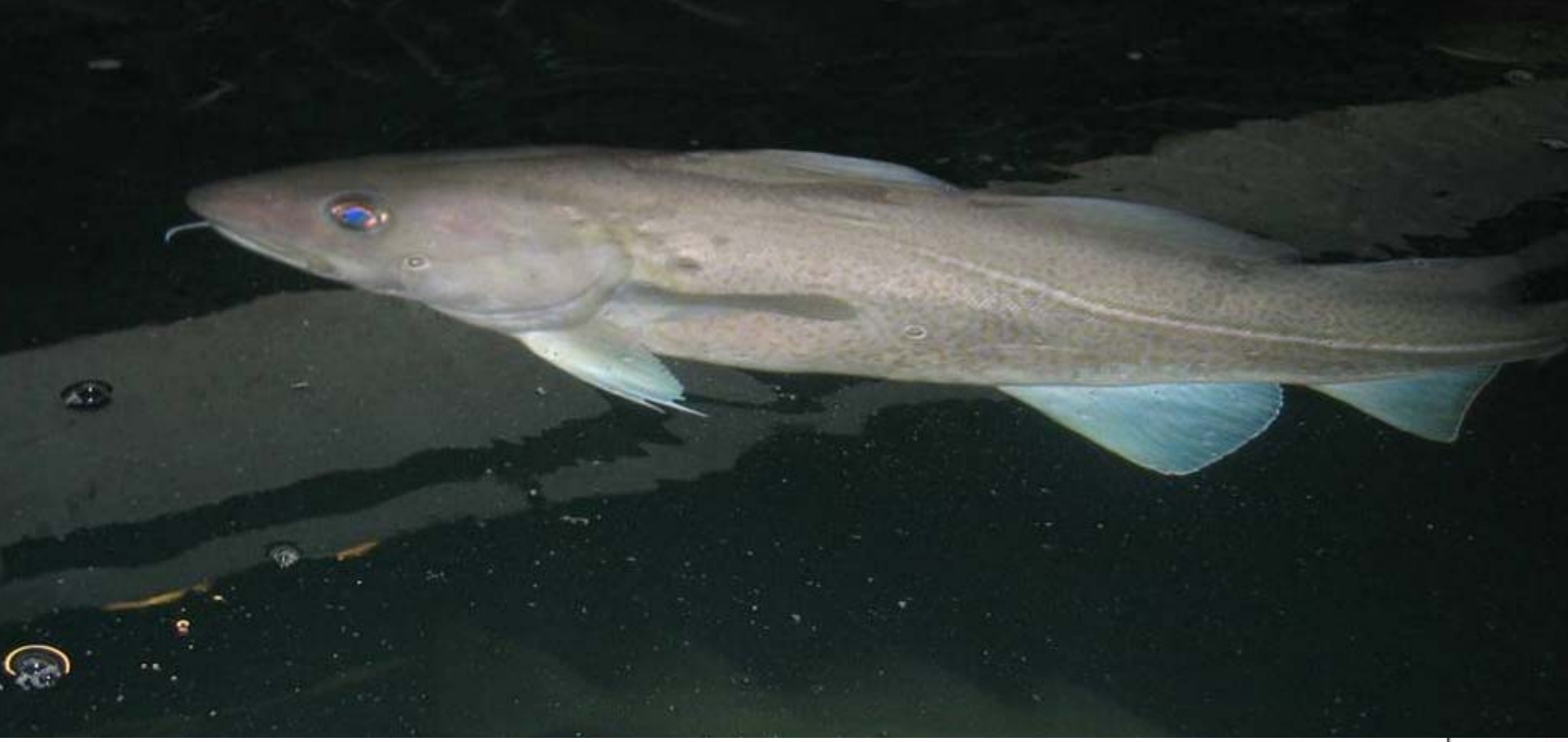

Substitution in Feed for Cod

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AVS

Research Group

- IFL
  - Analysis and coordination
- Laxa feedmill Ltd.
  - Provided the diets
- Hólaskóli
  - Facilities
- Marine Research Institute of Iceland
  - Provided the cod

The Main Goal

- to look for a feasible way to reduce feeding cost in cod farming by:
  - **Try different protein raw materials for 25-100g cod fry**
    - **Three different qualities of fishmeal**
    - **Hypro soybean-meal**
    - **Maize gluten meal**

Farming Conditions

- Fish was distributed among 18 tanks of 90L capacity
- Each feed formula fed in triplicate
- Flow rate 120 L/hour
- Temperature 12°C and constant light 24h
- The density was ≤15 kg/m^3
- The fish was handfed two times per day (morning and evening)
- The trial lasted from December until February

Raw Material Tested:

- Superior fishmeal (LT)
- Special fishmeal (NSM)
- Standard fishmeal

Ca. 70 % protein

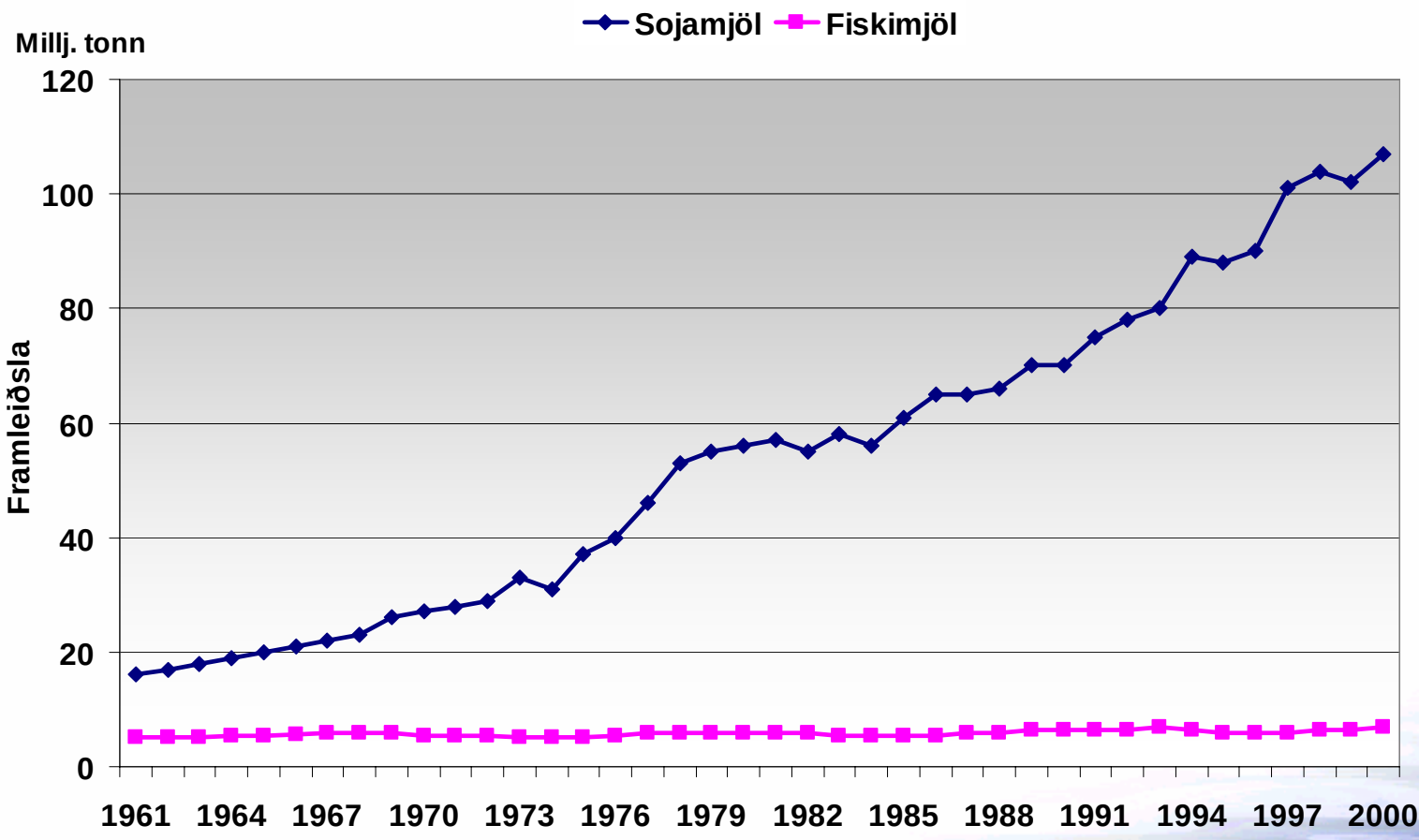
- Maize gluten meal (MGM)
  - 60% protein
- Hypro soybean meal (not full fat)
  - 47% protein and 2% fat

AVS

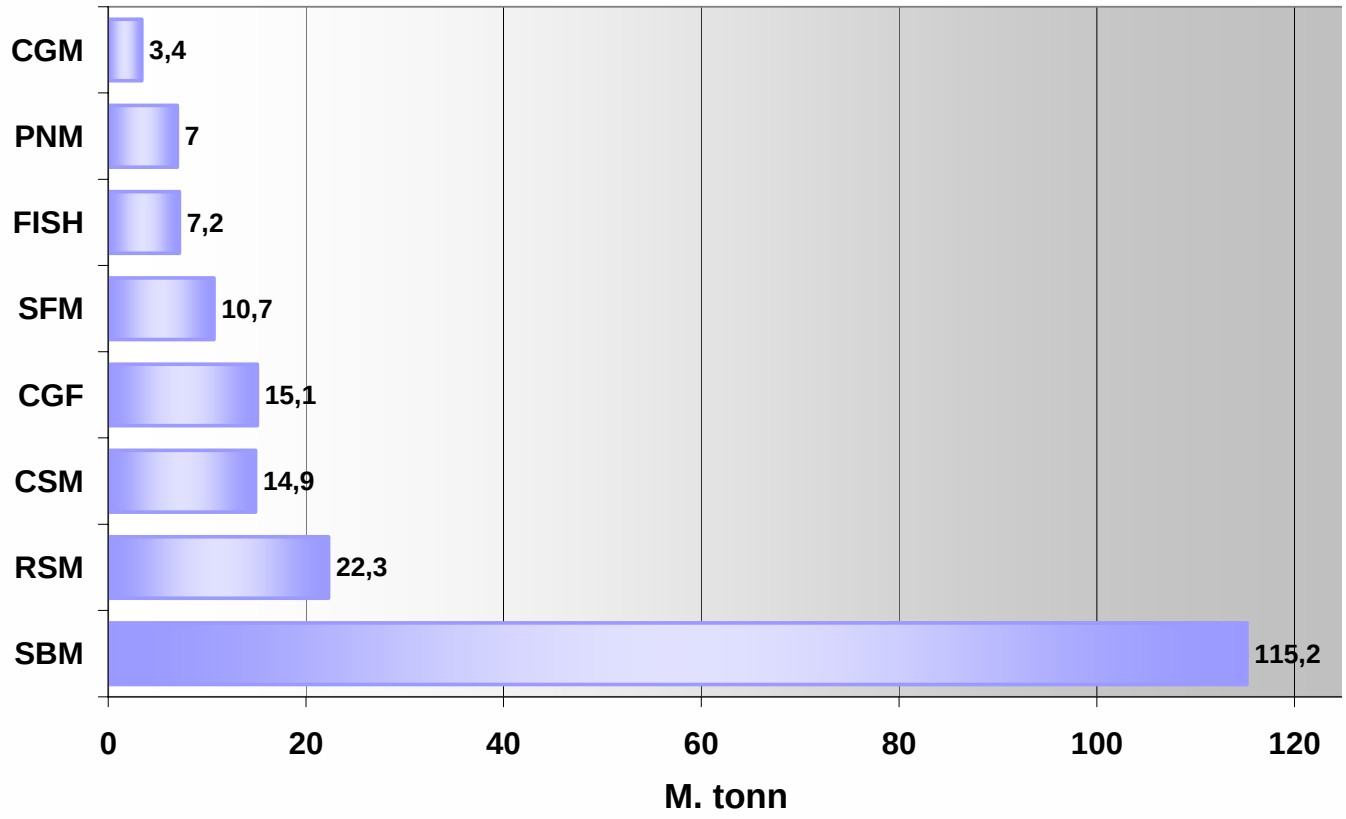
Hlutfallslegt verð á prótein-einingu

	Prótein innihald	Hlutfallslegt verð á próteinum
Superior fishmeal – (LT)	70	100
Special fishmeal (NSM)	70	93
Fish meal standard	70	90
Maize gluten meal (MGM)	60	65
HYPRO soybean meal	47	62

Heimsframleiðsla á soja- og fiskimjöli



Plant protein source



Mynd 1. Heimsframleiðsla á próteingjöfum árið 2000

SBM - Sojamjöl; RSM – Repjumjöl; CSM – Bómullarfræsmjöl; CGF – Maís-gluten fóður; SFM – Sólblómamjöl; Fish – Fiskimjöl; PNM – Jarðhnetumjöl; CGM – Maís glútenmjöl.

Feed Types

- Six types of diets were produced
- Iso-energetic (16MJ/kg) and iso-nitrogenic diets of different raw material

Feed	Protein	Fat	Carb.	Ash
HYPRO	58,0%	9,5%	8,8%	9,7%
STST	58,0%	9,0%	12,0%	10,8%
ST	58,0%	9,1%	11,6%	11,6%
MGM	58,0%	8,0%	13,3%	8,8%
SPES	58,0%	9,0%	12,4%	9,9%
SUP	58,0%	9,0%	12,4%	9,9%

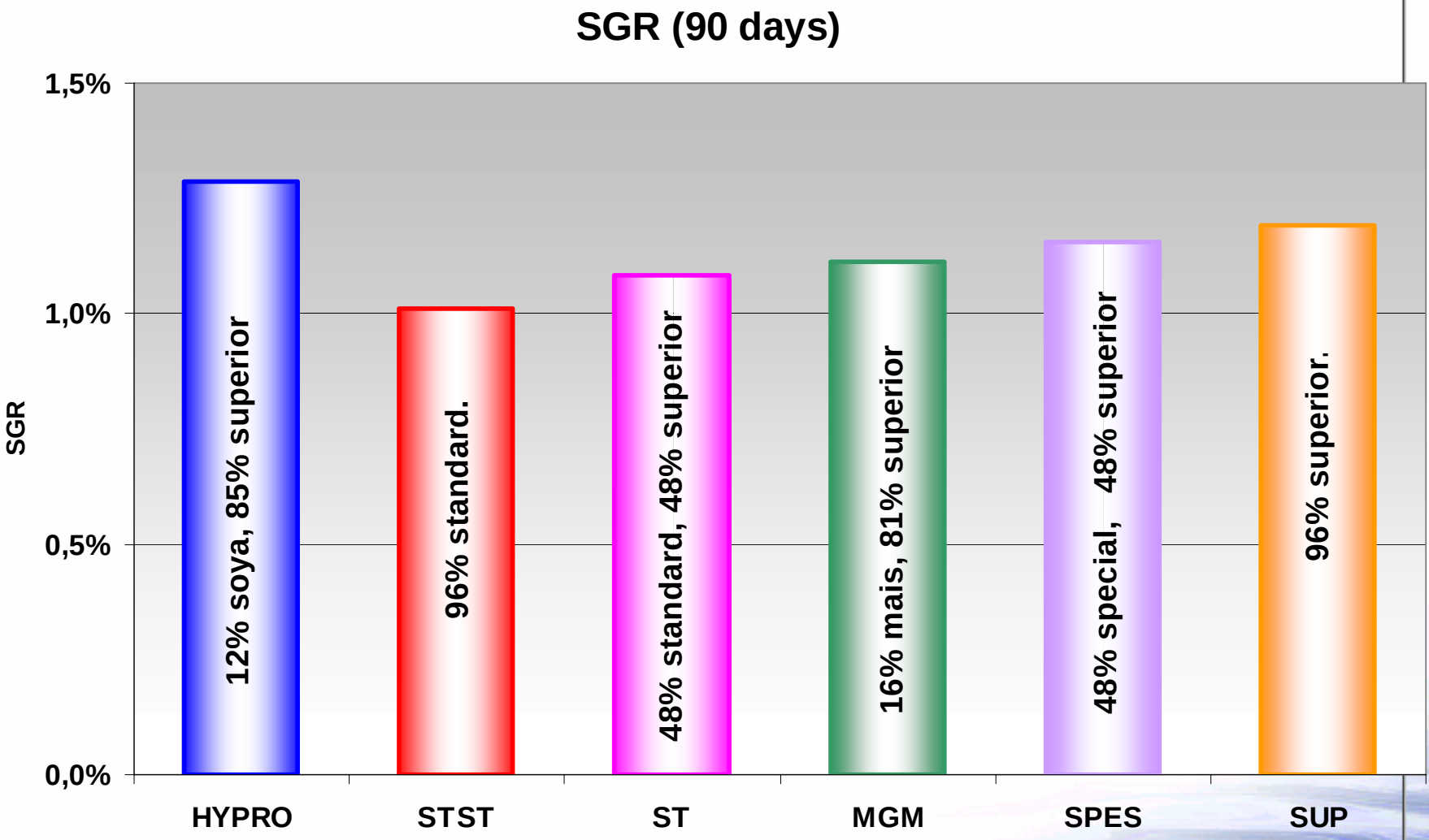
Feed Formulation

- Percentages of crude protein in the diets

Feed	SUP %	SPES %	STAND %	MGM %	HYPRO %
HYPRO	85	-	-	-	12
STST	-	-	96	-	-
ST	48	-	48	-	-
MGM	81	-	-	16	-
SPES	48	48	-	-	-
SUP	96	-	-	-	-

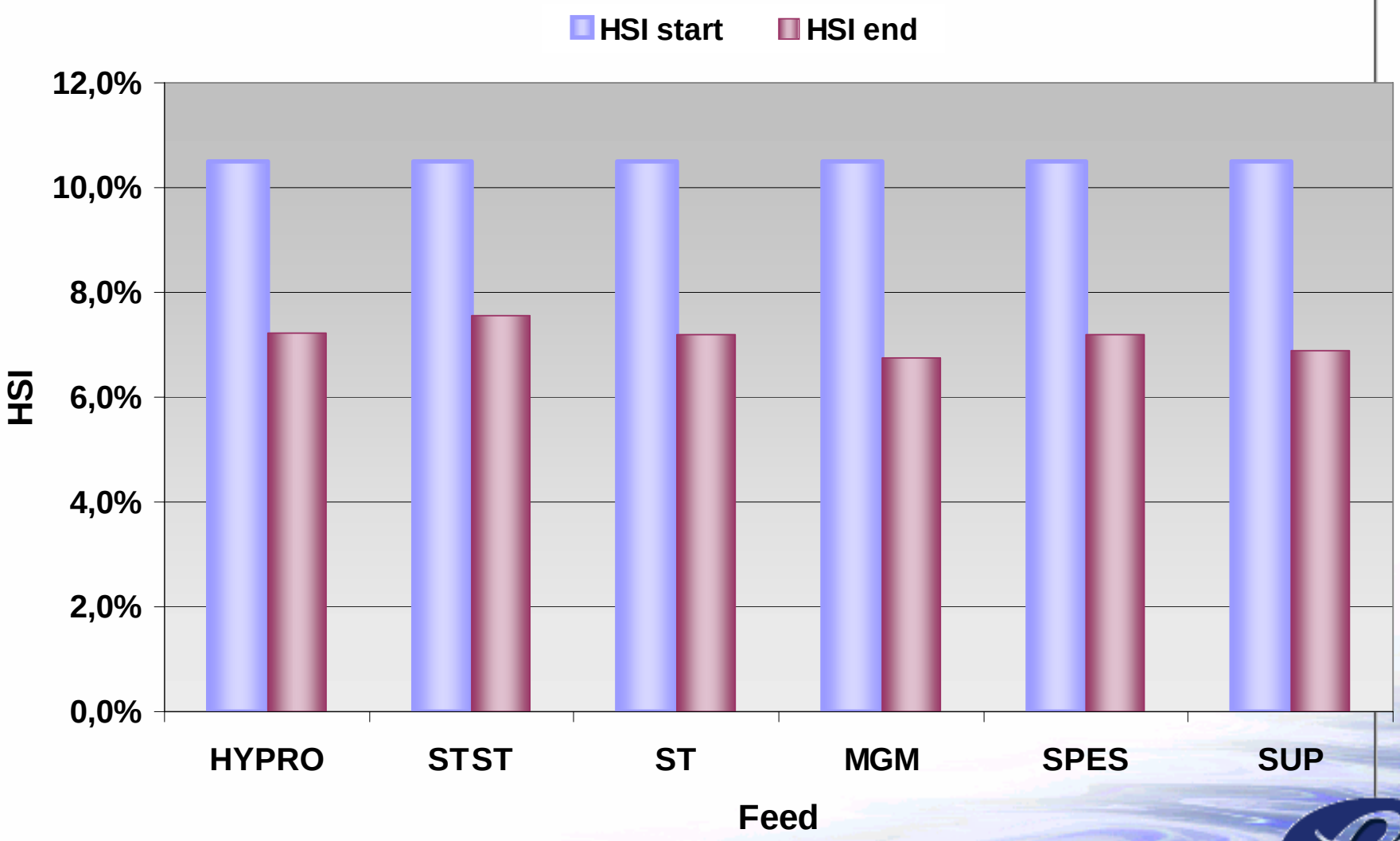
- The rest of the protein comes from wheat
- There is higher fishmeal content in the Hypro diet because soy-meal contains lower protein compared to MGM

Growth


SGR (90 days)
SGR
1,5%
1,0%
0,5%
0,0%
12% soya, 85% superior
96% standard.
48% standard, 48% superior
16% mais, 81% superior
48% special, 48% superior
96% superior.
HYPRO
STST
ST
MGM
SPES
SUP

AVS

Liver Index (HSI)



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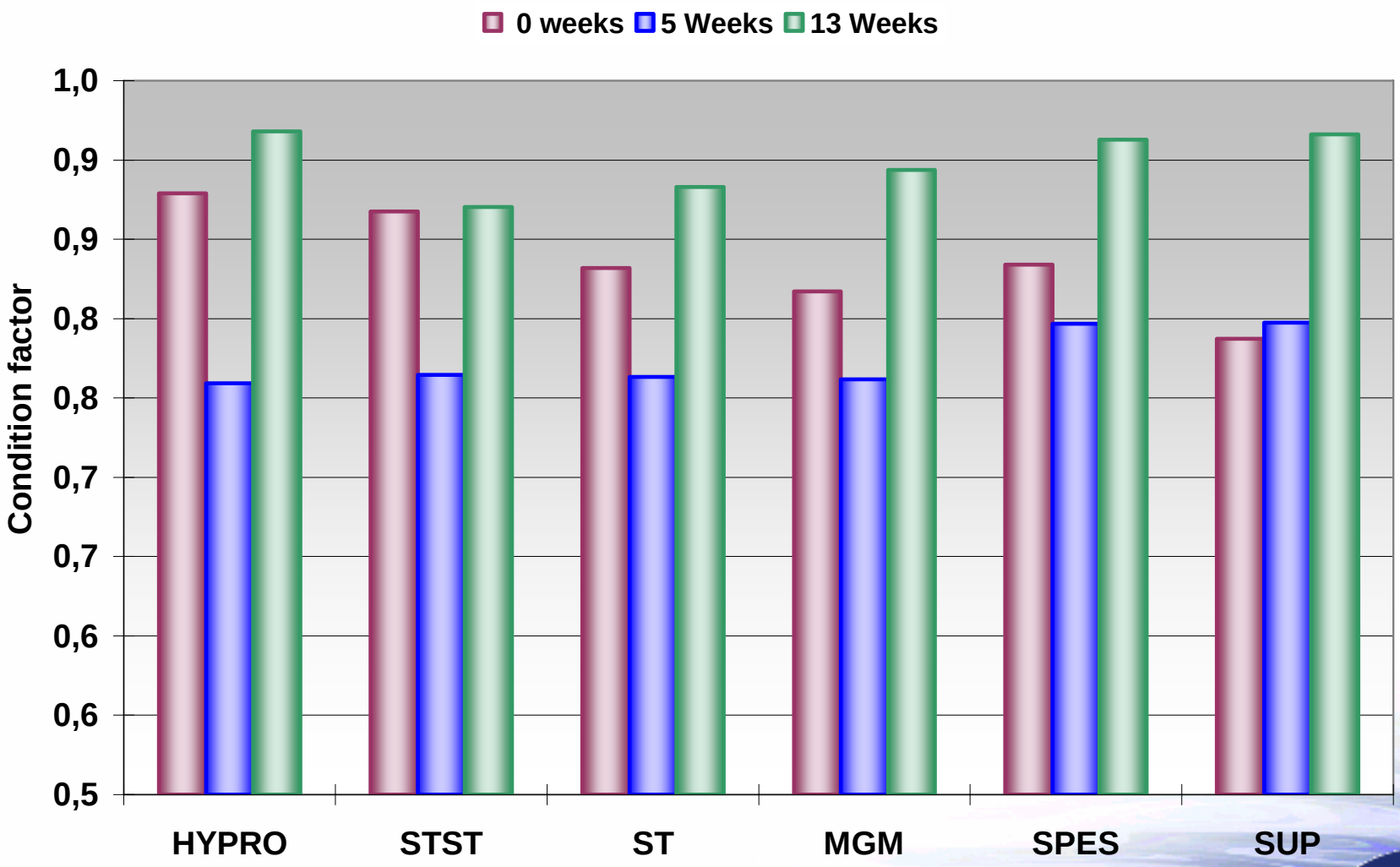
Condition factor



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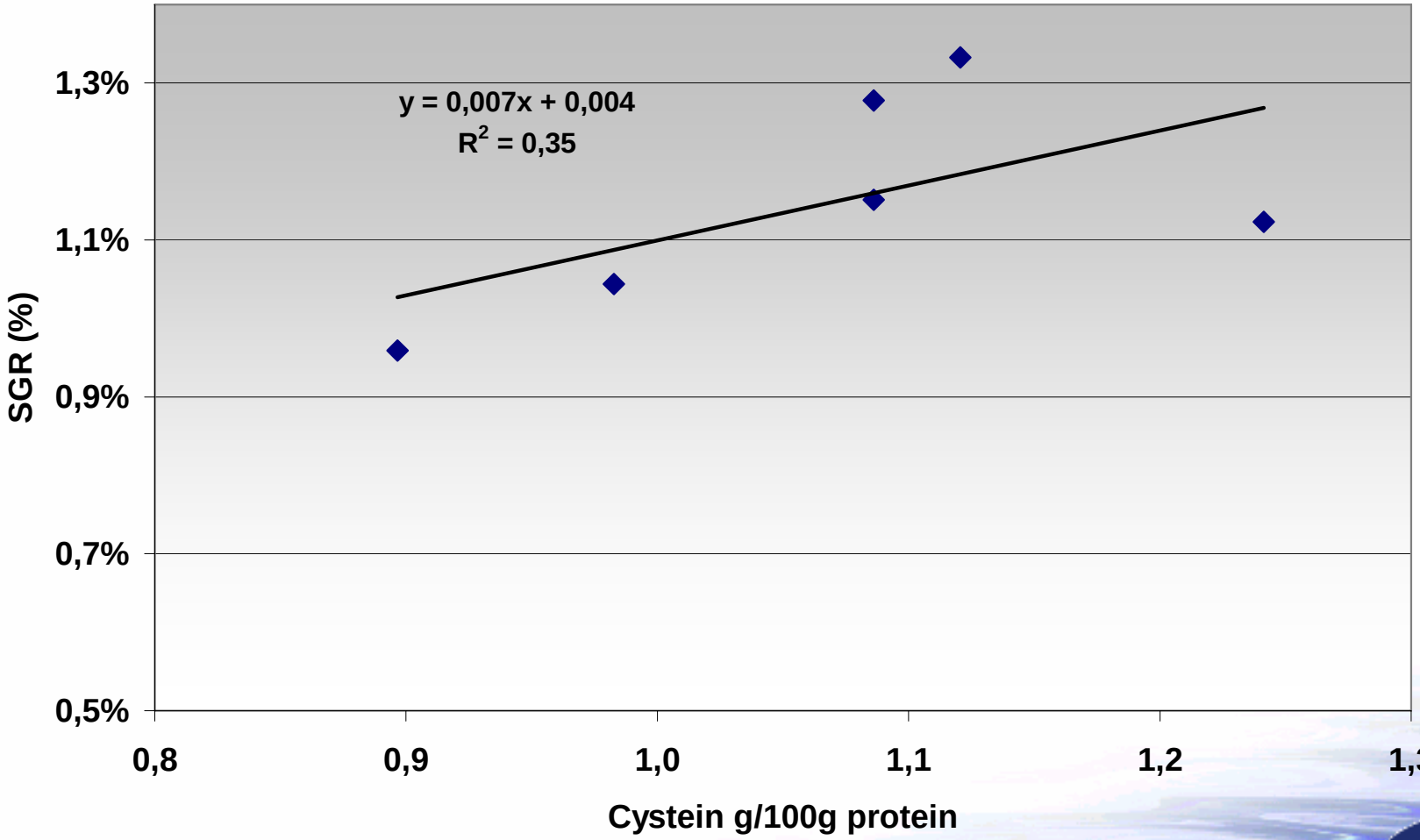
Amino Acid Composition

Feed	Lysin g/kg feed	Methionin g/kg feed	Cystein g/kg feed
Hypro	58,4	15,7	6,5
STST	43,6	17,1	5,2
ST	52,3	16,9	5,7
MGM	52,7	16,6	7,2
Spes	61	16,7	6,3
Sup	61	16,7	6,3

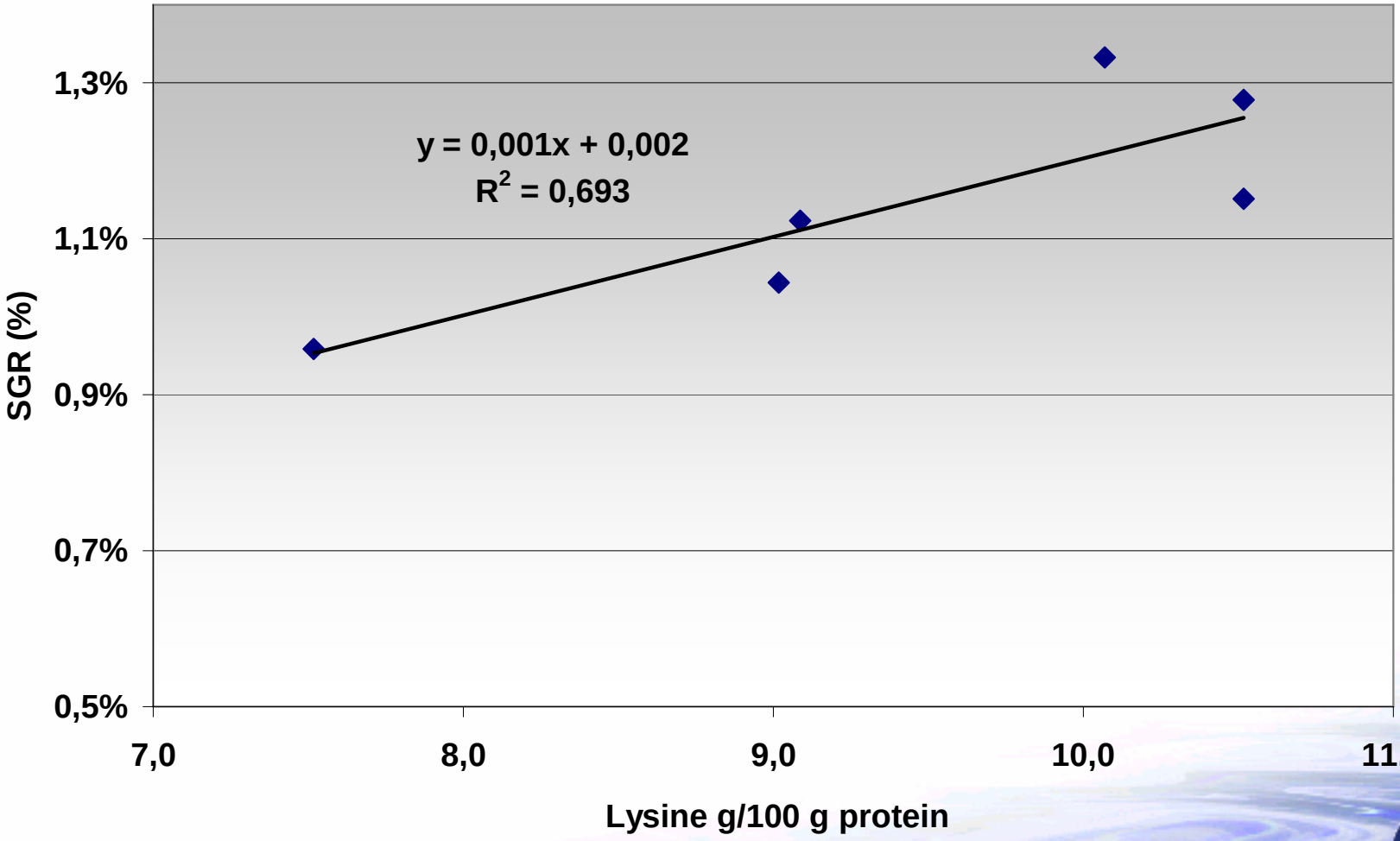
aa

- Cystein eykur meltanleika próteina, fitu og kolvetna.
  - Meltingarensím innihalda mikið af cysteini
- Methionine eykur meltanleika fitu og gegnir mikilvægu hlutverki í nýmyndun próteina.
- Lysine hefur áhrif á vöxt í mörgum tegundum fiska.

Tengsl cysteins og vaxtar



Tengsl lysine og vaxtar



Conclusion

- The diets HYPRO and SUPERIOR gave the best growth, all other treatments gave poorer growth.
- The results have been supported by other trials.
- The outcome was 5% reduction of feeding cost

Takk