

Fresh fish for high quality fish meal

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Update on the effect of potassium diformate on the quality of fish under tropical conditions.

The acid preservation of fish and fish viscera to produce fish silage is a common practice (Lückstädt, 2007) and its final product has been widely used in fish feeds with reported beneficial effects (Gildbert and Raa, 1977; Åsgård and Austreng, 1981). It is a widely used method in many European countries to extend storage or preserve fish-by-products as well as freshly caught “industrial fish” for further fish meal or fish oil production with formic acid, acetic acid or potassium diformate.

The present study examined the effectiveness of a liquid blend of potassium diformate, antioxidant and corrosion inhibitor (Fishform, Addcon) as a preservative for sardines, caught in the Indian Ocean. During preservation, a storage temperature of 12°C was chosen, which reflects the situation of the tropical 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 determination of Total Volatile Nitrogen (TVN), histamine and dry matter (DM) content of fish.

TVN

TVN is the most important quality criteria for the freshness of fish raw material (Haaland and Njaa, 1987). The main constituents of TVN are trimethylamine and ammonia. Its amount increases with the time of storage in the unfrozen state. Trimethylamine originates from bacterial decomposition. The presence in fish is therefore taken as an indication for bacterial growth as ammonia comes from decomposition of amino acids. High levels are indicative of a reduction in 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. Furthermore biogenic amines, such as histamine, 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.

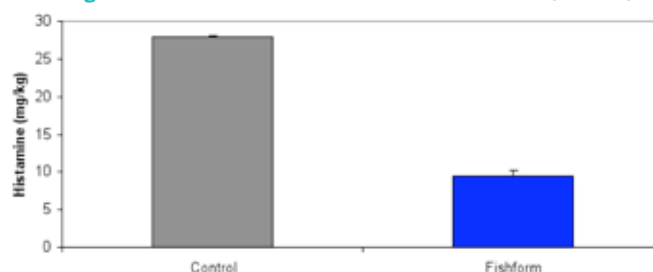
Delaying TVN and histamine development

The TVN 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



Good quality sardines for further fish meal production.

Figure 1. Development of histamine levels (average ± SD) after 48 h of storage with 0 / 0.4% Fishform and without Fishform (control).



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 (Table 1).

Table 1: Quality parameters of sardines for fish meal production (TVN 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)	DM (%)	TVN (mg/100g)	DM (%)
0.0%	26.0a	24.9	59.4b	24.3	52.4b	26.0
0.4%	25.2a	26.1	30.2a	24.9	37.5a	26.3

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

Furthermore, the analysed values of histamine in the preserved fish was nearly 3 times lower than that in negative control after 48 hours of storage. This clearly proved the bacterial degradation of non-treated fish and that treatment improved quality of the fish raw material (Figure 1).

Finally, the average dry matter content over the whole experimental period of fish preserved with Fishform had an average dry matter content of 25.8%. In comparison, dry matter of the non-treated fish was 25.1%. A significant increase in dry matter of nearly 2.8% would lead to a more optimized fish meal production.

These results clearly indicate that the addition of Fishform improved the quality of the stored fish and that the yield of fish meal can be increased. This translates to a more economic and sustainable use of the limited resource fish meal.

References are available on request.



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