Effect of fishmeal replacement by silkworm meal on growth and physiological status of rainbow trout (*Oncorhynchus mykiss*) using recirculated water system

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Introduction

Fishmeal and Fish oil

- High quality protein and fatty acids
- Essential dietary ingredients for farmed fish, especially carnivores
- Increase in production – drop in catches
- Availability in the future?
- Price?

Alternative Protein Sources

- **Plant origin** (soy, corn gluten, cottonseed, etc.)
- **Animal origin** (by-products of poultry, dairy industry, etc.)

Insect Larvae *e.g.*

- *Bombyx mori*
- *Musca domestica*
- *Hermetia illucens*
- *Tenebrio molitor*

Cost of fishmeal and other feed ingredients 2000-2010 (US$/ton) (indexmundi.com)

Year	2000	2004	2006	2008	2009	2010
Fishmeal (Peru, min. 65% protein)	461	664	950-1250	1000-1200	1000-1700	**1700-1961**
Soybean meal min 48% protein	170	340	175	**452**	442	300-335
Wheat No.1 Hard Red Winter, ordinary protein, FOB Gulf of Mexico	120	150	180-200	**440-220**	240-200	160-200
Corn (Maize), U.S. No.2 Yellow, FOB Gulf of Mexico	75-96	133-96	103-166	**287-158**	160	160

Silkworm pupae
Bombyx mori

Composition

- Protein up to 66%DW (77% defatted)
- Lipids 12,5-30%DW (4-10% defatted)
- CHO 19-32%DW (Chitin)
- Phosphorus, trace elements

Use

- As silkworm meal: in carp species, catfish, broiler chickens

Aim

To investigate the effect of partially replacing fishmeal with silkworm meal on growth and physiological status of rainbow trout (*Oncorhynchus mykiss*) using recirculated water system

Experimental design

	Control-0% inclusion	10% SM	20% SM
Water (%)	8,36	8,48	8,40
Proteins (%D.W.)	59,17	58,89	58,99
Lipids (% D.W.)	9,78	9,54	9,46
Ash (% D.W.)	10,17	9,53	8,75
ENEO (% Ξ.B.)	20,88	22,04	25,94
Energy (Mj/kg D.W.)	17	17	17