Characterization of the Polymeric Proteins of Sorghum

Dr. Hulya Dogan, Dr. Scott Bean, Project Leaders

Cooperators:

Graduate Student: Brian Ioerger

Goals:
- Develop a method to characterize the absolute molecular weights and distribution of the polymeric proteins in hard and soft sorghum endosperm.
- Refine characterization of isolated SEC fractions using CE, RP-HPLC, and lab-on-a-chip.
- Develop methods to study heat aggregation of kafirin and zein proteins, and how this is related to digestibility and functionality.
- Determine the involvement of polymeric proteins from hard and soft endosperm in aggregation.

Recent Publications:
Schober et al., 2011, Cereal Science (In Press)

Statement of Problem:
The nutritional value of sorghum based foods is compromised due to poor protein digestibility compared to other cereal grains. Previous research indicates the problem almost certainly involves protein interactions, and that protein digestibility diminishes even further after wet heat cooking. It would be beneficial to characterize sorghum protein polymers in terms of how they differ between hard and soft endosperm, how they change during and after application of heat, and their involvement in aggregation behavior and correlation to digestibility. Identifying how sorghum protein polymers interact, and discovering how they differ in sorghum varieties exhibiting variations in digestibility will help answer essential questions in the quest for improvement of the nutritional quality of sorghum foods.

Current Activities:
Initial studies have been completed differentiating protein content and composition between vitreous and floury endosperm of sorghum. Differences in protein cross-linking were determined using differential solubility, size exclusion chromatography (SEC), and analysis of sulphydryl content. Optimizing the extraction and separation of sorghum polymeric proteins as well as determining the absolute molecular weights of sorghum protein polymers is currently being developed. SEC in conjunction with multi-angle light scattering will be used to study the relationships between sorghum protein digestibility and functionality attributes. Methods will be developed to study heat aggregation of kafirin and zein. A comparative determination of how polymeric protein involvement differs in the aggregation and digestibility of sorghum and maize proteins will provide insight into the digestibility and functionality issues of sorghum proteins.

Identifying the underlying cause(s) contributing to poor protein digestibility of cooked sorghum based foods will provide basic information required for innovation in the design of new strategies for tapping sorghum’s full nutritional potential.