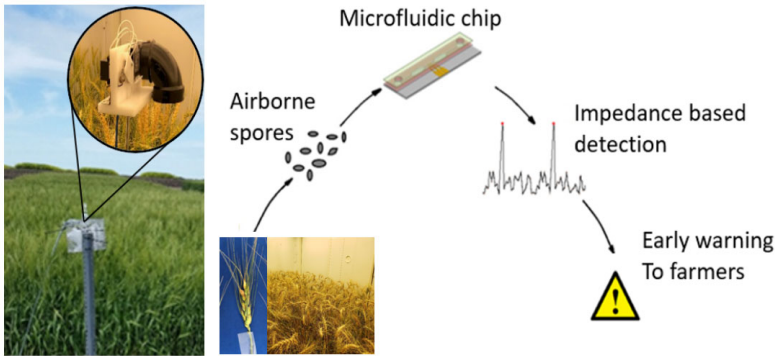# Development of a Biosensor for Fusarium Head Blight Forecasting in Wheat

Fusarium Head Blight (FHB) causes yield loss and reduced quality of wheat and other important cereal crops in Canada. FHB is well established in southern Alberta and continues to spread. Data from 2015 suggests that having as little as 0.4% of FHB-damaged wheat kernels in a sample could lead to revenue losses of up to $65 per acre. The goal of this project is to develop a portable in-field, real-time biosensor for FHB forecasting, without the need for complicated laboratory tests. The biosensor is being designed to detect a threshold of the FHB pathogen spore *Fusarium graminearum* and warn its users, via Bluetooth, when there are enough spores to cause FHB. The results of this project will reduce or prevent yield loss and unnecessary fungicide applications due to FHB, and increase profitability and sustainability of the cereal industry in Alberta and Canada.

Microfluidic chip
Airborne spores
Impedance based detection
Early warning To farmers

FUNDING DETAILS

RECIPIENT:
InnoTech Alberta

PARTNERS:
Alberta Barley Commission
&
Alberta Wheat Commission

TOTAL BUDGET:
$317,000

AI FUNDING:
$171,000

PROJECT DATES:
March 2019 – February 2022

PROJECT TRL:
Start: 4
End: 7

APPLICATION

FHB forecasting is typically conducted using models developed by researchers around the world. However, the models tend to be too geographically specific or too complicated and cannot be adapted to Alberta. The biosensor under development will use a specific antibody to monitor the levels of *Fusarium graminearum* spores in wheat fields. The device contains a biosensor chip (which costs about $10) that detects the presence of spores. When the threshold of spores to cause FHB (which is also being determined in this project) is reached, a warning will be sent to the user (e.g, producers and agronomist). This smart technology aims to replace available forecasting tools that are laborious, time consuming and lack accuracy.

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PROJECT GOALS

- Develop an in-field, real-time biosensor for Fusarium Head Blight (FHB) forecasting that can reduce or prevent yield loss and reduce unnecessary fungicide applications in cereal crops.
- Design a biosensor chip and make the chip dimensions suitable for FHB pathogen spore detection.
- Build a correlation between pathogen level and FHB disease through growth chamber, greenhouse, and field studies to determine the biosensor threshold.

BENEFITS TO ALBERTA

- Increase the sustainability of the cereal industry by decreasing disease incidence and yield loss.
- The timely control of *F. graminearum* will increase food safety for humans and livestock by reducing the mycotoxin "DON" presence, which is regulated in more than 40 countries due to its toxicity to human and animal health. It can affect animal feed consumption, growth, and reproduction, resulting in economic loss of livestock industry.
- Reduced use of fungicides, which will increase environmental sustainably and maximize farmer investment.
- Provide a technology platform to allow the detection of any agriculturally relevant airborne agent, including real time measurement of invasive organisms such as clubroot and soybean rust spores.

4 Publications   **1 New Product/Service**   **1 Patent**   **3 Project Jobs**

CURRENT STATUS

August 2020

The team has successfully produced anti-*F. graminearum* antibodies. This is key for specific detection of FHB pathogen spores in wheat crop where many other microbes are present. They have optimized the biosensor for *F. graminearum* detection which can achieve single spore detection. They have also successfully designed and made a spore trap that will be used as a sampling tool for the biosensor for disease detection. The spore trap has more than 80% collecting efficiency.