PI: Jiajia Rao
PI's E-mail: jiajia.rao@ndsu.edu
Project ID: FY20-RA-017
ARS Agreement #: *59-0206-8-212*
Research Category: FST-R
Duration of Award: 1 Year
Project Title: Essential Oil Nanoemulsion to Control of Mycotoxin Production in Cereals

PROJECT 1 ABSTRACT
(1 Page Limit)

Fusarium mycotoxins are ubiquitous on the basis of global surveillance of mycotoxin contamination in cereal foods. The complete prevention of *Fusarium* mycotoxins in the raw materials (e.g. barley, wheat) by limiting toxigenic fungal species in the field and during storage is not practically achievable. The most common Fusarium mycotoxin found in cereal grains and their products is deoxynivalenol (DON), a type B trichothecene produced predominantly by *Fusarium Spp*. Additionally, mycotoxins are stable chemical compounds that can be transferred from the raw cereal materials to the finished food products, which pose a health risk to the consumer. In order to ensure the quality and safety of cereal products, it is of great urgency to develop antifungal and mycotoxin inhibition strategies that can be applied during food processing. For more than a decade, researchers have been exploring numerous strategies including physical, chemical and biological methods to prevent fungi infection and mitigate mycotoxin contamination during the food process. It is clearly shown that no currently available single method can completely prevent mycotoxin contamination in cereal foods. Recent studies from my laboratory have demonstrated that certain plant essential oil (e.g. clove oil) nanoemulsions have strong antifungal and *Fusarium* mycotoxin inhibitory activities in vitro. However, the underline mechanisms for such activities remain to be addressed. In addition, hop essential oil and hop female cone extract showed certain antifungal acitivity. As the hop is the part the beer brewing ingredient. It would be great to use the hop essential oil or hop extract as antifungal agent during the malting process. This proposal seeks to understand the mechanisms of antifungal and mycotoxin inhibitory activities of essential oil nanoemulsions including clove oil, hop essential oil, hop extract and their major chemical compounds for improving their efficacy as antifungal agents in food supply chain. This proposal will be achieved by addressing three objectives below:

Objective 1: Preparation, Characterization of essential oil nanoemulsions their major chemical compounds nanoemulsions (05/01/2019- 02/01/2020)
Objective 2: Antifungal and antimycotoxigenic mechanisms of action (MOA) of essential oil nanoemulsions (02/02/2020-07/01/2021)
Objective 3: Application of essential oil nanoemulsions for reducing *Fusarium* infection and DON production during the micro malting process (08/01/2021-04/30/2022)