

Production of savoury compounds from different side-streams of the seafood value chain.



Optimal utilization of seafood side-streams through the design of new holistic process lines

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AZTI, Food Research, Basque Research and Technology Alliance (BRTA)

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This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 837726. The JU receives support from the European Union's Horizon 2020 research and innovation programme and the Bio Based Industries Consortium. This output reflects only the author's view and the JU cannot be held responsible for any use that may be made of the information it contains

Side-streams are good sources of protein

Fish discarded
(under MCRS*)



Salmon frames



*MCRS: Minimum Conservation Reference Size

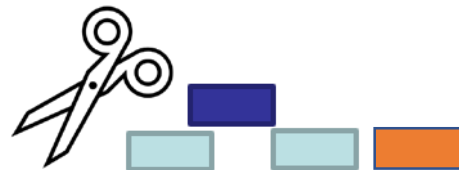
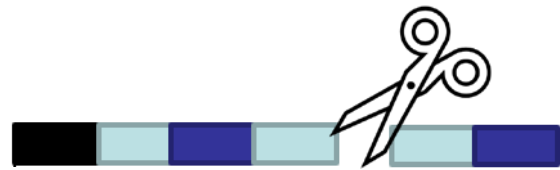
Protein hydrolysis

Raw material, protein



Endoproteases

Exoproteases



Peptides

Amino acids

Glutamine

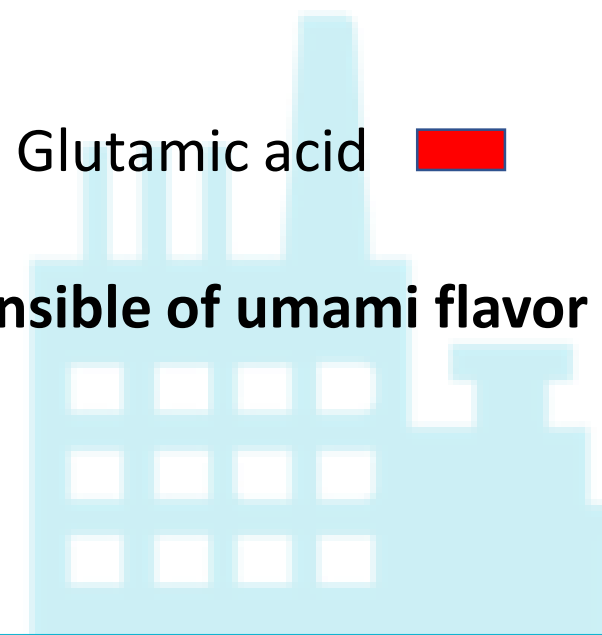
Glutaminase



Glutamic acid



Responsible of umami flavor



Protein hydrolysis

Enzymes used

- Endo-protease of the serine type (A)
- Broad-spectrum endo-protease mixture (P)
- Endo-exo-protease mixture (F)
- Exopeptidase (E)
- Glutaminase (U)

+ Control without added enzymes (endogenous enzyme activity)

Process conditions

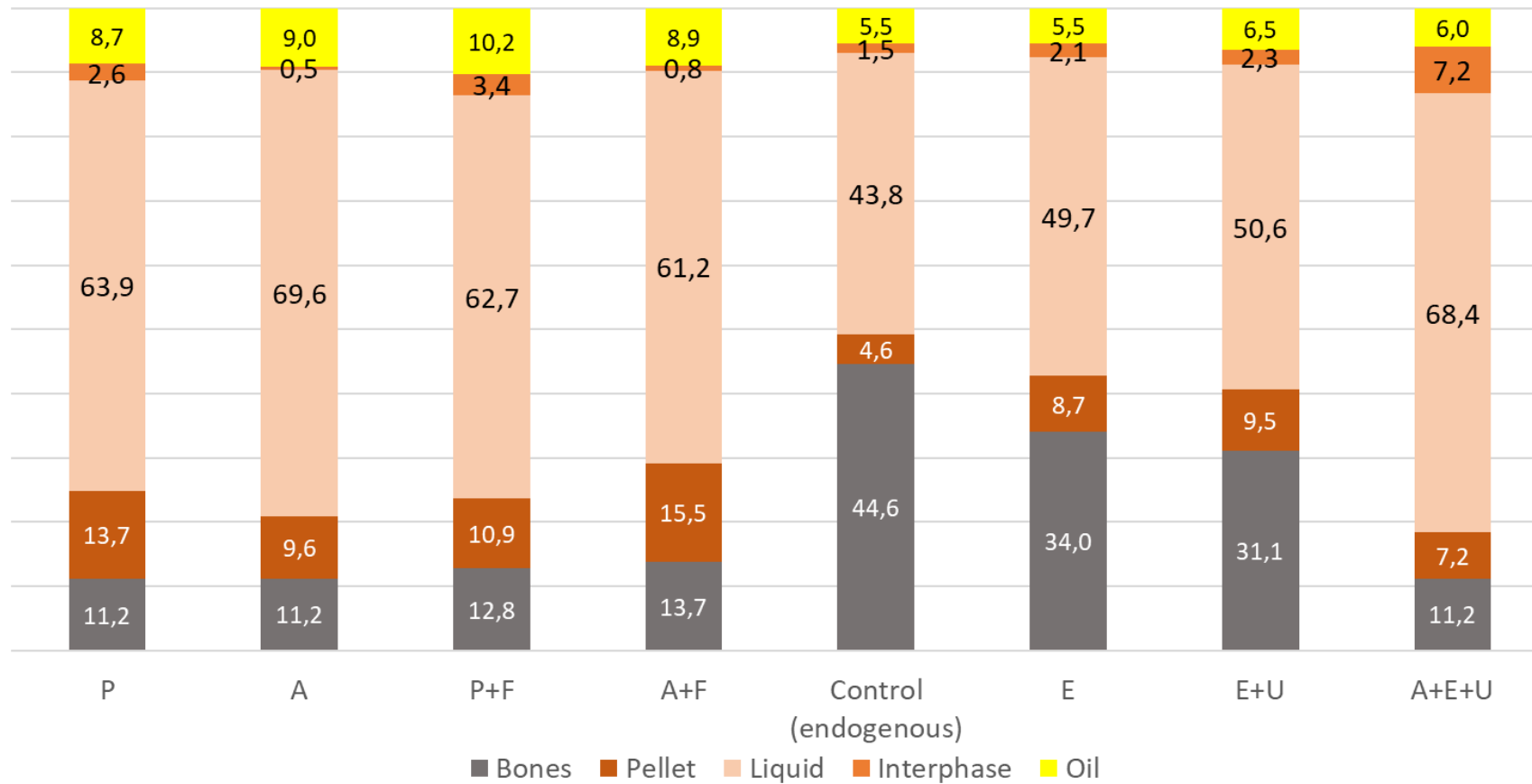
1 % enzyme (protein based), 50 °C, pH 6 and 3 hours.

Inactivation 95 °C during 15 min.

Samples sieved to separate the bones and centrifuged at 2650 x g 15 minutes.



Hydrolysis fractions distribution (salmon frames)

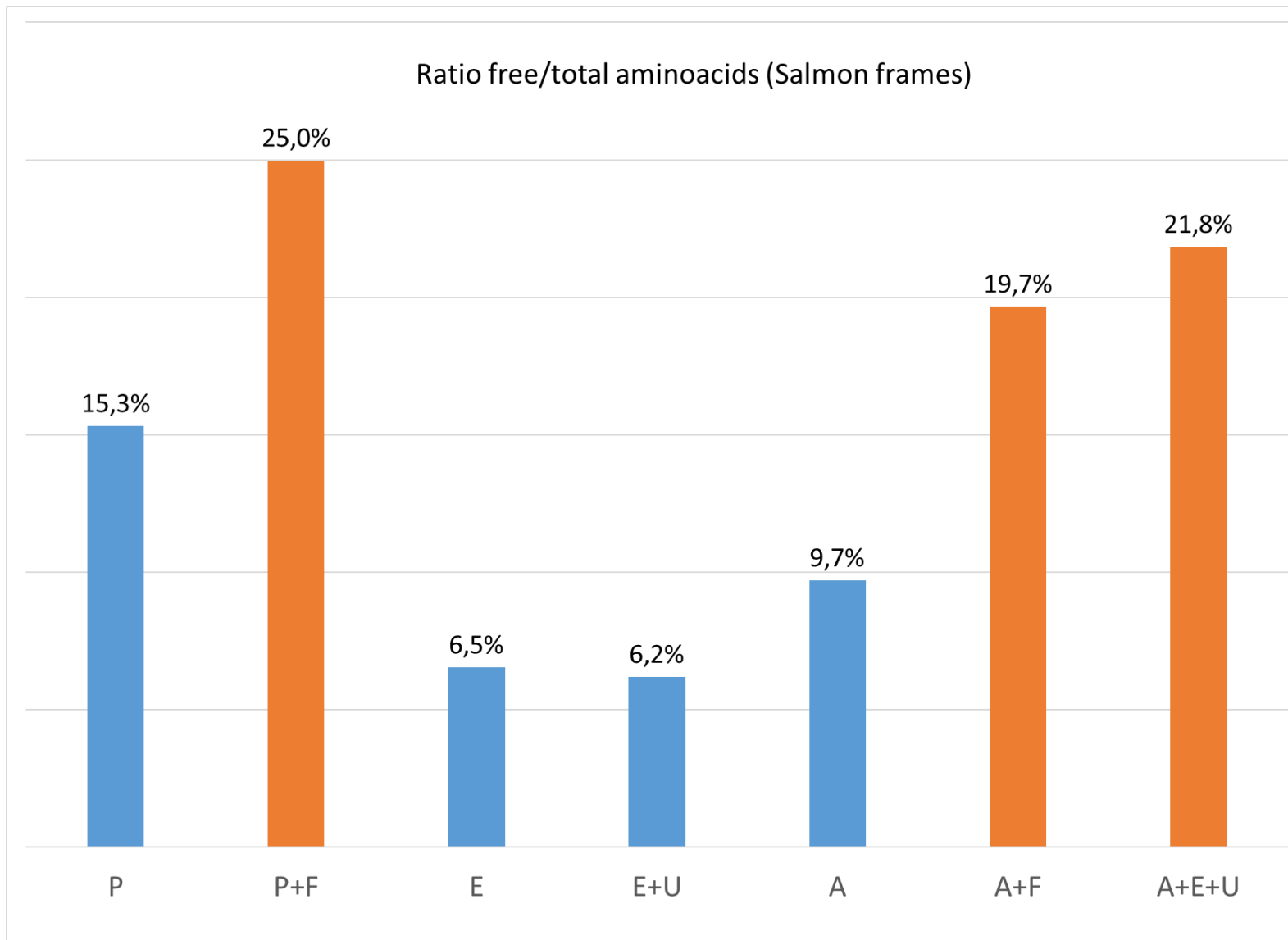


Endoprotease A gave the best hydrolysis efficiency.

Endogenous activity was low as expected.

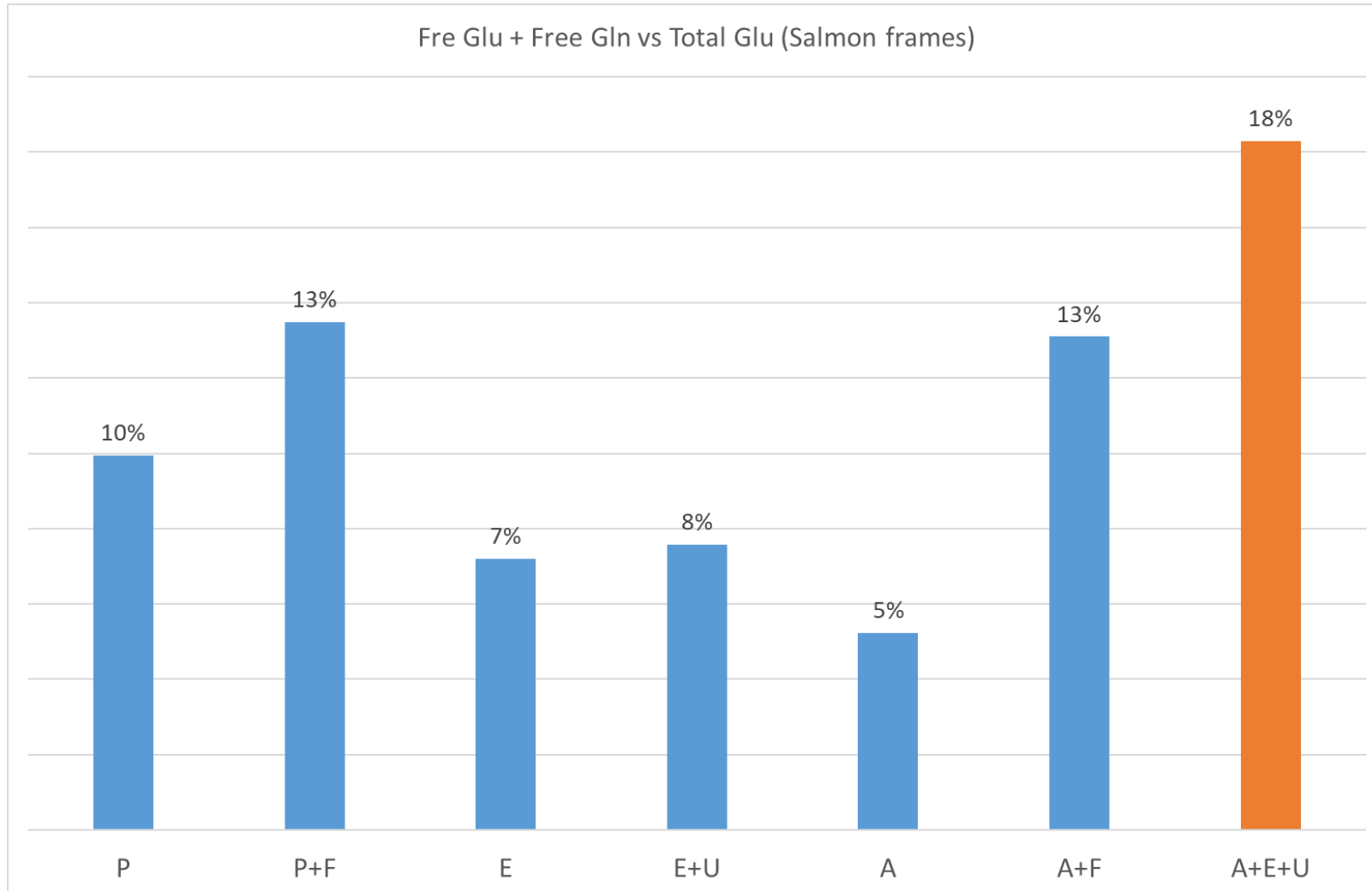
A: Endo-protease of the serine type
 P: Broad-spectrum endo-protease
 F: Endo-exo-protease mixture
 E: Exopeptidase
 U: Glutaminase

Ratio free/total aminoacids (Salmon frames)



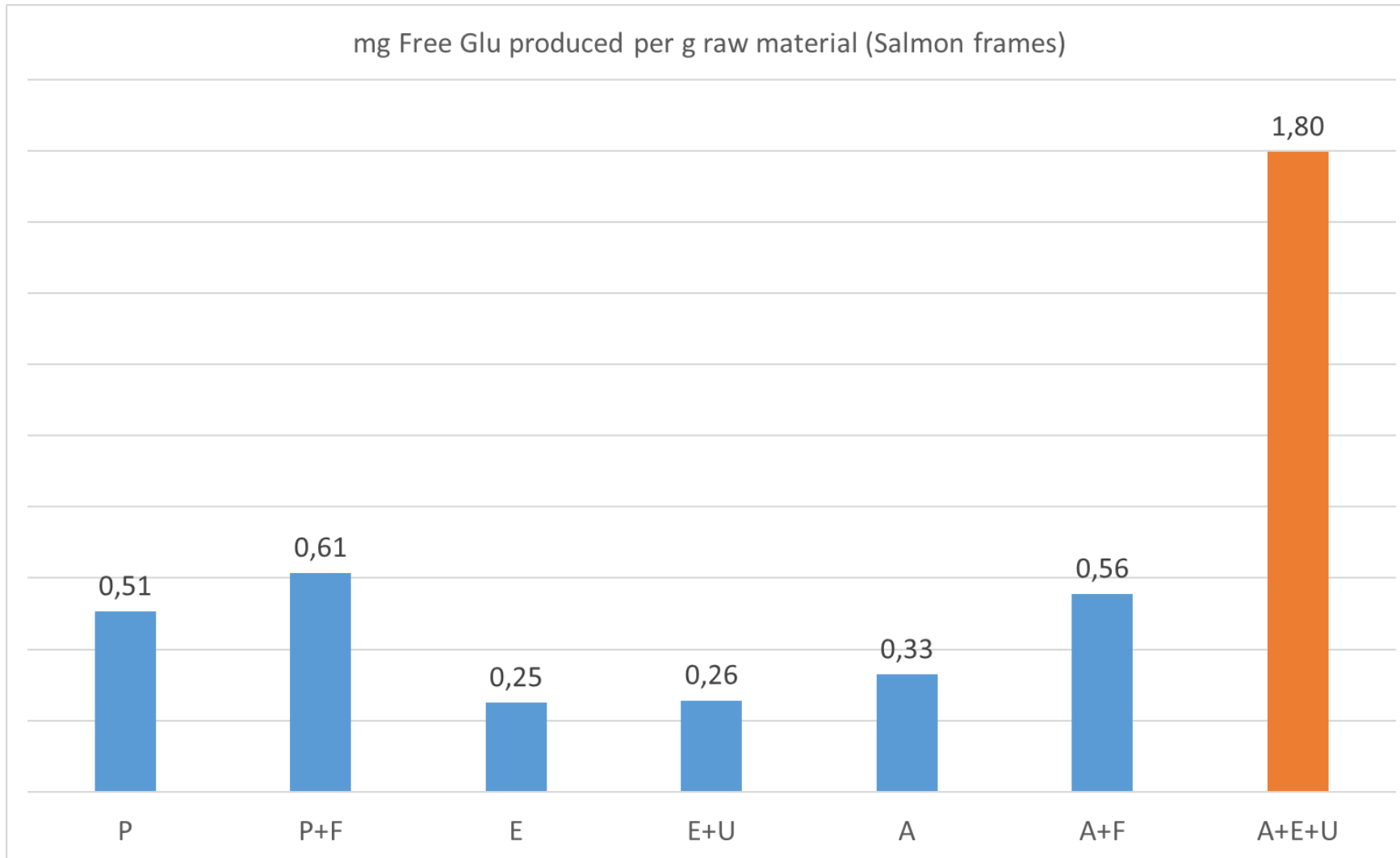
Only the combination of endo and exoproteases produced a significant “hydrolysis degree”.

A: Endo-protease of the serine type
 P: Broad-spectrum endo-protease
 F: Endo-exo-protease mixture
 E: Exopeptidase
 U: Glutaminase



Exoprotease E seems more efficient than F in liberating Glu + Gln.

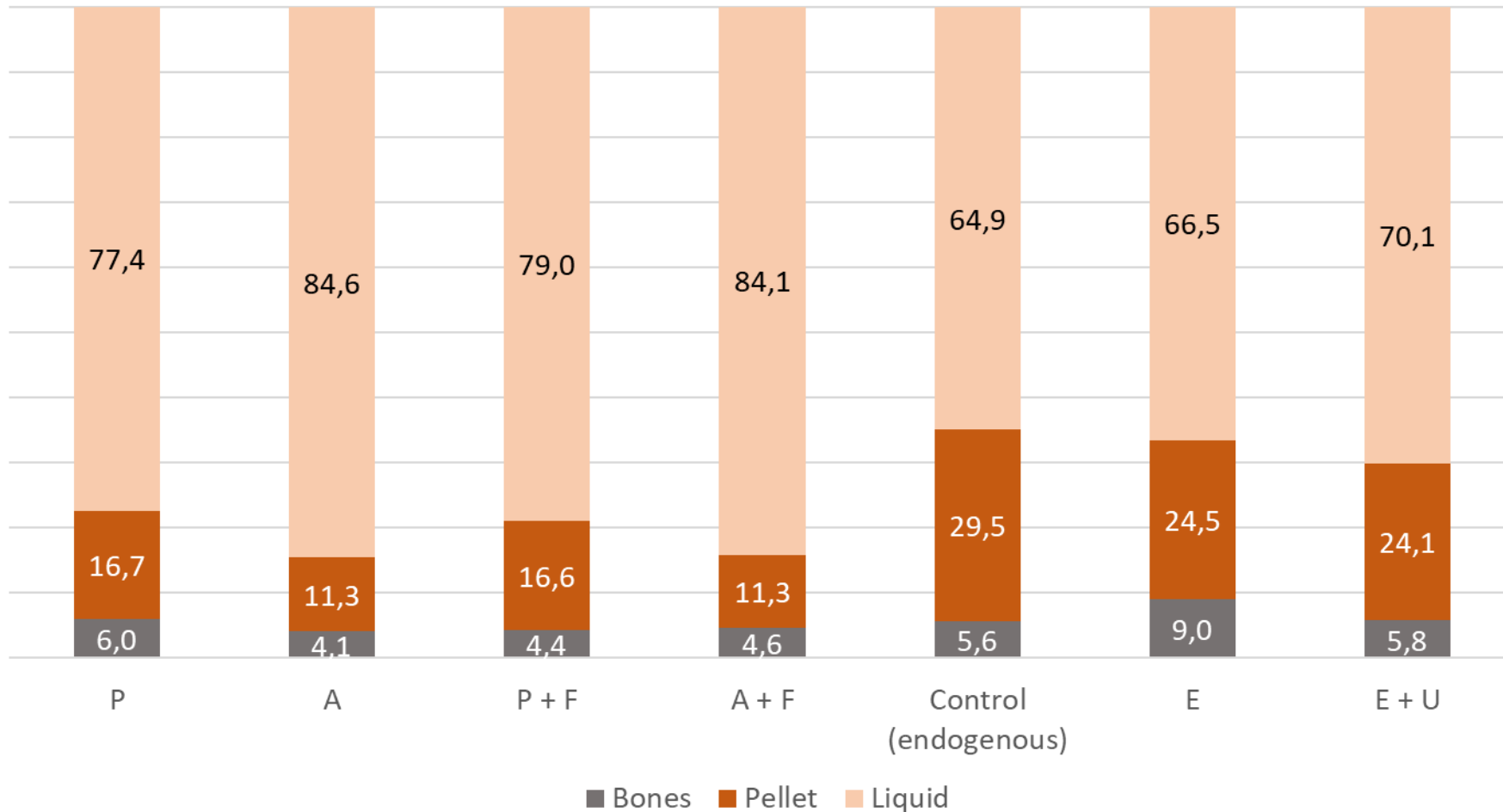
A: Endo-protease of the serine type
 P: Broad-spectrum endo-protease
 F: Endo-exo-protease mixture
 E: Exopeptidase
 U: Glutaminase



The combination of endo and exoproteases with glutaminase was effective in increasing the quantity of free Glu per g of frames.

A: Endo-protease of the serine type
 P: Broad-spectrum endo-protease
 F: Endo-exo-protease mixture
 E: Exopeptidase
 U: Glutaminase

Hydrolysis efficiency: fractions distribution (Hake)

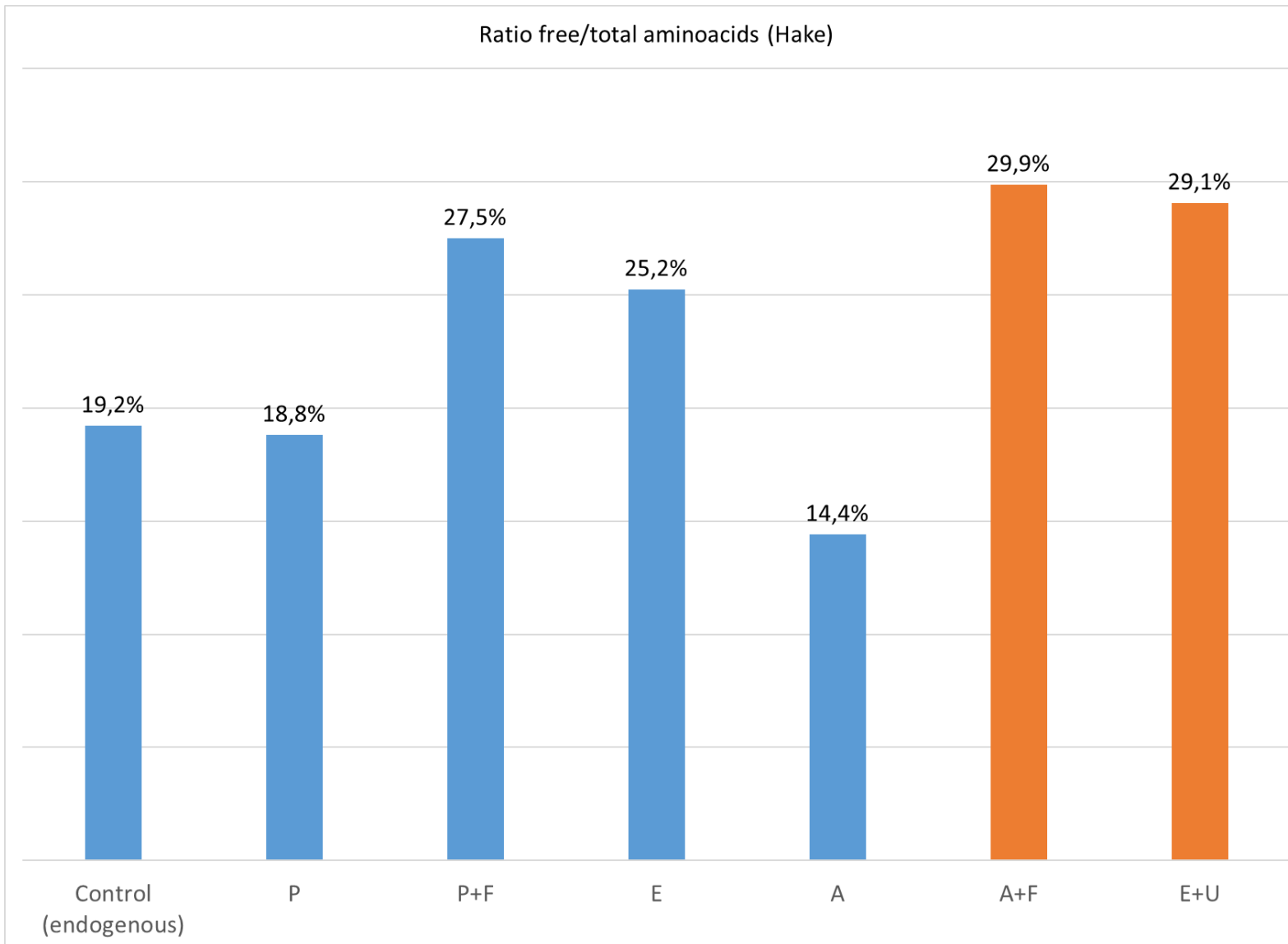


No oil fraction produced (lean fish).

Endoprotease A gave the best hydrolysis efficiency.

A: Endo-protease of the serine type
 P: Broad-spectrum endo-protease
 F: Endo-exo-protease mixture
 E: Exopeptidase
 U: Glutaminase

Ratio free/total aminoacids (Hake)

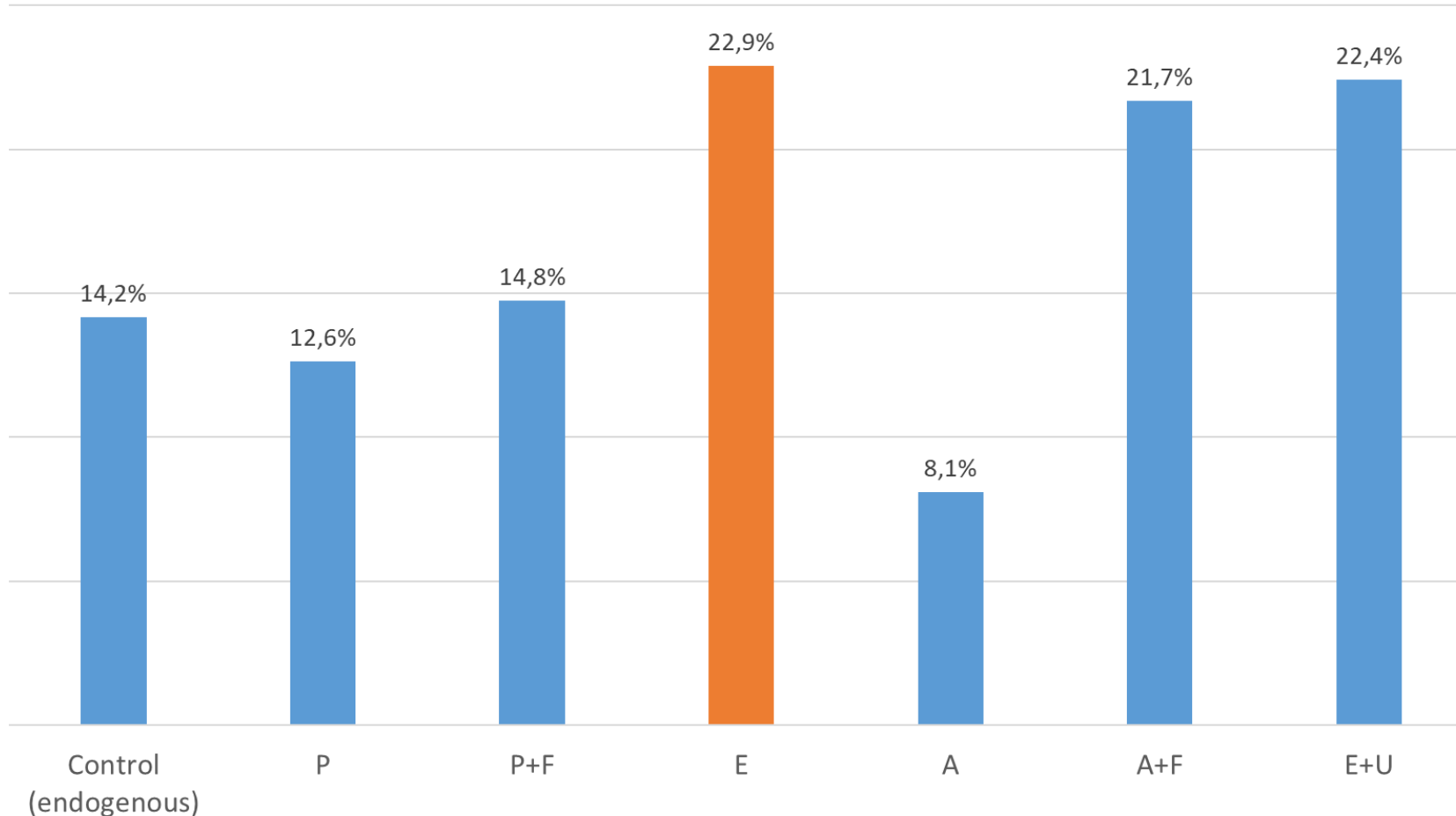


The endogenous enzymes were as efficient as the commercial endoproteases in producing free AA when combined with exoproteases and glutaminase.

Exoprotease E with endogenous enzymes was as efficient as the use of endoproteases P or A with exomixture F in producing free AA.

A: Endo-protease of the serine type
P: Broad-spectrum endo-protease
F: Endo-exo-protease mixture
E: Exopeptidase
U: Glutaminase

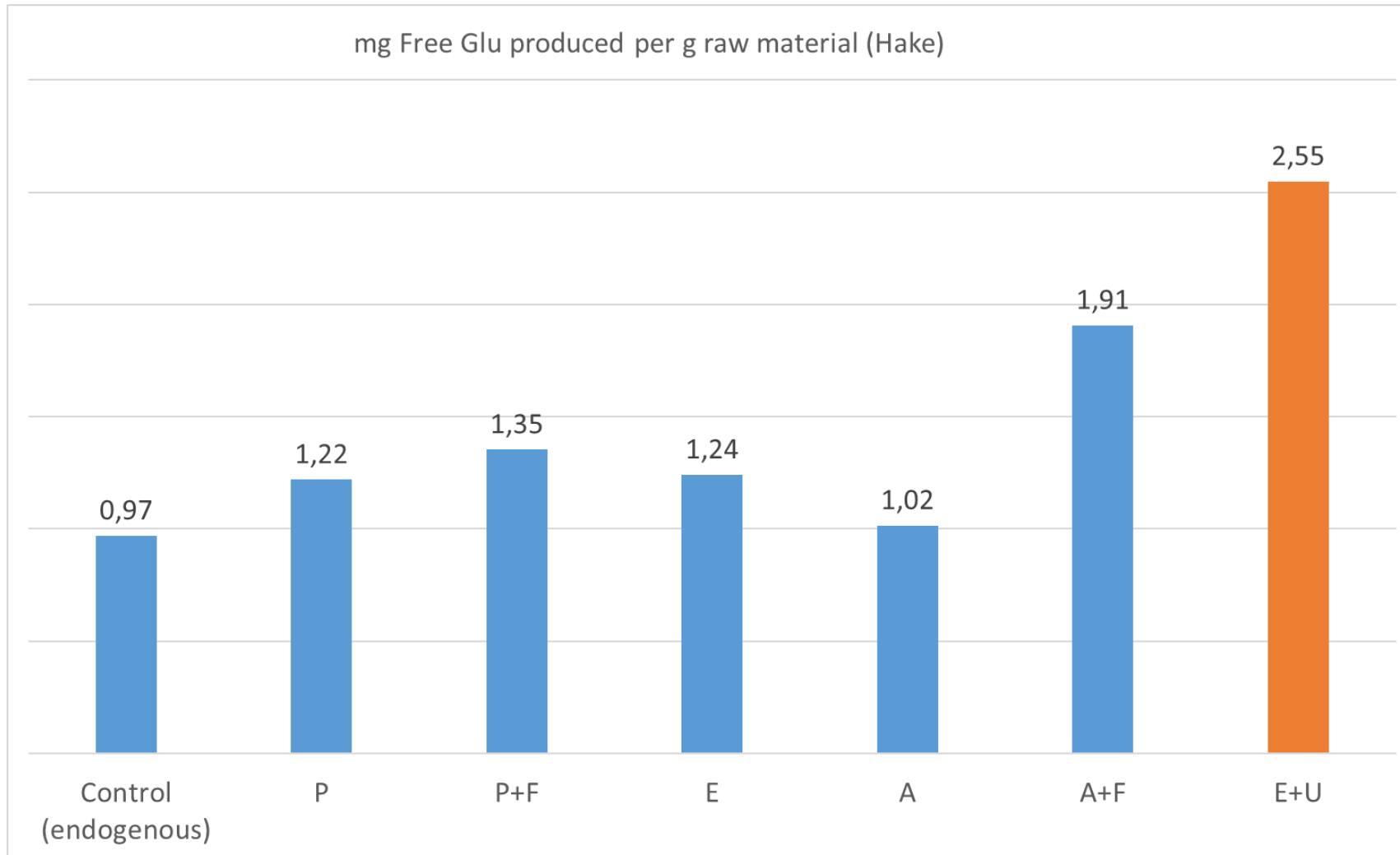
Fre Glu + Free Gln vs Total Glu (Hake)



Exoprotease E was slightly more efficient as endo-exomixture F in producing free Glu + Gln.

Endogenous enzymes make the role of the endo-protease A.

A: Endo-protease of the serine type
 P: Broad-spectrum endo-protease
 F: Endo-exo-protease mixture
 E: Exopeptidase
 U: Glutaminase



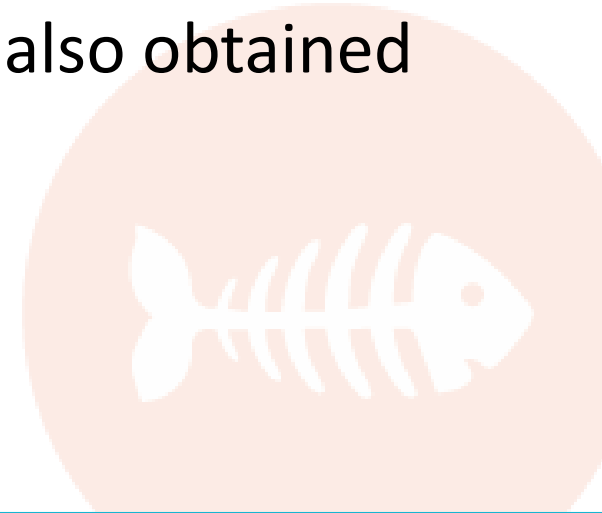
Endo-exo mixture F do not specifically producing free Glu.

Endogenous Hake Enzymes have a similar result than serine type and broad spectrum endoprotease.

A: Endo-protease of the serine type
 P: Broad-spectrum endo-protease
 F: Endo-exo-protease mixture
 E: Exopeptidase
 U: Glutaminase

In salmon frames, the best results in terms of free glutamic acid obtained per g of sample were obtained with the use of endoprotease A combined with the exopeptidase E plus the glutaminase action U.

In the case of hake, the presence of endogenous enzymes of viscera makes unnecessary the use of endoproteases. The best results are also obtained with exoprotease E plus glutaminase.



Thank you for
your attention!



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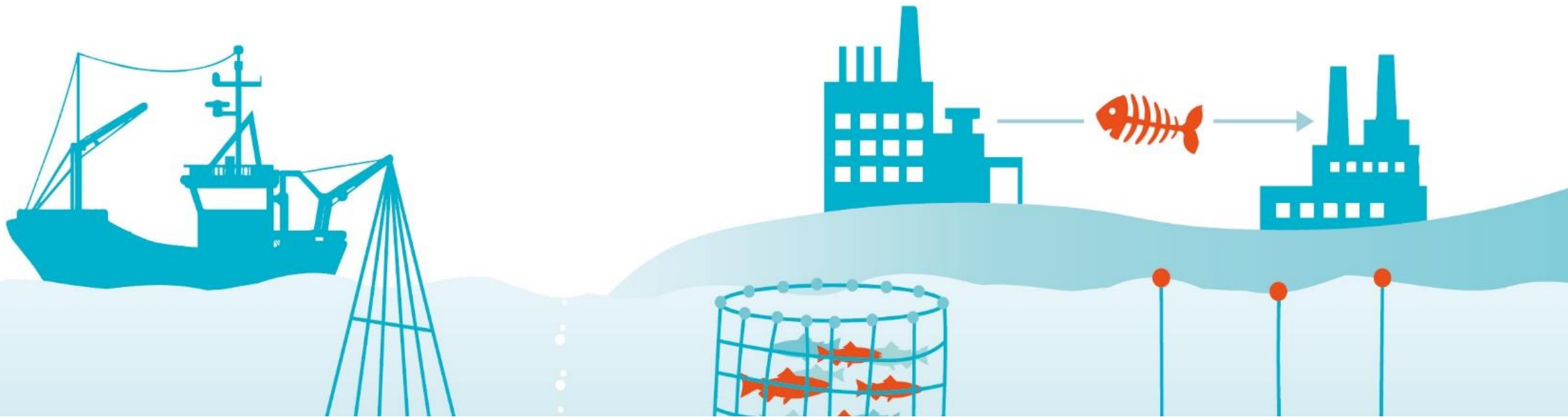
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