Project FY22-FR-003: Natural Photosensitizer for Decontamination of Mycotoxin in Sprouted Cereal Grains

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1. What are the major goals and objectives of the research project?

Major goal and objective one: Screening natural photosensitizers (PS), designing and characterizing the natural PS loaded delivery system;
Major goal and objective two: Antifungal and mycotoxin inhibitory activity of PS loaded delivery system in vitro;
Major goal and objective three: Antifungal and mycotoxin inhibitory efficacy of PS in cereal grains and sprouted cereal grains.

2. What was accomplished under these goals or objectives?

Major activities in goal one:

- Menadione sodium bisulfite (MSB) and coumarin based delivery systems were formed and the physiochemical properties of these systems have been characterized including particle size, particle size distribution and long term physiochemical stability.
- Quantification of singlet oxygen method has been established.
- The generated singlet oxygen under UV light exposure for 30mins from these systems were measured.

Major activities in goal two:

- The antifungal activity of MSB and coumarin have been evaluated by measuring the inhibition of mycelial growth and spore germination rate of two *Fusarium* isolates (10-124-1, 10-125-1).
- In terms of inhibition of mycelial growth and spore germination. For example, For Fusarium strain 10-124-1, effective concentration for inhibiting 50% of spore germination (EC50) was 5 Mm of coumarin. In general, MSB showed lower antifungal efficacy as compared to coumarin by using 5mM.
- The impact of MSB and coumarin on morphological changes of spores and mycelium have been observed through scanning electron microscopy (SEM). For example, abnormal surface morphology changes were observed in spores treated with either MSB or coumarin, especially with coumarin. The coumarin treated spores showed severe shrinkage, which can be easily recognized under × 2500 magnification.
- The impact of MSB and coumarin on expression of Tri genes (*Tri3*, *Tri4* and *Tri5*) have been conducted. Overall, all genes are upregulated by using 5mM of treatments.

Major activities in goal three:

- The fusarium contaminated wheat grains have been grown in the field, the samples will be collected in August 2024.

3. **What opportunities for training and professional development has the project provided?**
   This project has provided an opportunity for one Ph.D. student to improve their fundamental knowledge of cereal, food, physicochemical and statistics sciences.

4. **How have the results been disseminated to communities of interest?**
   The result has been submitted in peer review journal and will be presented in national conference (International association for food protection 2024 annual meeting).

5. **What do you plan to do during the next reporting period to accomplish the goals and objectives?**

   Major activities in goal two:
   - The impact of MSB and coumarin on inhibition of mycotoxin in rice culture will be evaluated.

   Major activities in goal three:
   - The impact of MSB, curcumin and coumarin on the quality and mycotoxin level of sprouted fusarium infected wheat and barley will be tested.
   - The Fungicidal Property of MSB, curcumin and coumarin against fusarium infected wheat in a greenhouse and field will be tested