

FUNDING DETAILS

Nanocarrier technology for the next generation of cereal seed treatments

In cereal production, broad spectrum fungicides are used to reduce the risk of smut and bunt diseases caused by pathogenic fungi. These fungi infect germinating seeds, reducing yield and quality of crops by producing soot-like spores in the leaves, grains, and/or ears of the plant. The aim of this project is to develop new seed coat technology containing nanocarriers that can cross the cellular membrane, delivering RNA molecules for silencing fungal gene expression, and concomitantly suppressing smut and bunt diseases. This technology will increase specificity, reduce dependency on broad spectrum fungicides, improve soil health, and facilitate the use of beneficial microbes.



Developing RNAi seed coatings as an alternative to broad spectrum fungicides



RECIPIENT:
Agriculture and Agri-Food Canada
PI: John Laurie



PARTNERS:
Alberta Wheat Commission
Saskatchewan Wheat Development Commission



TOTAL BUDGET:
\$680,300



AI FUNDING:
\$146,300



PROJECT DATES:
March 2019 –
March 2023



PROJECT TRL:
Start: 3
End: 5

APPLICATION

This project will develop seed coatings containing nanocarrier-complexed RNAi inducers, which will protect seeds from colonization of pathogens during early seedling development, and at the same time allow beneficial microbes to thrive in the rhizosphere. Further, RNAi containing seed coatings can also be used to target specific plant gene expression networks, allowing for seed coatings designed to optimize seedling performance under various environmental conditions.

PROJECT GOALS

- To develop seed coating technology containing nanocarriers of the Cell Penetrating Peptides (CPP) class together with RNAi for the suppression of smut and bunt diseases in cereal crops.
- To provide an alternative to broad spectrum fungicides, allowing adoption of technologies utilizing beneficial fungi and promotion of improved soil health.
- To develop seed coating technology containing CPP-RNAi for modulation of plant genes during early seedling development for improved seedling performance.

BENEFITS TO ALBERTA

- Alberta based researchers are leading this novel application of CPP-RNAi as a licensed tool for seed companies to block smut and bunt diseases in cereals.
- Reducing fungal pathogens may increase average yields of cereal crops up to 3%, which would translate to an approximate additional \$200 million (and \$780 million across Canada) in annual farm receipts.
- Improvement of overall soil health is anticipated with the shift away from use of broad-spectrum fungicides. Utilization of beneficial microbes, especially fungal endophytes, will be possible providing crops with an added boost.
- The ability to modulate plant gene expression during germination will be of great use to seed companies by allowing producers to have added seed coat technologies aimed at increasing seedling performance.



6 Presentations



1-2 Patents



4 Highly Qualified
Personnel

CURRENT STATUS

May 2021

The team has focused on optimization for suppression of smut disease and will move to targeting bunt genes. Several CPPs for efficient delivery to basidiospores of barley smut had been screened. It was found that Penetratin (a type of CPP) works best for delivering double stranded RNA to covered smut. Identification of the best CPP for delivering cargo to bunts has not yet been tested, but target gene sequences have been identified for RNAi.