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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. 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 activity. 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 two objectives below in 2021-2022:

2: Antifungal and antimycotoxigenic mechanisms of action (MOA) of essential oil nanoemulsions (02/02/2020-07/01/2021)

We will focus on elucidating antifungal and antimycotoxigenic mechanisms of action (MOA) of the clove oil, hop essential oil nanoemulsions and their major chemical constituents nanoemulsions in grains (barley).

3: Application of essential oil nanoemulsions for reducing fusarium infection and DON production during the micro malting process (08/01/2021-04/30/2022)

Clove oil nanoemulsion with good physicochemical stability, antifungal and antimycotoxigenic efficacy will be incorporated in malting barley system. Upon the completion of experiments, we should have identified that a number of nanoemulsions have good antifungal efficacy, and the potential practical application in malthouse.