Working Package 2
Extraction and Characterization Of Sugar Beet Leaf Proteins

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Physicochemical Properties of Protein Concentrates Isolated by Different Assisted Extraction Methods

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Presentation Flow Chart

- INTRODUCTION
- OBJECTIVE
- METHODS
- RESULTS
- CONCLUSION

INTRODUCTION

It has been determined that protein concentrates obtained as a result of different precipitation methods have different physicochemical properties.

In addition, the physical properties of protein concentrates can be improved by exploring their effects on the properties of the product in different food products such as cakes, vegan burgers, sauces, snacks and new generation foods.

(Akyüz ve Ersus, 2021)

OBJECTIVE

- ✓ To characterize the pysicochemical properties of the extracted proteins

Analysis for Physicochemical Properties

Total dry matter

Total ash

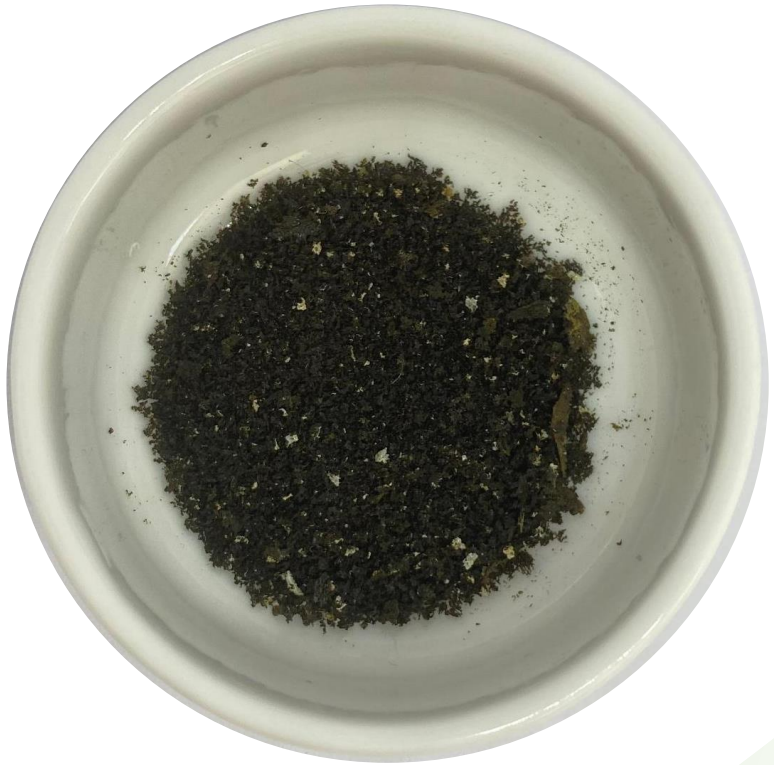
Total protein (Kjeldahl) content

Color measurements

Bulk and tapped bulk density

Protein solubility

Fourier transform infrared (FTIR) spectroscopy



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RESULTS

PROTEIN CONTENT

✓ **The protein content of the fresh sugar beet leaves and protein concentrates was determined by Kjeldahl.**

	Protein (%)
Sugar Beet Leaf	23.65±0.17

Protein Concentrates	Protein, %
ISO	**54.92±0.93^{b}**
ISO-US	**61.75±0.25^{a}**
ISO-E	**51.68±1.11^{c}**
ISO-USE	**51.60±0.67^{c}**

*Duncan test (P<0.5)

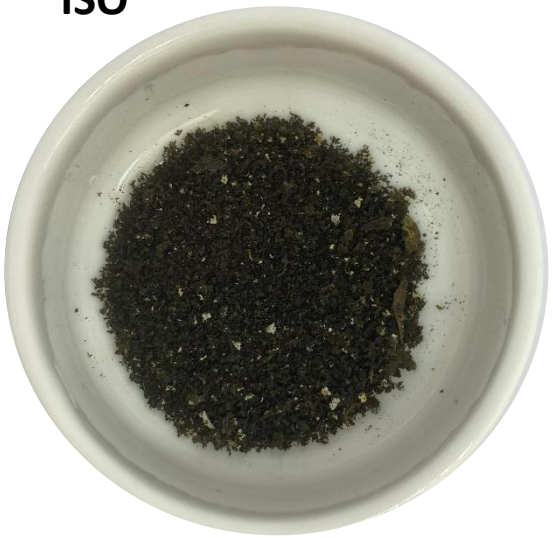
Physicochemical Properties of Protein Concentrates

Protein Concentrates	Total Dry Matter, %	Total Ash, %	Bulk Density (kg/m³)	Tapped Bulk Density (kg/m³)
Sugar Beet Leaf	16.07±0.68^{c}	19.63±0.12^{a}	-	-
ISO	95.91±0.37^{a}	5.57±0.13^{d}	284.2±3.1^{b}	332.7±3.5^{b}
ISO-US	95.51±0.11^{a}	3.94±0.24^{e}	196.7±9.4^{d}	211.5±5.6^{c}
ISO-E	91.18±0.18^{b}	9.25±0.28^{b}	257.8±4.2^{c}	343.8±7.5^{b}
ISO-USE	95.21±0.12^{a}	6.66±0.21^{c}	366.5±1.7^{a}	409.9±6.6^{a}

*Duncan test (P<0.5)

COLOR VALUES OF PROTEIN CONCENTRATES

ISO

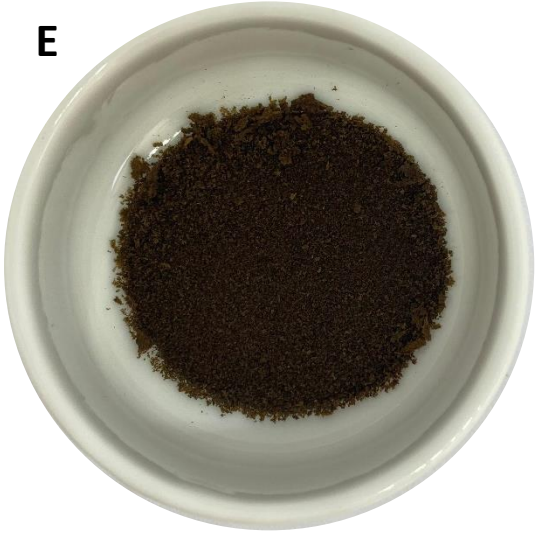


Color Values	
L*	18,88±0,08[a]
a*	1,70±0,04[b]
b*	6,40±0,16[b]

Color Values	
L*	16,91±0,12[b]
a*	0,24±0,08[c]
b*	3,14±0,09[c]

US

E



Color Values	
L*	16,74±0,12[b]
a*	5,05±0,13[a]
b*	8,61±0,33[a]

Color Values	
L*	12,36±0,30[c]
a*	0,10±0,06[d]
b*	0,40±0,10[d]

USE

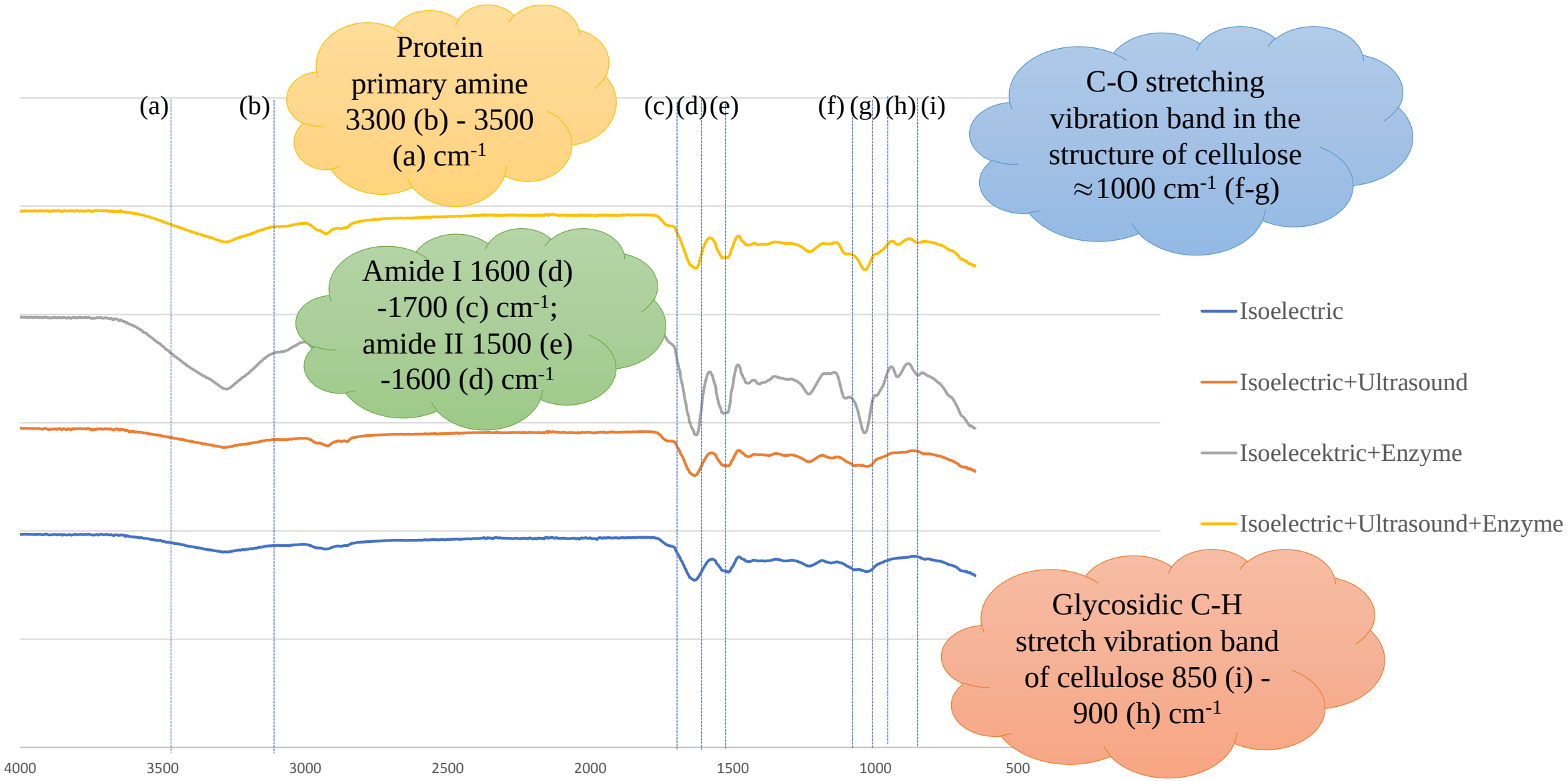
Protein Solubility

Protein solubility against different pH Values (%)			
Sample	pH 3.5	pH 7	pH 9
ISO	$7.41\pm0.79^{c,b}$	$59.19\pm0.23^{b,c}$	$87.51\pm0.45^{a,b}$
ISO+US	$6.42\pm1.24^{c,b}$	$46.77\pm1.07^{b,d}$	$76.72\pm2.30^{a,c}$
ISO+E	$7.54\pm0.43^{c,b}$	$84.57\pm1.64^{b,a}$	$97.12\pm1.21^{a,a}$
ISO+US+E	$14.58\pm0.46^{c,a}$	$65.77\pm0.45^{b,b}$	$86.47\pm1.82^{a,b}$

Data represent the mean values and standard deviations

Different letters regarding each analysis represent statistically significant differences ($P<0.05$)

Fourier Transform Infrared (FTIR) Spectroscopy



CONCLUSION

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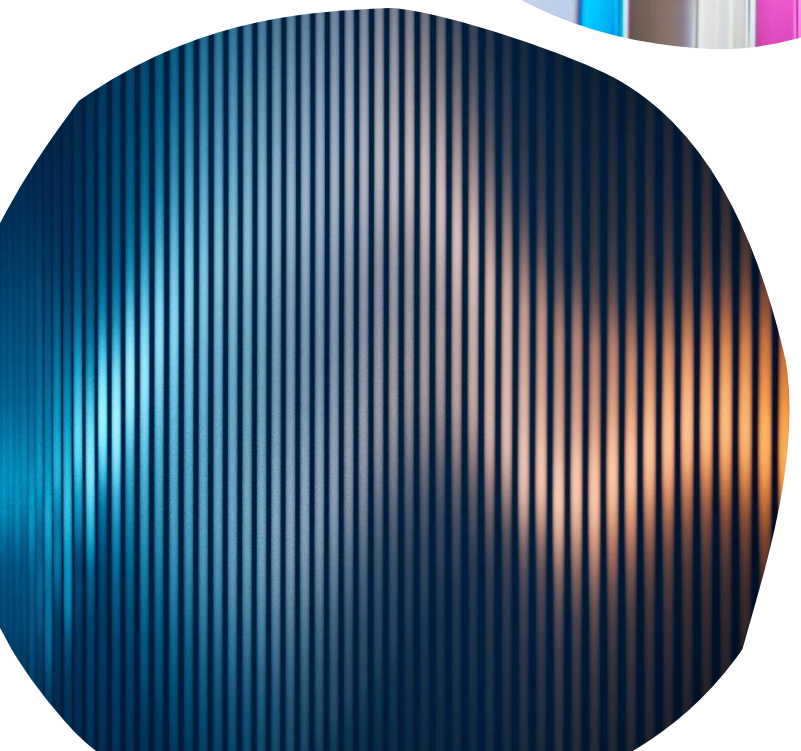
Conclusion

- The highest protein content was identified through ultrasound-assisted extraction.
- While total dry matter content did not show a statistically significant difference except for enzyme-assisted extraction, the highest ash amount was determined in enzyme-assisted extraction, and the highest bulk density and tapped bulk density were determined in enzyme+ultrasound-assisted extraction.



Conclusion

- While the best lightness (L^*) value was obtained in isoelectric extraction, the highest resolution was determined at pH value 9 and isoelectric and enzyme-assisted extraction.
- Finally, in addition to observing specific protein peaks in FTIR spectra, the presence of cellulose and cellulose derivatives content was determined by specific peaks in enzyme and ultrasound-assisted extractions.

References

References

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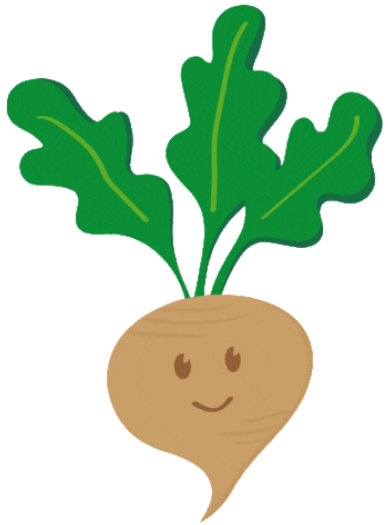
- ✓ Yang, S., Zhang, Q., Yang, H., Shi, H., Dong, A., Wang, L., & Yu, S. (2022). Progress in infrared spectroscopy as an efficient tool for predicting protein secondary structure. International Journal of Biological Macromolecules.
- ✓ Akyüz, A., & Ersus, S. (2021). Optimization of enzyme assisted extraction of protein from the sugar beet (Beta vulgaris L.) leaves for alternative plant protein concentrate production. Food Chemistry, 335, 127673.



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- THANK YOU FOR YOUR PARTICIPATION...