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Aqua feed formulation using Linear Mathematical Programming Model to optimize nutrients and cost of ingredients

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This aqua feed formulation was conducted for the course of independent study during postgraduate program, using one of mathematical models. Background: Aqua cultural production is a major industry in many countries; grow as the demand for fisheries products increases and the supply from natural sources decreases. In aquaculture, farming is serious because feed represents maximum of the production costs. Nutrition plays a critical role in aquaculture because it influences production costs, fish growth, health and waste production. However, there are various research gaps on aqua feed formulation, such as lack of experience on choosing ingredients, optimization nutrients, cost determination, minimum nutritional requirement, artificial feed preparation using mathematical models, etc. Thus, the researcher focus on aqua feed formulation to solve some of the above gaps using linear mathematical model. Objectives: The main objective of this study is to formulate aqua feed using LiMPM to optimize nutritional composition and cost of ingredients. Methods: Experimental ingredients of cattle blood (CB), poultry manure (PM), rumen liquor (RL) and Nacl salt were collected from the local abattoir and market; CB, PM and RL are locally available as waste product of abattoir and poultry farm. The nutritional composition of ingredients was collected from various published articles, done following the procedures of AOAC, (2005). The mean value of nutritional composition, minimum nutrient requirement and ingredients cost and also decision variables, objective function and constraints were done following linear program solver (LiPS). Then, the proper amount of ingredients was premixes, milling and making pellet. Results: Feed is one of the most important factors for the development of an aquaculture industry, to produce aqua feed with a minimum cost in order to reduce operational cost and gain more profit. Diet formulation model used to combine different ingredients for balanced feed to fish, to satisfy all nutritional levels, availability restrictions, and demand constraints. Aquaculture nutrition is a vital area for maintaining the sustainability of aquaculture industry and culture systems depend on supply of supplementary artificial feeds. The nutritional composition and minimum requirement of nutrients contain 38% of protein, 5% of lipid, 30% of carbohydrate, 1% of minerals, and 1% of vitamins. The result of the optimal solution obtained from the Lips indicates that 10.8585kg of CB, 43.3748kg of PM and 45.7667kg of RL were used with minimum cost of 749.45birr to formulate 100kg of aqua feed. In addition, 0.01% of Nacl salt is added as additive. Conclusion: Aqua feed preparation is the processes of combining different ingredients to form mixture that meet the specific requirements. This formulated feed can satisfies the minimum nutrient contents requirement of fish and minimize the cost of ingredients. Recommendation: It is advisable using such ingredients due to local availability, least cost, full of nutritional composition, great economic and environmental benefits. However, while formulating the feed, nutritional composition, price and availability of ingredients, anti-nutritional factors and palatability of mixtures must be considered. This study also recommended that nutritional composition of blood meal and poultry manure together can fully replace fishmeal and separately can be used as a partial replacement for fishmeal, and also a combination of rumen content and blood meal assures a potential alternative protein sources.

Biography

Firew Admasu Hailu has persuaded his studies from Jimma University, Ethiopia and is currently working as an instructor in the College of Natural and Computational Science at department of Biology at Dilla University. He has completed B.Ed. degree in Biology with minor chemistry, M.Sc. degree in the area Ecological and systematic zoology and a PhD Fellow in the area Aquaculture and Fisheries Management at Jimma University. He has more than 12 published articles, a book, and abstracts on international conferences.