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**Progress Report**

PROJECT TITLE: Recovery and Use of Value-Added Corn Functional Ingredients

PROJECT NUMBER:

REPORTING PERIOD: Jan 31, 2020

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1.) PROJECT ACTIVITIES COMPLETED DURING THE REPORTING PERIOD. (*Describe project progress specific to goals, objectives, and deliverables identified in the project workplan.*)

A national survey of ethanol plants is currently in progress to determine the current level of interest in value addition from corn fractions from the ethanol plants. This survey was distributed electronically through collaboration with Dr. Kurt Rosentrater, Distillers Grains Technology Council. It is hoped that findings from this survey will be presented at the next meeting of the DGTC in Omaha, Nebraska.

<https://app.smartsheet.com/b/form/6e60b41ba82a4f289d8e81f90e7b2607>

The survey contains over 30 question and the findings will be helpful in developing “actionable” information in relation to research needs and resource development. The response rate has been slow so far. We will determine an alternate strategy to encourage wider participation by the respondents.

2.) IDENTIFY ANY SIGNIFICANT FINDINGS AND RESULTS OF THE PROJECT TO DATE.

Raw DDG and Raw DDGS originating in the ethanol plant and (used as starting materials) yielded Total Phenol Content (TPC) of 412mg/100 and 487 mg/100g, respectively. Raw DDG and Raw DDGS originating in the ethanol plants had a total carotenoids (TCC) content of 13.3mg/100g and 14.8mg/100g, respectively. Either material (DDG or DDGS) may serve as a consistent source to be optimized for extraction and recovery of moieties that may serve useful roles as supplements in human and animal food rations.

The fate and stability of these compounds in processing is of interest to food processors. Solvents such as hexanes and ethanol, may be selectively used to optimize recovery. Ethanol, for example, yields high levels of TPC in the residue that will used in food grade applications. This same treatment yield leads to losses of carotenoids in the oil fractions removed during ethanol washing. The oils pose problems of rancidity in food grade DDG and therefore, need to be removed to ensure FDDG shelf stability. The ethanol solvents can thus yield carotenoids. Graduate Research Assistant Brady Bury, has employed a 6-liter solvent extractor to “wash” DDG and DDGS employing two techniques (sequential and non-sequential washing) in order to determine which technique is more effective in partitioning TPC and TCC and also to determine which technique conserves solvent use. While ethanol is the food grade solvent of choice, comparisons are made relative to hexane washing which serves as a control. A Soxhlet apparatus was also used as a parallel technique for continuous refluxing with solvents to determine if yields of TCC in recovered and concentrated oils are comparable to recovery encountered in the Six Liter Extractor.

Oils recovered from DDG or DDGS serve as repository of carotenoids. TPC and TCC thus serve as quality control measurements to be followed by further mass balance studies employing more accurate and precise quantification using High Performance Liquid Chromatography techniques.

3.) CHALLENGES ENCOUNTERED. (*Describe any challenges that you encountered related to project progress specific to goals, objectives, and deliverables identified in the project workplan.*)

No challenges have been encountered.

4.) FINANCIAL INFORMATION (*Describe any budget challenges and provide specific reasons for deviations from the projected project spending.*)

No budget challenges or deviations from projected spending are anticipated.

5.) EDUCATION AND OUTREACH ACTIVITES. *(Describe any conferences, workshops, field days, etc attended, number of contacts at each event, and/or publications developed to disseminate project results.)*

Two papers have been accepted for presentation at the Institute of Food Technologists Conference in June, Chicago, IL.

An invited presentation is planned for the DGTC Conference in Omaha, NE in June 2020.

A manuscript relating Food Grade DDG use in Chinese Steamed Bread was accepted for publication following peer review.

X. Li,C. Wang,and P. Krishnan. 2019. Effects of corn distillers dried grains on dough properties and quality of Chinese Steamed Bread. 2019. Journal of Food Science and Nutrition (Accepted for publication).

An abstract on valuable corn compounds will be presented at the National Corn Utilization Conference in Missouri, 2020.

An automated ANKOM Total Dietary Fiber Analyzer, acquired through National Institutes of Food and Agriculture (NIFA) USDA funding, was used to characterize food grade DDG for fiber fractions useful in food and health promotion.

We are collaborating with a company on Supercritical CO2 Extracted DDGS for refinement of corn pigments.