

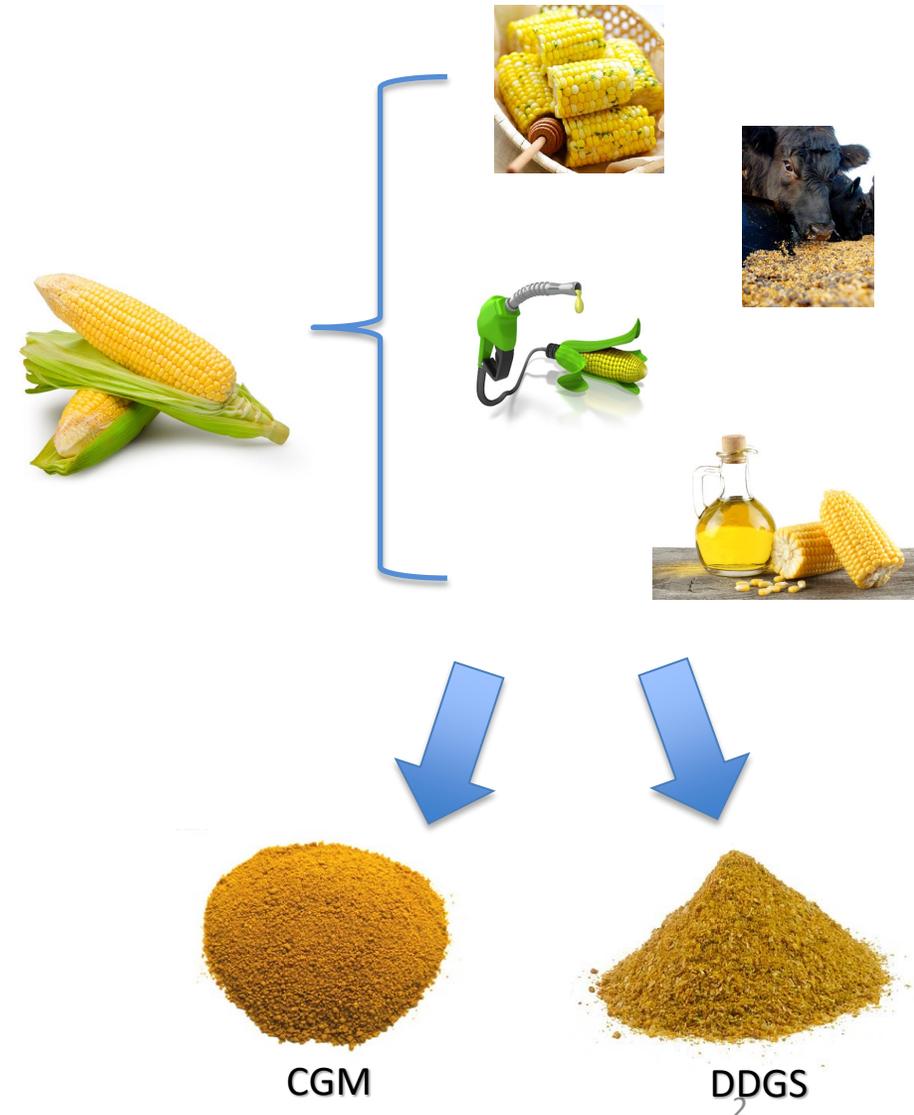


Developing Antioxidants from Corn Distiller's Dried Grains with Solubles (DDGS)

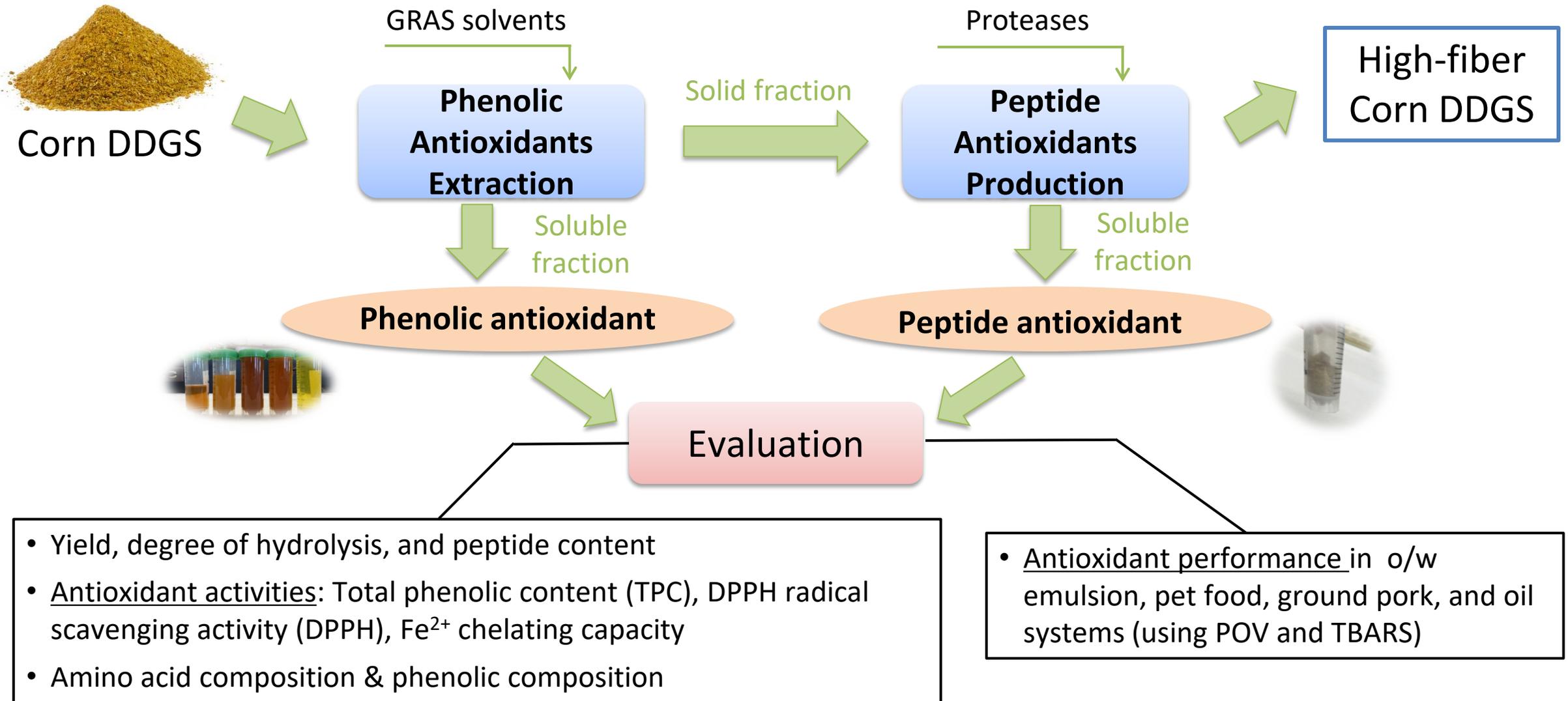
- DGTC Symposium
- Ruijia Hu
- Major professor: Yonghui Li
- 05.11.2022

Introduction

- According to USDA, 5360 million bushels of corn were processed through dry milling to produce ethanol in 2020, generating protein-rich distillers' dried grains with solubles (DDGS) as the major coproduct.
- **High phenolic content**
 - The highest total phenolic content (up to 1.5%, dry basis) among common whole grains
 - especially in bran and germ
- **High protein content**
 - About 30% protein (dry basis)
 - specific protein hydrolysates produced from corn proteins exerted significant antioxidant properties
 - Enzymatic hydrolysis can release functional peptides and domains, which significantly improved their functionality and antioxidant capacity

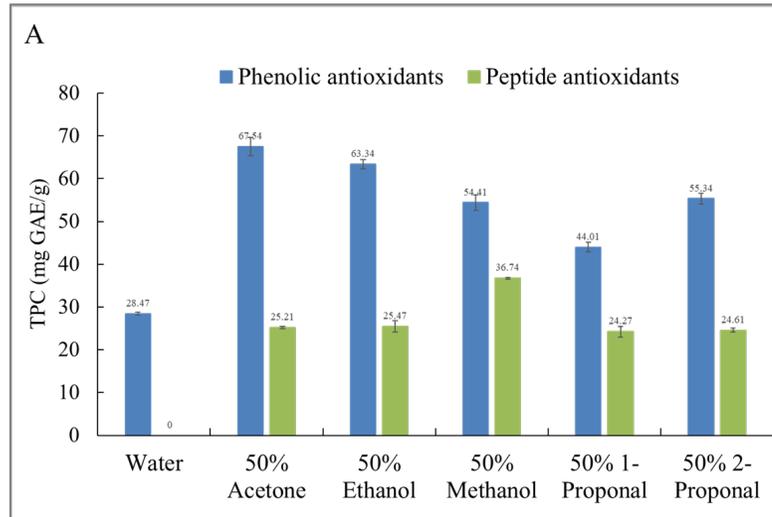


Materials and Methods

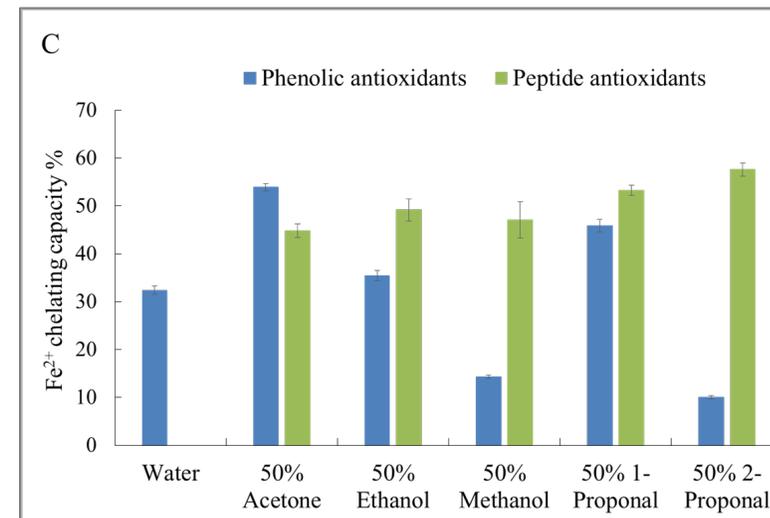
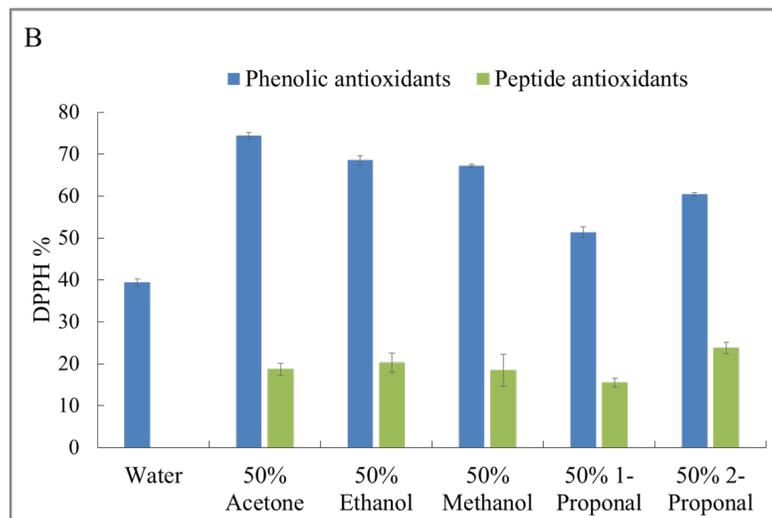


Results and Discussion

- Total phenolic content (Fig. A); DPPH scavenging activity (Fig. B); and Fe²⁺ chelating activity (Fig. C).

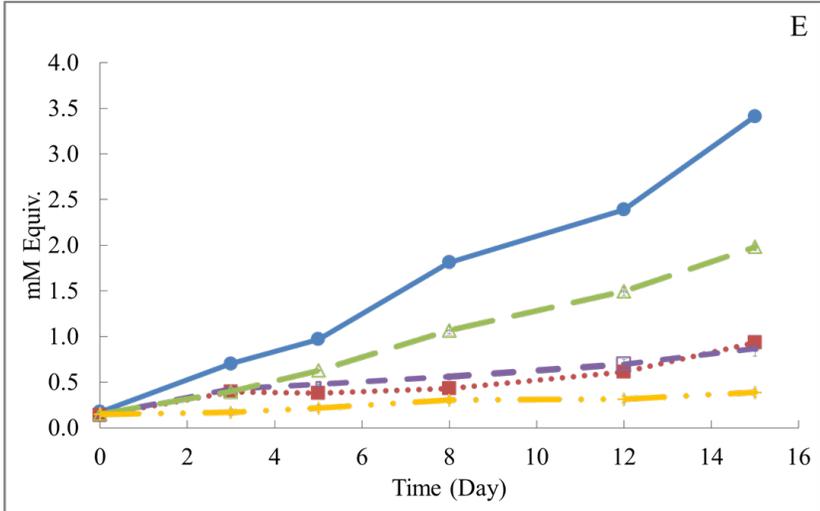
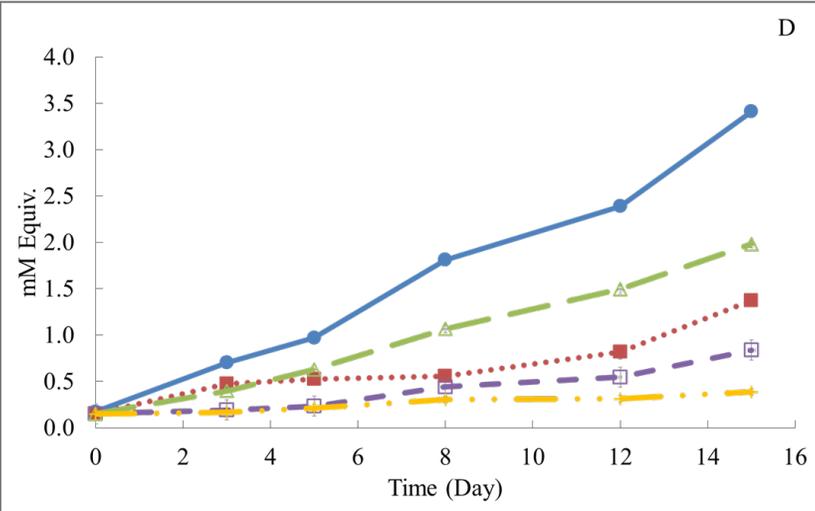


- Phenolic extracted by 50% acetone had the highest TPC (67.54 mg GAE./g), followed by that extracted by 50% methanol (63.34 mg GAE./g).
- Phenolic compounds from DDGS showed higher DPPH scavenging activity than peptides.
- Peptide antioxidants had better Fe²⁺ chelating capacity than phenolic antioxidants



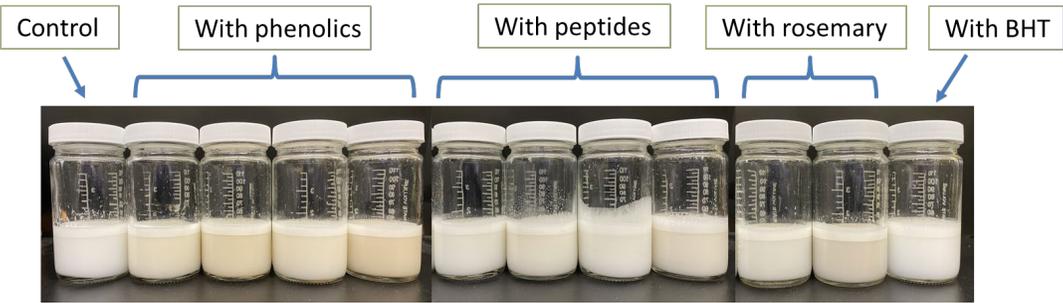
Results and Discussion

➤ Peroxide values of emulsions with phenolic antioxidants (Fig. D), and peptide antioxidants (Fig. E).



- Emulsions containing phenolic, or peptide antioxidants showed slower oxidation trend with lower POV value during 15 days incubation comparing to the control

- Control
- 1 mg/mL Phenolic -50% acetone
- 1 mg/mL Phenolic -50% ethanol
- 1 mg/mL Rosemary extract
- 1 mg/mL BHT



- POV of samples on day 15



- From left to right: Control, with phenolic extracted by 50% acetone (1 and 2.5 mg/mL), with phenolic extracted by 50% ethanol(1 and 2.5 mg/mL), with peptides from acetone-extracted DDGS (1 and 2.5 mg/mL), with peptides from methanol-extracted DDGS (1 and 2.5 mg/mL), with commercial rosemary extracts (1 and 2.5 mg/mL), with 1mg/mL BHT.

Conclusions

- Phenolic and peptide antioxidants produced from corn DDGS showed antioxidant potentials based on several chemical assays including TPC, DPPH and metal chelating.
- Our study also provided evidences that the antioxidants from corn DDGS can enhance oxidation stability in emulsions by effectively retarding the oxidation.
- Overall, the phenolic and peptide antioxidants showed great potential as naturally derived antioxidants.

Acknowledgements

❖ **The USDA/NIFA/AFRI Grant no. 2020-68008-31408 (2020-2023)**

❖ **The Kansas Corn Commission (2017-2020)**

❖ **Related publications**

- R. Hu, J. Xu, G. Qi, W. Wang, X. S. Sun, Y. Li*. 2022. Antioxidative hydrolysates from corn gluten meal may effectively reduce lipid oxidation and inhibit HepG2 cancer cell growth. *Journal of Agriculture and Food Research*, 7, 100252.
- R. Hu, G. Chen, Y. Li*. 2020. Production and Characterization of Antioxidative Hydrolysates and Peptides from Corn Gluten Meal using Papain, Ficin, and Bromelain. *Molecules*. 25, 4091.
- R. Hu, K. M. Dunmire, C. N. Truelock, C. B. Paulk, G. Aldrich, Y. Li*. 2020. Antioxidant Performances of Corn Gluten Meal and DDGS Protein Hydrolysates in Food, Pet Food, and Feed Systems. *Journal of Agriculture and Food Research*. 2, 100030.



Questions?