



Canadian Grain
Commission

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des grains



Occurrence and Fate of Toxigenic Fungi and Associated Mycotoxins in Oats

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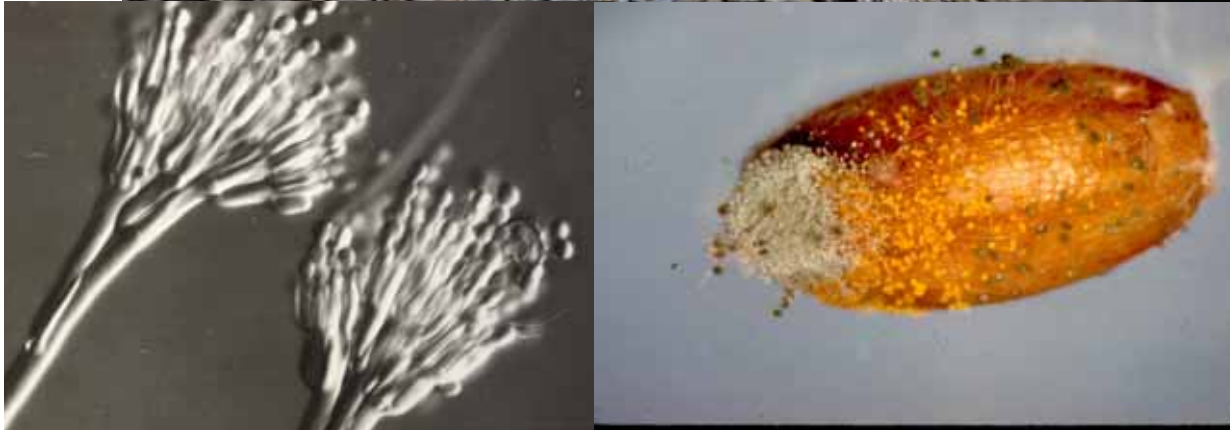
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Fungal Diseases and other Microbial Degrading Factors of Oats



- Fusarium Head Blight
- Smuts (*Ustilago* spp.)
- Mildew (mainly *Alternaria* spp.)
- Storage moulds
- Impact on yield, grain quality and safety
- Range of different mycotoxins (DON, OTA, ...)

Storage Moulds on Cereal Grains



- *Aspergillus*,
Penicillium
- Spoilage
- Degradation of
nutrients
- Odour
- Grain properties
- Contamination
with mycotoxins

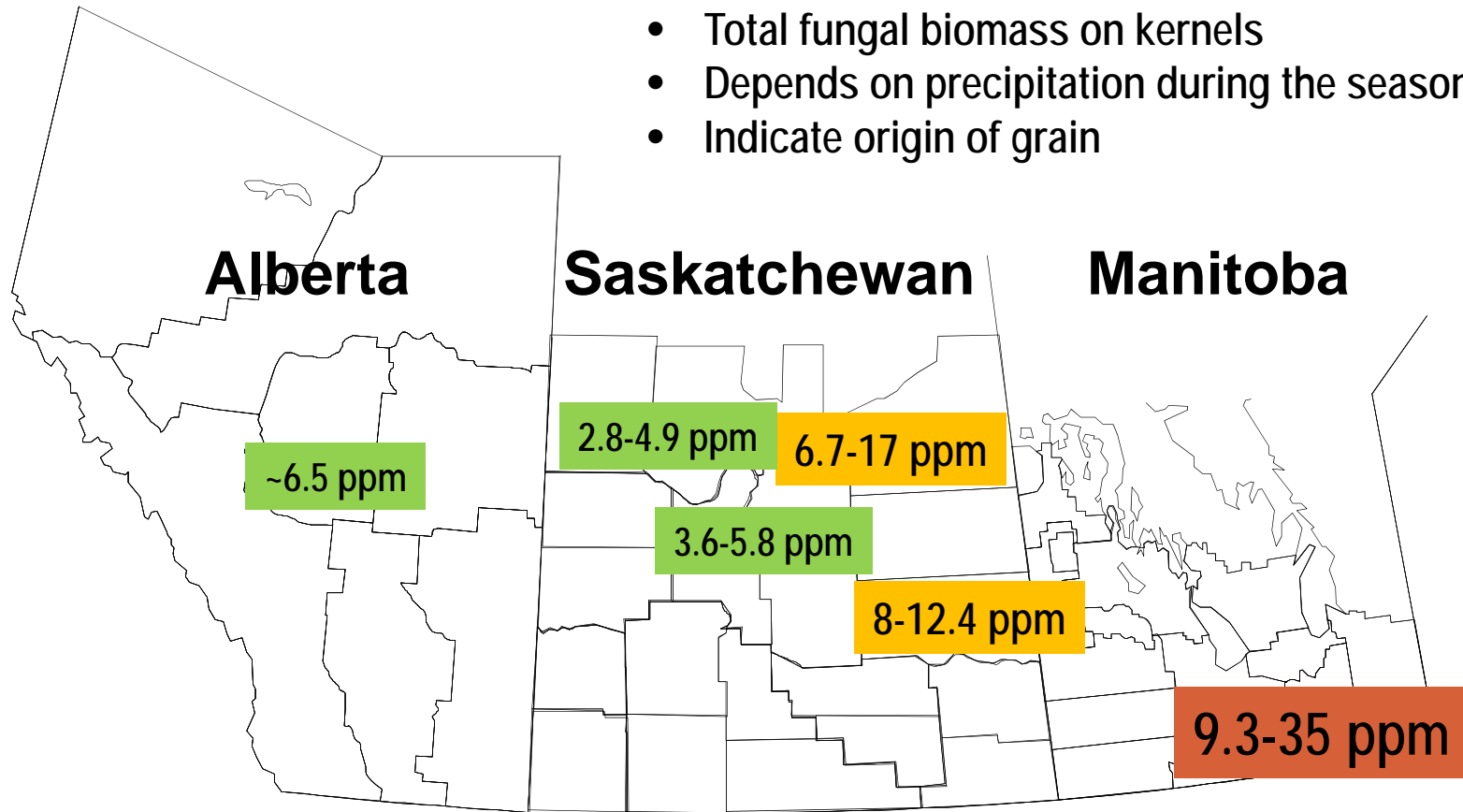
Project material: 2013-14 oat samples

- Total of 39 composite samples (SK=17, AB=3, MB=19)
- Contributions from Emerson Milling, Cargill, Paterson
- Loading/sampling dates: May 19 – Oct 24, 2014
- 2014 Harvest Sample Program: 42 producer samples (not yet analyzed)
- Sample size
500–2000 g



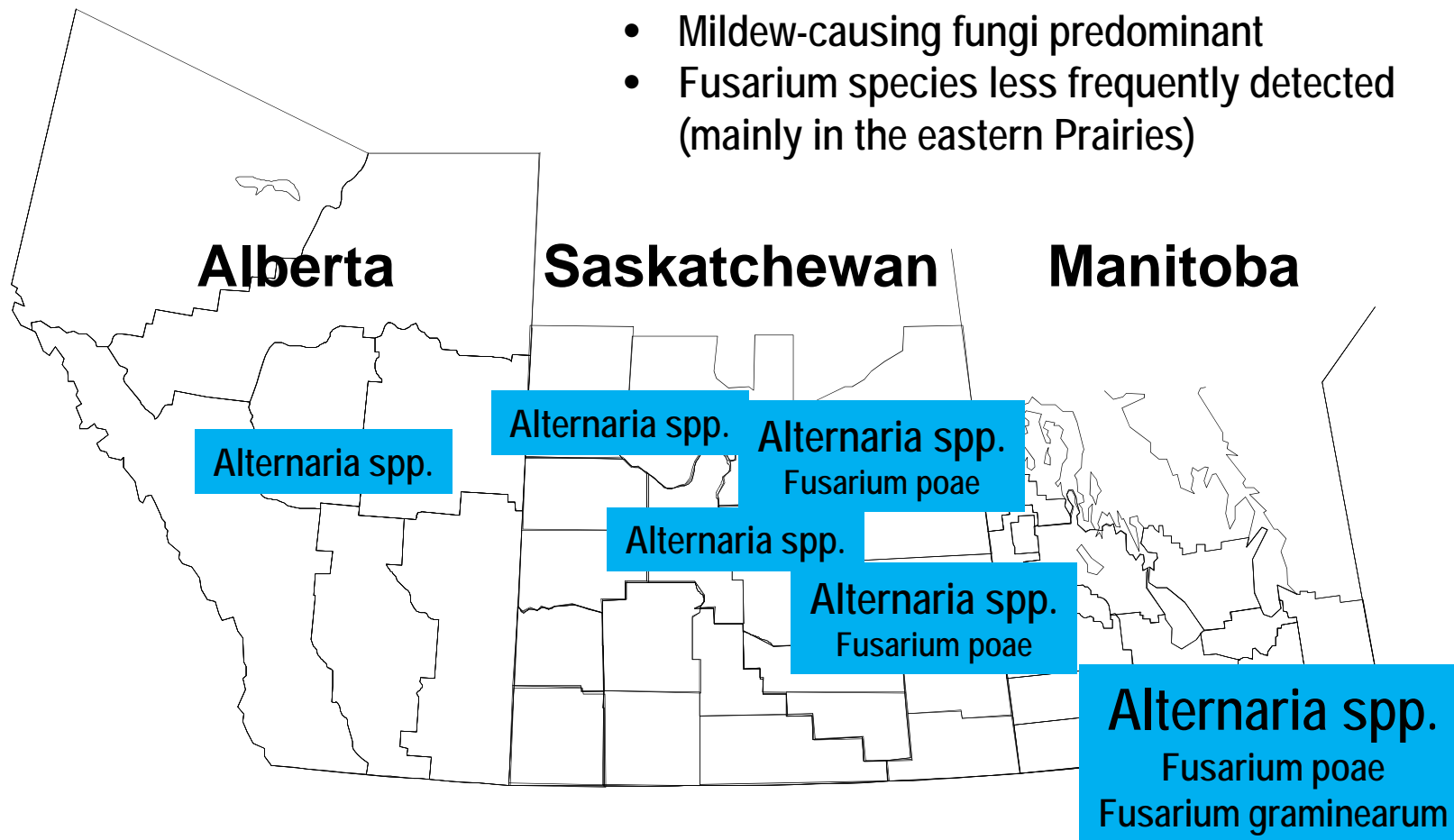
Mould Load (ergosterol) in Oats 2013-14

- Total fungal biomass on kernels
- Depends on precipitation during the season
- Indicate origin of grain



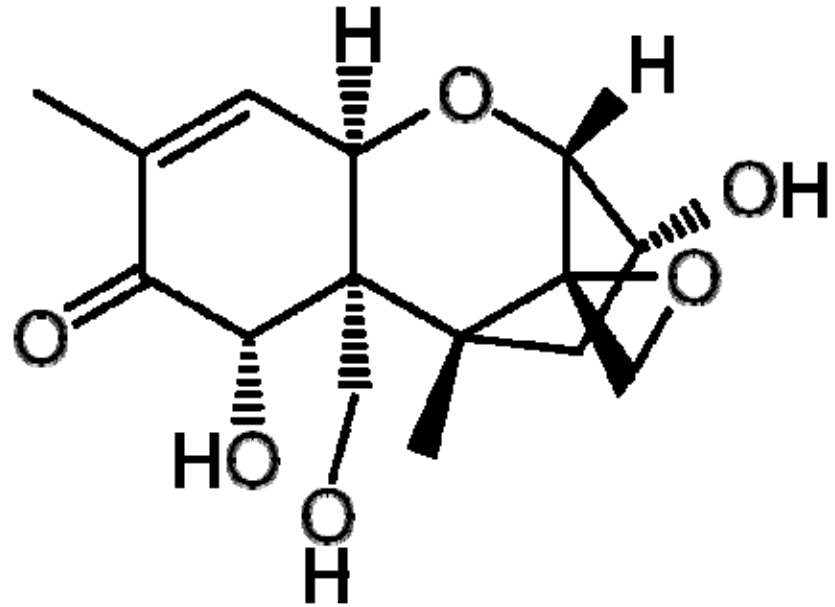
Fungal pathogens in Oats 2013-14

- Mildew-causing fungi predominant
- Fusarium species less frequently detected (mainly in the eastern Prairies)



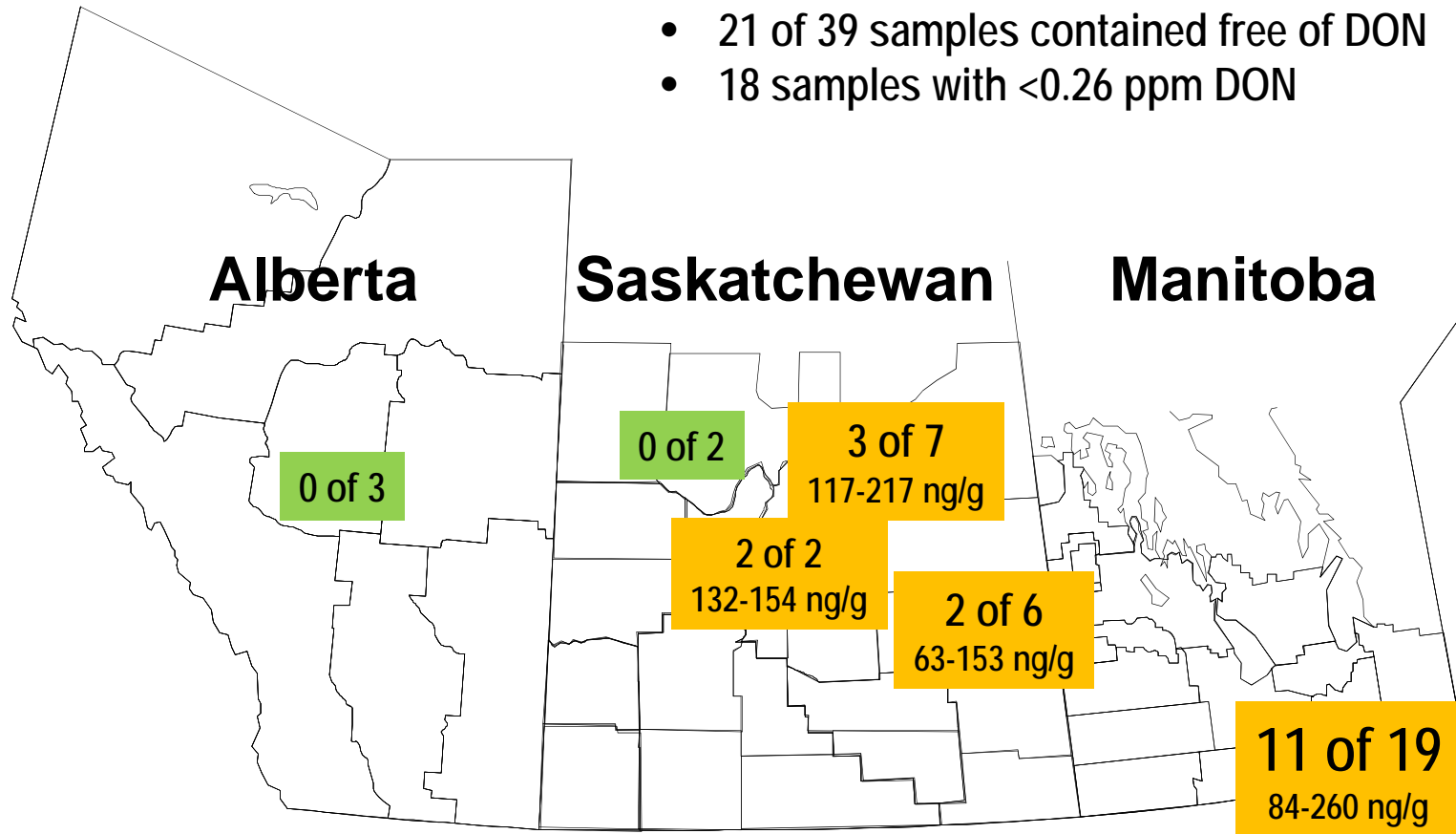
Deoxynivalenol (DON)

- relatively stable
- Symptoms of toxicity for livestock: Reduced feed intake, decrease in performance
- Maximum allowable limits in the EU for raw grains including oats = 1.75 ppm
- Processed cereal based foods for infants and young children = 0.2 ppm

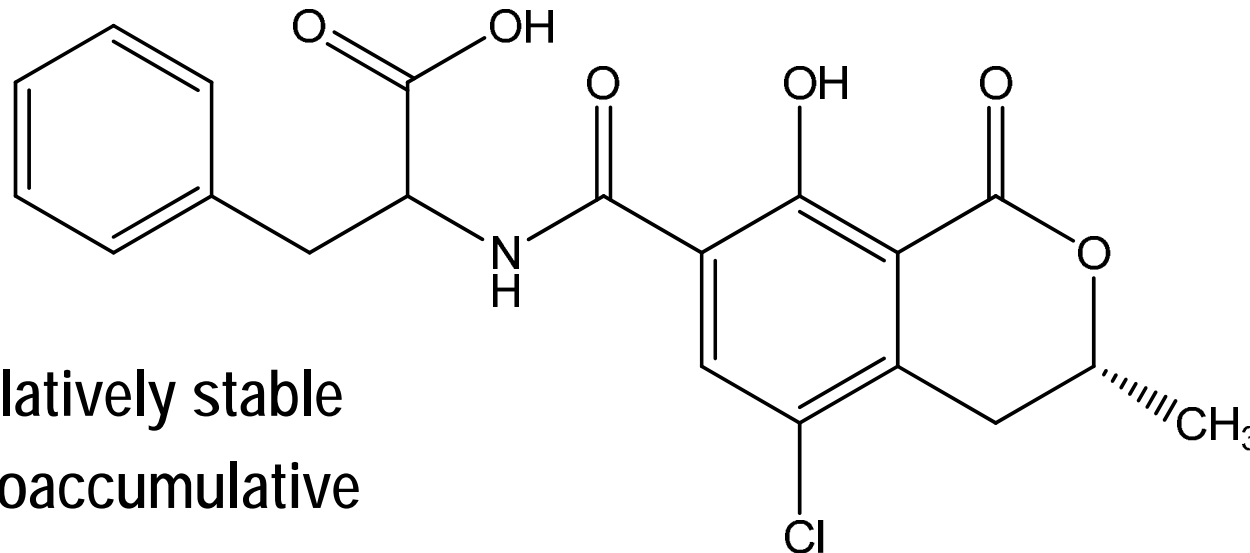


Deoxynivalenol (DON) in Oats 2013-14

- 21 of 39 samples contained free of DON
- 18 samples with <0.26 ppm DON



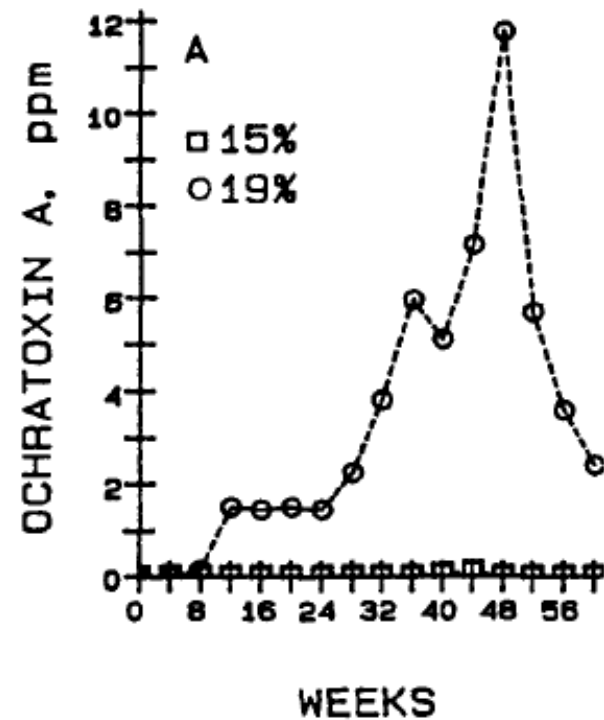
Ochratoxin A (OTA)



- relatively stable
- bioaccumulative
 - detected in human milk and serum
- potentially carcinogenic to humans, neurotoxicity, immunotoxicity
- Proposed Value by HC (under consideration as a guideline)
 - Raw cereal grains (i.e., wheat, barley, oats, rice) 5 ng/g (ppb)

Production of OTA during Grain Storage

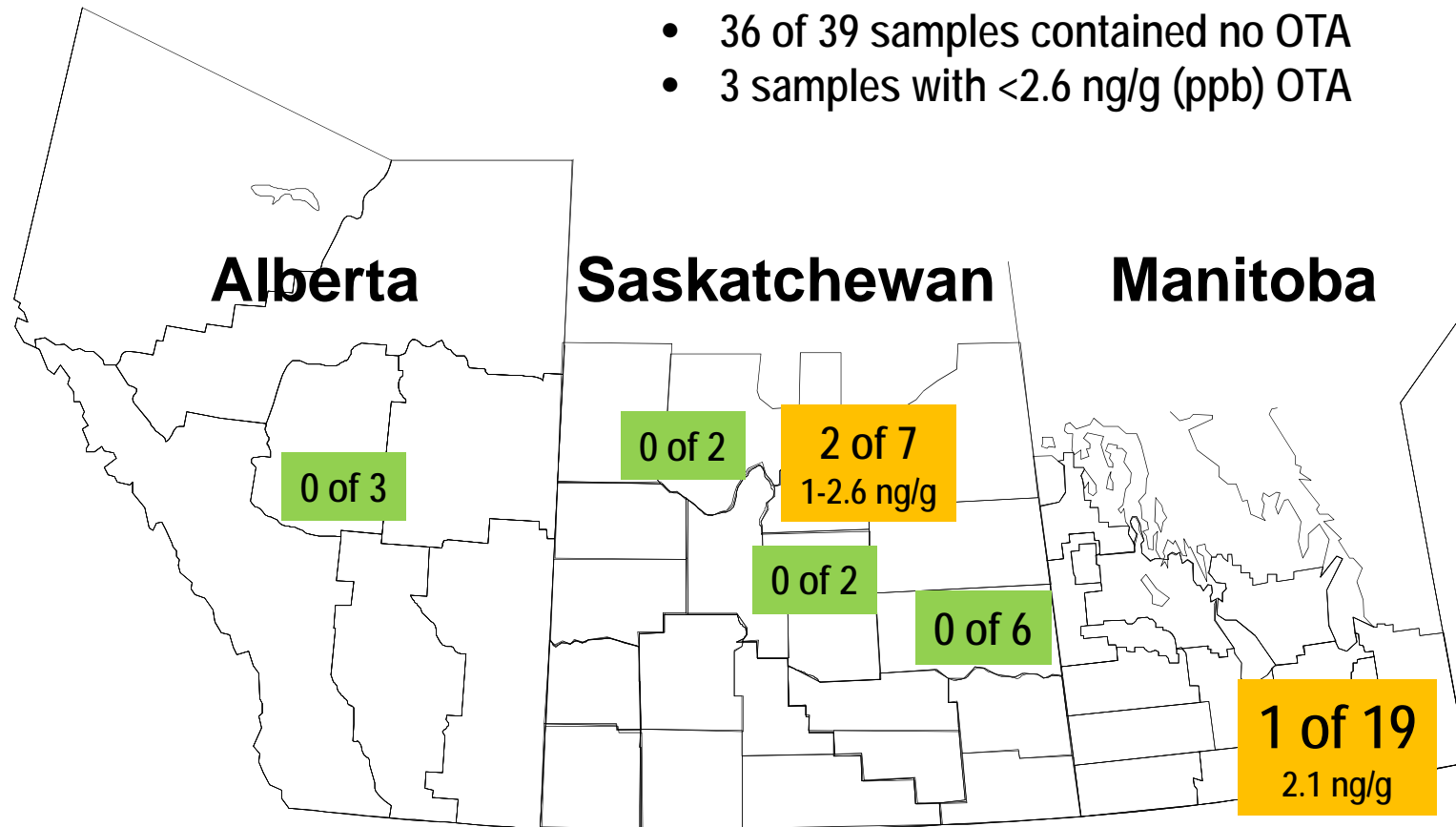
- Not a disease of field crops
- Different from DON issue
- *Penicillium verrucosum* growth and OTA production is driven by
 - moisture content / water availability
 - temperature



(Abramson et al. 1990)

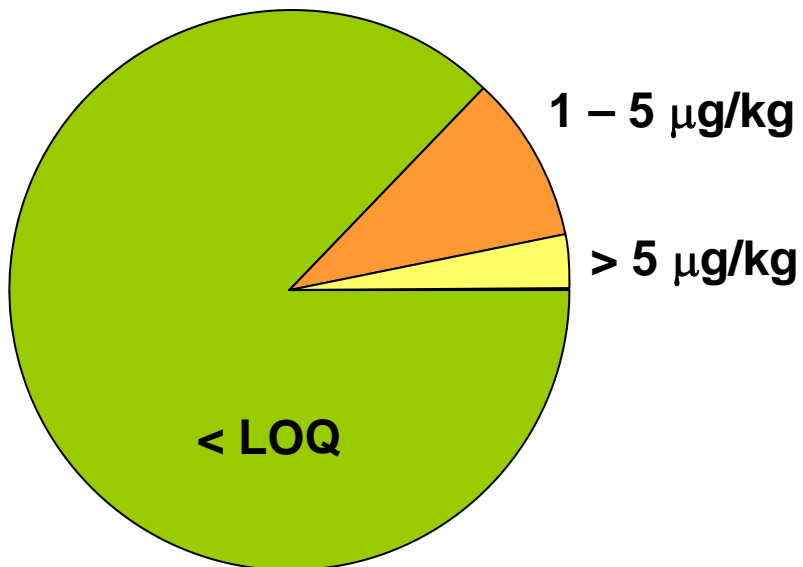
Ochratoxin A (OTA) in Oats 2013-14

- 36 of 39 samples contained no OTA
- 3 samples with <2.6 ng/g (ppb) OTA

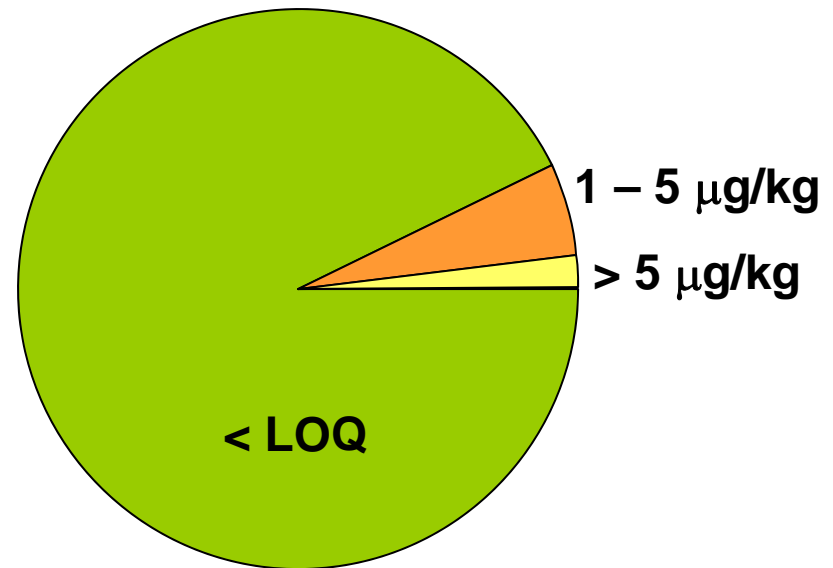


Occurrence of OTA in Canadian Grain Cargoes

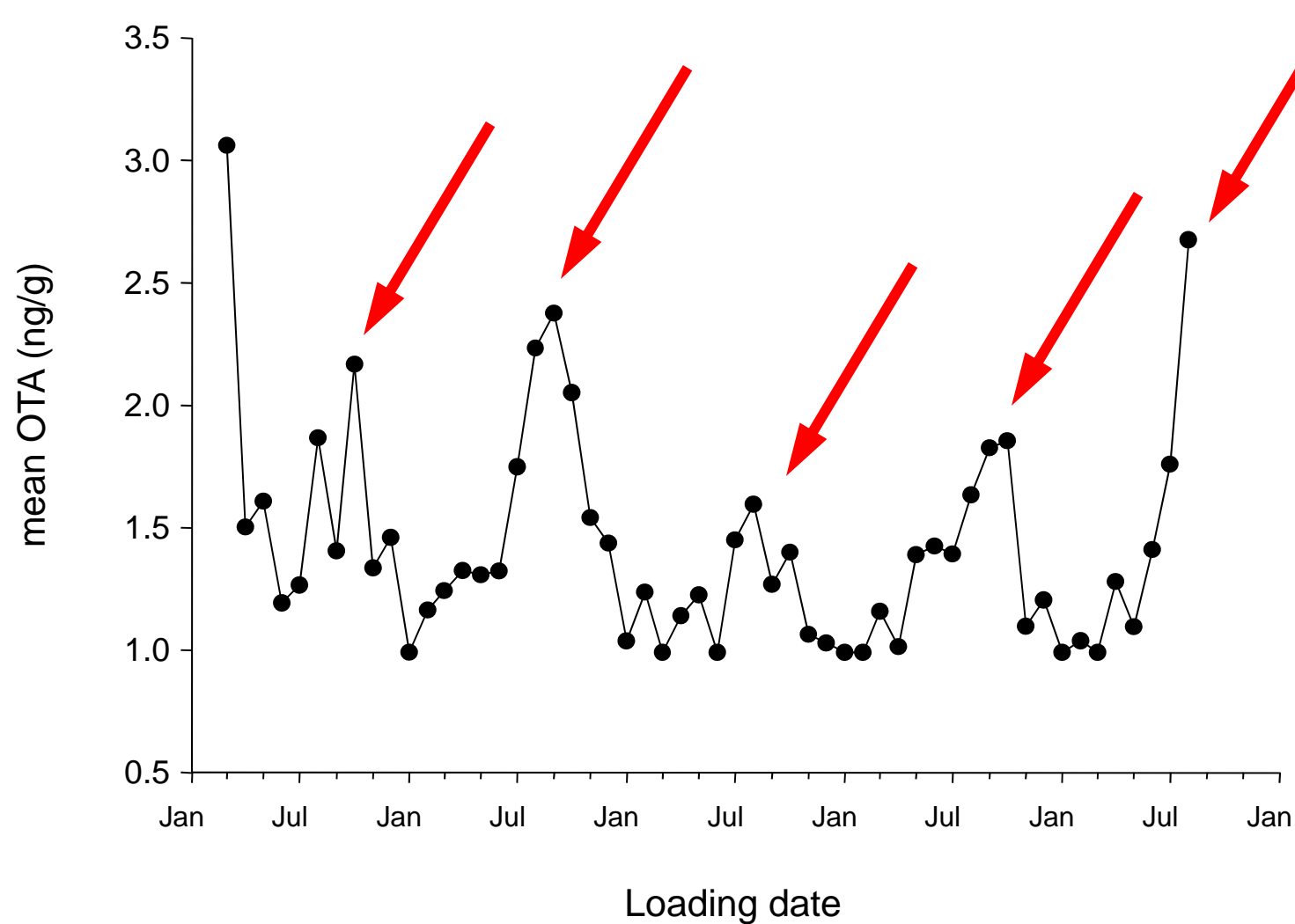
cereals



oilseeds and pulses



OTA in wheat shipments vary throughout the year

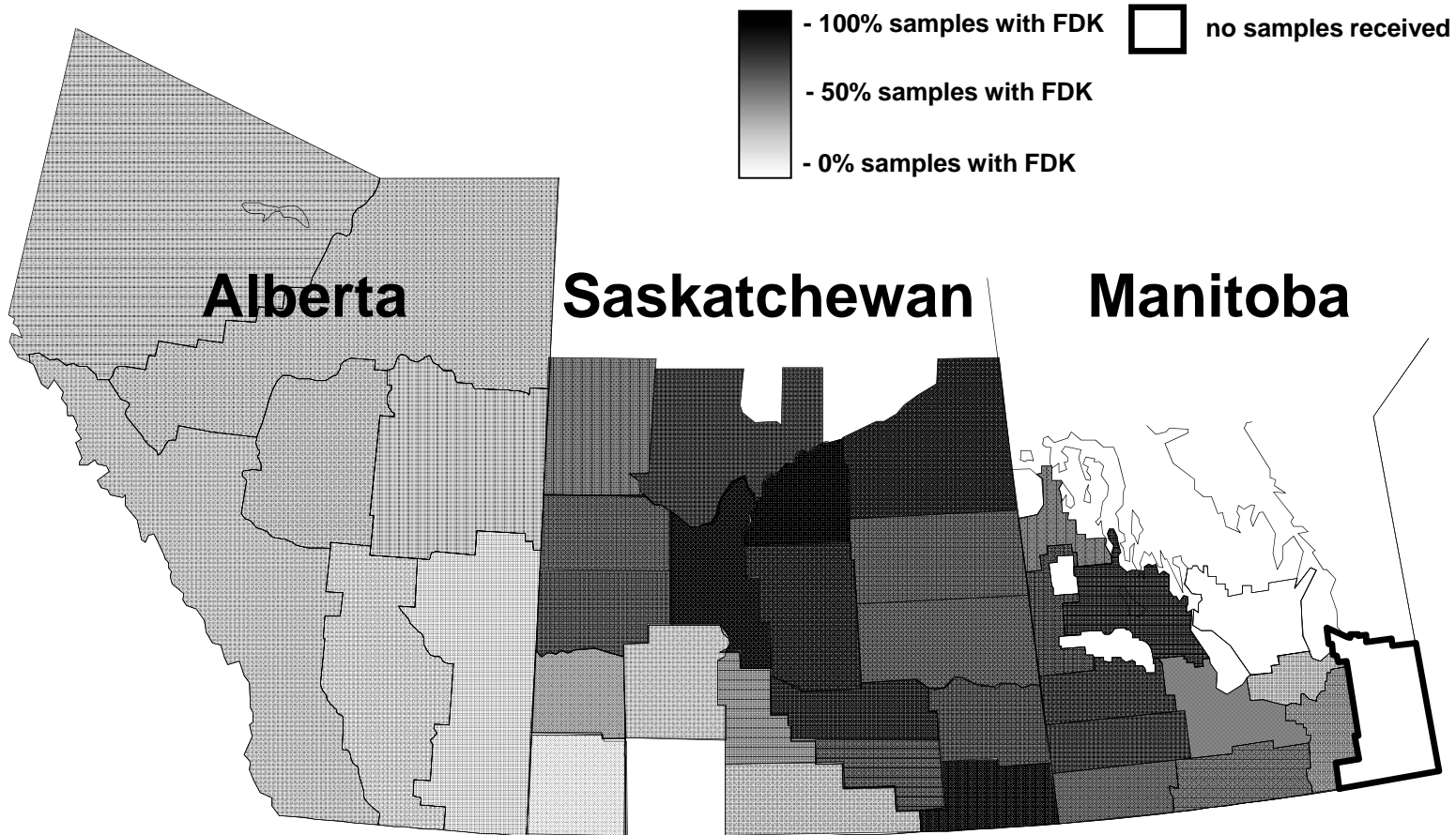




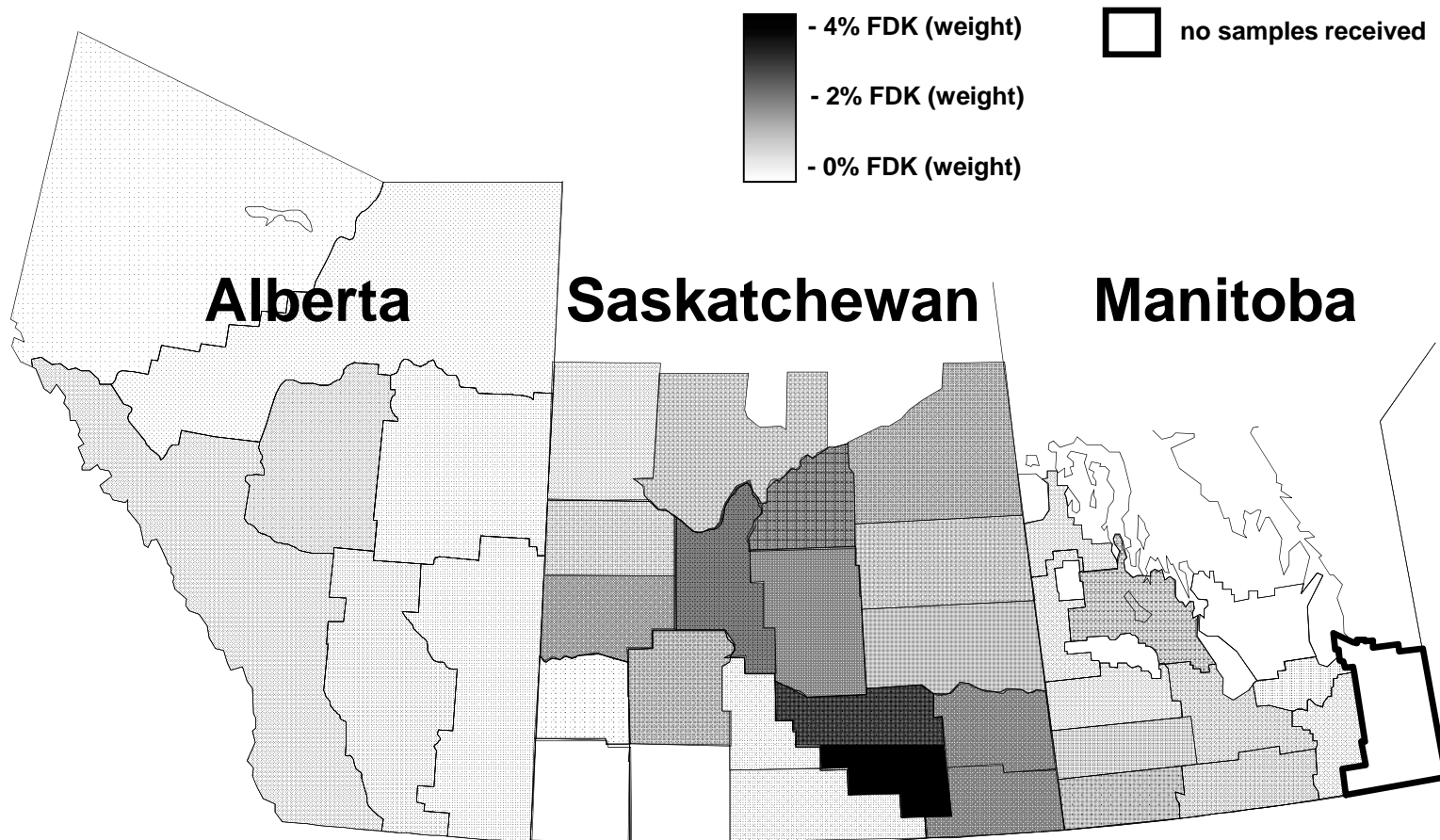
Outlook for 2015

- Mildew and Fusarium damage main degrading factors in wheat across western Canada in 2014
- Total mould load (fungal biomass) on oats higher in 2014 producer samples
- Frequency of *Alternaria* and *Fusarium* pathogens increased
- DON levels may be higher in 2014 harvest samples
- First results of processing study

Fusarium incidence on CWRS in 2014



Fusarium severity on CWRS in 2014



Acknowledgements

- Prairie Oat Growers Association
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- CGC Harvest Sample Program





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