



PROTEIN EXTRACTION FROM BIOETHANOL BY-PRODUCTS FOR HUMAN CONSUMPTION USING LIQUID HOT WATER PRETREATMENT

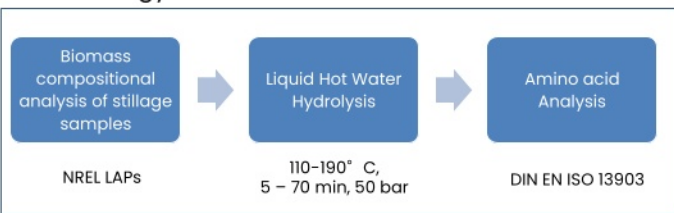
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Motivation and Introduction

- Growing global demand for sustainable, plant-based protein sources [1]
- Declining availability of arable land caused by climate change and soil degradation
- Dried distillers grains (DDG), a by-product of bioethanol production has a protein content between 20-40%
- Potential for sustainable valorization of stillage as a protein source for human consumption
- Liquid Hot Water (LHW) treatment for protein recovery : chemical-free pretreatment method
- Improved solvation properties due to changes of its chemical and physical properties [2]



Methodology



Results

Biomass compositional analysis

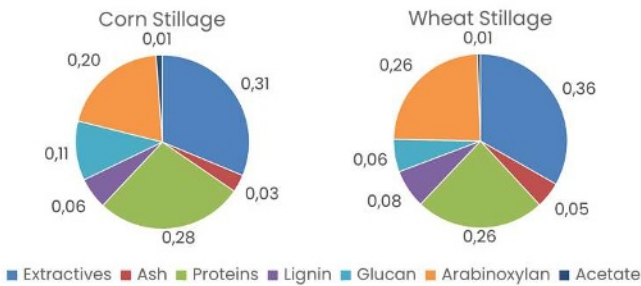


Image 1: Results of compositional analysis of corn and wheat DDG from bioethanol production based on the dry weight

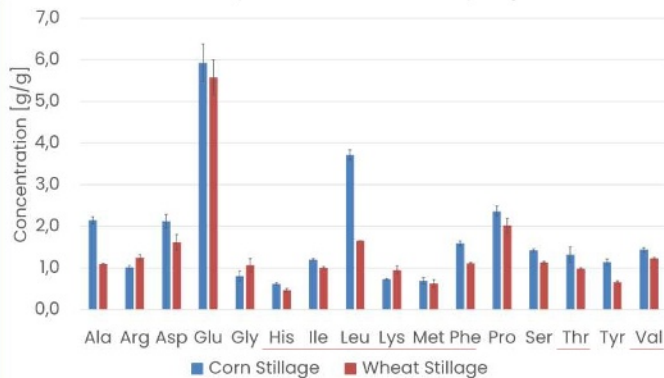


Image 2: Concentration of 16 Amino acids in corn and wheat DDG

Table 1: Phenolic compounds in corn and wheat DDG

Sample	Vanillin [mg/L]	p-Coumaric Acid [mg/L]	Ferulic Acid [mg/L]
Wheat DDG	<2	2,6	39
Corn DDG	2,1	13,5	110

Liquid Hot Water Treatment

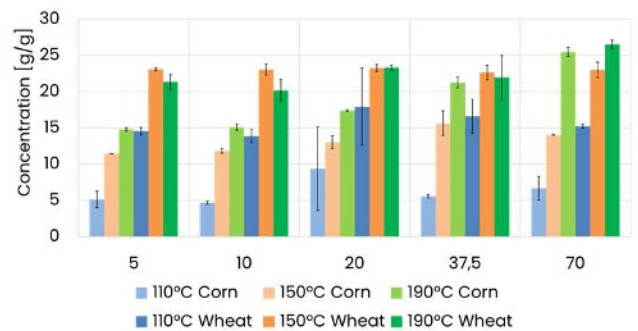


Image 3: Protein concentration of hydrolysates after hydrothermal pretreatment at 110, 150 and 190° C from 5 to 70 min

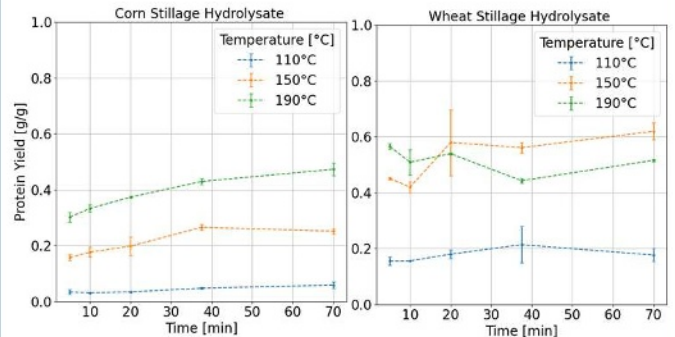


Image 4: Total protein yield in hydrolysate after hydrothermal pretreatment of corn and wheat DDG at 110, 150 and 190° C from 5 to 70 min

Conclusion

The optimal pretreatment conditions vary between corn and wheat DDG. Corn DDG yielded the highest protein recovery at 190° C, whereas wheat stillage showed better results at a lower temperature of 150° C.

Protein concentration in the hydrolysate remains low, indicating the presence of other valuable compounds. Further research is needed to characterize these components for potential applications.

References

- [1] T. Kirner and B. Manns, "Nachhaltige Ernährung der Zukunft - Beitrag alternativer Proteinquellen," in Die UN-Nachhaltigkeitsziele als interdisziplinäre Herausforderung: Aufgaben, Aspekte und Ansätze, S. Beier, P. Hense, C. Klümper, S. Lechtenböhmer, and C. Reicher, Eds., Wiesbaden: Springer Fachmedien Wiesbaden, 2024, pp. 139-155.
- [2] B. Yang, L. Tao, and C. E. Wyman, "Strengths, challenges, and opportunities for hydrothermal pretreatment in lignocellulosic biorefineries," *Biofuels, Bioproducts and Biorefining*, vol. 12, no. 1, pp. 125-138, 2018.