



Working Package 2
Extraction and
Characterization
Of Sugar Beet Leaf
Proteins

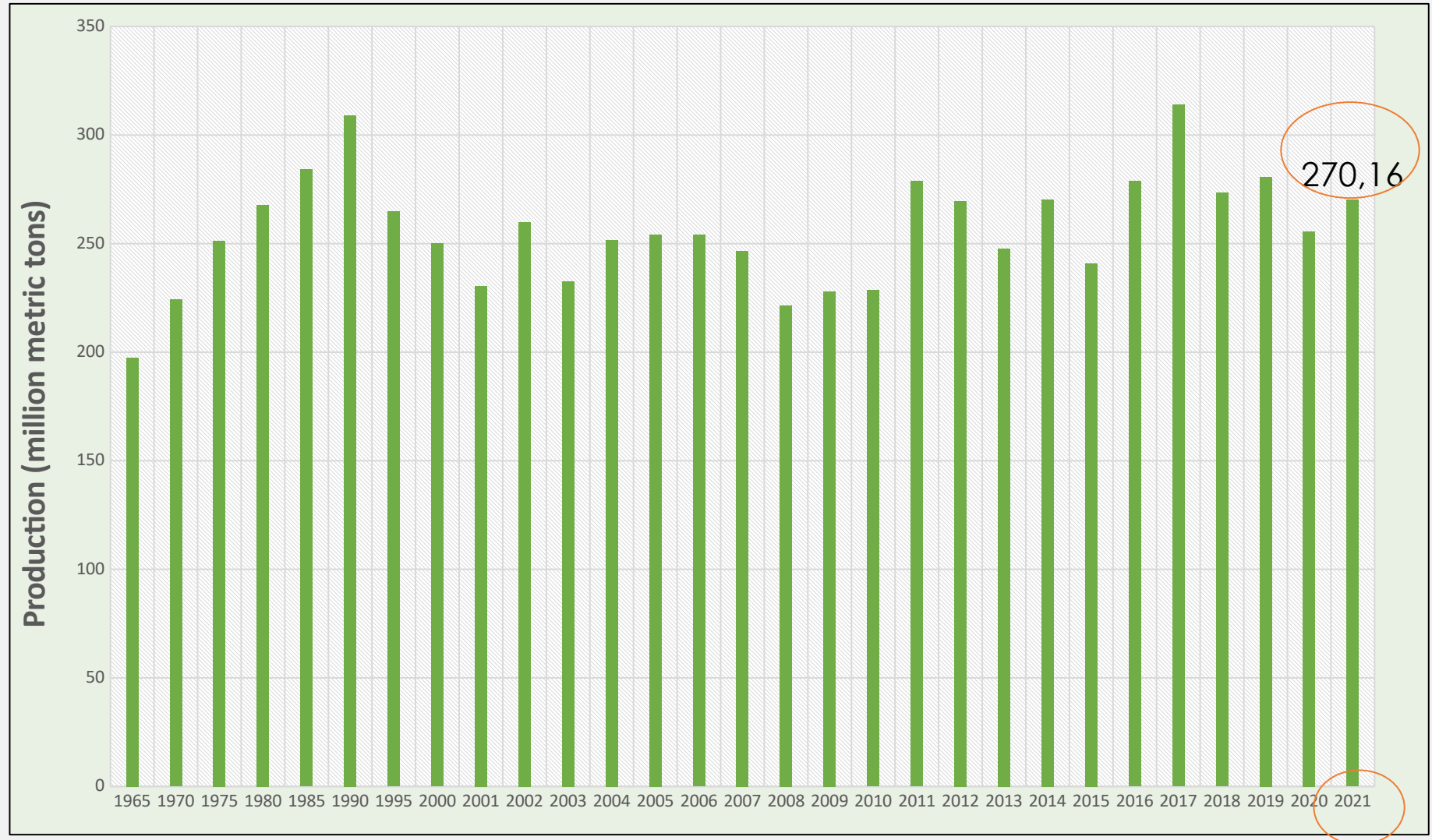


Comparison of some assisted extraction methods to improve protein yield from sugar beet leaves

Assoc. Prof. Seda ERSUS

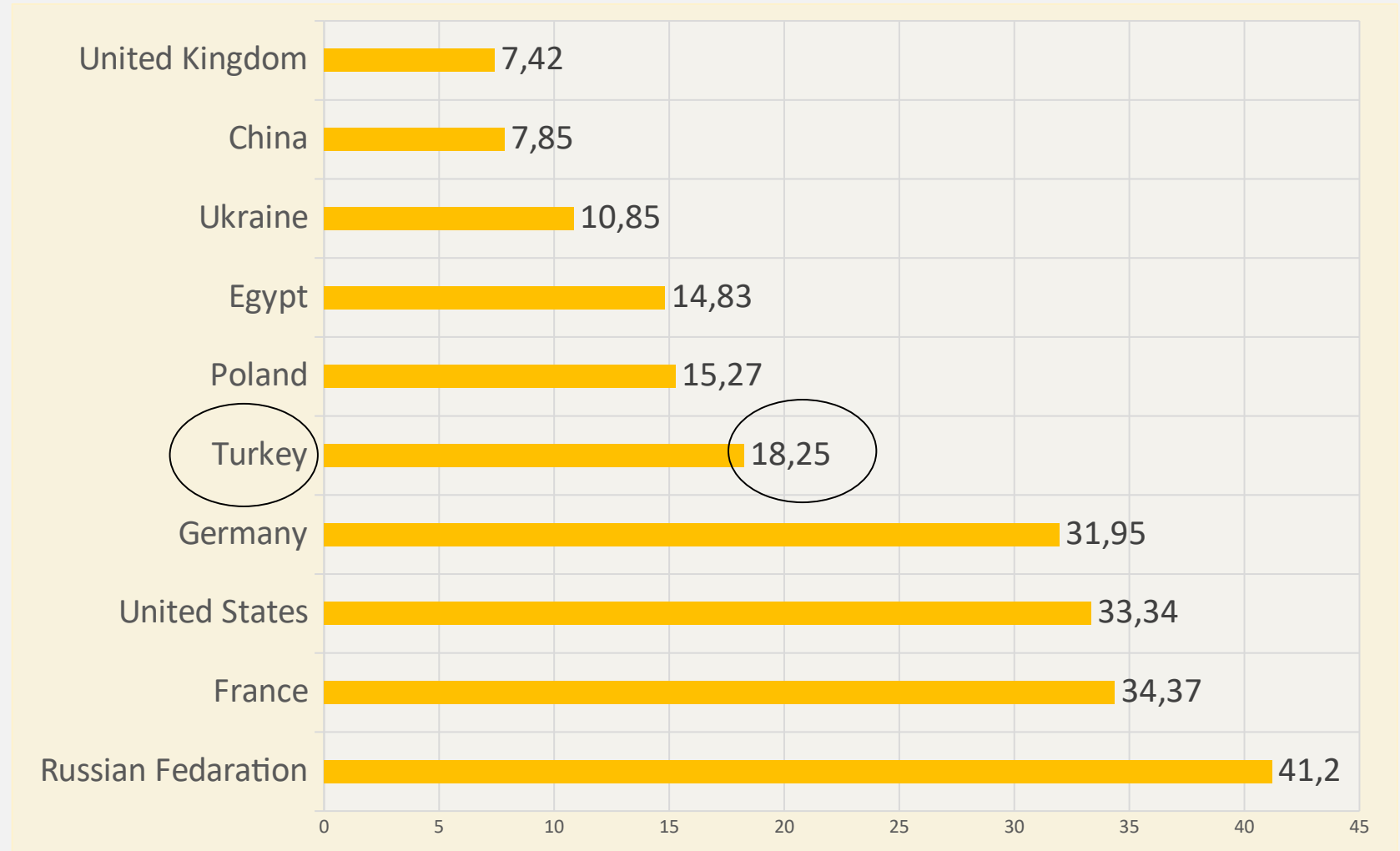
Ph.D. Candidate Ayça AKYÜZ

SUGAR BEET PRODUCTION WORLDWIDE



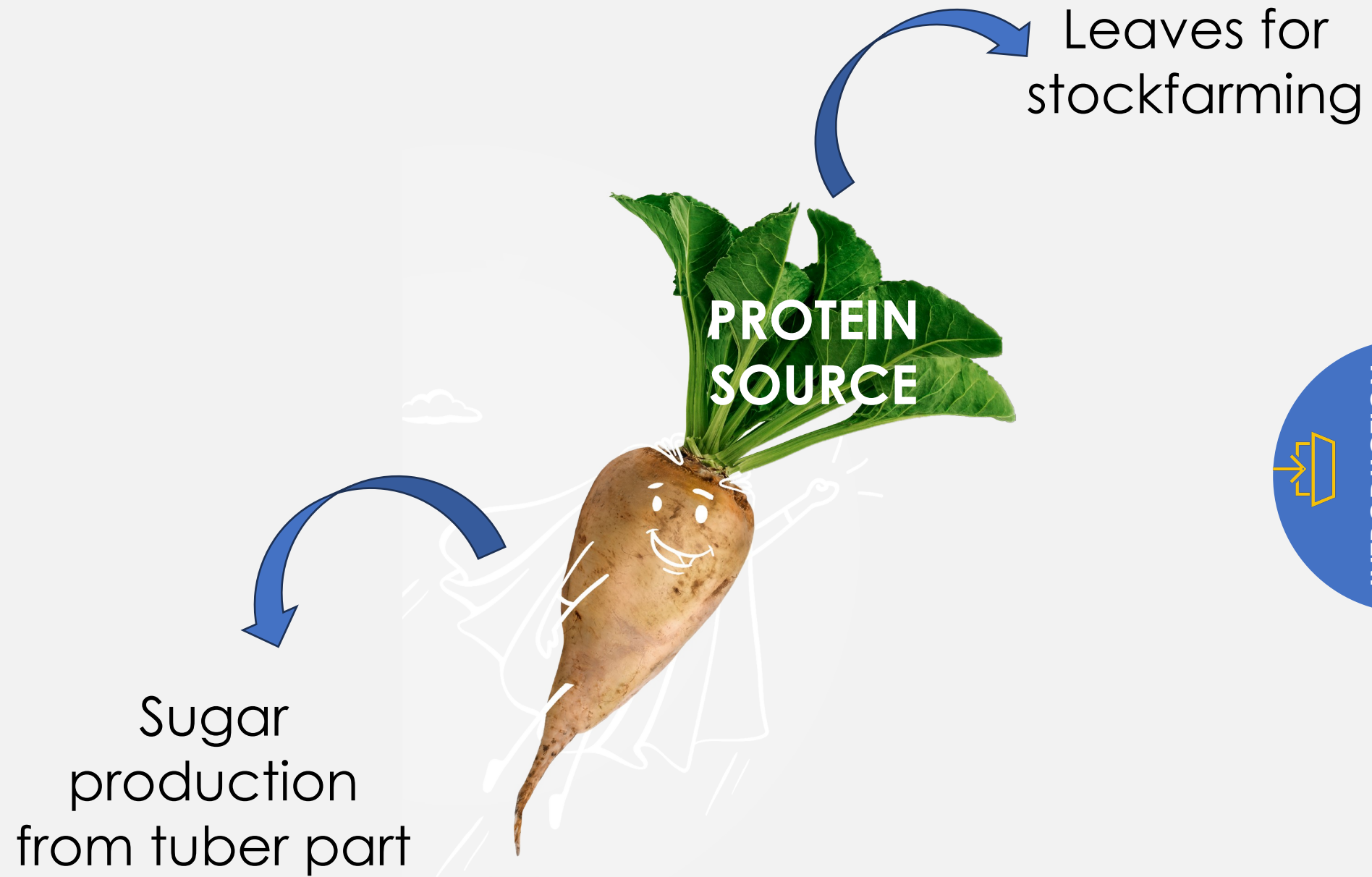
(Statista, 2023)

Leading sugar beet producers worldwide in 2021

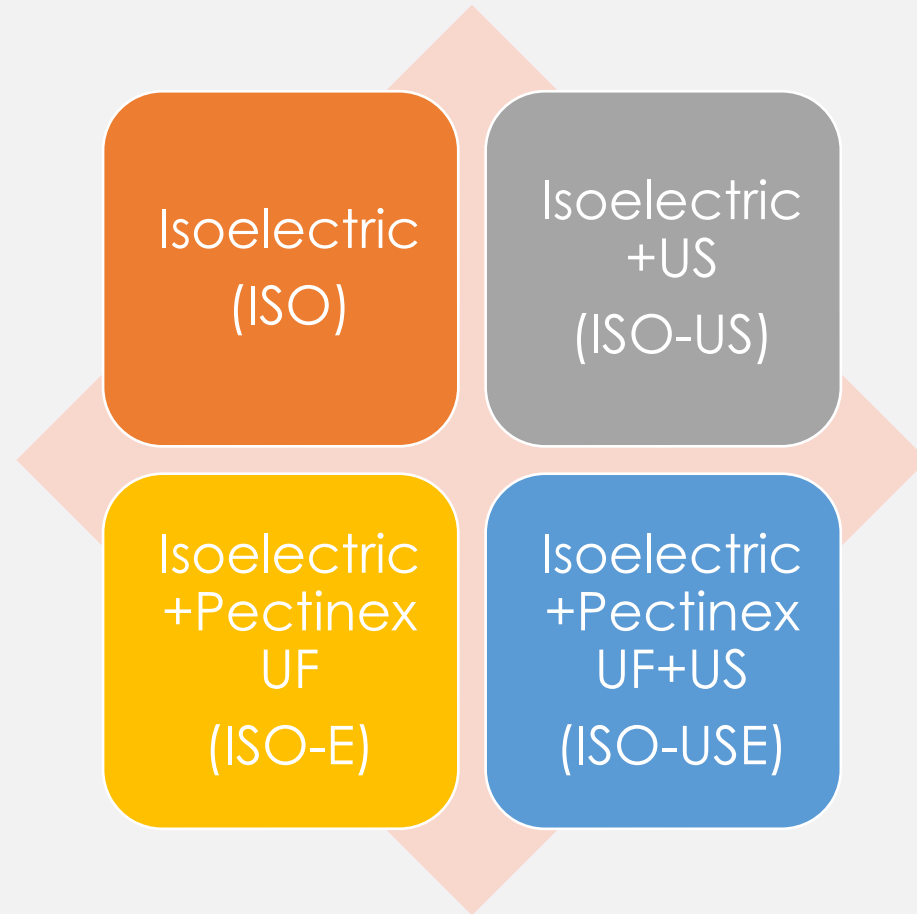


(Statista, 2023)





The efficiencies of 4 different assisted extraction methods which is determined in the previous meeting are compared to detect the best method for maximum yield.





- ✓ The sugar beet leaves were supplied from Kayseri Sugar Company in July-August 2023.
- ✓ The methods;
 - ✓ 4 extraction methods; isoelectric, ultrasound assisted, enzyme assisted and enzyme-ultrasound assisted
 - ✓ Total dry matter (Raw material and all protein concentrates)
 - ✓ Total protein (Raw material and all protein concentrates-Kjeldahl)
 - ✓ Total ash (Raw material)
 - ✓ Protein yield (Protein concentrates produced from different assisted extraction)



PROTEIN ISOLATION METHODS

ENZYME-ULTRASOUND ASSISTED
ISOELECTRIC PRECIPITATION
ULTRASOUND ASSISTED ENZYME ASSISTED



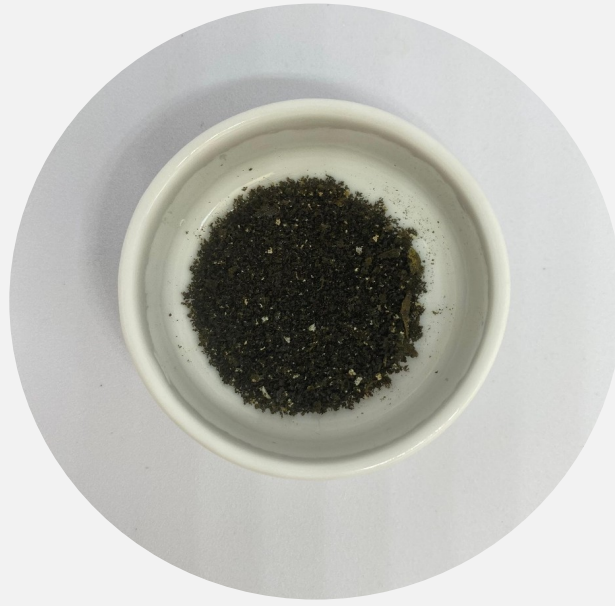
PHYSICOCHEMICAL PROPERTIES OF SUGAR BEET LEAVES

	2022 Harvest		2023 Harvest
Total dry matter, %	16.40±0.24 ^a	≈	16.07±0.68 ^a
Protein, % (Wet basis)	4.73±0.05 ^a	↓	3.80±0.03 ^b
Protein, % (Dry basis)	28.88±0.29 ^a	↓	23.65±0.17 ^b
Total ash, % (Dry basis)	17.78±0.42 ^b	↑	19.59±0.11 ^a

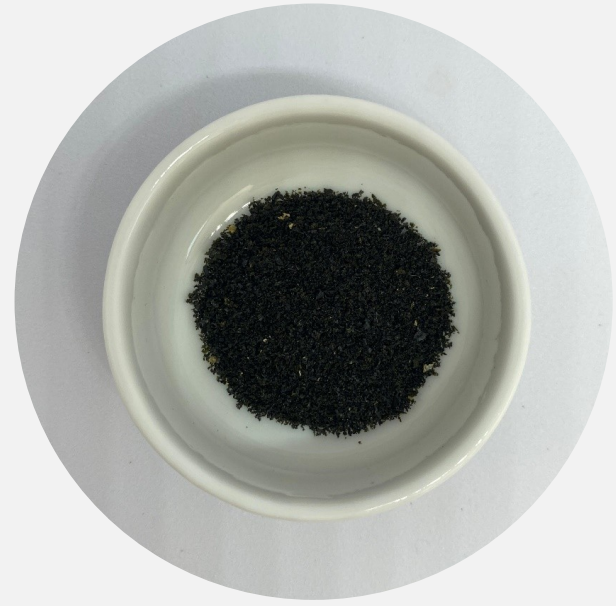
Data represent the mean values and standard deviations

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

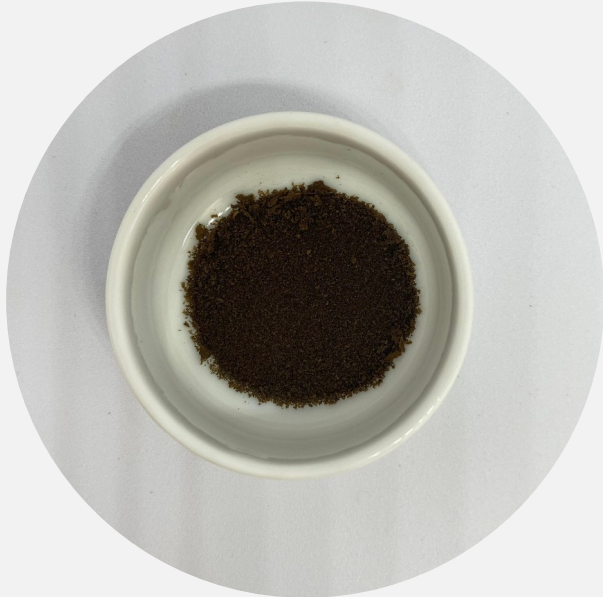




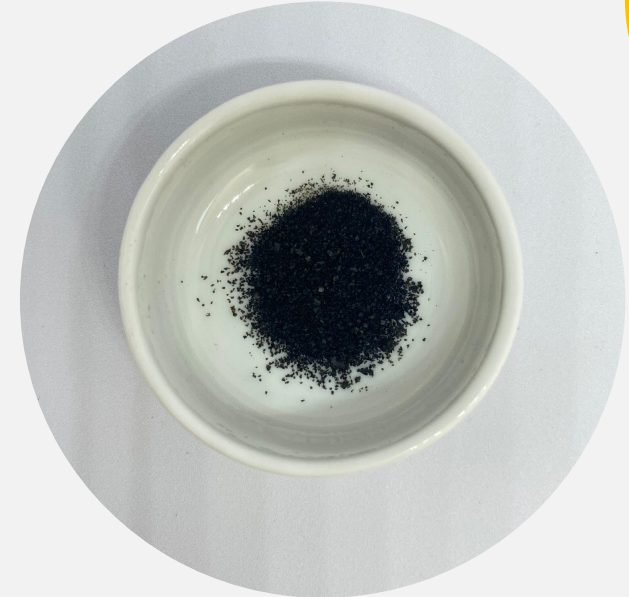
ISO



ISO-US



ISO-E



ISO-USE

COMPARISON OF EXTRACTION METHODS ACCORDING TO PROTEIN YIELD

METHOD	INITIAL AMOUNT OF LEAF	FINAL AMOUNT OF POWDER	POWDER/LEAF	PROTEIN%	PROTEIN YIELD, %
ISO	70.6219	0.9380	0.0133	54.92±0.93 ^b	19.19±0.59 ^d
ISO-US	70.4212	1.9143	0.0272	61.75±0.26 ^a	44.17±1.13 ^c
ISO-E	30.1144	1.0720	0.0356	51.68±1.11 ^c	48.38±1.66 ^b
ISO-USE	10.6389	0.6909	0.0649	51.60±0.67 ^c	88.18±1.47 ^a

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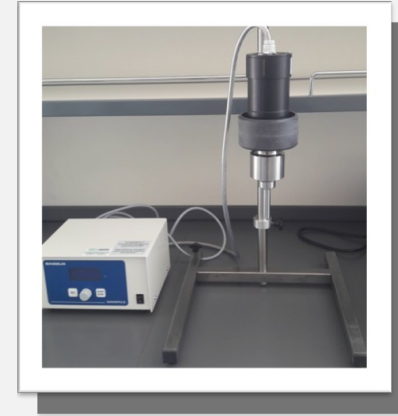


RESULTS

CONCLUSION

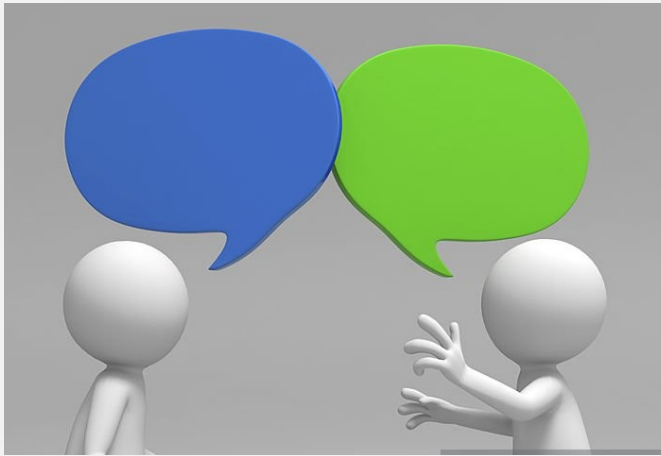
REFERENCES

- ✓ While the highest protein content was determined by ultrasound assisted extraction, the highest protein yield was detected by enzyme-ultrasound assisted extraction.



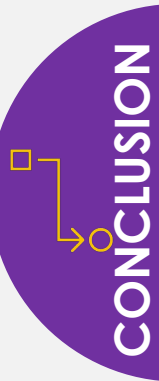
- ✓ The reason for this is that a greater amount of protein powder is obtained from a certain gram of leaves with enzyme-ultrasound-assisted extraction.





- ✓ Although the best method is enzyme-ultrasound assisted extraction, there is a controversy situation in enzyme usage.

- ✓ When considered on a large scale, the cost of using high amounts of enzymes and the sustainability of enzyme use should be evaluated in this context.
- ✓ However, the enzymes are also proteins. During isolation process, the enzymes are denatured. Therefore, the protein content of powder could be increased with denatured enzymes.





- ✓ Another criterion will be that the proteins have the desired functional properties in the products to be used.



- ✓ Statista, (2023). Sugar beet production worldwide from 1965 to 2021 (in million metric tons), Data accessed on January 5, 2023
- ✓ Statista, (2023). Leading sugar beet producers worldwide in 2021, based on production volume, Data accessed on January 6, 2023
- ✓ 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.



THANK YOU FOR YOUR PARTICIPATION...

