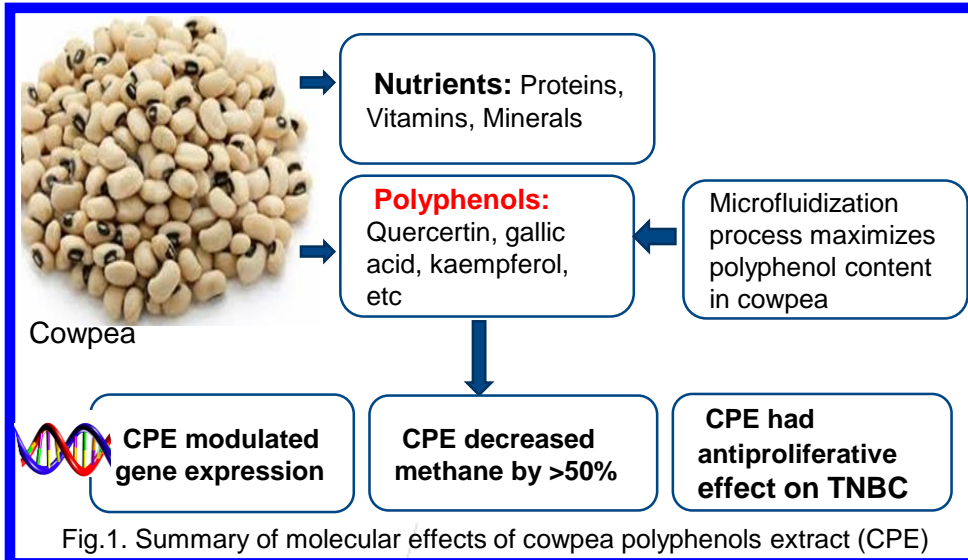


Sarah Adjei-Fremah

Department: Energy and Environmental Systems

Title: “Molecular Effects of Cowpea Polyphenols on Mammalian Transcriptome, Proteome, and Microbiome”

Major Professor: Dr. Mulumebet Worku



RESEARCH QUESTIONS / PROBLEMS:

- What is the polyphenol composition in selected cowpea cultivars?
- What is the effect of microfluidization process on the polyphenol content of cowpea?
- What is effect of cowpea polyphenol extract (CPE) on gene transcription in animal blood?
- What is the effect of CPE on *in vitro* methane production and methanogen population:?
- What is the effect of CPE on proliferation of triple negative breast cancer cells (TNBC)?

METHODS:

- Polyphenol content was measured with Folin-ciocalteu and ultra-performance liquid chromatography tandem mass spectrometry (UPLC-MS) methods
- Microfluidization was done with the M-110P Microfluidic processor with an interaction chamber of 200µM, and pressure of 20000 psi.
- Gene expression analysis was done using microarray and real-time PCR techniques.
- The effect of CPE on methane production and methanogens was determined with Picarro gas analyzer, high throughput Illumina sequencing and RT-PCR.
- MTT assay was used to determine the effect of CPE on TNBC cells

RESULTS / FINDINGS:

- Cowpea cultivars had variation in polyphenol content.
- Microfluidization process reduced the particle sizes of the cowpea flour and increased the surface reactive polyphenol content (>100%) in cowpea.
- Polyphenol extracts from cowpea modulated the expression of genes associated with immunity and homeostasis, and also reduced methane and methanogen population
- Cowpea polyphenol extract (1 mg/ml) inhibited proliferation of TNBC cells.

SIGNIFICANCE / IMPLICATIONS:

- Cowpea polyphenols impact animal and human health and microbial diversity and function at the molecular level. The identified molecular targets need future studies for application in nutrigenomics and precision dieting for humans and animals.