Valorisation of the by-product of the grape seed oil extraction

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PROTEIN-BASED FOOD INGREDIENT

HERAKLION 2019
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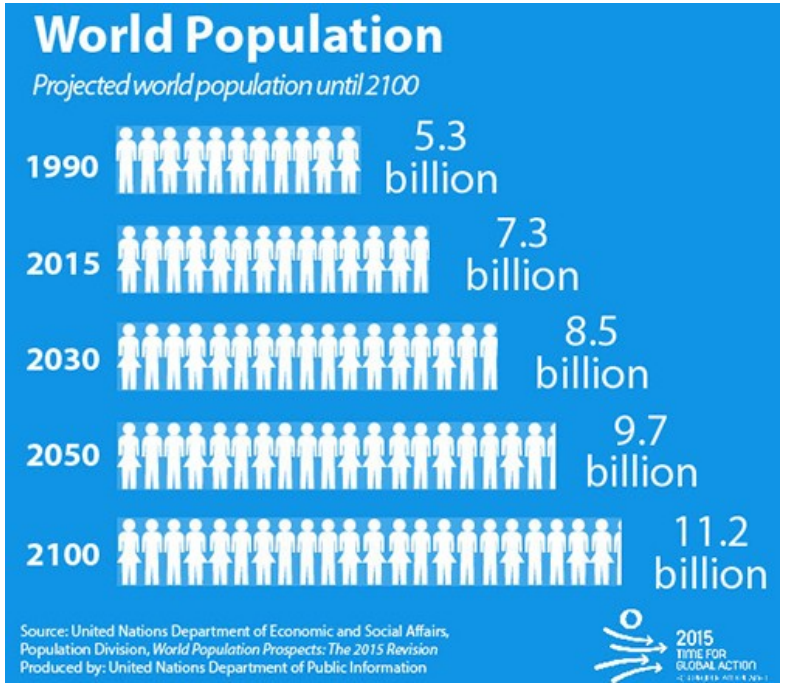
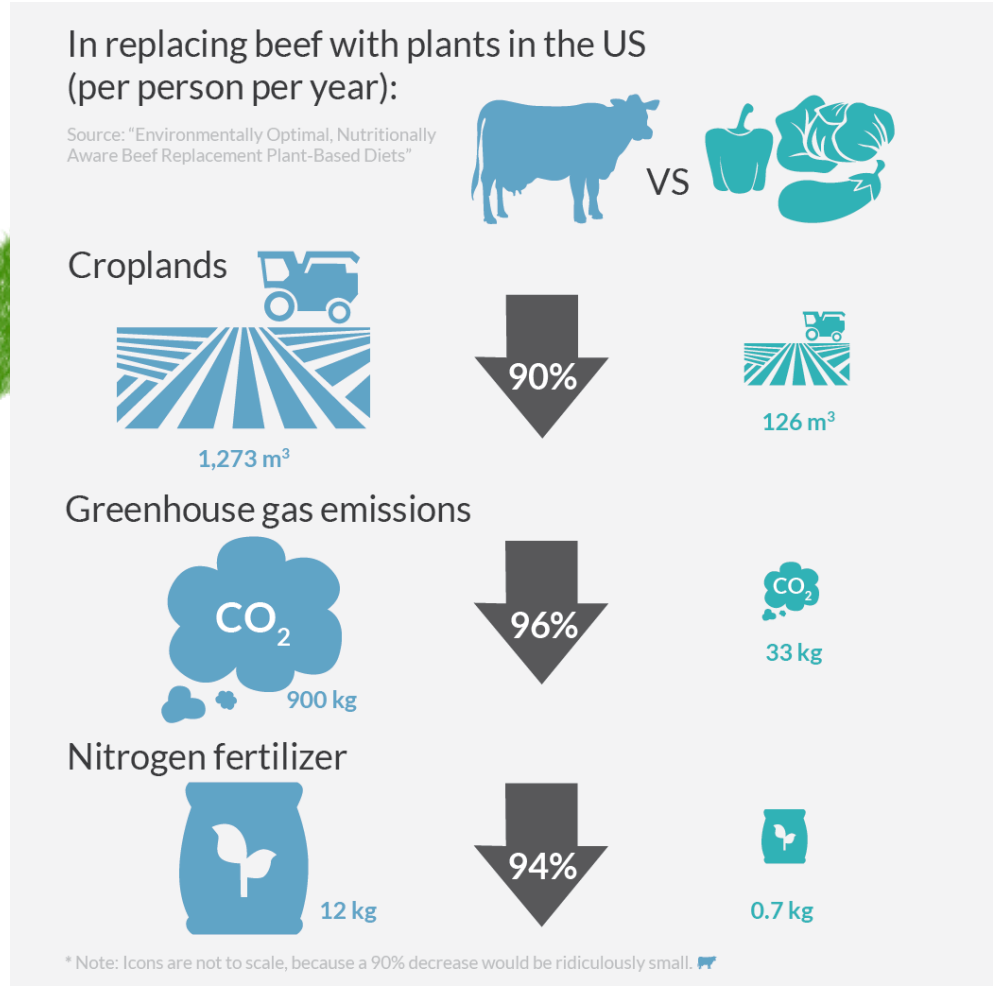
Protein quality related health outcomes

Short-term outcomes	Long-term outcomes
• Growth and tissue repair (wasting and stunting) • Immune function and host defence system (prevalence and severity of infection) • Muscle and skeletal mass (capacity for physical work and athletic performance) • Mental performance, mood, sleep patterns • Detoxication of chemical agents and anti-oxidant system	• Life course events, linear growth, menarche, aging • Age-related functional losses, muscle, bone strength, immunity, cognitive decline • Nutrition related chronic diseases. CVDs, cancer, hypertension, oxidative damage, repair systems

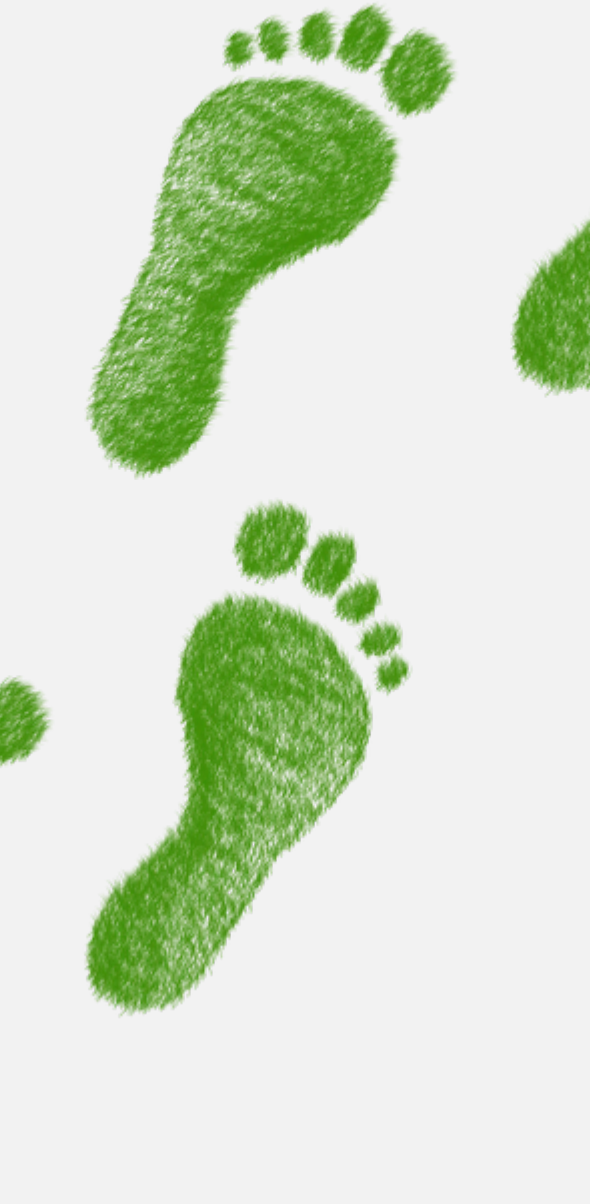
FAO-WHO. Dietary protein quality evaluation in human nutrition. FAO Food and Nutrition paper 2013;92.



PROTEIN-BASED FOOD INGREDIENT
VEGETABLE ORIGIN



Environmentally Optimal, Nutritionally Aware Beef Replacement Plant-Based Diets
Gidon Eshel, Alon Shepon, Elad Noor, Ron Milo
Environ. Sci. Technol. 2016 50, 15, 8164-8168



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VEGETABLE PROTEIN-BASED SUSTAINABLE FOOD INGREDIENTS

Improved wine-making biorefinery scheme

VINEYARD

74 million tonnes of grape harvested in 2017 worldwide

WINE INDUSTRY

Processes the 75% of the grape harvested

By-product:
Grape Pomace
Grape seeds and skins
(10 million tonnes per year)

GRAPE SEED OIL

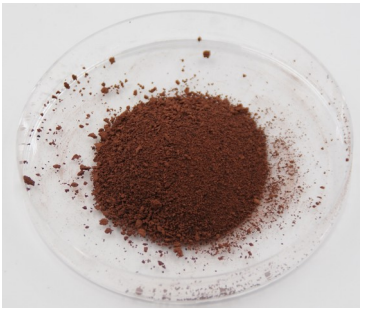
Most relevant alternative to valorise grape seed

By-product:
Defatted grape seed meal

Substrate for combustion
96,000 tonnes just in Spain per year

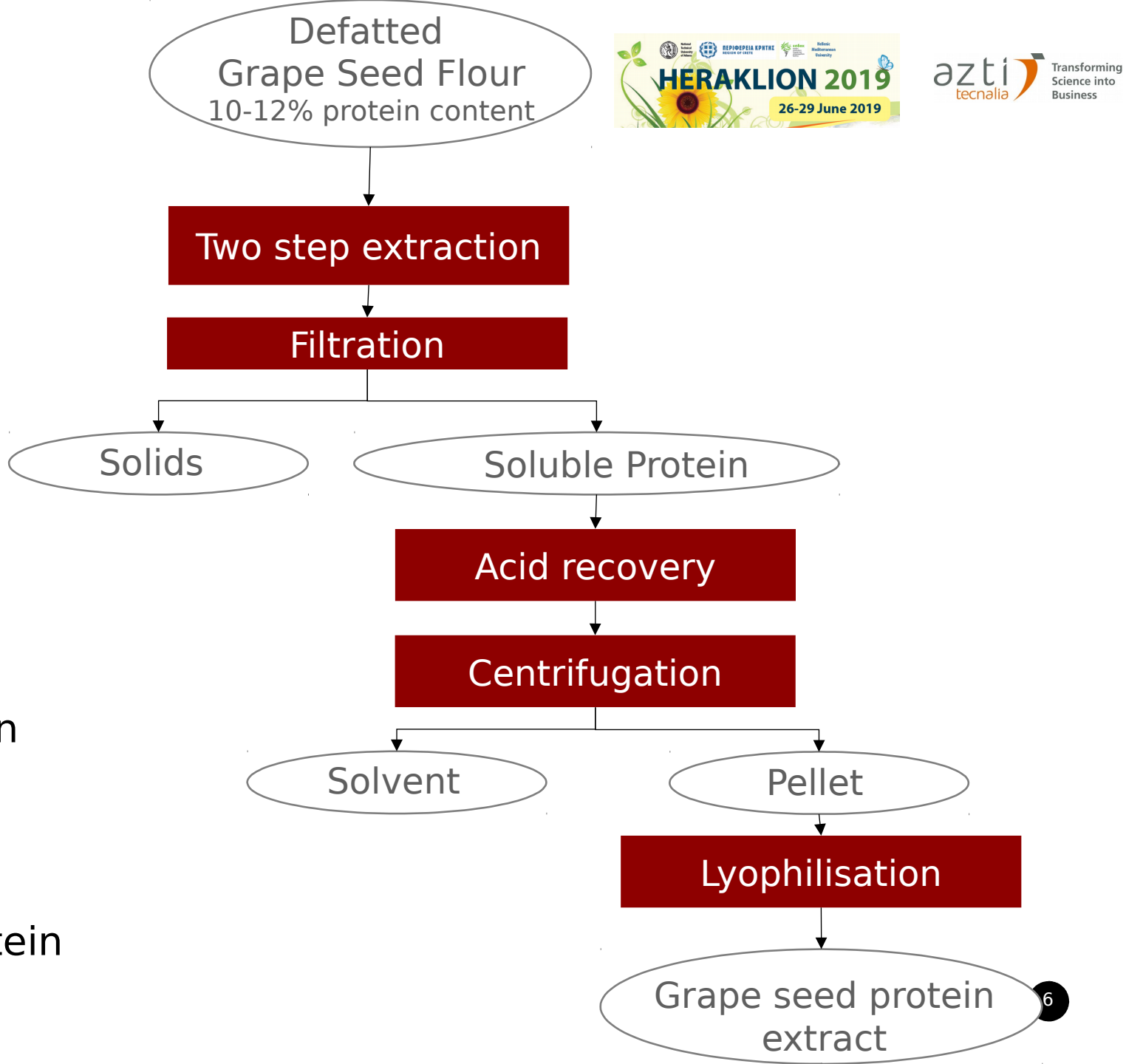
This project

NEW PROTEIN-BASED FOOD INGREDIENT



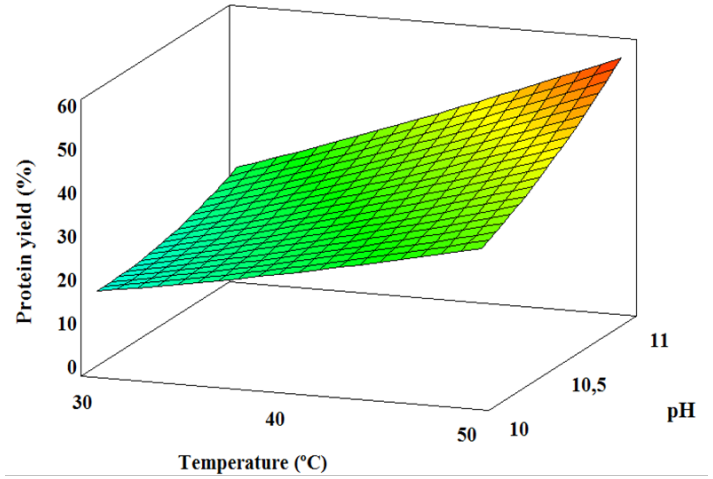
THE PROJECT

- Assessment of the effect of independent factors of extraction process
- Optimization of the alkaline extraction process for maximizing protein extraction yield
- Characterize grape seed protein extract obtained



Box-Behnken experimental design for surface response method

Independent variable		Coded factor		
		-1	0	1
Temperature (ºC)	X_1	30	40	50
Solvent/meal ratio (1: x)	X_2	4.0	9.5	15.0
pH	X_3	10.0	10.5	11.0
Time (minutes)	X_4	90	120	150

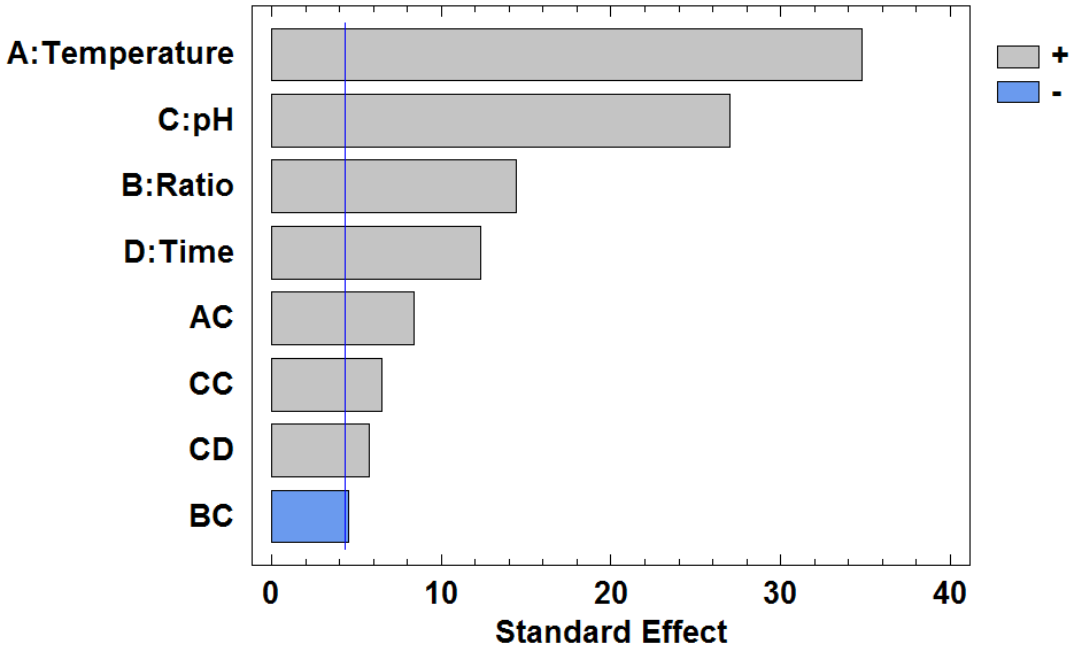


Solvent/meal Ratio: 1:15
Time: 150 min

27 Combination Tests

Protein extraction yield

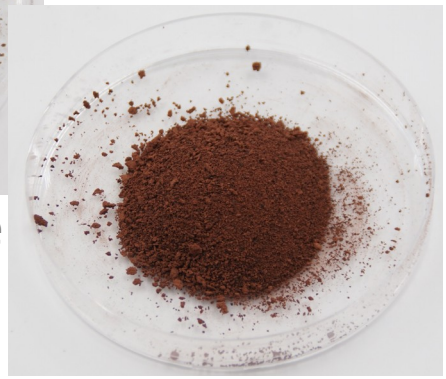
$$Y = A_0 + \sum A_i X_i + \sum A_{ii} X_i^2 + \sum A_{ij} X_i X_j$$



1 T

Defatted grape seed meal

198 kg



Grape seed extract

70 kg

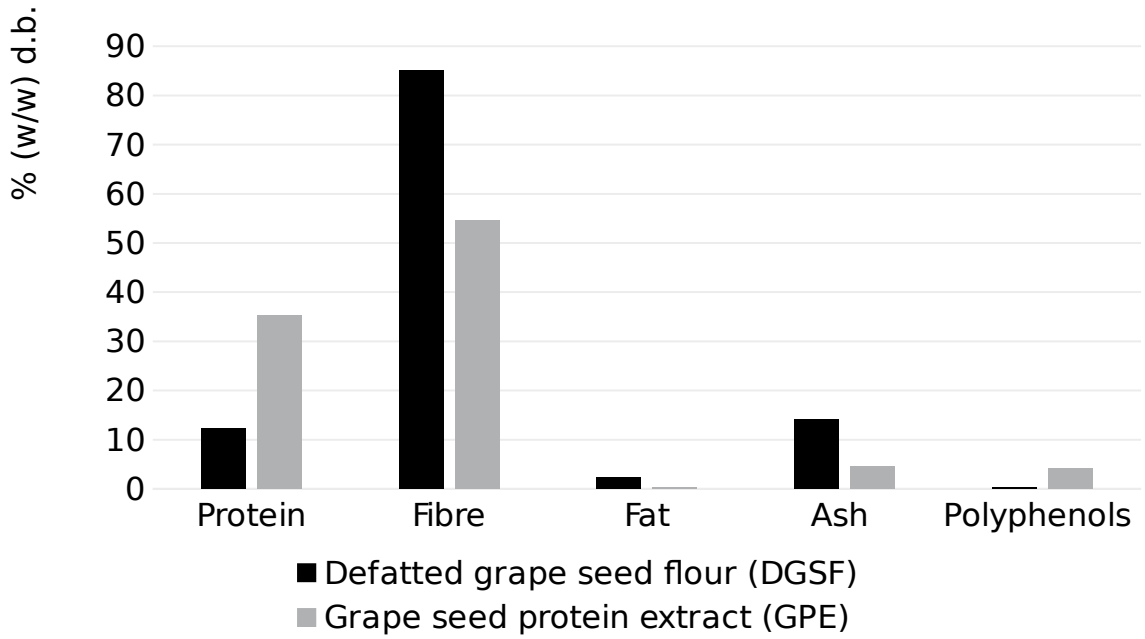
Protein

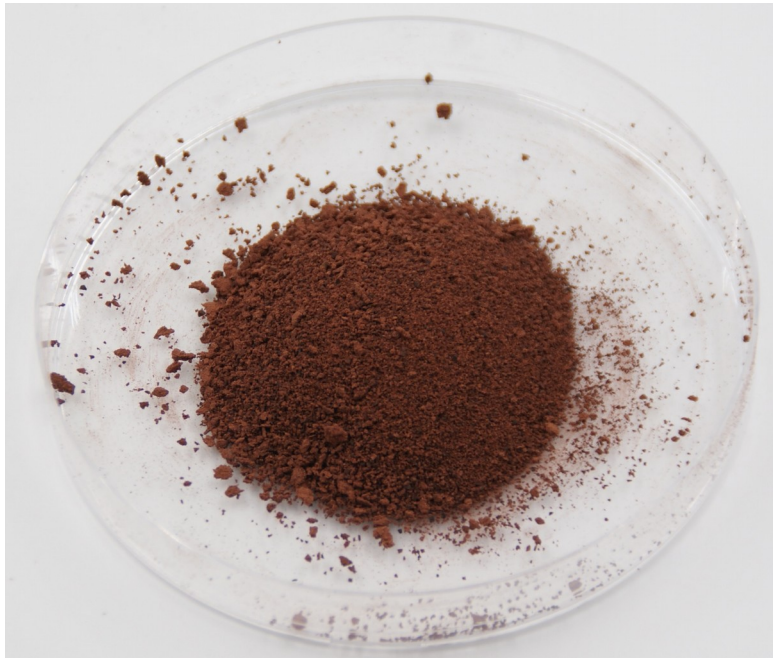
Optimizing extraction conditions for maximizing protein extraction yield

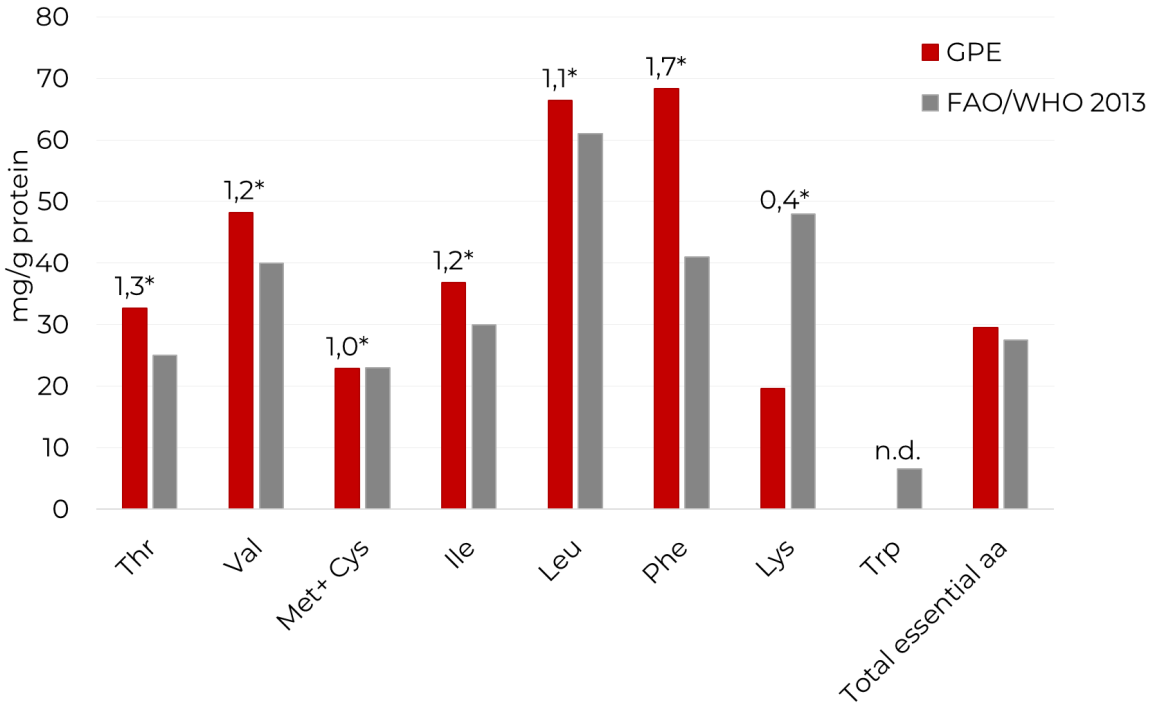
Conditions		Protein extraction yield	
Temperature	50 ºC	Predicted	Observed
Solvent/meal ratio	1:15	57.37±1.93 % (w/w)	59.12 %(w/w)
pH	11.0		
Time	150 min		

Proximal composition of grape seed extract obtained in optimized conditions (%(w/w))

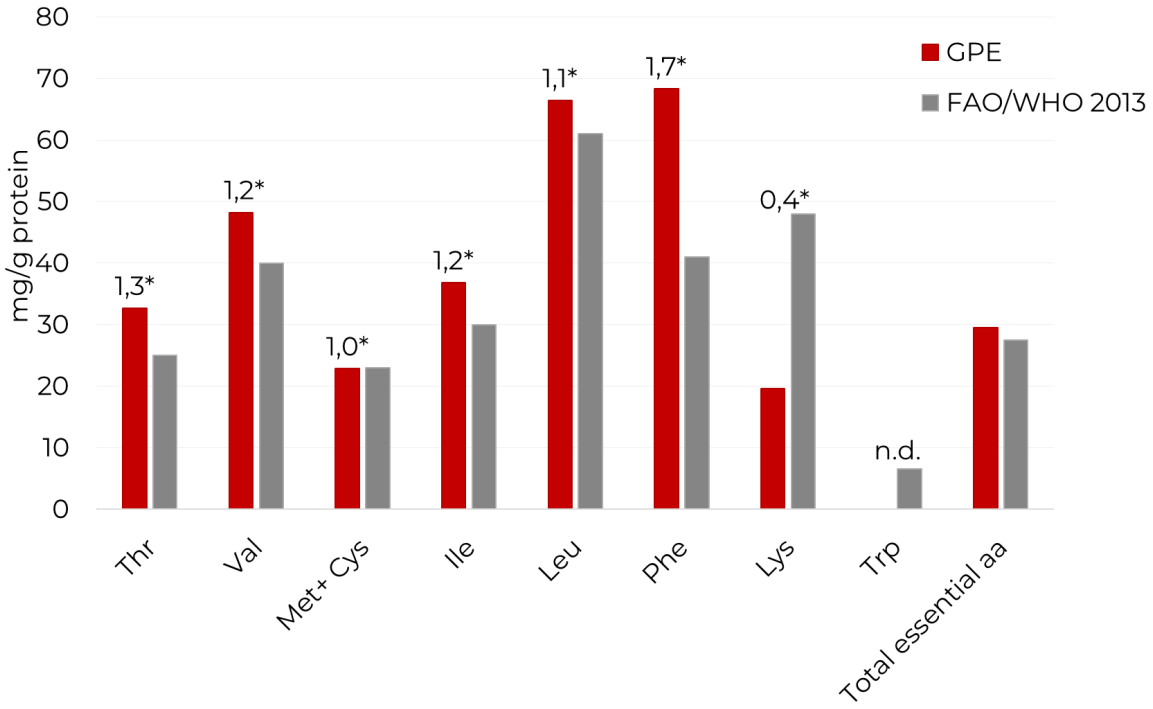
Moisture	4.36
Protein (N x 6.25)	33.78
Fat	0.29
Fiber	52.16
Ash	4.05
Polyphenols	5.84







* FAO/WHO score for essential amino-acid composition



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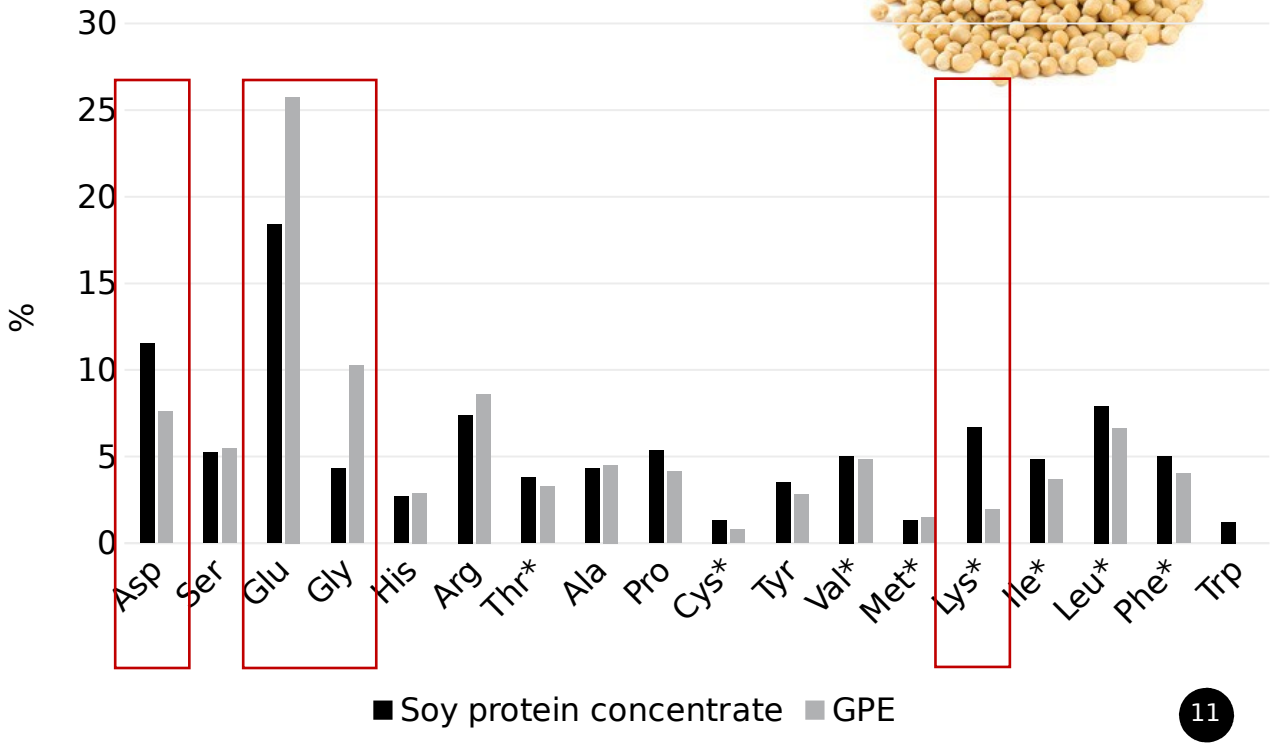
Comparing amino-acid profile



Conclusions

- ✓ The mathematical model for protein extraction developed allows to predict the extraction yield varying the conditions of temperature, solvent/meal ratio, pH and time.

- ✓ Protein extraction yield obtained in the optimized conditions is higher than those previously reported. However, the protein concentration in the extract was lower than expected and will be improved in further studies through a more selective separation step to minimize the fiber fraction.

- ✓ In order to complete the biorefinery process, potential uses for the remaining fraction after the alkaline extraction of protein will be proposed.

Future studies will evaluate technological

Valorisation of the by-product of the grape seed oil extraction

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THANKS FOR YOUR ATTENTION

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