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## Study of shelf life of formulated fish feed

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#### Abstract

Feed plays a vital role in aquaculture. Growth and all activities of fish mainly depend on the food they consume. The formulated feed is a combination of different ingredients of plant formulated feed. Quality of feed depends upon the nutritional content and shelf ration. Nutritional content and shelf life with the passage of time gives rapid growth of fish. The present study was undertaken to formulate the fish feed using plant material as source of protein and then analyzing the formulated fish feed after one year, for its shelf life. The proximate analysis of formulated fish feed after one year, showed no loss of nutritional composition as compared to the feed which for formulated at the time of analyzing for quality and nutritional composition. The present study reveals that, formulated fish feed can be used by fish farmers for one year without loss of nutritional composition.

**Keywords:** Feed formulation, plant protein source, nutritional analysis, shelf life of feed

### 1. Introduction

Fish do not require feed ingredients or formulas, but rather the nutrients, which are part of the chemical composition of these ingredients and feed formulas. Therefore, a feed formula is meaningless if we don't understand the nutritional principles involved in formulating the feed. It is characterized by high levels of production and a diversification of species, requiring increased industrial capacity and improvements in feed. To improve the diets it is necessary to know the nutritional requirement of the species, produce a pellet with optimal and physical parameters at a minimum cost and has non degradable shelf life. Shelf life is defined as 'length of time for which an item remains usable, edible and saleable. Fish feed plays an important role in the economy of fish culture practices as a major chunk of investment goes in feed for fishes in captivity for culture purpose.

Formulated feeds are expensive as most of the ingredients are imported and prices are rising continually. Thus, it becomes necessary to seek cost effective replacement to supply dietary protein from locally produced inexpensive materials in order to avoid high feed costs<sup>[1]</sup>. The nutrient balance of feed influences feed utilization and growth of fish. It is very essential to know the nutritional requirements particularly for protein, lipid and energy for optimum growth of a fish species as well as in formulating a balanced diet. Dietary protein and energy levels are known to influence the growth and body composition of fish. Improper protein and energy levels in feed increases fish production cost and deteriorates water quality. Insufficient energy in diets causes protein waste due to the increased proportion of dietary protein used for energy and the produced ammonia can reduce the water quality<sup>[2, 3]</sup>. Variety of fish feed are available in market at lucrative prices and the government has no legal legislation and control over the feed components and feed quality. Also, there are no guidelines for the establishment of a new feed industry. So, there is a great possibility that the farmers will be deceived by the feed manufacturer. Therefore, it is an urgent need to assess the actual nutritive value of the feed ingredients available in the market<sup>[4]</sup>.

Fish feed has been formulated from locally available plant protein source such as Reddish, Maize, Mulberry, Castor and Ficus leaves. These ingredients are not costly and contain high proteins which are beneficial for the growth of fishes. Protein is the main dietary source in feed formulation. The formulated feed is analyzed for their nutritional value, after one year of their formulations to assess if there is any loss or devaluation in ingredients as compared to recently formulated feed. Now days fish feed of low cost are available to attract the fish farmers, but ones purchased, the fish farmers realizes that the feed is of low value or fish at farm are not accepting the same and due course it causes pollution of water bodies. Therefore,

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shelf life of feed is an important criterion in the aquaculture feed industry. The shelf life recommended that maximum amount time for which products remain fresh during which the defined quality of a specified proportion of the goods remains acceptable under expected (or specified) conditions of distribution and storage. So that feed will be beneficial to fish farmers.

## 2. Materials and Methods

### 2.1 Feed formulation

Feed formulation and preparation is the processes of combining feed ingredients to form mixture that will meet the specific goals of production. It is often a compromise between an ideal formula and practical considerations. While formulating the feed one must take into account some considerations such as price, availability of ingredients used anti-nutritional factors and palatability of mixtures.

Along with plant sources other ingredients such as milk powder, corn flour, eggs, cod liver oil, vitamin mixture containing vitamin B Complex and E, agar powder, garlic paste, pepper powder and cumin powder were used. Maize powder, Reddish, Fresh Ficus and Mulberry leaves (80 g) were taken as principal ingredients. Paste was prepared. Other ingredients like milk powder (60 g), corn flour (20 g) and eggs (70 g) were added and mixed well. Agar powder (4 g)

was added as binding agent; turmeric (0.5 g) and garlic (1 g) as antibiotics. The constituents were boiled, cooled at room temperature. After cooling cod liver oil (3.5 ml), vitamin mixture of vitamin B complex (1 g) and vitamin E (1 g) were added. It was kept under refrigeration for 12 hours. After 12 hours it was squeezed over polythene sheet and dried at room temperature for 48 hours. The dried nodules were crushed into small pellets then pellets were sun dried to avoid fungal infection, weighted and stored in the bottle. Following the above procedure all the feeds were formulated.

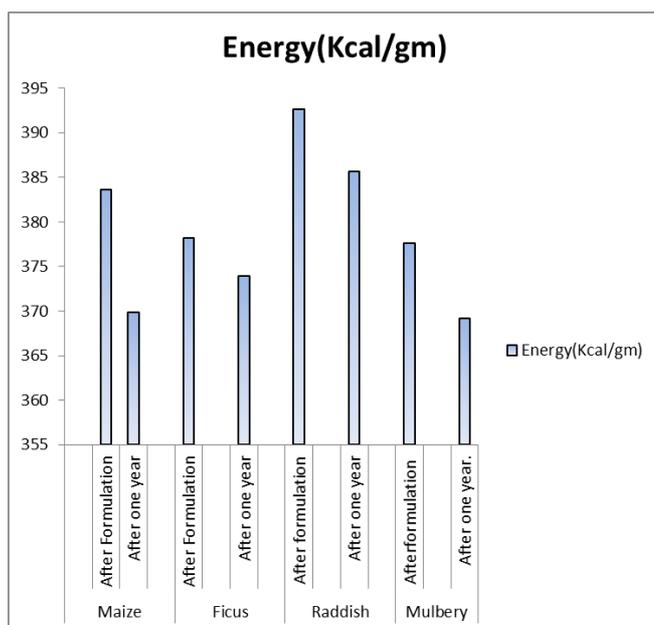
### 2.2 Proximate analysis of feed

The feeds were analyzed for moisture, crude protein, crude lipid, crude fiber, carbohydrates and ash values. Crude protein (N\* 6.25) was determined after acid digestion by Kjeldhal method; lipid after extraction with petroleum ether in a Soxhelt apparatus; dry matter after drying at 100-105°C for 24 hrs and ash after combustion at 550°C for 12 hours. Gross energy values were calculated assuming the energy value of protein, lipid and carbohydrates respectively. Moisture from feed was obtained by drying the feed in the oven. Crude fiber was obtained by petroleum spirit and reaction with sulphuric acid

## 3. Results and Discussions

**Table 1:** Nutritional analysis of formulated feed

Parameter	Maize		Ficus		Radish		Mulberry	
	After formulation	After one year						
Moisture (%)	6.91	6.66	7.03	6.14	5.43	5.29	6.55	6.04
Total minerals (%)	3.65	2.39	4.15	4.13	1.84	4.26	4.0	5.27
Crude Protein (%)	19.64	16.69	17.90	20.07	15.70	20.24	21.37	16.67
Fat (%)	7.07	1.33	6.32	4.32	5.75	5.23	5.45	4.1
Crude Fiber (%)	2.38	0.16	2.18	1.66	1.75	0.58	1.87	1.52
Carbohydrate (%)	60.35	72.77	62.42	63.68	69.53	64.4	60.96	66.4
Energy(Kcal/gm)	383.59	369.81	378.16	373.88	392.67	385.63	377.57	369.18



**Fig 1:** Graphical presentation of Energy in Kcal/gm

Plant protein supplements are widely used in feeds for aquaculture species. Global availability and relatively low cost compared to ingredients of animal origin are their most obvious positive attributes. They can often be used in

combination or to replace more expensive ingredients such as fishmeal. Without exception, however, every ingredient of plant origin has some component or other factor that requires consideration or limits its use in aquaculture feeds. Among ingredients of plant origin, relatively high crude protein contents and well-balanced amino acid profile is important for fish feeds, which do not deteriorate with passage of time. Essential and indispensable amino acids cannot be synthesized by fish and often remains inadequate but are needed for growth and tissue development of fish body.

Plant protein supplements like Maize, Ficus, Radish and Mulberry leaves were used to formulate the fish feed along with other ingredients such as milk powder, corn flour, eggs, cod liver oil, vitamin mixture containing vitamin B complex and E, agar powder, garlic paste, pepper powder and cumin powder. Freshly formulated fish feed was analyzed for moisture, crude protein, fat, crude fiber, carbohydrate and energy value and it was compared with formulated feed, with same ingredients, of one year old, which was kept in air tight glass jar and date was noted. There was no major loss in any of the parameter assessed including energy, measured in Kcal/gram.

Good growth, health and reproduction of commercial fish and other aquatic animals primarily depend upon on adequate supply of nutrient, both in terms of quantity and quality, irrespective of the culture system in which they are grown [5]. Protein is the major growth promoting factor in feed. The

protein requirements of commercial fish are influenced by various factors such as water temperature, feeding rate, availability and quality of natural diet. Nutrient balance of feed influences feed utilization and growth of fish. Protein and energy levels affect the growth and body composition of fish<sup>[6, 7]</sup>. (Table No 01 and Figure No 01)

#### 4. Conclusion

Comparing the parameters like: moisture, crude protein, fat, crude fiber, carbohydrate and energy value of freshly formulated fish feed with that of one year old formulated fish feed, one does not observe major fluctuations or deterioration in any parameter analyzed or any fungal infection in formulated feed, which in turn may have adverse effect on health of fishes used in aquaculture practices. For confirmation of any deteriorating effect of one year old fish feed, it was fed to fingerlings of fresh water fishes in aquarium at laboratory condition for 30 days. The fed fishes did not exhibited any constipation or negative response to fish feed of one year old, which confirms that, formulated fish feed has good shelf life i.e. there is no deterioration of ingredients present in formulated fish feed.

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