



◀ Catch in the Gulf of Thailand with FISHFORM treatment

Effects of liquid potassium diformate (FISHFORM) as acid-based preservative for the storage control of sardines under tropical conditions

ADDITIVES

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Almost a third of the world fish harvest is not used for direct human consumption, but is converted into fish meal or fish oil for further application in animal feed. Of the 75 million tons of fish about 25 million tonnes is therefore handled and processed in other ways than fresh, frozen, smoked or canned (Balios, 2003). The supply of huge volumes of high quality fish meal is necessary to supply the aquaculture industry, which has been growing with around 8.8% annually since the 1950ies (FAO, 2007). It was recently estimated that 25% of the produced fish meal world-wide comes from usage of waste from the fish processing sector (FeedInfo, 2009). The world-wide supply of fish meal is presently stable at 6 to 6.5 million t a year. On the other hand the percentage of high quality fish meal of the total amount of fish meal is expected to grow from 8% to 50% during the next 30 years (Hydro Norway, 2000). However, according to an IntraFish.com report (2001), access to premium quality fish meal, without dehydration damage to proteins and / or rotting which make the final product rancid, is still limited.

The present studies examined the effectiveness of a liquid blend of potassium diformate, antioxidant and corrosion inhibitor (FISHFORM) as a preservative for sardines, caught in the Indian Ocean, under Asian fish storage conditions.

During the sardine preservation a storage temperature of 12°C was chosen, which reflects the situation of the South East Asian fish storage conditions (on ice) on modern fishing vessels. The potassium diformate blend was added in one concentration (0.40%) next to a negative control. Samples (3 replicates) of the fish were taken after 24 h, 48 h and 72 hours storage time, for Total Volatile Nitrogen (TVN), histamine and dry matter content of fish.

TVN is often used as a criterion for the freshness of fish raw material (Haaland and Njaa, 1987). This value in the fish before processing is known as the most important quality criteria for raw industrial fish and the fishermen is paid according to the measured TVN level when landing the catch at the fishmeal factories.



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The main constituents of TVN are trimethylamine and ammonia. Its amount increases with time of storage in the unfrozen state. Trimethylamine originates from bacterial decomposition, and the presence in fish is therefore taken as an indication for bacterial growth, while the ammonia comes from decomposition of amino acids - thus reducing the quality of the available protein. Levels of mainly 40 mg TVN per 100 g fish mass are regarded by the industry as limits for a good quality fish meal for instance. Furthermore biogenic amines, like Histamine (Hist.), are formed if the bacterial degradation of protein (amino acids) has started and is therefore an important criterion for the quality of the fish too. Histamine, for instance, is formed during the bacterial degradation of Histidine, which is an essential amino acid in fish nutrition. Contamination with histamine can cause food poisoning and allergic reactions (Diel et al., 1997). Finally, the dry matter content (DM) of fish is an important economic criterion, since it indicates how much fish meal can be produced with the fish raw material.

The total Volatile Nitrogen values in the negative control increased rapidly and exceeded the above mentioned 40 mg already after 48 hours at 12 °C storage temperature. The fast TVN development was significantly delayed by the addition of the potassium diformate blend. After 48 h the TVN-level in the group treated with FISHFORM was only half compared to the negative control (see table 1).

Table 1: Quality parameters of sardines for fish meal production (TVN, Histamine and dry matter) stored with or without FISHFORM (potassium diformate blend) at different storage times (at 12 °C)

Storage time (h)	24		48			72	
	TVN (mg/100g)	DM (%)	TVN (mg/100g)	Hist. (mg/kg)	DM (%)	TVN (mg/100g)	DM (%)
0.0%	26.0 ^a	24.9	59.4 ^b	28.0	24.3	52.4 ^b	26.0
0.4%	25.2 ^a	26.1	30.2 ^a	9.5	24.9	37.5 ^a	26.3

Values with a different superscript differ significantly (P<0.05)

Furthermore the analysed values of histamine after 48 hours of storage in the negative control clearly prove the bacterial degradation of non-treated fish, while the amount of histamine in the preserved fish was nearly 3 times lower - indicating an improved quality of the fish raw material.

Finally, the average dry matter content over the whole experimental period was in the non-treated fish 25.1%, while the fish preserved with FISHFORM had an average dry matter content of 25.8% - this is an increase in dry matter of nearly 2.8% and would lead to a more optimized fish meal production.

The determined results clearly indicate that due to the addition of a potassium diformate blend the quality of the stored fish can be improved and also the amount of possible fish meal production can be increased. This seems to be a very important finding, since the higher quality of the produced fish meal will allow a more economic and sustaining use of the limited resource fish meal.



For more information or to obtain literature references, please contact [Dr.Christian Lückstädt](#)

