Project Summary

DNA testing for mycotoxin producing fungi in fodder

September 2020 – August 2023

Background

Internationally, there is growing interest in mycotoxin contamination in agricultural commodities (Santos Pereira et al, 2019). Initially led by the European Union, other countries including Japan, South Korea and China are developing regulations to restrict mycotoxins levels in feed. Many mycotoxins have been identified, but only a few, Aflatoxins, Fumonisins, Ochratoxins, Trichothecenes and Zearalenone, are considered to be of economic concern. A strategy is required to manage the risks posed by mycotoxins and protect the Australian export fodder industry's reputation as a producer of safe high-quality hay. Most mycotoxins are produced by saprophytic (mould) fungi, but some are also plant pathogens such as the Fusarium species associated head blight. Mycotoxin production can start in crop and continue throughout harvesting, drying, processing and storage. It is also strongly dependant on environmental conditions and agricultural practices.

Objectives

This project aims to develop a novel testing capability for fungi that can produce mycotoxins. These tests will be able to be used to develop innovative management strategies and conduct surveys. Notably:

- A panel of DNA tests will be developed to quantify the fungi capable of producing mycotoxins including Aflatoxins, Fumonisins, Ochratoxins, Trichothecenes and Zearalenone.
- Sensitivity of the assays will be compared to current mycotoxins tests.

Research

This project will draw on the scientific literature and DNA sequences documented in the public domain to develop and evaluate a series of new and existing DNA tests to monitor levels of the main mycotoxin producing fungi that can develop during production and storage of fodder.

Many fungal species are responsible for production of Aflatoxins, Fumonisins and Ochratoxins. Three tests will be designed to detect a gene involved in production of each of these mycotoxins.

1. Trichothecenes and Zearalenone are mainly produced by three Fusarium species. DNA tests have already been developed for these species, and they will be evaluated.
2. Sensitivity and specificity of the DNA tests and the liquid chromatography–mass spectrometry (LS-MC) method currently used to detect mycotoxins will be compared using milled samples of rain damaged fodder.
3. Sample kits will be developed to ensure sample integrity, minimise transport costs and facilitate rapid processing in the lab.

Learn more
agrifutures.com.au/export-fodder

AgriFutures™ Export Fodder

Expected outcomes and implications

We hypothesise that DNA tests for the mycotoxin producing fungi will be more sensitive, have faster turnaround times and be cheaper than the LC-MS methods used to quantify mycotoxins. It is expected that the DNA tests will be more useful for evaluating novel methods to manage production of mycotoxins and conduct surveys.

Expected outcomes

- A panel of DNA tests will be available to quantify the fungi responsible for producing mycotoxins of interest to the fodder industry.
- A testing capability will be available to researchers and industry to study development of the mycotoxin producing fungi in different stages of fodder production, evaluate research treatments and conduct surveys.

Implications
The novel testing capability will assist:

- Industry manage the risk of mycotoxin contamination in fodder and enhance Australia's reputation and a producer of safe high-quality fodder.
- Researchers will have new tools to evaluate field trials and conduct surveys.
- Growers will have better options to understand and manage the risk of mycotoxin contamination.

Publications

Santos Pereira C., Cunha S.C. and Fernandes J.O. (2019) Prevalent Mycotoxins in Animal Feed: Occurrence and Analytical Methods. Toxins 2019, 11, 290 (62 pp).

Acknowledgements

The main collaborators in this project are Dr Ray Correll (RHO Environmetrics), expert in developing sampling strategies and Denis McGrath (AEXCO) who will coordinate the sourcing of fodder quality samples.

Contact

Dr Alan McKay, Principal Scientist
South Australian Research and Development Institute
2b Hartley Grove, URRBRAE, SA 5064

08) 8429 2216; 0419 842 952
alan.mckay@sa.gov.au

AgriFutures Australia Publication **20-102**
AgriFutures Australia Project No. **PRJ-012664**

Learn More
agrifutures.com.au/export-fodder

AgriFutures™
Export Fodder