

FISH SILAGE

Utilisation of fish offal for animal feed or fish feed

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In the last issue of INFO-SAMAK International Magazine (4.2005), was the production of fish silage presented. In this article is the utilisation of fish silage for animal or fish feed presented.

In the next number of INFOSAMAK International Magazine will the extrusion into pellets be presented.

Utilisation of fish silage in animal nutrition.

By-products from the fish industry and fish caught only for industrial purposes are very important ingredients in animal nutrition. In different forms they are commonly used in feeding of all animal species such as cattle, pigs, chickens, fur animals, fish and pets.

The reason for the high interest in fish products for animal nutrition is the high content of very valuable protein and fat (oil).

The use has been increasing currently with the development of the fishing industry. Fish products for use in animal nutrition including fish farming have over the years nearly always been considered in short supply in relation to the demand.



For all animal species, except fur animals, fish products have mainly been used in the form of fishmeal. The main part of the fish products used in fur animal nutrition is, however, utilised as raw, frozen or ensiled products. This difference is due to the consumer's possibility to keep the quality of the fish products until they are given to and eaten by the animals.

Advantages in the use of fish silage.

Silage has a very high nutritive value, because the treatment keeps the quality in top and in some circumstances represents an almost completely sterile product with intact vitamins etc. This goes for all animal

species, and in the necessary amount of 5-8% the silage can also be considered to have a nutritional effect far above the price calculation based on content of protein and energy. This is especially because of the bioavailability of the micronutrients, the relatively intact enzyme systems and the content of polyunsaturated essential fatty acids.

Furthermore, irrespective of preservation method, silage has a very pronounced preservation effect in the feed mixtures to which it is added. This is obvious, especially in wet feed systems for pigs and in fur animal feed.

All kinds of silage being very liquid because of hydrolysis are also effective dust binders.

Use of the silage for animal and fish feed

Broilers

Regarding the use of fish silage in broilers nutrition, the experimental documentation is very scarce.

In spite of the lack of experimental documentation, different kinds of fish silage have been used in broiler feeding for years.

Producers who utilise fish silage, normally in an amount of 10-15% usually do not want to stop using it. The arguments are that the reproduction is better and health problems clearly reduced.

Feeding of broilers with feed mixtures where fish meal is replaced by fish silage shows no mortalities and no symptoms of malnutrition. Feeding with fish silage feed mixtures shows a net increase in weights of broilers, but only with slight differences between the different formulas compared to each other and to the commercial standard feed mixture with fish meal.

The different formulas are safe and balanced for the nutritional requirements. It should also be noticed that there is not added any vitamins and minerals nor antibiotics to the formulas. The safety and nutritional quality of the ingredients used in the feeding formula are interrelated in such a way that toxins and pathogenic microorganisms ingested by broilers would have a negative effect on growth even if the formula is well equilibrated in nutrients. These two properties (safety and nutrition) should go together for an optimization of the poultry breeding.

Not only should the weight gain be considered, but also other observations on the animals fed with the silage ingredient. In fact, neither mortalities nor abnormal symptoms (diarrhea, stress, malnutrition, drowsiness, feathers removal...) had been observed when feeding with silage.

comparison of the results obtained from different controlled tests and the practical use of fish silage in the feed mixtures indicate that there is a considerable potential for the use of fish silage as a nitrogen source and possibly as a probiotic ingredient (use of microorganisms in a positive way to benefit health) for poultry feeding.

Cattle and other livestock animals

Beef cattle. In Cuba, acid silage material was promoted as a substitute for fish-meal in cattle feedlot rations based on restricted amounts of protein supplement and forage and free-choice molasses-urea (Preston, 1969). The practice was to substitute 1 kg of silage for 0.25 kg of fish-meal in order to provide 162 g of crude protein. The animals were also fed free-choice molasses/3 percent urea and fresh forage at the rate of 3 kg/100 kg live weight, or had daily access to pasture for four hours. Daily live weight gains for animals between 150 and 375 kg under commercial feedlot systems ranged from 0.6 to 0.8 kg.

Dairy cattle. In most tropical and subtropical countries, the quality of pastures and forage tends to deteriorate during the dry winter months. This is reflected by lower levels of digestibility and available crude protein and generally results in a seasonal milk-yield reduction. Test feedings shows that the addition of 1 kg of fish silage to the daily diet of milk cows during the winter months, December through February, maintained milk production at a level comparable to that obtained during the wet season.

Camels. In Morocco, fish silage blocks have been used to feed camels. The basal ration used per 100 kg of live weight was 1.5 kg of barley and 0.5 kg of straw. When 0.5 kg of fish silage blocks was used to substitute an equal amount of barley for camels fed the basal ration, dry-matter digestibility and growth performance improved by 2 and 17 percent, respectively.



Sheep. Fish silage has been used successfully in rations for sheep in Morocco and in Cuba. The data in table 11 show how growth performance was improved by more than 24 percent when 200 g of molasses fish silage blocks and 300 g of barley replaced 500 g of commercial ration (dry-matter basis) in rations for fattening sheep. Carcass evaluations were performed, and fish silage had no effect on meat flavour or taste. When the same type of silage replaced barley in diets for ewes prior to weaning, there was an improvement in digestibility and a reduction in feed conversion.

Pigs

Different kinds of fish silage have been used in pig feeding for many years especially for sows and piglets upto 30 kg. Fish products containing fat are not allowed for use in Denmark after 40 kg live weight of porkers. This is because fish fat may leave a fishy taste in the meat.

Producers who utilise fish silage, normally in an amount of 10-15% usually do not want to stop using it. The normal arguments are that the reproduction is better and health problems clearly reduced.

Using of fish silage for pig feeding in Poland has shown good results (Szkuner/Grabowo since 1993) and resulted in bigger demand than available production. The farmers were surprised about how fast they



obtained the positive result, which was improved reproduction and health status.

The conclusion is mainly based on practical experience, that fish silage under many circumstances can be used with advantage in pig nutrition. Only price, storage and handling problems as compared to alternative possibilities set the limit.

But it has to be emphasized that until experiments result in different recommendations, the use of fish silage in pig nutrition has to be limited to 15% equal to 5% on dry matter basis.

For animals

The use of acid preserved fish silage in the fur animal nutrition has – besides the economic advantage – resulted in:

1. Better quality of readymade feed mixtures.
2. Reduced health problems – especially bladder stones and yellow fat are eliminated.
3. Better growth and pelt quality, especially because of the higher amount of very good quality fish oil in the feed. The same effect on the pelt quality has been obtained by adding very good fish oil alone, but it is more expensive and not so easy to handle.

The only problem in the use of acid preserved fish silage in fur animal nutrition is that the acids added –

depending on origin (inorganic or organic) limit the use for physiological reasons. The recommendations given limits the use during breeding and suckling periods to 5-8% silage (wet feed basis) and increasing to 10% in the fast growing period and going up to 20-25% in the late growth and furring period.

Fish farming

The use of fish silage as feed ingredient in the fish feed industry, as partial or total substitute for commercial fish meal, may help solving environmental and sanitary problems originated by the lack of destiny of the fish processing residues. The silage must be of good quality and the pH monitored daily.

In Scandinavian fish farming industry have the silage been included in many kinds of formulated fish feeds for many years and the practical results obtained have been good and beneficial.

Research in the use of silage has also been done and following is given an example of one of these research programmes. Biological assay have been performed by feeding large-mouth bass (*Micropterus salmoides*) fingerlings, average initial weight 23.70g g, with extruded diets containing 0.0 (control), 7.5, 10.0, 12.5, or 15.0% of fish silage in partial substitution to the fish meal. Fish in all treatments displayed good acceptance of feed. Feed conversion ratio (FCR; kg feed/kg gain) and weight gain for treatments were, respectively: 1.26 and 15.76g; 1.11 and 17.07g; 1.19 and 17.81g; 1.18 and 19.83g; 1.47 and 14.64g. The average individual feed consumption during the experimental period was 19.52g; 18.95g; 21.02g; 22.50g, and 21.50g, respectively. No significant differences were detected among treatments. Results indicate that it is possible to use up to 15% fish silage as partial substitute of commercial fish meal in the formulation of carnivorous fish feeds.

Animal feed mixtures

One of the many advantages of the silage is that it can be stored for a long time - up to more than one year without quality loss – as a liquid in large concrete or non-corrosive tanks.

The corresponding disadvantage of the liquid silage is excessive transport and storage costs due to the low content of dry matter (approx. 20%), resulting in transport and storage of 80% water. It also requires tank storage facility and mixing equipment at the farmers end. For the small farmers the silage could be supplied in barrels of 60 - 120 litres, which is possible to handle and distribute by the farmers themselves or by normal transport companies. In this way the silage could also be used as a dust binder when animal is fed with traditional, dry animal feed.

However, to reduce the storage and transport volumes and costs the silage can be concentrated by low temperature heating. Concentration of the silage by heating is very expensive due to high energy costs and also difficult to do without loss of product quality.

Alternatively, a dry and high quality product could be obtained if the silage instead is mixed together with other feed components such as soy grits or grain (barley, rye, etc.) and extruded. Such a product could be packed in paper bags and would be stable during storage at ambient temperature, and easy to handle, distribute and use in automatic feeding systems at farmers end. ■

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