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PROXIMATE COMPOSITION FOR ASSAY OF QUALITY OF SOME FISHES MEALS

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Abstract
Fish meal is the major source of protein in fish and livestock feeds. Protein represents the major component of fish feeds. It is a source of energy for the fish. Protein can be easily denatured leading to deterioration. Fish samples such as Herring, Capelin, Blue whiting were obtained from traditional markets in Busher town, Iran. The proximate composition was determined using the method described by AOAC (1990). The raw material freshness and drying methods are determining factors of fish meal quality. Blue whiting, herring and capelin meals produced in commercial fish meal processing plants in Iran were obtained. The samples were categorized (according to the freshness of raw fish and processing technique) into three grades (low temperature (LT), Norsea Mink (NSM) and standard). Results obtained indicated that the salt content of LT meal of blue whiting was comparatively higher than all the others and it was significantly higher (p=0.001) in LT meal of herring than in NSM and standard meal. LT meal of blue whiting and herring contained very high amounts of salt 4.05% and 3.92% respectively. This may be because of a long storage time of raw fish in RSW tank before processing on shore. It is concluded that usage of fresh raw materials, low temperature and low retention time (during drying) for fish meal processing retains quality properties to a greater extent which is useful in the fish feed industry.

Keywords**:** chemical composition, fish meal, nutritive quality.

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1. INTRODUCTION

Fish meal is the main dietary protein source in aquaculture feeds (Hardy and Masumoto, 1990). Fish oil is also used as the main oil supplement in fish diets in order to increase their energy content and provide essential fatty acids. The supply of these materials is limited and their cost is continuously increase, affecting in a direct way feeding costs and total production costs in aquaculture. For this reason considerable research efforts have been directed towards the evaluation of other ingredients as potential substitutes in fish diets.
Sea bream and sea bass are the major marine fish cultured in Mediterranean countries. Intensive aquaculture of these species in Greece has greatly expanded during last years (Spinelli, 1979). However, there is a lack of information concerning the potential of including different feedstuffs in practical diets for these specie. High quality fishmeal is recognized by animal nutritionists as an excellent source of protein, energy, minerals and vitamins. Worldwide, millions of tons of fishmeal are produced annually. The majority of the fishmeal produced is included in commercial diets for poultry, swine, dairy cattle, mink and fish. Good quality fishmeal demands a higher price than other high protein feedstuffs. Its proper use, however, requires knowledge of not only its nutrient profile but, of how it was produced. An understanding of fishmeal production will give users a better understanding of how the various factors interact to influence the quality of fishmeal.
Feeding in fish farming takes 60% of the operating cost. In formulating suitable nutritive feed for fish, fish meal is the major component. This has made the cost of growing fish over a period of time to be very high. In order to seek for alternative to fish meal suitable plant protein has been investigated over the years. Fish meal forms the major protein source in fish feed because of its high nutritive value and

palatability. Studies have shown that high levels of plant protein in fish diets or complete substitution of animal proteins has resulted in poor growth and feed efficiency in feed. Poor growth in such studies have been attributed to anti nutritional factors or toxic substances; improper balance of essential nutrients such as amino acids, energy and minerals, high amount of fibre and carbohydrate, decrease in palatability of the feed; and reduction of pellet quality especially water stability (Rumsey, 1993). Fish require a well – balanced mixture of essential and non essential amino acids. The most effective, economical source of these amino acids is a proper combination of high quality natural proteins in feedstuffs. A protein that is deficient in one or more essential amino acids is of low biological value while that which closely matches that required by the fish is of high nutritive value (Kaushik et al, 1995). Fish feeds are the largest single operating cost in aquacultural production. Consequently. there is a continuing effort to reduce feed cost by using lower-priced ingredients. Fish meal is a major ingredient in many feeds and is commonly targeted for replacement because of its high cost and finite World supply. Several low-cost agricultural byproducts are produced in the Midwestern United States and replacing fish meal with these products in diets for rainbow trout *(Oncorhynchus mykiss)* would reduce the cost of feed. However. reducing feed costs by replacing fish meal in diets does not necessarily reduce operating costs in aquaculture. Many plant byproducts contain lower protein levels and lower levels of essential amino acids than fish meals. In addition. plant protein feedstuffs contain antinutritional factors. For example. soybean meal contains as many as five trypsin inhibitors, non-digestible carbohydrates. lectins. saponins. phytates and possibly allergenic storage proteins. all of which have been implicated inhindering digestion in rainbow trout. In the early 1970s. there was a world-wide shortage of fish meal caused by a significant reduction in harvest of Peruvian anchovy. This stimulated efforts to find suitable alternative protein sources. In general. those studies found that fish fed plant byproducts grew at a slower rate than fish fed diets containing high levels of fish meal. However. in recent years. there have been renewed efforts to increase the amount of plant byproducts in diets for trout. This results from several factors. Including improved processing and quality of plant byproducts. Better understanding of the nutritional requirements of trout and development of feed-grade amino acids. Recent studies have shown considerable success in the total replacement of fish meal in diets for rainbow trout with plant byproducts. Using soy flours and protein concentrates. and soybean meal and corn gluten meal mixtures (Ruiter, 1995).

This study sets out to investigate of chemical composition of some fishes meals in Iran.

2. MATERIALS AND METHODS

Commercial fish samples (Herring, Capelin, Blue whiting) produced in different regions in Iran were obtained from traditional markets and supermarkets in Busher town. Two packets of each brand were picked at random and brought for analysis. Label informations on the package with ingredient listed were recorded. The fish meal were prepared by cooking in boiling water for 4 minutes. The proximate composition was determined using the method described by AOAC (1990). Crude protein content was determined using Kjeldahl method (Kjeltex System-Texator, Hagonas, Sweden). Crude lipid content was determined by Soxhlet method (Soxtec System-Texator, Hagonas, Sweden). Ash content was determined by ashing the samples overnight at 550 C. Moisture content was determined by drying the samples overnight at 105 C until constant weight was achieved. Fish meal samples from each packet was used for proximate analysis in triplicate. A completely random design was used for the study. Data were analyzed using General Linear Model procedures of Statistical Analysis Systems (SAS) version 6.11 (SAS 1994). Treatment showing significant differences ($p<0.05$) were subjected to Duncan's Multiple Range Test.

3. RESULTS AND DISCUSSION

Mean values of percentage of protein, fat, moisture and salt as determined by standard methods are shown in Table 1. Protein content in herring meal ranged from 70.5% to 73.1% and in blue whiting and capelin from 68.0% to 70.8% and 69.6% to 72.7% respectively. As fish meals are obtained by separating protein and ash from water and oil, meals with very similar composition can be expected irrespective of the species being processed (Ruiter, 1995). LT meal of blue whiting had higher concentration of salt than NSM and standard meal while it was significantly higher (p=0.001 and 0.0004) in LT meal of herring than in NSM and standard grades. Moisture content of all samples for all methods ranged from 6.0% to 8.5%.

Table 1: Composition of the experimental fish meals

Type of meal	Crude Protein (N*6.25) %	Crude Fat %	Moisture %	Ash%
Blue whiting LT	69.4 ± 0.02	8.3± 0.05	6.1 ± 0.22	24±0.5
Blue whiting NSM	70.8 ± 0.20	6.7 ± 0.18	6.0 ± 0.01	21.5±0.02
Blue whiting ST	68.0 ± 0.01	9.5±0.17	7.0 ± 0.01	22±0.07
Herring LT	70.5 ± 0.16	10.5 ±0.04	6.8 ± 0.02	23±0.05
Herring NSM	73.1 ± 0.27	8.0 ± 0.06	7.0 ± 0.06	24±0.01
Herring ST	72.2 ± 0.06	8.9 ± 0.13	7.2 ± 0.06	21±0.03
Herring ST	71.1 ± 0.12	8.1± 0.15	8.5 ± 0.11	22±0.05
Herring ST	72.7 ± 0.02	9.0 ± 0.02	6.4 ± 0.08	21±0.07
Capelin LT	69.6 ± 0.01	11.6± 0.04	7.0 ± 0.27	21±0.09
Capelin NSM	71.1± 0.02	12.2 ±0.27	7.3 ± 0.04	23±0.1

Note: Values are mean ± standard deviation of 2 replicates
LT : Low temperature , NSM : Norsea mink , ST: Standard

The fat content of the fish meal normally indicates the species used. Fluctuations in oil and moisture levels are seasonal and occur within species. Herring and capelin are fatty fish while blue whiting is considered a lean fish. Fish meals from white fish are naturally low in fat. Moisture contents between 5% and 10% are quite normal (Valle and Anguilera, 1991). According to Burt the salt content in the body fluids of all fish is nearly the same. Increased effort has been put into maintaining the freshness of the raw material on board fishing vessel by cooling directly after catch. Various types of refrigerated sea water (RSW) and chilled sea water (CSW) systems have been used on board fishing vessels. LT meal of blue whiting and herring contained very high amounts of salt 4.05% and 3.92% respectively. This may be because of a long storage time of raw fish in RSW tank before processing on shore. Unbound ammonia content in fish meal reflects the TVN content of the raw material used. Since cultured aquatic species are more sensitive to the quality of raw feed ingredients than other livestock and have higher nutritional requirements, only high quality raw materials are needed in aqua feeds (Winder and Barlow, 1981).

4. CONLUSION

The raw material freshness has a significant effect on compounds contents in fish meal, which was irrespective of the fish species used. The use of fresh raw material and low temperature drying of fish meal for less retention time (Dyno air dryer) has a significant effect on quality properties such as water holding capacity of fish meal. Fish meals with low moisture content and low water activity, produced stable products whose properties were not changed at high temperature.

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