Aquafeeds in Bangladesh: Status and Nutritional Quality of Commercial Feed Ingredients and Feeds




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Fish Nutrition & Feed Management Research Activities of BFRI

- A survey was undertaken to identify potential fish feed ingredients based on their availability, price and primary nutritional value
- Nutritional requirements studies of different species in different ages
- Utilization of non-conventional feedstuff of plant origin as dietary protein sources in formulated fish feeds
- Formulation of cost-effective quality feeds from indigenous raw materials for nursery and grow-out system of carp, cat fishes and other commercial important species
- Reduce feeding costs of pangas and tilapia farming through feeding techniques

- Development and optimization of quality feeds and feeding strategies of commercially important fish species
- Developed low-cost semi-auto pellet machine using locally available materials
- Feed reference standard manual (2004) has been published
- A three years research (2008-11) on evaluation of nutrient quality and shelf life of commercial feed ingredients and feeds on aquaculture production has been completed
- BFRI scientists contribute to prepare Fish Feed Acts 2010 and Fish Feed Rules 2011 with DoF
- According to Fish Feed Acts 2010, analyze the nutritional quality of commercial feed ingredients and feeds
- Evaluation of probiotics as feed additives in formulated feeds for commercially important fish species

Classification of available fish feed ingredients

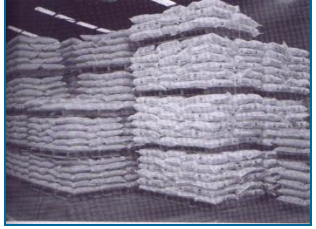
SL No.	Groups	Ingredients
1.	Energy Sources:	(i) Various cereal grains: Rice, Wheat, Maize, Starch, Rice polish, Rice polish (Deoiled), Rice bran, Wheat bran, Wheat grain (milled to flour), Molasses, Cassava meal etc. (ii) Fats and Oils
2.	Protein Sources:	
	(i) Animal protein sources:	Fish meal, Meat meal, Bone meal, Meat and bone meal, Silkworm pupae, Shrimp meal, Poultry by-product meal, Hatchery by-product meal, Offal meal, Blood meal, Crab meal.
	(ii) Plant protein source:	Soybean (raw), Soybean meal (solvent or mechanically extracted), Mustard oil cake, Mustard meal, Sesame (Til) meal, Sesame oil cake, Rapeseed cake, Sunflower cake, Cotton seed meal (oil extracted), Groundnut meal, Groundnut cake (Deoiled), Coconut oil cake, Maize oil cake, Maize gluten meal.
	(iii) Dried leaf meal:	*Azolla* sp. meal, Duck-weed, Helencha, Ipil-ipil, Cowpea, bean, Cabbage, Water hyacinth.
3.	Vitamins supplements:	Natural feed sources, Manufactured sources.
4.	Minerals supplements:	Fish meal, Bone meal, Dicalcium Phosphate, Limestone, Oyester shell, Common salt, Egg shell.
5.	Others:	Dried yeast and Yeast sludge, Dehydrate poultry waste, Fish liver oils/ Fish oils.

Feed Ingredients (Animal Sources)

Common ingredients (animal sources) used in fish and shrimp feeds

Identification of feed Ingredients		Nutrient content (%)			Gross Energy, GE* ($kJ.g^{-1}$)
Name of Ingredients (Animal sources)	Physical properties	Crude Protein (%)	Crude Fat (%)	Carbohydrate, NFE (%)	
Fish meal (Grade-A)	Powder	60-65	8-15	1-2	17-21
Fish meal (Grade-B)	Powder/crumble	50-55	5-10	2-3	14-17
Dry fish (Mixed)	Dry fish/ Flakes	35-45	5-8	2-4	3,132
Fish meal (Cheoya)	Dry fish/ Flakes	30-40	10-15	2-3	15-20
Meat and bone meal (Imported)	Powder/crumble	45-55	7-12	10-12	14-19
Bone meal	Crumbles	10-25	3-5	20-30	14-19
Blood meal (Cow)	Crumbles	70-90	1-8	1-2	17-24
Silkworm pupae	Powder/crumble	45-60	15-30	3-7	17-26
Fish silage	Powder/crumble	40-55	15-25	10-16	18-25
Shrimp meal (whole)	Crumble	25-40	1-3	15-18	10-13
Shrimp meal (head)	Crumble	20-30	1-2	10-15	8-10
Crab meal	Crumble/ flakes	20-40	6-10	5-10	9-14
Meat (Tenary)	Crumble/ flakes	60-90	1-4	1-2	14-22

Imported feed ingredients (animal sources) available in the country



Trade name	Nature	Origin	Lipid (%)	Protein (%)
Meat & bone meal	Meat & bone meal	Austria	10-12	50-54
Meat & bone meal	Meat & bone meal	Croshia	12-14	50-55
Meat & bone meal	Meat & bone meal	Belgium	8-10	45-48
Meat & bone meal	Meat & bone meal	Netherland	10-12	44-49
Meat & bone meal	Meat & bone meal	Spain	8-10	45-48
Provimi (63%)	Protein concentrate	Holland	12-13	60-64
NBL protein conc.	Protein concentrate	USA	11-13	60-63
QL Fish meal	Fish meal	Malaysia	10-11	58-60
Jasoport 60%	Protein Concentrate	USA	10-11	58-60
Super fish	Protein Concentrate	USA	10-12	55-60
Fish Pack	Protein Conc.	USA	10-12	55-58

Feed Ingredients (Plant Sources)




Common ingredients (plant sources) used in fish and shrimp feeds

Identification of feed Ingredients		Nutrient content (%)			Gross Energy, GE* ($kJ.g^{-1}$)
Name of Ingredients (Plant sources)	Physical properties	Crude Protein (%)	Crude Fat (%)	Carbohydrate NFE (%)	
Soybean powder (whole seeds)	Powder	35-45	15-18	30	19-22
Soybean oil cakes	Flakes	40-50	5-7	34	17-20
Soybean meal (solvent extract)	Cake/ flakes	45-55	0.5-1.5	34	16-19
Mustard oil cake	Cake	28-35	8-12	40	16-19
Rapeseed meal/cakes	Flake/powder	30-40	6-12	32	14-19
Sesame (Til) oil cake	Cake	25-32	4-12	40	14-19
Cotton seed cake	Cakes	20-30	4-7	47	14-17
Groundnut meal/cake	Cakes	20-35	10-18	30	14-20
Maize (whole seeds)	Powder/ Atta	8-10	3-6	80	16-18
Rice polish	Powder	10-13	9-15	60	16-18
Rice bran (Traditional milling)	Powder	7-10	10-12	56	15-16
Rice bran (Auto, boiled)	Powder	10-12	10-15	45	13-16
Rice bran (Auto, atob)	Powder	10-14	10-18	45	13-17
Wheat (whole seeds)	Atta/ powder	11-15	1.2-2.5	80	16-18
Wheat bran	Small coating	12-18	3-5	66	15-17

Feed Ingredients (Inclusion level of animal Sources)

Recommended maximum inclusion levels for animal ingredients in fish/ shrimp feed

Feed ingredients	Crude protein (%)	Inclusion level (%)	Limiting Constraint's
Fish meal (A grade)	60 - 65	Required	Cost; quality; unavailability
Meat & bone meal	45 - 55	25	High fiber, ash, calcium and phosphorus content
Bone meal	10 - 30	5	High fiber & ash content but low protein content
Meat meal	50 -70	30	Cost, unavailability
Blood meal	70 - 90	10	Cost, unavailability, amino acid balanced, palatability
Shrimp meal	40 to 50	25	Chitin content, availability, cost
Silkworm pupae	45 - 60	20	Availability
Poultry by-product meal	50 - 60	30	Poor amino acid balance, cost, unavailability, high level of saturated fat
Poultry offal meal	60 - 65	30	Poor amino acid balance, cost, unavailability, high level of saturated fat

Feed Ingredients (Inclusion level of plant Sources)

Recommended maximum inclusion levels for plant ingredients in fish/ shrimp feed

Feed ingredients	Crude protein (%)	Inclusion level (%)	Limiting constraint's
Soybean, raw	24 - 26	10	Anti-nutritional factors
Soybean meal, solvent extracted	40 - 45	< 30% of dietary protein	Anti-nutritional factors, amino acids deficiency
Cotton seed meal, oil extracted	30 - 40	15	Available lysine, gossypol content
Groundnut meal	30 - 50	25	Low methionine content, availability
Sunflower seed meal	30 - 40	25	Crude fibre content, palatability
Sesame seed meal	30 - 40	25	Phytic acid content
Mustard oil cake	25 - 35	20	Toxin content
Rape-seed meal	30 - 40	20	Glucosinolate level
Rice bran (Auto)	10 - 14	75	Low Nutrient value
Wheat grain (milled to flour)	12 - 14	20	Cost, availability
Wheat bran	12 - 16	50	Low Nutrient value, Availability

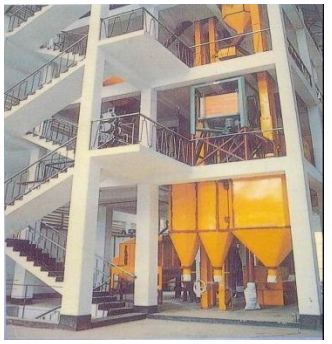
Adulteration of feed ingredients available in the markets

Name of ingredients	Observation of chemical analyses	Probable causes (Mixing with)	Source-wise poor quality (%)
Fish Meal/ Protein Conc.	• Moisture and ash content too high • Protein & lipid/ fat content too low	Soil, wood dust, break dust, rice husk, Ashes, fish oil, burned mobile etc.	Animal sources 72% Plant sources 64%
Chewya/ Mixed fish meal			
Meat and bone meal			
Rice bran/ wheat bran			
Mustard /Sesame oil cake			
Soybean meal/ grits			
Soybean Powder			

Shelf life (Favorable storage time) of common feed ingredients

Feed ingredients/ Shelf life (Storage time)	
Group-1 (Shelf life < 2 months)	Group-2 (Shelf life < 6 months)
Fish (dried)	Fish meal
Rice bran, raw	Meat & bone meal
Rice bran (De-oiled)	Shrimp/ crab meal
Wheat flour (Atta)	Krill meal
Mustard oil cake/ Sesame oil cake	Squid products
Silkworm pupae meal	Rice polish/ broken rice
*** These have either a high moisture content (more than 11%) or a high level of unsaturated fatty acids (HUUFA and PUFA)	Ground-nut cake
	Maize meal
	Soybean meal
	Wheat gluten
	Vitamin premixes
	Egg powder

Commercial Feed Mills in Bangladesh



- Around 100 feed mills currently in operation and 20 more are in pipeline
- About 600 of small-scale noncommercial and on-farm feed manufactures produced feed for their own consumption
- 6-8 large feed mills account for 60-70% of market share
- Almost all commercial mills also produce poultry feeds
- Most of the mills produce Pangas, Koi, Shing/Magur and Tilapia feeds
- Only few feed mills produce feed for shrimp and carps

Types of fish feeds produced by the commercial feed mills



Type of feeds	Pellet Size (Diameter, mm)	Species wise feed production (%)	Type wise feed production (%)
Nursery	Mesh/ Fine Crumbles	• Pangas-60% • Tilapia-28% • Koi/shing-8% • Carp/other-2% • Shrimp-2%	• Nursery-5% • Starter-25% • Grower-70%
Starter-1	Crumbles		
Starter-2	Crumbles		
Starter-3	1.8-2.5		
Grower	2.0-4.0		
Finisher	2.0-4.0		

Status of nutritional quality, packing and labelling of commercial fish/shrimp feeds

Types of Feeds	Quality level on the basis of nutritional studies, packing and labelling		
	Highly satisfactory (%)	Satisfactory (%)	Not satisfactory (%)
Nursery	12.00	32.00	56.00
Starter(1,2& 3)	18.00	34.00	48.00
Grower	28.00	38.00	34.00
Fishiner	30.00	45.00	25.00

RECOMMENDATIONS

- The nutritional quality, packing and labeling of the feeds of the most industries are not satisfactory, Moreover, adulterations of common feed ingredients have been recently increasing. Proper monitoring is needed to ensure the quality and shelf life

- This could be achieved through urgent implementation of the Fish and Animal Feed Acts 2010

- Feed manufacturers, feed traders and farmers needs to be provided training on good aquafeed manufacturing practices

- Feed quality analytical lab could be established in district level, to analyze feed and feed ingredients of the small-scale feed millers, feed traders and farmers

RECOMMENDATIONS Cont'd

- Farmers should encouraged to used pelleted feeds. BFRI developed semi-auto pellet machine could be used to make the pellet for small and mid-scale farmers.

- The government should take necessary measures to encourage fishmeal production in the country. If necessary, quality fishmeal should be imported from abroad

- Create awareness among the feed manufacturers, traders and farmers about the quality of the commercial feeds and ingredients

- The linkage between BFRI, DoF and Universities needs to be strengthened


Thank You All