



Issue 9: November, 2013: This e-bulletin is aimed at personnel in fisheries & aquaculture, at fish packers, processors, distributors, retailers, and finally consumers.

Fish Farming for Function: the Selenium Story

Functional foods are broadly defined as those that offer 'something extra' in terms of health benefits than the basic food item; there are many examples with probiotic-enriched yoghurt versus ordinary yoghurt one of the best known to most consumers. Fish farming is ideally suited to introducing bio-active substances to fish flesh via the feed thereby producing functional fish. A study conducted by (Schram et al., 2008) as part of the EU SEAFOODplus project produced selenium enriched African catfish by including selenium in their diet.

Selenium deficiency

Many European soils are deficient in selenium and consumers in these regions are, therefore, likely to be selenium deficient. Selenium is an important trace element for human health and the Recommended Dietary Amount (RDA) is 55 micrograms per day (EC Directive 90/496/EC). Glutamyl-Se-methylselenocysteine and Se-methyl-selenocysteine are easily absorbed and are linked to cancer protection (Careche et al., 2008). Additionally, blood selenium concentrations in humans were shown to be inversely related to the risk of colon (Jacobs et al., 2004), prostate, and lung cancers (Clark et.al., 1996; Finley, 2003). These data suggest that it is important to have sufficient selenium in the daily diet.

Enriching African catfish with selenium

African catfish were the species chosen because of their good appetite and rapid rate of growth. A two pronged approach was used. Trial 1 involved including selenomethionine at a range of concentrations in the fish feed (Table 1) whereas in Trial 2 selenium enriched garlic was used (Table 2). Both trials lasted about 43 days with fish being tested for selenium content at the start and finish. In Trial 1 a five-fold increase in selenium content of the fish flesh was achieved by using increasing amounts of selenomethionine in the feed (Table 1). The dose response relationship was high with a correlation coefficient of 0.993.

Table 1: Enriching African catfish with selenomethionine by dietary modulation (Trial 1) (data of Schram et al., 2008)

Selenomethionine (mg/kg) in fish FEED	0	0.3	0.6	1.0	2.0	4.0
Selenomethionine (mg/kg) in fish FLESH	0.26	0.36	0.43	0.48	0.74	1.34

Garlic was used in Trial 2 as it readily converts and accumulates inorganic selenium added to the soil to organic selenium compounds. The selenium enriched garlic was added to the fish feed and a four-fold increase in organoselenium content of the fish flesh was achieved (Table 2). The concentration of selenium in the catfish was reduced by cooking (steaming; roasting; deep frying) but retention levels were still satisfactory at 60-70%.

Table 2: Enriching African catfish with organoselenium by dietary modulation (Trial 2) (data of Schram et al., 2008)

Organoselenium (mg/kg) in garlic enriched fish FEED	1.92	2.77	3.94	5.14	8.51
Organoselenium (mg/kg) in fish FLESH	0.24	0.35	0.47	0.60	0.85

Conclusions

These trials demonstrate the potential of fish farming for producing functional fish (fish farmers alert!), in this case selenium enriched catfish. A number of other successful studies have also been conducted using fish feed as a carrier for introducing bio-actives, beneficial to human health, into fish flesh.

A 33 page supplement (Fish as a Functional Food: some issues and outcomes) to this article is available on line (see link below) as are previous issues of SeaHealth-ucd. A pdf copy of the supplement is available from ronan.gormley@ucd.ie

Link: <http://www.ucd.ie/foodandhealth/whatsnew/seahealth/>

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