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Determination of proximate composition of fish feed ingredients locally available in Narsingdi region, Bangladesh

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Abstract
The present study was carried out to determine the proximate composition of feed ingredients collected from local feed mill in Narsingdi Region during 21 March, 2015 to 25 August, 2015. The research was performed to qualify the nutrients (protein, lipid, carbohydrate) and to assess the content of ash and moisture. Proximate composition was determined on the homogenous basis. The percentage of protein in different feed ingredients ranged from 8.89±1.30-38.23±2.76. The highest protein content (38.23±2.76) was recorded from the dried fish and shell fish meal and the lowest value (8.89±1.30) was recorded from the maize. The percentage of lipid in different feed ingredients varied from 2.04±0.43-17.23±0.17. The maximum lipid content (17.23%) was found in mastered oil cake and the minimum (2.04±0.43) in wheat meal. From which ingredients it was found, the percentage of carbohydrate, moisture and ash were recorded (24.65±2.15-58.92±1.73), (7.00±1.88-13.20±2.67) and (13.25±1.32-20.27±1.56) respectively. The highest value of carbohydrate (58.92±1.73) was recorded from rice bran and the lowest value (24.65±2.15) was recorded from mastered oil cake. The highest amount of moisture (13.20±2.67) was found in crab shell and the lowest amount (7.00±1.88) was found in meat and bone meal. To maintain the optimum nutrient content and ultimately rapid growth in the aquaculture farms, the farmer should take proper initiatives for measuring the nutrients in feed usually offered in farms.

Keywords: Proximate, Composition, Fish feed, Locally, Narsingdi

1. Introduction
Bangladesh is an agrarian based country and most of the people largely depends on agriculture. Besides agriculture, aquaculture is the second most important sector in case of meeting nutrition demand. Almost 58% of animal protein requirement and fish consumption of people rely on fish [1]. The consumption rate at present is 17.52 kg/ people/ year while demand of fish is 20.44 kg/ year/ people and total demand of fish is 29.74 MT per year [2]. This increasing trend of nutrient demand from fish and the decreasing trend of capture fisheries production compelled to intensify the aquaculture production two times higher than the traditional aquaculture production. That results the shift of low density culture system (traditional or extensive) to high density culture system (semi intensive or intensive). As a result, this culture systems getting unprecedented popularity to the farmers because of its rapid production, low cost raw materials (feed), stress-free marketability and high demand of culture fish both in national and international market. The farmers tend to use farm made low cost but high nutrients contain feeds (as supplementary feed) rather than traditional feeds. This tendency of using farm/factory made feeds in aquaculture proves the probability of swelling production and ultimately reveals the prospective importance of aqua feeds [1]. Low cost but nutrient rich supplementary feed from feed mill is considered as another major sector of country. Because the feed cost is a key limitations against the greater extension of aquaculture [3]. The feed plays an important role that ensures optimal growth for different fish species reared under different conditions [4]. As feed is important for economically productive aquaculture system that largely depends on low cost and nutrient rich feed [5]. The requirement of low cost nutrient rich feed in place of expensive feed, locally available feed ingredients are being used to cut off the expensive feed cost [6]. Nutrient (protein, lipid and energy) is essential for growth and utilization of feed in aqua farm and it is proved that the improper nutrient can lead to increase fish production cost along with deterioration of

water quality [7-9]. Animal origin protein contains more than 20% protein [10] and the source of animal proteins are fish meal, fish silage, bone meal, cattle viscera, poultry viscera, fish viscera, oyster shell meal, silkworm pupae, blood meal, crab meal, frog waste, snail muscle etc. available in Bangladesh. But unfortunately, there is a scarcity of information on chemical composition of profitmaking fish feed in Bangladesh though Bhuiyan *et al.* [11] made an extensive survey to isolate potential feed ingredients based on their availability, price and primary nutritional value. On the other hand, the local farmers have no knowledge about the feed compositions and cost. They have to depend only on feed industries, this dependency pose a potentiality of deceiving the farmers [1]. Moreover, the government has no legislation in case of feed quality and establishing new feed industry. In this state, it can be stated that the information on nutritive value of local market feed and proximate composition of feed is essential [12] but the information available in this aspect is unreliable. Some Nongovernmental Organizations (NGOs) and extension agencies functioning for aquaculture extension in the southern part of Bangladesh and they enthusiastically trying to identify the nutritive value of fish feed available in that area [1]. Markets of Narsingdi district enrich with nutritional feeds though lacking of proximate chemical composition information. Present research will be the pioneer about the information of availability of feed and quality of these feed in this area. The research was conducted to identify the locally available feed and to find out the nutritive value of these feed for the meaningful and marginalized development of the aquaculture in this region.

2. Materials and Methods

2.1 Sampling sites

The extensive field survey was made to identify the feed ingredients mostly used in aqua farms in Narsingdi Region (23º55'28.52"N and 90º45'12.06"E). Rice bran, maize, wheat meal, mastered oil cake, meat and bone meal, earth worm, crab shell, dried fish and shell fish meal were identified as used feed. Rice bran, maize, wheat meal and mastered oil cake are available in our country, but animal origin is imported from foreign. These collected feed ingredients are used in grower stages of fishes such as Rui, Silver Crap, Pangus, Koi, Shingi and Tilapia etc.

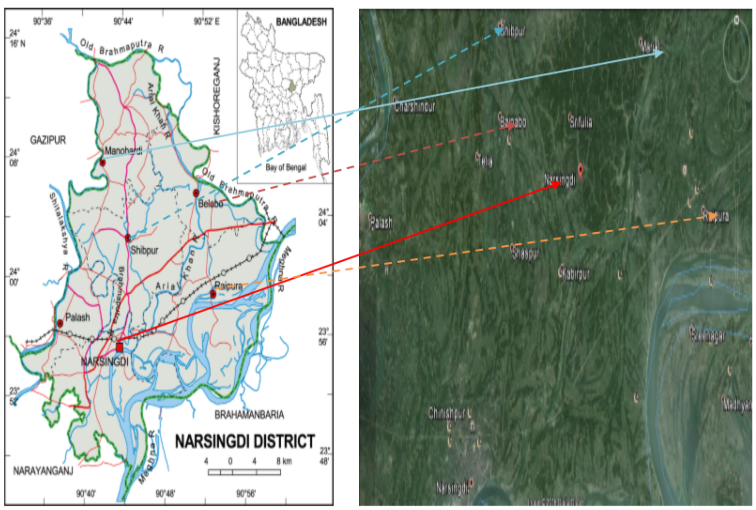

Fig 1: Map showing sampling station of Narsingdi district.

2.2 Data collection

Primary data were collected mostly from farmers while secondary data were collected from research papers, book, Fisheries Resource Institute, thesis paper and term paper.

2.3 Sample collection and preparation

Samples were collected from different area of Narsingdi and immediately after collection samples were taken to the Nutrition Laboratory of Institute of Marine Science & Fisheries, University of Chittagong for proximate composition analysis of moisture, ash, protein, lipid & carbohydrate.

2.4 Method of proximate analysis

These analyses show the moisture, crude protein, crude lipids, ash and carbohydrate content of the sample.

2.5 Determination of Moisture

Moisture contents in the feed were determined by [13]. The percentage of the moisture content in the sample was calculated by the following formulae:

% of moisture = {weight of original sample – weight of dried sample) / weight of original sample} ×100.

2.5 Determination of Ash

Ash content of each feed was estimated by following incineration method [14].

Calculation: % of ash= (weight of ash ÷ weight of sample) × 100

2.6 Determination of Crude Protein:

Micro kjeldhal method [15-18] as used to determine the crude protein.

Calculation: % Nitrogen= $\frac{\text{value of HCL}\times 0.1\times 0.014}{\textit{weight of sample}} \times 100$

% of Crude Protein = % Nitrogen × Conversion factor (Conversion factor for animal and plant origin is 6.25 & 5.90 respectively).

2.7 Determination of Crude lipid

Fat is examined with low boiling organic solvent (petroleum ether/ diethyl ether, xylem) by soxhlet extraction and the extract thus obtained weighed after recovery of the solvent. Crude fat was determined through Soxhlet extraction technique [14, 17] sing hexane (65 ºc-70 ºc) as the solvent.

Calculation
% of crude fat = (corrected weight of fat ÷ weight of sample) × 100
% of carbohydrate = 100 – (moisture + ash + protein + fat)

3. Results and Discussion

Various locally available & comparatively cheaper feed ingredients (most of the ingredients are found free of cost) both plants and animal originated feed is found in our country. The present research work was done on the database development on proximate composition of aqua feed constituents which help the nutritionist in feed formulation for aquatic species. From the database, it was found that there are many plant & animal originated by-products, which contains a lot of nutrients. So these by–products may be used in feed formulation for the contentment of nutrients requirements of specific aqua culture species. In the present study eight feed ingredients were identified from local feed mill in Narsingdi Region. Among the eight feed ingredients highest moisture content 13.20% was recorded for the Crab shell and lowest moisture content 07.00% for the Meat and Bone Meal (Table 1 & Fig 1). [19] National Research Council found the moisture value of (13.63%) in crab Shell. These ingredients are locally available in Bangladesh. So these feed ingredients may be used in feed formulation in our country. Taylor *et al.* [20] have recorded the moisture of 7% meat and bone meal. These feed ingredients are costly can be used to feed the aqua culture directly.

Table1: Amount of nutrients, moisture and ash content in different feed ingredients

No	Feed ingredients	Moisture content (Mean± SD)%	Ash content (Mean± SD)%	Protein content (Mean± SD)%	Lipid content (Mean± SD)%	Carbohydrate content (Mean± SD)%
1	Rice bran	9.20±2.65	17.88±1.43	9.34±1.69	4.66±0.90	58.92±1.73
2	Maize	11±2.52	18.23±2.12	8.89±1.30	5.23±1.30	56.65±2.10
3	Wheat Meal	9.30±2.95	20.27±1.56	9.72±0.46	2.04±0.43	58.67±1.52
4	Mastered Oil Cake	10.00±1.74	17.18±2.79	30.94±2.19	17.23±0.17	24.65±2.15
5	Meat And Bone Meal	7.00±1.88	13.25±1.32	37.23±2.61	8.02±1.34	34.50±1.27
6	Earth Worm	12.02±2.34	17.96±1.92	27.03±0.69	6.04±0.86	36.95±0.73
7	Crab shell	13.20±2.67	16.06±1.94	25.67±2.81	4.25±0.37	40.82±1.28
8	Dried Fish And Shell Fish meal	12.38±2.35	14.42±2.05	38.23±2.76	7.12±1.29	27.85±2.03

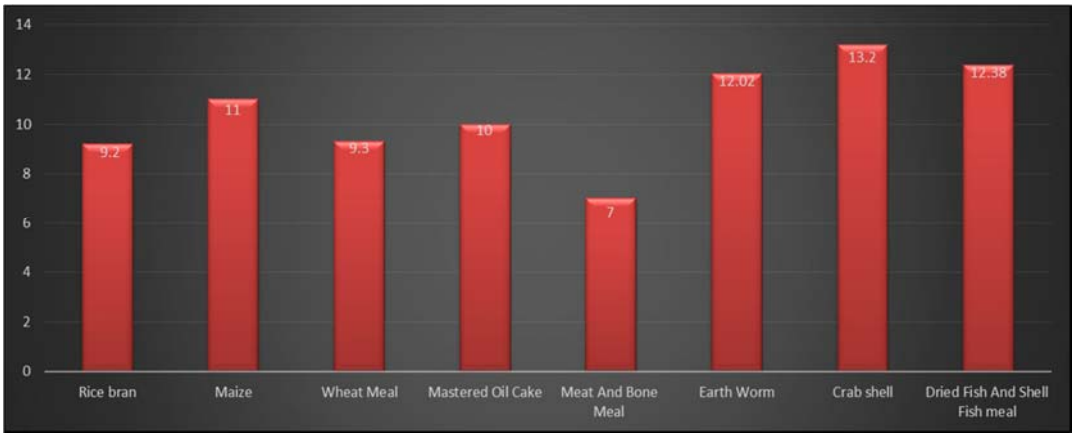

Fig 2: Percentage of moisture content in different feed ingredients

The percentage of ash of different feed ingredients ranged was from (20.27%-14.42%). The highest Ash content (20.27%) was recorded for the species wheat meal (Table 1 & Fig 2). Hossain [21] has recorded 18.77% of ash content in wheat meal. These ingredients are locally available in Bangladesh. And the lowest Ash content (14.42%) was recorded for the dried fish and shell fish meal.

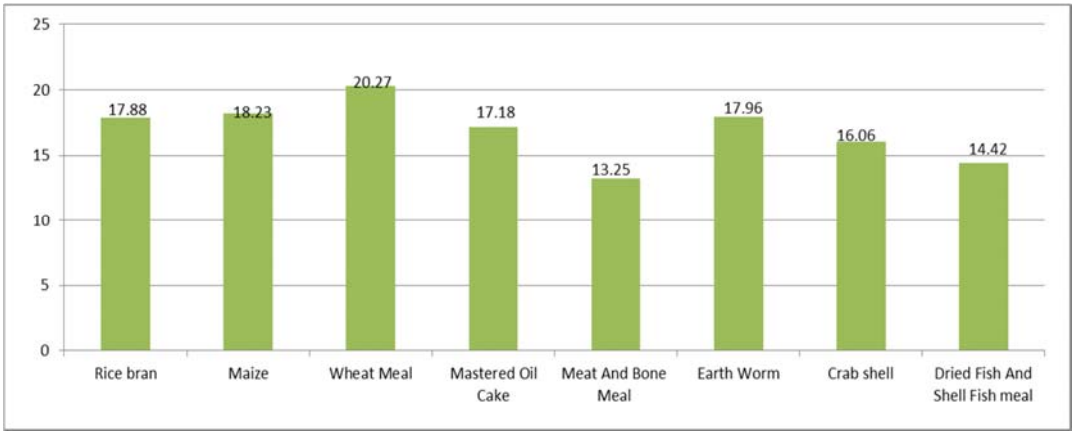

Fig 3: Percentage of ash content in different feed ingredients

Proximate composition was determined on the homogenous basis. The percentage of protein in different feed ingredients ranged from (8.89%-38.23%).The highest percentage of protein content (38.23%) was recorded in the dried fish and shell fish meal (Table 1 & Fig 4). Dabrowski [22] has reported that, dried fish and shell fish meal contain more or less (40.00%- 41.00%) protein respectively. Even though dried fish and shell fish meal is a noble source of protein, but these ingredients are costly. It is well-known that highest protein is essential for better production. On the contrary, the lowest protein content (8.89%) was recorded from the maize. In this context, Landry and Moureaux [23, 24] found 8%-11% protein content in maize.

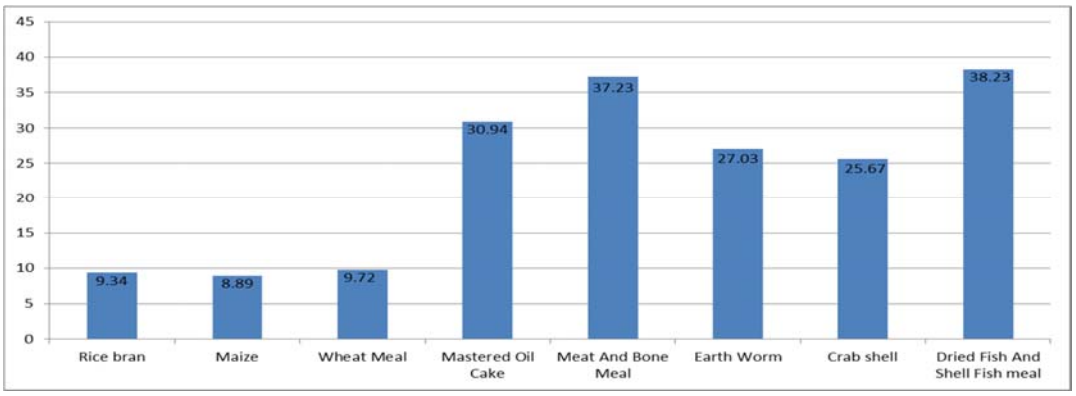

Fig 4: Percentage of protein content in different feed ingredients.

The percentage of lipid was found in different feed ingredients varied from (17.23%-2.04%). The maximum lipid content (17.23%) was recorded for the mastered oil cake (Table 1 & Fig 4). These ingredients are locally available as well as Narsingdi Region. Mustard seeds had lipid content between 30-35% [25]. The lowermost lipid content (2.04%) was recorded for the wheat meal. Similar results was found by De Silva *et al.* [26]. These ingredients are locally available in Bangladesh, so these feed ingredients may be used in feed preparation.

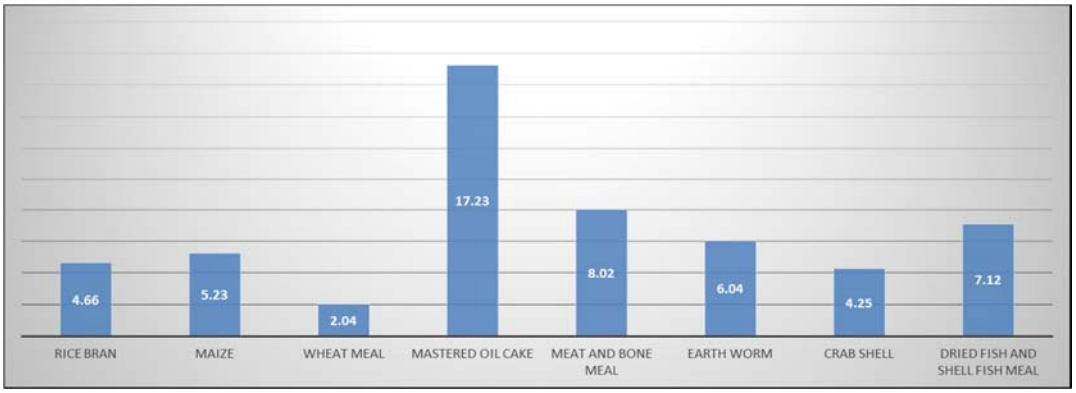

Fig 5: Percentage of lipid content in different feed ingredients.

The percentage of carbohydrate was recorded in different feed ingredients ranged from (58.92%-24.65%). The highest protein content (58.92%) was recorded from the rice bran (Table 1 & Fig 4). Rao *et al.* [27] have found carbohydrate content in rice bran (53.33%-56.55%). The lowest carbohydrate concentration (24.65%) was recorded in mastered oil cake. Rice bran is a good source of carbohydrate these are very available & cheaper (sometimes free of cost) in Bangladesh. These feed ingredients may be used in feed formulation to fulfill the high demand of carbohydrate of cultured animal.

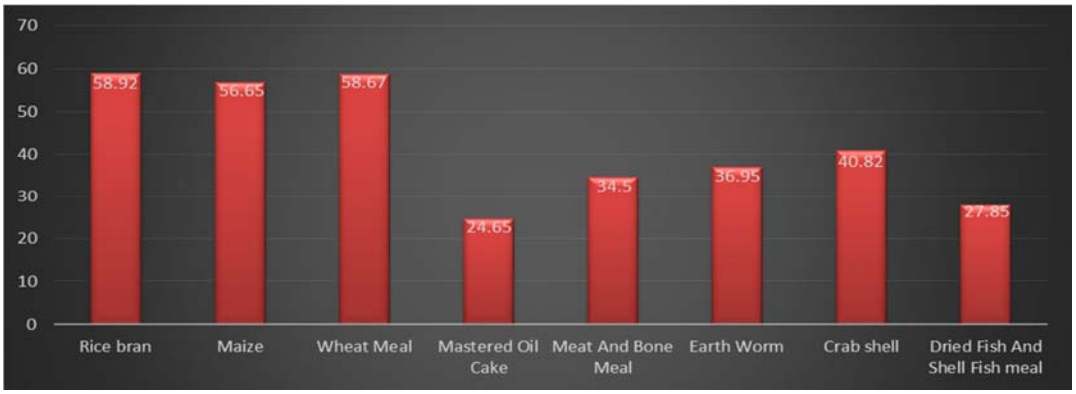

Fig 6: Percentage of carbohydrate content in different feed ingredients.

4. Conclusion

From the present research, it is apparent that for the better and rapid growth of aquaculture species, the importance of nutrition rich feed is inevitable. During the launched period of aquaculture, it is obvious to concentrate about the cost and nutritional quality of feed given to the culture species. Nutrition rich feed can be formulated using locally available plant and animal origin. This types of feed with natural feed contribute to increase the growth and survival and decrease the feed conversion of the rearing species. A balanced mixture of feed ingredients will provide more balance nutrients than only use inadequate feed components to formulate fish feed. Consequently, the aqua farmer can detect the chemical composition of different feed ingredients effortlessly and select the right feed ingredients to their culture species accurately.

5. References

1. Mahmud NA, Hasan MDR, Hossain MB, Minar MH. Proximate Composition of Fish Feed Ingredients Available in Lakshmipur Region, Bangladesh. American-Eurasian J Agric & Environ Sci. 2012; 12(5):556-560.
2. Department of Fisheries (DoF). Fishery Statistical Yearbook of Bangladesh 2009-2010. Fisheries Resources Survey System, Department of Fisheries (DoF), Ministry of Fisheries and Livestock, Dhaka, Bangladesh, 2011.
3. Kaushik S. Use of alternative protein resources for the intensive rearing of carnivorous fish. In: Mediterranean aquaculture (ed. R. Flos, L. Tort and P. Torres), 1990, 125-138. Hellis Horwood Ltd. Chichester (GBR).
4. Thorarinsdottir RI, Jokumsen A, Bjornsson BT, Torrissen O. Local raw materials for production of fish feed for aquaculture. Nordic Innovation Centre. Project no. 10102. University of Gothenburg, Sweden, 2011.
5. Akiyama DM, Dominy WG, Lawrence AL. Penaeid shrimp nutrition. In: Fast, A.W. Lester, L.J. (eds.), Marine Shrimp Culture: Principles and Practices. Elsevier, Amsterdam, 1992, 535-568.
6. Posadas BC. Economic analysis of various prawn farming systems. In: Chiu, Y.N. Santos, L.M. Juliano, R.O. (eds.), Technical Consideration for the management and operation of Intensive Prawn farms. U.P. Aquaculture Society, Iloilo City, Philippines, 1988, 12-24.
7. Phillips AM. Calorie and energy requirements. In: Fish nutrition (ed. J.E. Halver). Academic Press, New York, NY, 1972, 2-29.
8. Prather EE, Lovell RT. Response of intensively fed channel catfish to diets containing various protein energy ratios. Proceedings of the 27th South-Eastern Association of Game and Fish Commissioner, 1973; 27:455-459.
9. Shyong WJ, Huang CH, Chen HC. Effects of dietary protein concentration on growth and muscle composition of juvenile. Aquacult. 1998; 167(1-2): 35-42. doi:10.1016/S0044-8486(98)00313-5
10. FRI. Survey of potential fish feed ingredients of Bangladesh on the basis of their availability and biochemical composition. Research Project Report No.1; Fisheries Research Institute, Mymensingh, Bangladesh, 1989, 70.
11. Bhuiyan AKMA, Begum M, Hoq ME. Survey of potential fish feed ingredients of Bangladesh on the basis of their availability and biochemical composition. Fisheries Research Institute Research Report, 1989; 1:70.
12. Zobayar ASMM. Study on the availability and nutritive value of shrimp feed ingredients in Khulna district. An M.S. thesis submitted to the Department of Aquaculture, Bangladesh Agricultural University, Mymensingh, 2003, 76.
13. AOAC. (Association of Official Analytical Chemicals). Official Method of Analysis, 12th ed, Association of official Analytical Chemists, Washington DC, 1995, 832.
14. Maynard J. Methods of Food Analysis, Academic Press, New York, NY, 1970, 163.
15. Crampton EW, Harris LE. Applied Animal Nutrition. Printed by W.H. Freeman and company, 1969, 49.
16. Mitchell P. Chemiosmotic coupling in energy transduction: A logical development of biochemical knowledge. J of Bio. 1972; 3(1): 5–24. doi:10.1007/BF01515993. PMID 4263930.
17. Jacobs MB. The Chemical Analysis of Food Products. 3ed. New York: Robert Krieger, Publishing Co, 1973, 80.
18. Pearson T, Galfre G, Ziegler A, Milstein C. A myeloma hybrid-producing antibody specific for an allotypic determinant on IgD-like molecules of the mouse. Eur J Immunol. 1977; 7: 684-690.
19. National Research Council (NRC). Nutrient Requirements of Poultry, NRC, Ninth Revised Edition, Washington, DC, 1994.
20. Taylor AG, Goffinet MC, Pikuz SA, Shelkovenko TA, Mitchell MD, Chandler KM, Hammer DA. Physico-chemical factors influence beet (Beta vulgaris L) seed germination. In: G. Nicolas, K. J. Bradford, D. Come and H. W. Pritchard. The Biology of Seeds: Recent Research Advances. CABI, 2003, 433-440. DOI: 10.1079/9780851996530.0433
21. Hossain MA. Proximate and amino acid composition of some potential Bangladesh fish feed ingredients. Bangladesh J Zool. 1996; 24(2):163-168.
22. Dabrowski K. Protein requirments of grass carp fry (*Ctenopharyngodon idella* Val.). Aquacult. 1977; 12(1):63-73. doi:10.1016/0044-8486(77)90047-3
23. Ladry J, Moureaux T. Het€rogen€it~desglut€linesdu grain de mais: Extraction Selective et composition en acides amin€s des trois fractions isol~es. Bull Soc Chim BioI. 1977; 52:1021.
24. Ladry J, Moureaux T. Distribution and Amino Acid Composition of Protein Fractions in Opaque-2 Maize-grain, Phytochemistry, 1982; 21(8):1865-1869. doi:10.1016/0031-9422(82)83004-5
25. http://www.feedipedia.org/node/53.
26. De Silva SS, Gunasekara RM, Shim KF. Interactions of varying dietary protein and lipid levels in young red tilapia: evidence of protein sparing. Aquacult. 1991; 95(3-4): 305–318. doi:10.1016/0044-8486(91)90096-P
27. Rao SSC, Stumbo P, Zimmerman B. Is coffee a colonic stimulant? Eur J Gastroenterol Hepatol. [CrossRef] [Medline] [Web of Science] Google Scholar. 1998; 10(2):113-118.