sector.

Keywords: Ghee sludge, Sustainable feed development, Proximate analysis, Poultry feed, Dairy by-products, Milco (Pvt) Ltd

TABLE OF CONTENT

ABSTRACT.....	i
TABLE OF CONTENT	ii
LIST OF FIGURES	vi
CHAPTER 1 - INTRODUCTION	1
CHAPTER 2 - LITERATURE REVIEW	4
2.1 Global and Sectoral Context: Sustainable Feed & Dairy Waste Valorisation	5
2.1.1 Drivers for alternative feed ingredients.....	5
2.1.2 Dairy industry waste: scale, types, and challenges	5
2.2 Ghee Production and Source of Sludge	5
2.2.1 Ghee (clarified butter) production process.....	6
2.2.2 Yield of sludge and industry volume	6
2.3 Composition and Physicochemical Properties of Ghee Sludge	6
2.3.1 Proximate composition: reported values and variability	6
2.3.2 Fatty acid profile, minor compounds and antioxidant potential.....	7
2.3.3 Compositional variability and influencing factors	7
2.4 Other Major Feed Ingredients Used in the Study	8
2.4.1 Maize (Corn)	8
2.4.2 Rice Bran.....	8
2.4.4 Maize Bran	9
2.4.5 Wheat Bran	9
2.4.6 Integration into Feed Formulation.....	9
2.5 Feeding Trials & Nutritional Evaluation	10
2.6 Safety, Storage Stability & Quality Constraints	11
2.6.1 Lipid oxidation and degradation	11
2.6.2 Microbial spoilage, contamination, and moisture control.....	11
2.6.3 Chemical contaminants and heat-derived compounds	11
2.7 Processing & Stabilization Methods.....	12
2.7.1 Drying / dehydration	12
2.7.2 Ensiling / fermentation	12
2.7.3 Antioxidant addition & protective coatings	12
2.8 Alternative Valorisation Pathways.....	12
2.8.1 Microbial valorisation and single-cell protein	13
2.8.2 Biofuel / biodiesel production	13

2.8.3 Other uses: functional food ingredients, additives, flavouring agents	13
2.9 Economic and Environmental (LCA) Considerations	13
2.9.1 Cost–benefit analysis	13
2.9.2 Life Cycle Assessment and environmental benefit	14
2.10 Regulatory, Adoption, and Practical Barriers	14
2.11 Research Gap	15
CHAPTER 03 - MATERIALS AND METHODS	16
3.1 Materials	16
3.1.1 Procurement of Materials	16
3.1.2 Preparation of base sample	16
3.1.3 Preparation of Treatment sample	18
3.1.4 Preparation of ghee sludge	18
3.2 Feed Trial Schedule	19
3.2.1 Experimental Design	19
3.2.2 Experimental Birds and Housing	19
3.2.3 Feeding and Management	20
3.2.4 Data Collection	20
3.2.5 Duration of the Experiment	20
3.2.6 Selection of the best treatment	20
3.3 Microbial tests	20
3.3.1 Total Colony Count (TCC)	21
3.3.2 Coliform Test	21
3.3.3 Yeast and Mould Test	22
3.4.1 Determination of Moisture Content (%)	23
3.4.2 Determination of crude protein	24
3.4.3 Determination of Crude Fibre	26
3.4.4 Determination of Fat	27
CHAPTER 04 - RESULTS AND DISCUSSION	29
4.1 Nutritional composition of ghee incorporated animal feed	30
4.2 Feed intake, weight gain and feed conversion ratio	31
4.2.1 Feed Intake	31
4.2.2 Weight gain	32
4.2.3 Feed Conversion Ratio	33
4.3 Proximate analysis	33
4.3.1 Moisture content	33
4.3.2 Crude Protein	34
4.3.3 Fat	35

4.3.4 Ash content36

4.3.5 Fibre37

4.4 Microbial analysis for Shelf life37

4.4.1 Total Colony Count (TCC)38

CHAPTER 05 – CONCLUSION.....38

5.1 Recommendations.....40

5.2 Limitations of the Study.....40

5.3 Suggestions for Future Research41

REFERENCES42