



EFFECT OF INCORPORATION OF A **PROTEOLYTIC ENZYME COMPLEX** IN THE DIETS FOR THREE SALMONID SPECIES

(Coho salmon, Atlantic salmon, Rainbow trout)

Conducted at the Universidad Catolica de Temuco, Chile in 2012

OVERVIEW

The trial was conducted at the Universidad Catolica de Temuco, Chile to assess the effects of Jefo Proteolytic Enzyme Complex (PEC) on the production performance and nutrient digestibility of three salmonid species. These three species are: coho salmon, *Oncorhynchus kisutch*, Atlantic salmon, *Salmo salar* and rainbow trout, *Oncorhynchus mykiss*. Four diets were prepared for the experiment. Protein sources used in the trial are fish meal (67% CP), poultry viscera meal (52% CP), feather meal (80%CP), soybean meal (47% CP) and corn gluten meal (60% CP) (Table 1). Two of these four diets (Diets 1 and 2 – Spec A) were formulated to contain high amount of fish meal (~34%). The other two diets (Diets 3 and 4 – Spec B) were prepared with 15% fish meal. Proteolytic Enzyme Complex was added to the diets 2 and 4 at a rate of 175 mg/kg. In the low fish meal diets, fish meal was replaced by poultry meal and feather meal. The growth trial for each species was conducted for 60 days. At the end of the growth trial, apparent digestibility of nutrient and energy from the test diets were assessed for each species in a separate trial.

Table 1: Composition of the protein sources included in the diets in the trial.

Protein Sources	Diets			
	1 Spec A	2 Spec A	3 Spec B	4 Spec B
Soybean meal, 47%	14	14	15	15
Corn gluten meal, 60%	15	15	12	10
Poultry meal, 52%	0	0	12	12
Feather meal, 80%	2	0	12	10
Fish meal, 67%	36	34	15	15
Proteolytic Enzyme Complex*	0	175	0	175

*\$20/kg



METHODS FOR THE ECONOMIC ANALYSIS

Apparent cost of protein sources in the experimental feed was calculated using recent FOB price (Jun-Aug, 2012) of the internationally traded commodities collected from various sources (Table 2). Total cost of proteins for each diet was calculated for per metric tons of feed. Price of Proteolytic Enzyme Complex was assumed as \$20/kg for the calculation.

Table 2: Price of various protein sources

	Crude protein (CP) %	ADC CP %	Digestible CP %	Month/Year	US \$/ ton
Animal products					
Fish meal ¹	67,0	90,0	60,3	Jun-2012	\$ 1642,30
Blood meal, porcine ²	90,0	85,0	76,5	Jul-2012	\$ 1300,00
Meat and bone meal, porcine ²	50,0	65,0	32,5	Jul-2012	\$ 525,00
Feather meal ²	80,0	65,0	52,0	Jul-2012	\$ 575,00
Poultry by-product meal ³	57,0	90,0	51,3	Jul-2012	\$ 580,00
Plant products					
Soybean meal ³	47,0	88,0	41,4	Aug-2012	\$ 630,00
Corn gluten meal ²	65,0	90,0	58,5	Jul-2012	\$ 720,00

¹ <http://www.indexmundi.com/commodities/?commodity=fish-meal>

² <http://agebb.missouri.edu/dairy/byprod/bplist.asp>

³ <http://hammersmithltd.blogspot.ca/>

RESULTS

The performance improvement (in percent) of the fish in terms of feed conversion (FCR) and growth rate (expressed as Thermal-unit growth coefficient-TGC), and percent improvement in apparent digestibility coefficients of crude protein (ADC-CP) and carbohydrate (ADC-CHO) with the addition of Proteolytic Enzyme Complex are presented in the Table 3. The total cost of proteins per metric ton of feed and fish produced are provided in Table 4. Cost savings in protein cost is provided in Table 5.



Table 3: Performance improvement (in percent) of fish fed Proteolytic Enzyme Complex diets (Diets 2 and 4) than those fed diets 1 and 3 respectively.

Species	Diets	FCR	TGC	ADC-CP	ADH-CHO
Coho salmon	Diets 1-2	-2,0	6,8	5,8	34,4
	Diets 3-4	-3,0	6,8	0,6	6,6
Atlantic salmon	Diets 1-2	1,0	0,0	8,2	35,8
	Diets 3-4	0,0	0,0	1,0	6,5
Rainbow trout	Diets 1-2	0,0	0,0	5,4	22,1
	Diets 3-4	0,0	0,0	-1,2	5,9

Note: FCR - Feed conversion ratio; TGC - growth rate (as thermal-unit growth coefficient); ADC CP - apparent digestibility coefficient of crude protein; ADC CHO - apparent digestibility coefficient of carbohydrate

Table 4: Cost of protein sources per metric ton of feed and fish produced

Cost of protein	Diets			
	Spec A		Spec B	
	1	2	3	4
Cost / MT feed	\$ 798,93	\$ 756,68	\$ 565,85	\$ 542,05
Cost /MT of fish	\$ 798,93	\$ 771,82	\$ 577,16	\$ 569,15

Table 5: Potential cost savings by adding Proteolytic Enzyme Complex

	Expensive Diet (\$ 757 - 798 / MT)	Less Expensive Diet (\$ 542 - \$ 565 / MT)
Savings in protein cost/ ton of feed	\$ 42,25	\$ 22,40
Savings in protein cost/ ton of fish	\$ 27,11	\$ 6,54

Key Inference

- Increased feed intake by fish fed Proteolytic Enzyme Complex diets resulted in higher growth.
- The protein cost of high fish meal diets is about 200\$ higher than the low fish meal diets, therefore, undesirable.
- The protein cost of low-fish meal diet (~\$550) is reasonable.
- Improved digestibility of crude protein.
- Also, an improved digestibility of carbohydrates (>20% for high fish meal and >5% for low-fish meal diets).

Savings in protein cost per ton of fish produced is \$ 6,54