

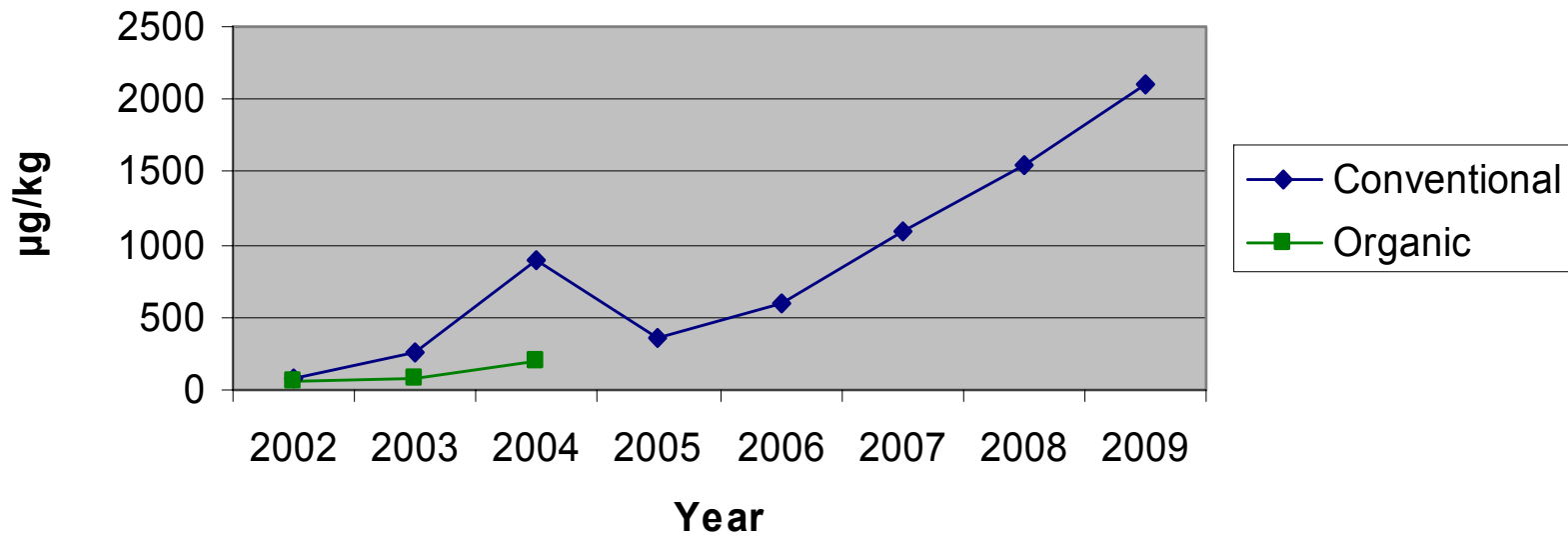
Trichothecenes in oats - temporal trends and factors influencing their occurrence

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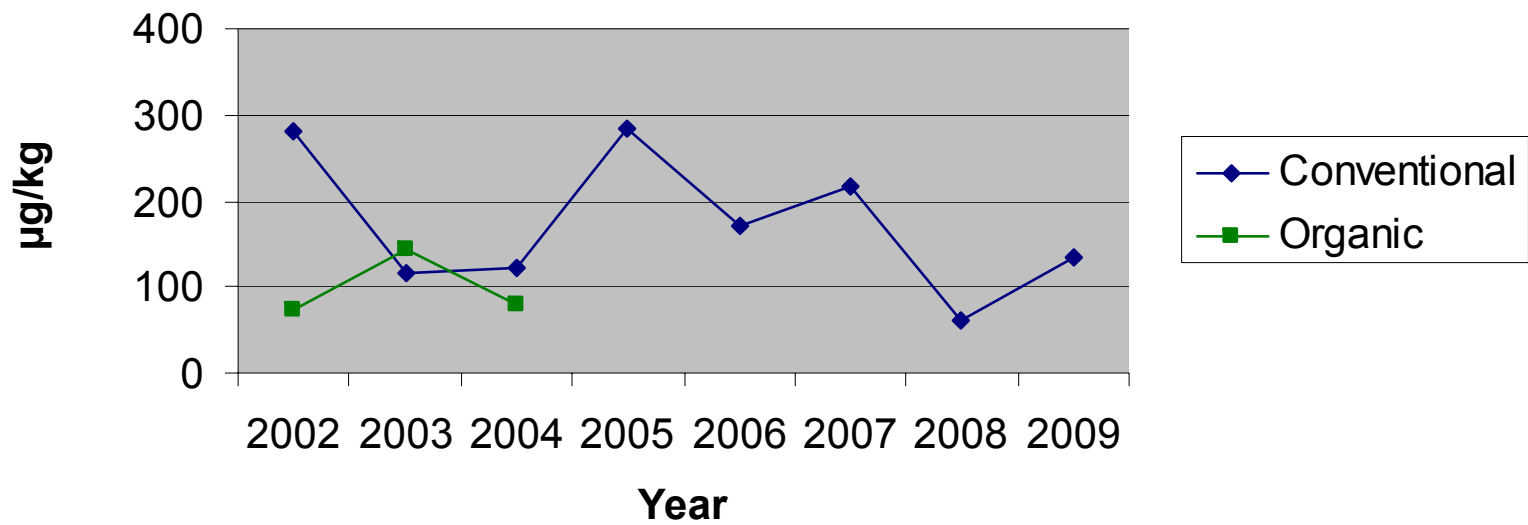
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Occurrence of DON in Norwegian oats (mean levels)



Occurrence of HT-2 + T-2 in Norwegian oats (mean levels)



Project 2002-04: *Fusarium* infestation and mycotoxin contamination of organically and conventionally produced cereals (oats, wheat, barley) in Norway

- Previous studies had found more *Fusarium* in cereals after use of mineral fertilizer than after use of organic fertilizer
- Common fungicides had shown no or, in best cases a rather insufficient effect on *Fusarium*

Project hypothesis

- the main hypothesis for our study was to investigate if organic cultivated grain had lower *Fusarium* infestation and mycotoxin contamination than conventionally cultivated grain
- furthermore, the attempt to explain the results should be done by collecting information on production management on each farm as well as climate data



Design

- Oats, barley and wheat were sampled at threshing time on the farms around in the main Norwegian cereal districts
- Samples of organic and conventional cereal of same species were collected simultaneously as pairs in the neighbourhood
- Ca 100 pairs of grains were sampled each year 2002-2004, in total 301 pairs
- Total *Fusarium*, *Fusarium* species and mycotoxins were analysed
- Information on production management on each farm as well as climate data were collected



Results:

Lower *Fusarium* infestation of organic oats, barley and wheat

Lower HT-2 and T-2 in organic oats and barley

Lower DON in organic wheat

- all as compared with corresponding values in conventionally produced cereals



Mixed effect model - P -values <0.0001

Total *Fusarium* explained 12 %:

- Fungicide use
- Non herbicide use
- Mineral fertilizer use
- Layed field

With climate parameters included: total explanation 14 %:

- Precipitation in July



Mixed effect model - P -values <0.0001

Fusarium graminearum explained 11 %:

- No clay soil
- Cereal as previous crop
- Mineral fertilizer use
- Layed field
- No silt soil
- Herbicide use
- Plant fertilizer use
- Manure fertilizer use

With climate parameters included: total explanation 30 %:

- Low precipitation in July
- Air humidity at harvest

DON explained 5 %:

- Cereal as previous crop

With climate parameters included: total explanation 10 %:

Non climate parameter <0.0001



Mixed effect model - P -values <0.0001

Fusarium langsethiae explained 11 %:

- Cereal as previous crop
- Non layed field

With climate parameters included: total explanation 15 %:

- Temperature in July

HT-2 toxin explained 16 %:

- Cereal as previous crop

With climate parameters included: total explanation 18 %:

- Air humidity at harvest



Other factors?:

Soil cultivation: Very few farmers carried out reduced soil cultivation (3, 6, and 8 % in oats, wheat and barley, respectively (2004). The results did not reveal a significant effect on *Fusarium* or mycotoxin level

Cereal strains: The main strains were used both in organic and conventional production. Some strains showed lower *Fusarium* and mycotoxin levels in organic compared with conventional production



Main conclusions:

- During the last eight-year period the level of DON shows an increasing tendency in Norwegian oats
- HT-2 and T-2 do not show a similar temporal pattern as DON
- Organically produced oats, wheat and barley show lower *Fusarium* and mycotoxin levels compared with paired samples of conventionally produced cereals
- Cereal production at the same field year by year implies a common risk for *F. graminearum*, DON, *F. langsethiae* and HT-2 (and T-2) in the cereal
- Use of fungicide and mineral fertilizer are also common risk factors
- Sandy soil seems more exposed to *Fusarium (graminarum)* than clay and silt
- Concerning climate factors, precipitation and temperature in July seem to influence differently on the various *Fusarium* species. Humidity around harvest may imply a risk for DON as for and HT-2 (and T-2)



