**Missouri Soybean Merchandising Council**

**Final Report**

**MSMC 17-403**

1. Title of Grant: Functional properties of soy protein isolate from high oleic soybeans
2. Period Covered: 03/01/17 to 08/31/18
3. Project Leader and Co-Primary Investigators:

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1. Layman’s Summary

This project investigated the functional properties of soy protein isolated from high oleic soybean (HOLL) and compared with commercial soy protein isolate (SPI). Determination of functional properties included solubility, heat stability, fat-absorption capacity, water holding capacity, emulsification and foaming properties. Extraction and isolation of soy protein from HOLL were conducted by Dr. Seemamahannop, while functional properties tests were conducted by Dr. Vardhanabhuti.

SPI from HOLL had similar composition and amino acid profile to protein isolated from commercial soybean. Solubility and heat stability are generally the required functions of protein when being used in food products. Compared to commercial sample, SPI from HOLL showed similar solubility and heat stability patterns across pH 3 to 7 (e.g., typical acidity range found in foods and beverages). Lowest solubility and heat stability were observed at pH 4 and 5. At other pH values, SPI from HOLL showed better solubility and was more heat stable compared to commercial SPI.

Emulsification properties are important function of protein in foods and beverages containing fat or oil. Both SPI from HOLL and commercial SPI had excellent emulsification properties except at pH 4 and 5. Better emulsion stability was observed with SPI from HOLL at pH 7.

Proteins including soy protein are important for the formation and stability of food foams such as ice cream, baked products and whipped desserts. Except at acidic pH (pH 3), foaming ability of SPI from HOLL was either comparable to or better than that of commercial SPI. Interestingly, foams prepared from SPI from HOLL were more stable than commercial SPI especially at pH 6 and 8.

The ability of proteins to bind water as well as absorb and retain oil is important in food formulations. Fat absorption capacity of SPI from HOLL was significantly higher and water holding capacity was slightly higher compared to those of commercial protein isolate.

In conclusion, our study reveals that soy protein isolate from high oleic soybean has similar or better functional properties compared to commercial sample. Future work could extend the use of soy protein isolate from high oleic soybean to the real food formulation development.

1. State your objectives in question form and discuss how your results answer these objectives.
2. What is the amino acid profile of protein isolated from HOLL soybean?

Our results show that HOLL soybean had similar proximate composition and amino acid profile compared to regular commercial soybean.

1. How are functional properties of protein isolated from HOLL soybean in comparison to commercial protein?

Our results show that protein isolated from HOLL soybean exhibited similar or better functional properties depending on the environment acidity compared to commercial protein.

1. Please answer the following.
2. How do your results benefit Missouri soybean growers?

The global protein ingredient market is expected to reach 28.9 billion by 2020 with 6.5% growth rate per year (Grand View Research, 2015). One major factor in selecting proteins for food applications is their functional properties. Our results show that soy protein isolate from high oleic soybean possessed similar composition and equivalent or (at certain conditions) better functional properties compared to regular commercial soy protein. The results demonstrate the potential benefits of protein isolate from HOLL soybean.

1. Estimate financial return for the average Missouri soybean producer.

By demonstrating the functional properties of protein isolate from high oleic soybeans, we could potentially increase the utilization of protein. This will result in an increase in value of high oleic soybean.

1. Do your results benefit the environment?

Not applicable.

1. What products or processes can be commercialized from this research?
2. List disclosure(s) of inventions or plant varieties submitted to the MU Tech Transfer Office.

None. Any food and beverage manufacturers could apply the findings in using protein isolate from HOLL to develop their products.

1. Identify potential disclosure(s) of inventions or plant varieties. *Please note that credit must be given to MSMC for any inventions or discoveries resulting from this research*.

Not applicable.

1. How would you commercialize these products or processes?

Protein isolate is among important value-added products from soybean. With improved functional properties, the protein isolate from HOLL could be utilized in a wider range of food applications. One way to promote the ingredient is to demonstrate its use in more applications.

1. If no specific products or processes were produced, how do you plan to make your results available to producers or industry?

Results could be presented at professional meeting and published in scientific journal.

1. Is additional time or research required before your results can be used by producers and industry?

Results can be directly tested in food applications.

1. List publications by type (popular press, thesis, journals, other) written or planned.

1. Presentation at the Institute of Food Technologists Annual Meeting in June 2019.

2. One manuscript will be submitted to peer-reviewed journal.

1. List cost of original project and actual expenditures. *The U.S. Department of Agriculture requires that we ask for budget information, including the number of hours spent on the project, the number of dollars remaining on account, as well as a breakdown of expenses. You are required to provide this information in your report.* Please also include names and titles/positions of those whose time has been charged to this project.

All expenditures will be submitted by the Office of Sponsored Programs Administration.

1. List equipment purchased with MSMC funds, identifying inventory and serial number. (It is not considered equipment unless it costs $500 or more and has a life expectancy of at least 2 years.) Indicate current and future use of this equipment in support of soybean research.

One Freeze Dryer was purchased to dry the isolated soy protein. The freeze dryer can be used in future soybean-related research.