

Nutrient Specifications and Quality Standards For Ingredients Commonly Used In Diets For Aquaculture Species

Fish Meal

Multiple Ingredient Codes

Product Description

Fish Meal is the clean, dried, ground tissue of undecomposed whole fish or fish cuttings, either or both, with or without the extraction of part of the oil. It must not contain more than 10% moisture. If it contains more than 3% salt (NaCl), the amount of salt must constitute a part of the brand name, provided that in no case must the salt content of this product exceed 7%.

Fish meals are generally classified by the type of fish and, more specifically, by the species of origin. White fish meals are produced from white-fleshed species such as pollock, hake and cod. Brown fish meals are produced from anchovy, mackerel, menhaden and sardines.

Type	Species	IFN	Ingredient Code
White Fish	Cod	5-02-025	XXXXXXXXXX
	Hake	5-02-025	XXXXXXXXXX
	Pollak	5-02-025	XXXXXXXXXX
Brown Fish	Anchovy	5-01-985	XXXXXXXXXX
	Herring	5-02-000	XXXXXXXXXX
	Mackerel	- -	XXXXXXXXXX
	Menhaden	5-02-009	XXXXXXXXXX
	Salmon	5-02-012	XXXXXXXXXX
	Sardine	5-02-015	XXXXXXXXXX

Use

Fish Meal is intended for use in feed as a protein supplement and as a valuable source of essential fatty acids and trace minerals. When used in any feed formulation, it must be listed in the “Ingredients” section of the feed label as “fish meal” or as “animal protein by-products.”

Typical Analysis

Type	Species	%Protein	%Fat	%Fiber	%Ash	%H ₂ O
White Fish	Cod	- -	- -	- -	- -	- -
	Hake	62.3	4.6	0.7	23.2	9.0
	Pollack	80.0	6.0	0.8	7.0	6.0
Brown Fish	Anchovy	65.5	9.5	1.0	14.8	9.0
	Herring	72.4	8.2	0.7	10.5	8.0
	Mackerel	- -	--	- -	- -	- -
	Menhaden	62.0	9.5	1.0	18.3	9.0
	Salmon	78.0	7.0	0.8	8.0	6.0
	Sardine	65.2	8.8	1.0	15.8	9.0

Factors Affecting Quality

The greatest factor affecting the quality of fish meal is the freshness of raw fish used to make the meal. It is said that, of the total nutritional value of fish meal, 80% is dependent on the condition of the fish when they are received at the rendering plant. Unfortunately, the effects of heat during normal processing of the meal make it difficult to determine the prior freshness of the raw material. There are, however, a few analytical tests on meals that can provide some indication of the condition of the raw fish prior to processing. These include measurements of specific biogenic amines and relative concentrations of total volatile nitrogen (TVN).

Concentrations of biogenic amines, formed by enzymatic degradation of amino acids, can be used to determine the extent of enzymatic hydrolysis of the raw fish protein before processing. In using measurements of biogenic amine concentrations in this way, it is important to consider that all fish meals contain low levels of these compounds and that minimum amounts of each may vary among species of fish used to produce fish meal. Biogenic amines are heat-stable and, as such, do not volatilize or evaporate during drying. However, they are also water-soluble. They can be separated from the presscake during drying and concentrated in the soluble fraction. This means that “whole” meals, in which the condensed solubles are added back to the presscake during the drying process, will contain relatively higher levels of biogenic amines than meals that contain only the presscake.

Histamine, resulting from the breakdown of histidine, is the biogenic amine that has probably been studied most up to this date. The other important ones include: cadaverine from lysine, putrescine from arginine and tyramine from tyrosine.

Fish such as anchovies, herring and menhaden have different amine patterns. The following table, summarized from *Standards for assessing Quality of Feed Ingredients* by I.H. Pike & R.W Hardy, show the differences between herring and anchovy meals made from raw fish of different qualities.

Analytical values for fish meals made from raw materials of different freshness

Analyses	Fresh		Moderately Fresh		Stale	
	Herring	Anchovy	Herring	Anchovy	Herring	Anchovy
TVN (mg /100g)	22	14	62	30	143	50
Protein (%)	73.5	69.6	73.1	67.5	69.4	65.8
Oil (%)	18.7	7.7	8.1	7.4	10.9	9.4
Cadaverine (ppm)	330	28	1000	1850	1600	4701
Putrescine (ppm)	30	51	230	503	630	1599
Histamine (ppm)	<30	35	440	446	830	916
Tyramine (ppm)	<30	-	400	285	800	657

The currently recommended quality standard for all fish meals includes a value for the most prominent amine as well as a maximum total for the four main biogenic amines. The general rule for a moderately high quality fish meal is that the amount of the most prominent biogenic amine should be less than 1000 ppm, and the total of all four of the main biogenic amines should be less than 2000 ppm.

Another factor affecting quality of fish meal is the quality of fat contained in the meal. The most common factors that influence fish oil quality in the meal are: oxidative rancidity and the presence of adventitious toxins. (Refer to the specification sheet for fish oil for a complete discussion on these two factors and quality standards.)

All meals received at the mill should contain an approved antioxidant, previously added by the supplier.

Physical Properties

- Color – light to dark brown, should be free from any evidence of scorching or burning
- Odor – shall be characteristic of fresh fish meal and free of rancidity
- Texture – fine granules and powder - generally free flowing, but less so with higher fat meals
- Appearance – meals should be free of any visible signs of mold, clumps or contamination