7th EC Forum on Fusarium toxins.
Brussels, February, 2010

T-2, HT-2 and DON in malting barley and malt

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Outline of presentation

- What is Euromalt?
- Summary of evidence presented to 6th Fusarium Forum
- Data from the 2009 malting barley harvest
  - Occurrence of T-2 and HT-2 toxins in malting barley
  - Changes in incidence
  - T-2 and HT-2 toxins in commercial malts
  - Occurrence of DON and other fusarium toxins in malting barley and malt

Euromalt

- Euromalt was established in 1959 and represents the interests of the EU malting industry
- Around 8.8 million tonnes of malt (42% of the world total) are produced annually in the EU
- Around one quarter of this is exported
- 94% of total malt production is used for beer brewing
- 4% is used for whisky distilling
- 2% is used in the food industry

- Euromalt has been surveying mycotoxins in European malting barleys and malts since 2002

Euromalt mycotoxin survey 2002 - 2009

- 100 - 200 samples per year in total, from all EU member states with significant malt production
- Number of samples per country is proportional to malt production
- 10kg samples are collected and analysed according to EU protocol (Directive 2002/26/EC)
- Samples are collected as pairs: a barley sample and the malt produced from that barley
- Samples analysed for Fusarium toxins by validated GC-MS or LC-MS/MS methods

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Summary of data presented at 6th Fusarium Forum

- Occurrence and concentrations of T-2 and HT-2 toxins in barley have increased across Europe since 2005 but levels appear to have stabilised in the last two years
- Occurrence of these toxins appears to be related to an increase in the incidence of *F langsethiae*
- Levels of these toxins in Winter barley varieties are generally lower than in Spring barley varieties
- Levels in malt are usually substantially lower than in the corresponding barley but there is no strong correlation between the two
- Levels of DON in malting barley have also increased in the past few years but there is no correlation with the incidence of T-2 and HT-2

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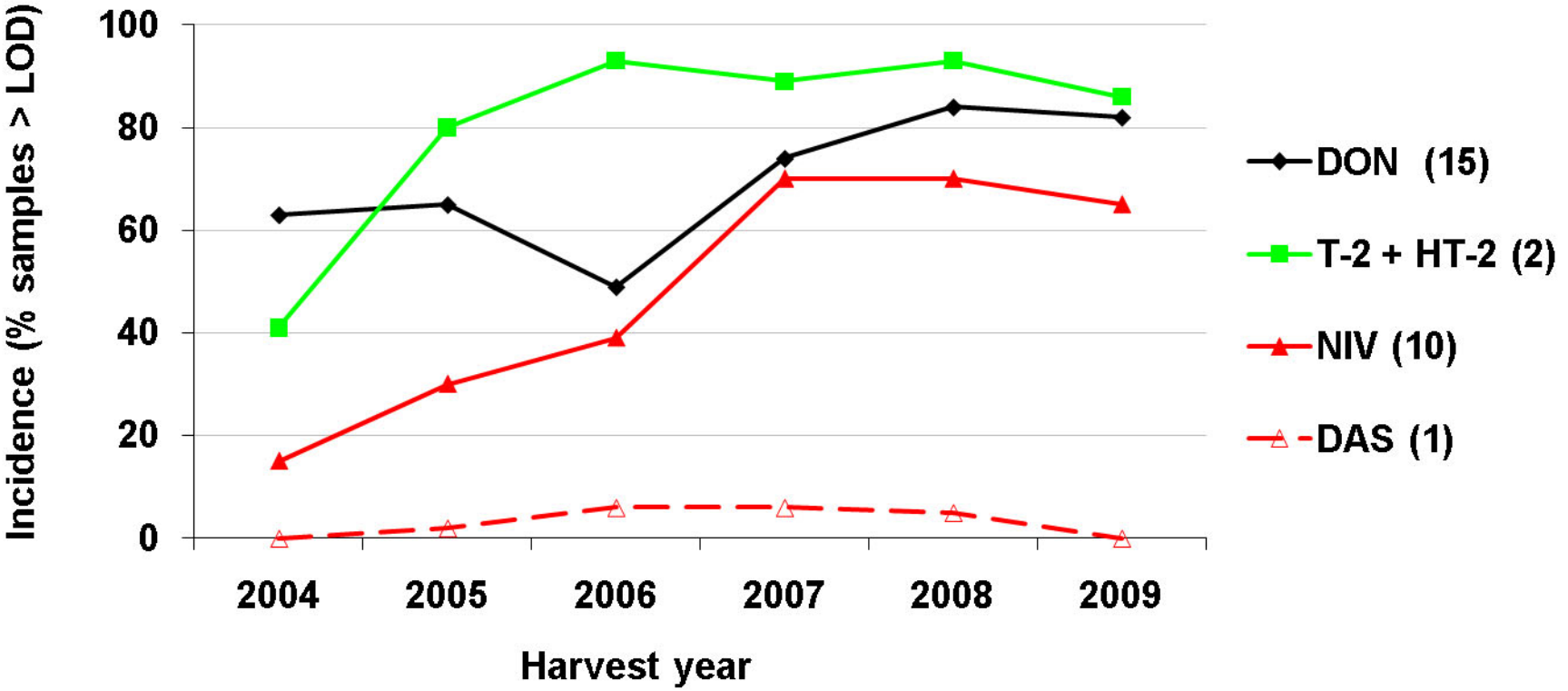
Incidence of trichothecenes in malting barley 2004-2009



77 to 95 samples per year

Numbers in parentheses denote LOD

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Incidence of trichothecenes in barley: summary of results

- The incidence of all fusarium toxins is lower in 2009 than in 2008
- The incidence of T-2 and HT-2 in barley, having risen from 2004-2006, appears to have stabilised at about 85% of harvest samples
- The incidence of deoxynivalenol and nivalenol have also risen over the years but do not correlate with that of T-2 and HT-2

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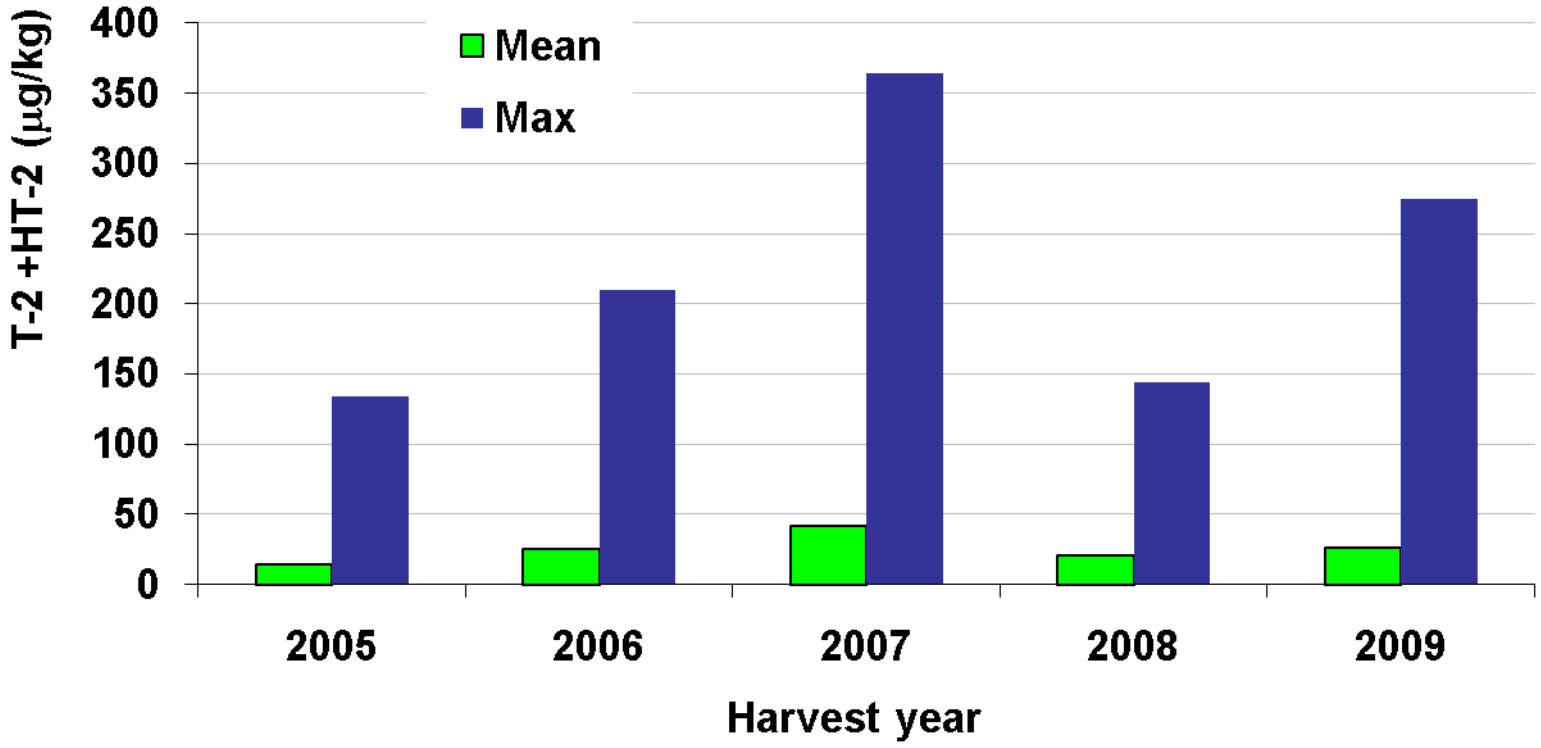
Mean and maximum [T-2 + HT-2] in harvested barley 2005 -2009



77 to 95 barleys per year

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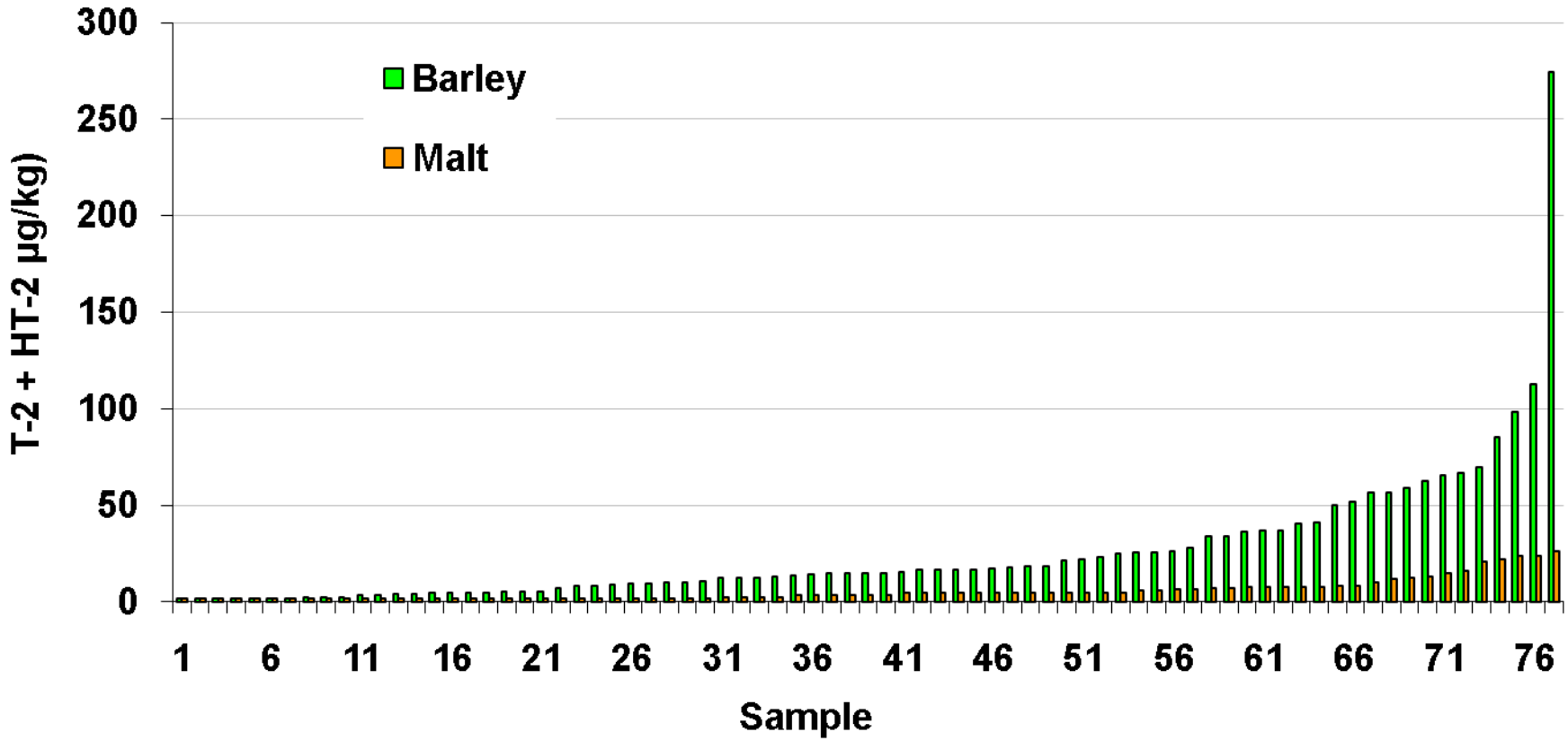
[T-2 + HT-2] in barley and malt 2009



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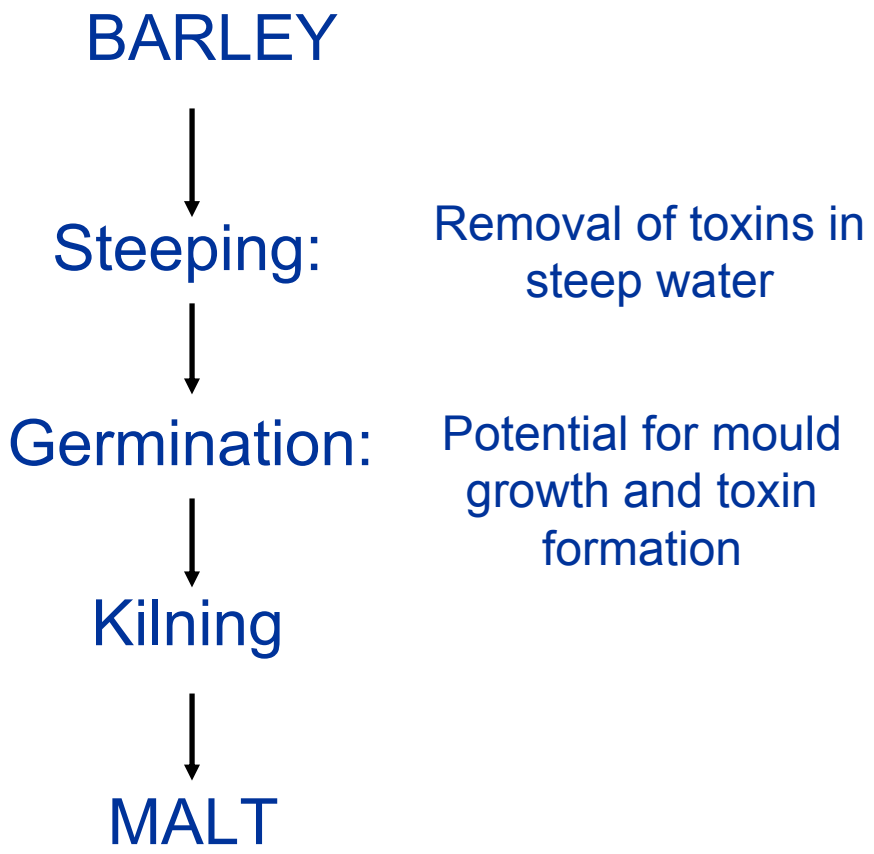
Schematic diagram of the malting process



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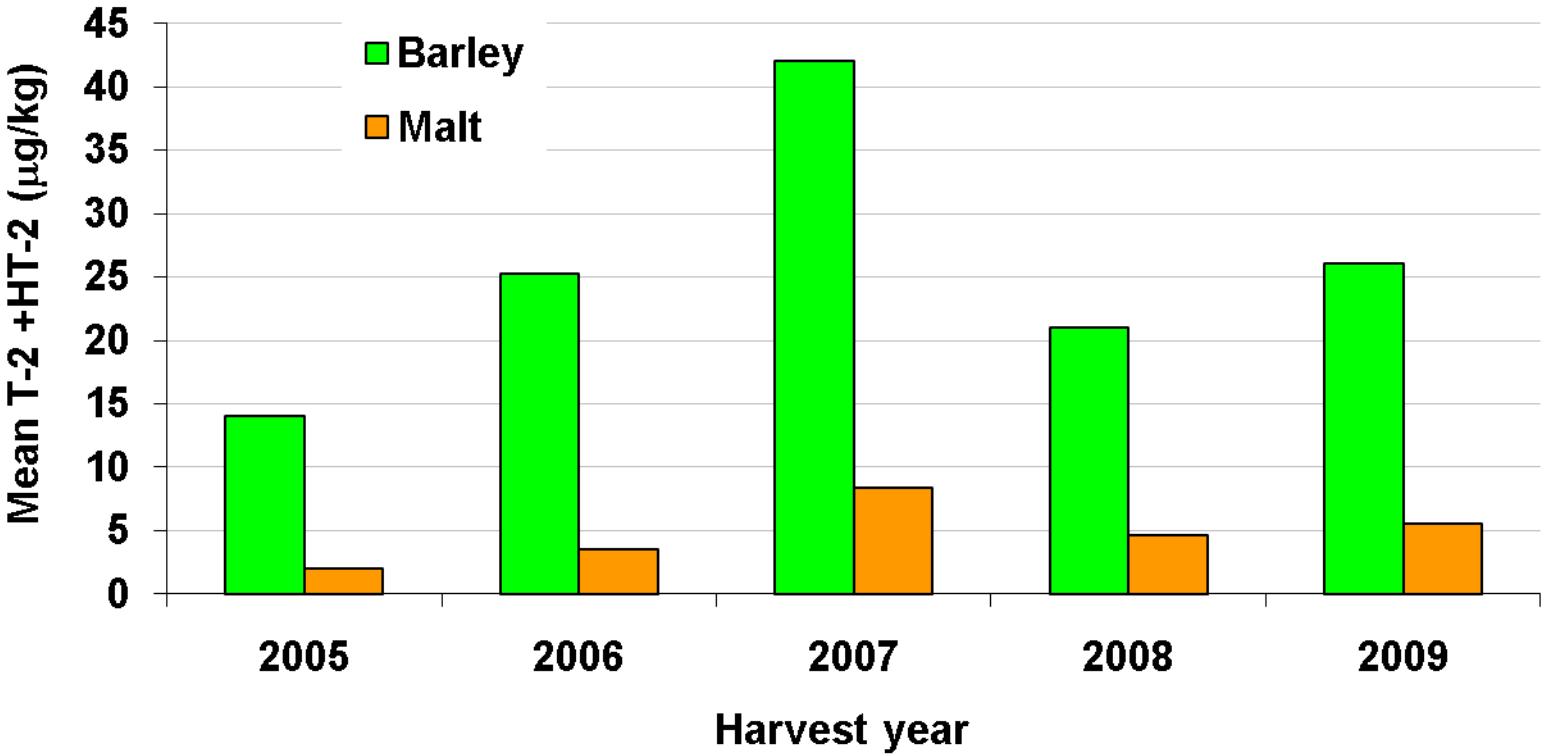
Mean [T-2 + HT-2] in barley and malt



77 to 95 barley & malt pairs per year

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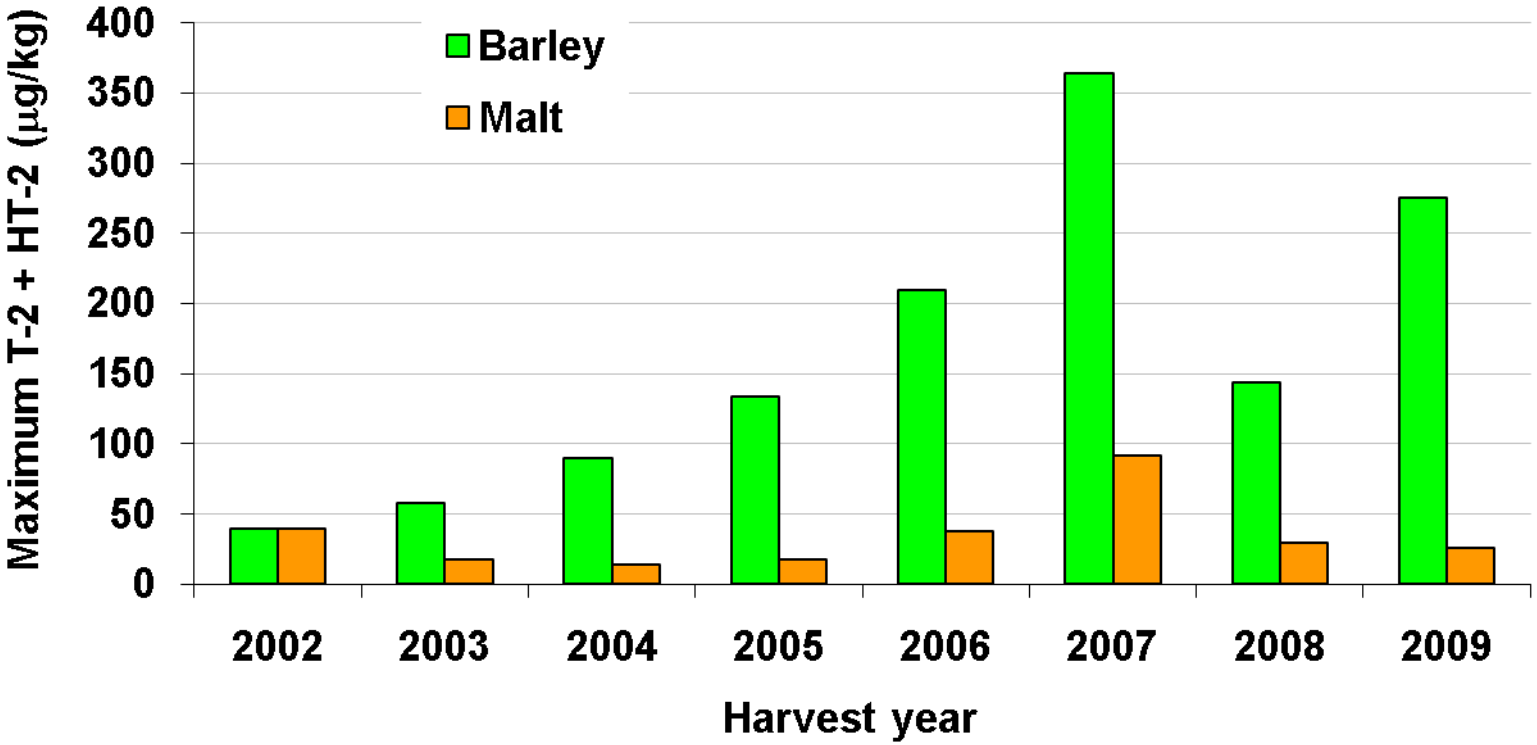
Maximum [T-2 + HT-2] in barley and malt



77 to 95 barley & malt pairs per year

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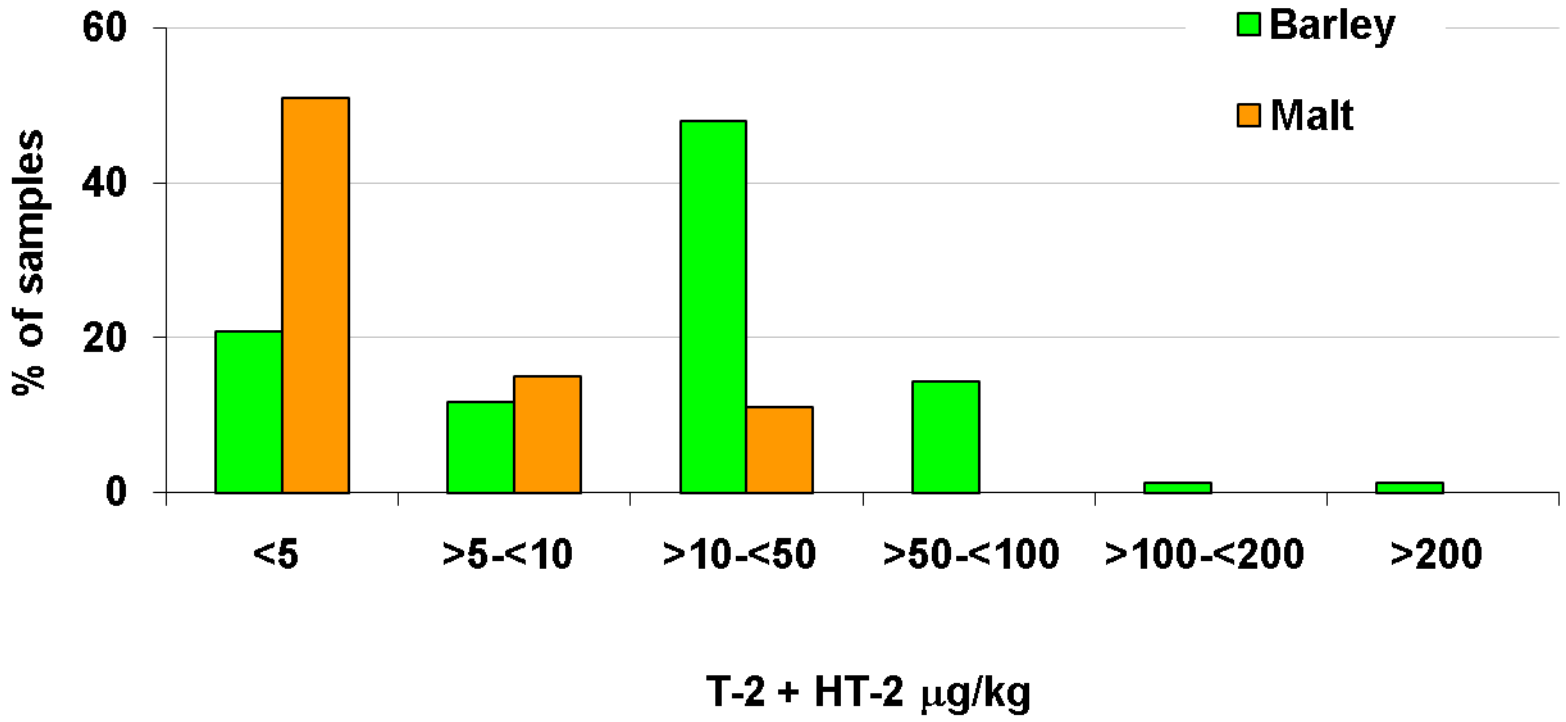
Distribution of [T-2 +HT-2] in barley and malt from the 2009 harvest



77 barley & malt pairs

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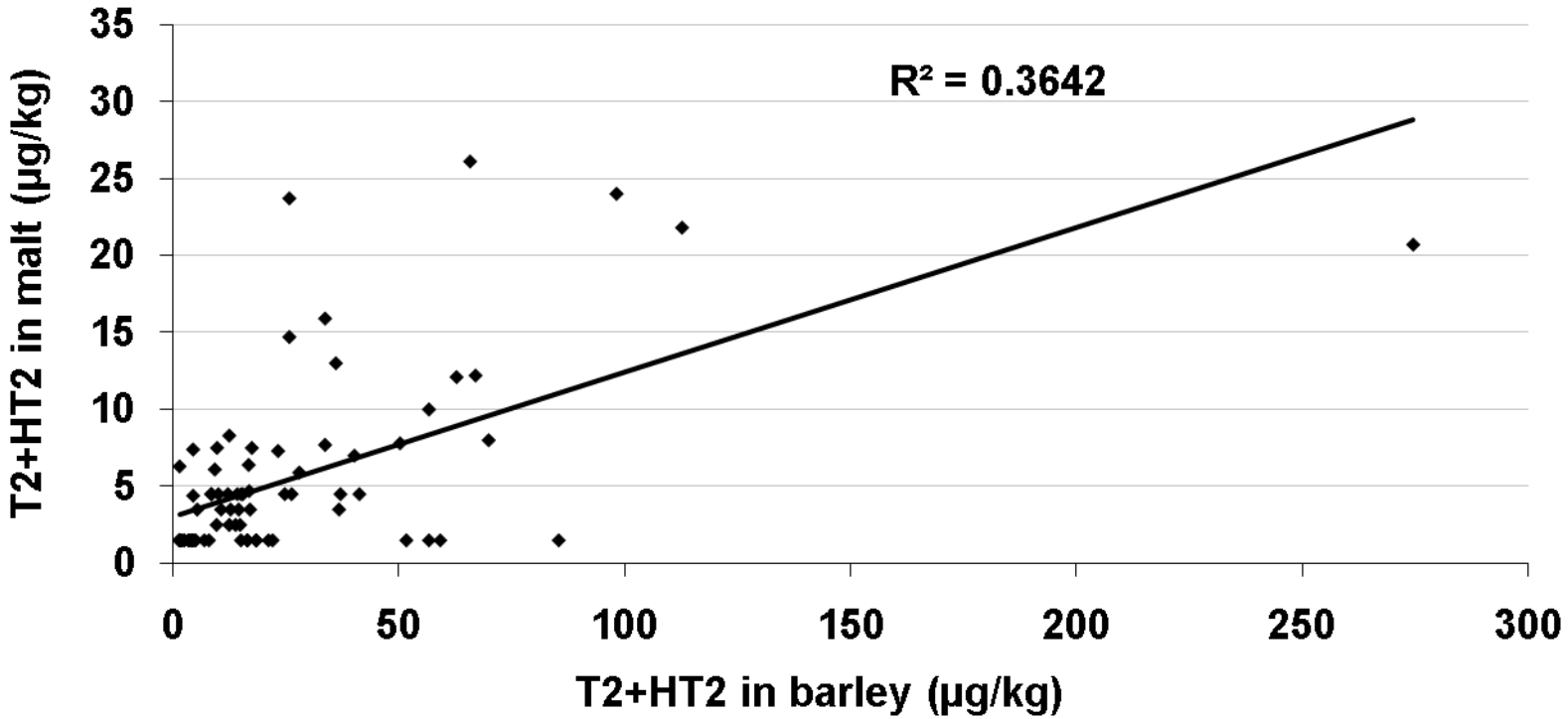
Comparison of [T-2+HT-2] in barley and malt: 2009 harvest



77 barley & malt pairs

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Conclusions on [T-2 +HT-2] in barley and malt from the 2009 harvest

- The correlation between individual barley and malt samples is poor but on average the impact of processing is a 75-80% reduction in [T-2 + HT-2] for barleys with >20 ug/kg [T-2 + HT-2]
- The pattern is the same as in previous years; poor correlation but overall a substantial reduction in toxin levels

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Spring v Winter Barley

- French data from the 2006 - 2008 harvests presented at the 2009 Fusarium Forum suggested that T-2 + HT-2 might be lower in winter-grown barley s compared with spring-grown barley
- Europe-wide data from the 2008 harvest suggested higher levels of T-2 + HT-2 in spring barleys, but the difference disappears after malting

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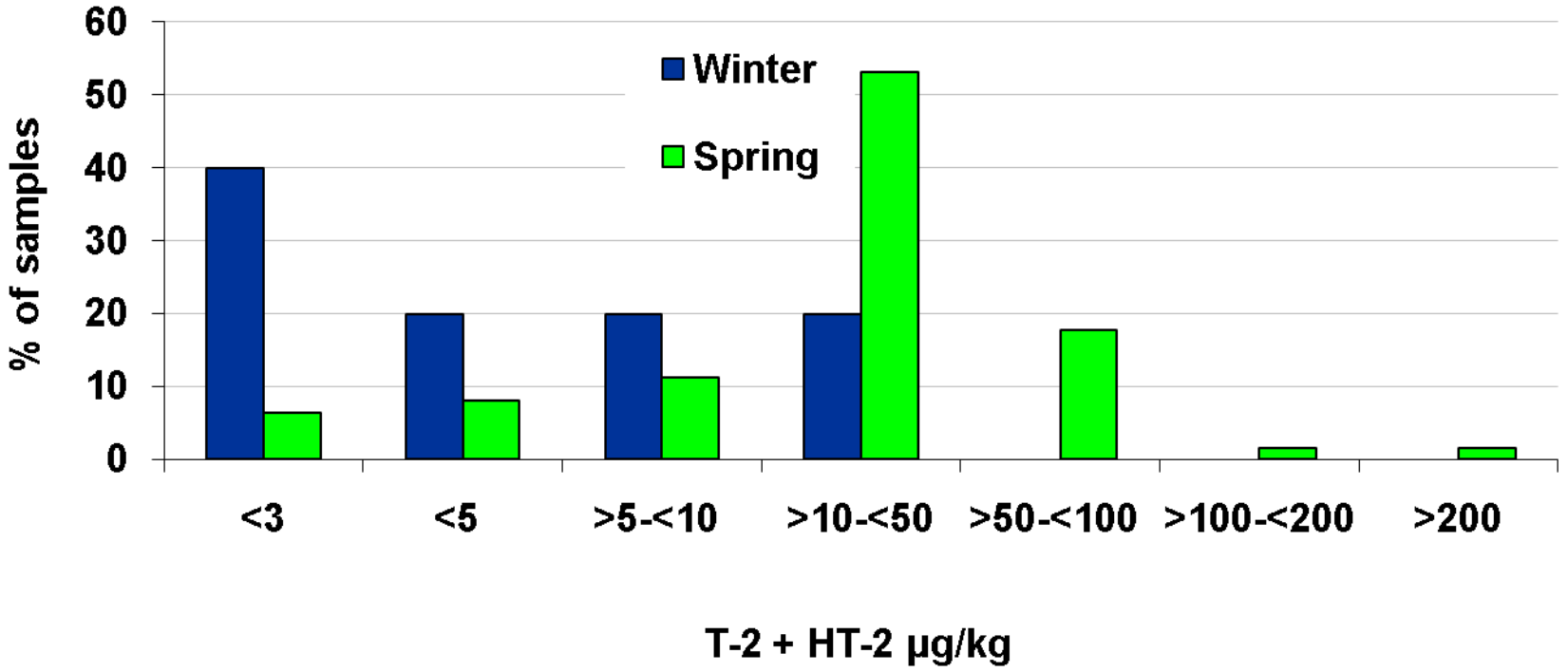
[T-2 + HT-2] in winter and spring barleys from the 2009 harvest



60 spring barleys & 17 winter barleys

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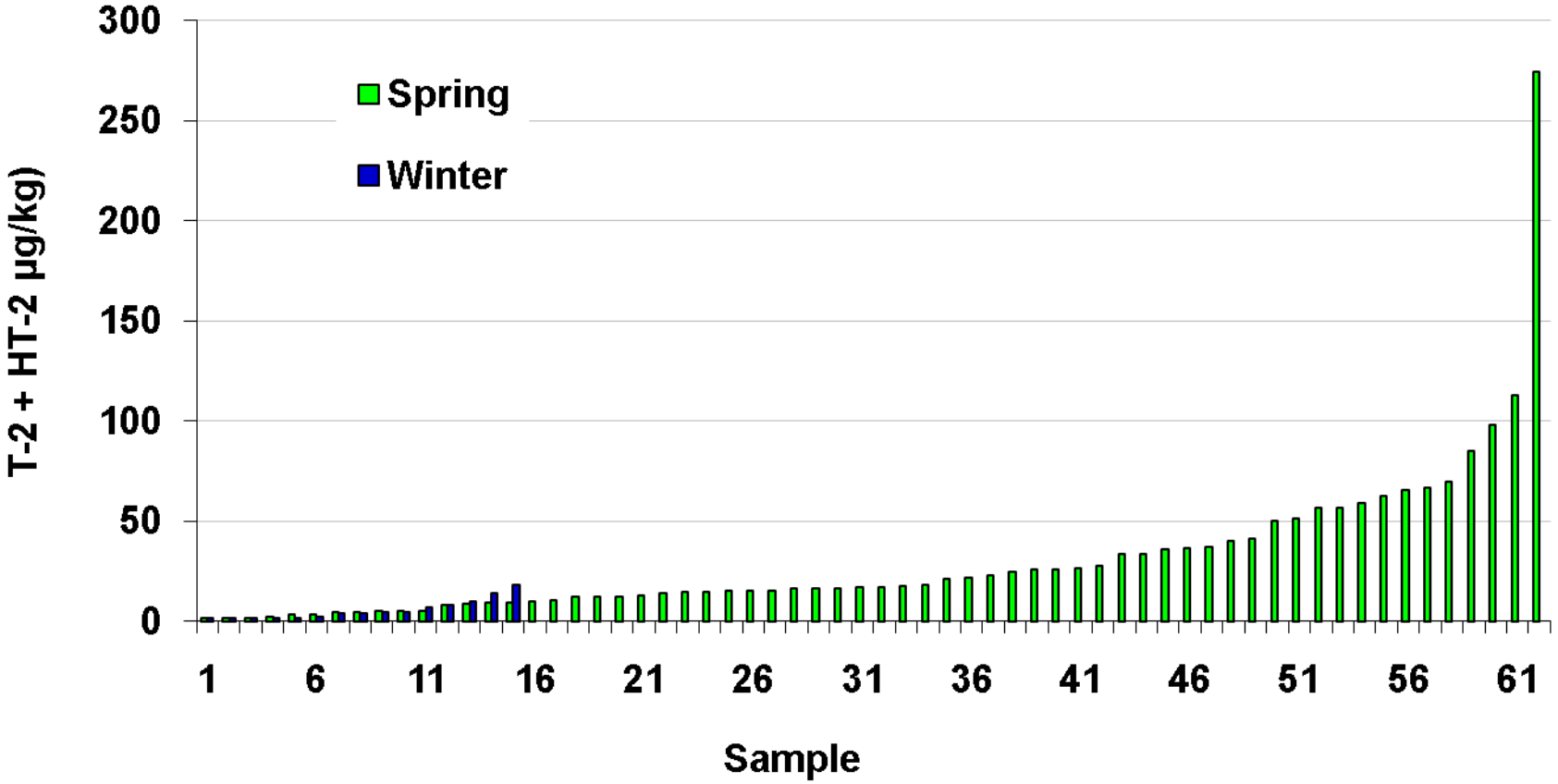
[T-2 + HT-2] in winter and spring barleys from the 2009 harvest



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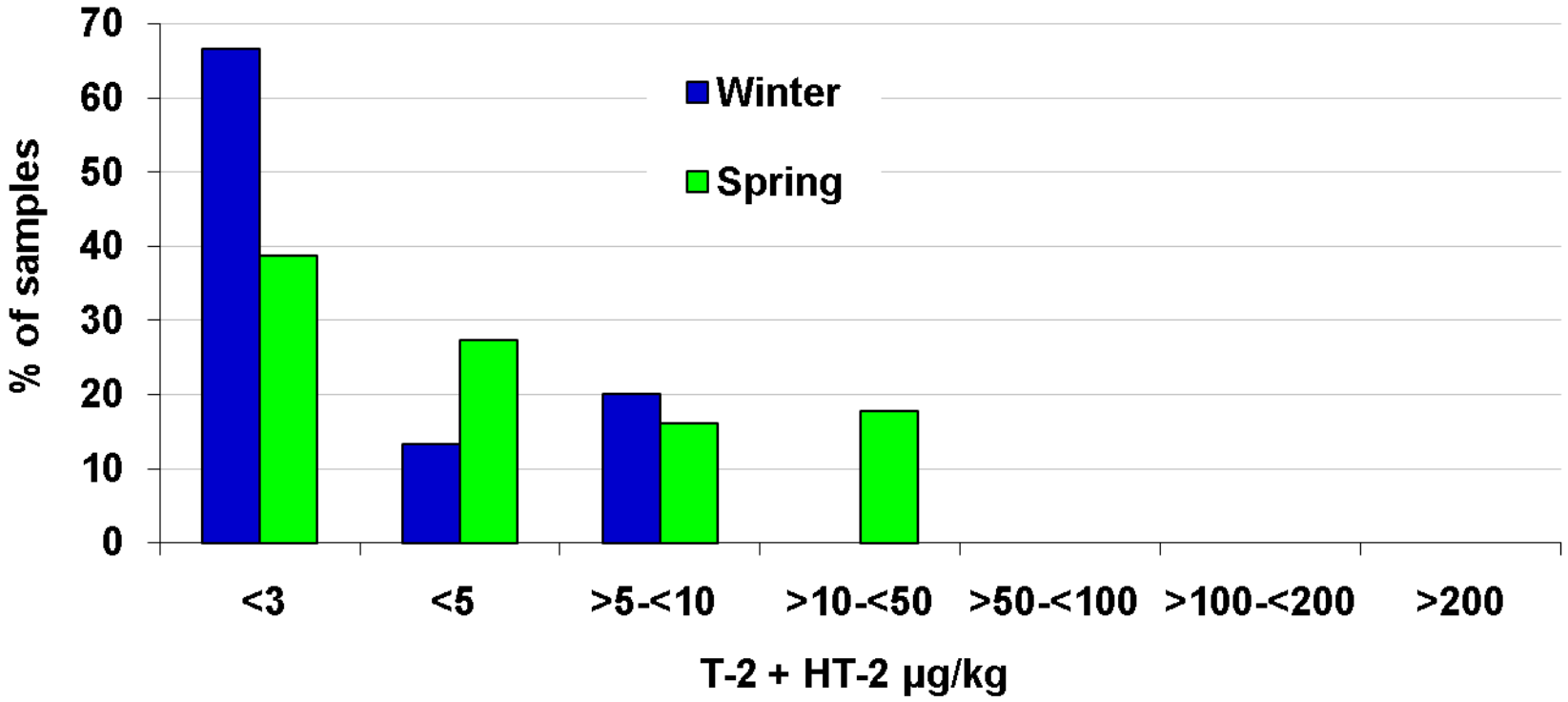
[T-2 + HT-2] in malt prepared from winter and spring barleys



60 malts from spring barleys & 17 malts from winter barleys

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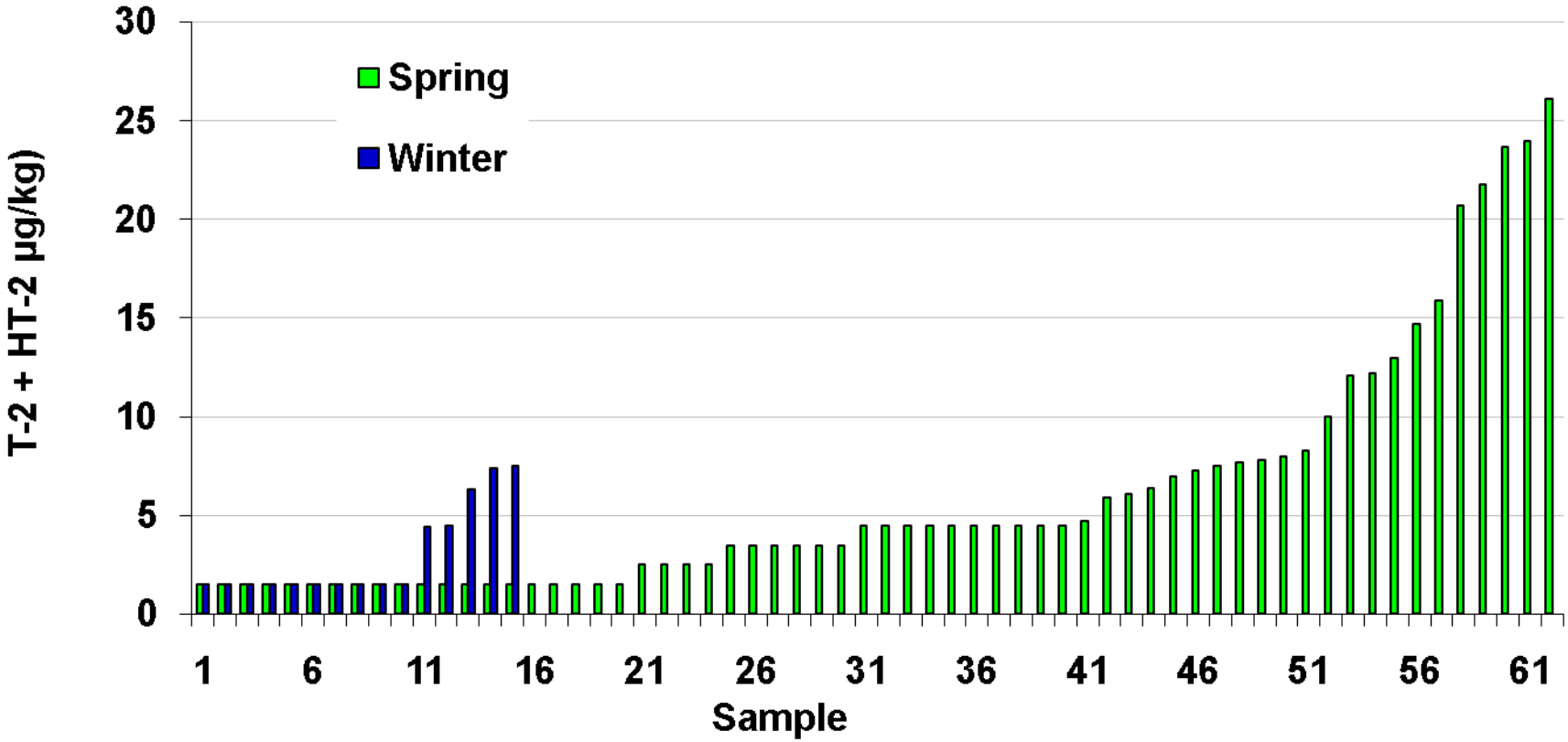
[T-2 + HT-2] in malt prepared from winter and spring barleys



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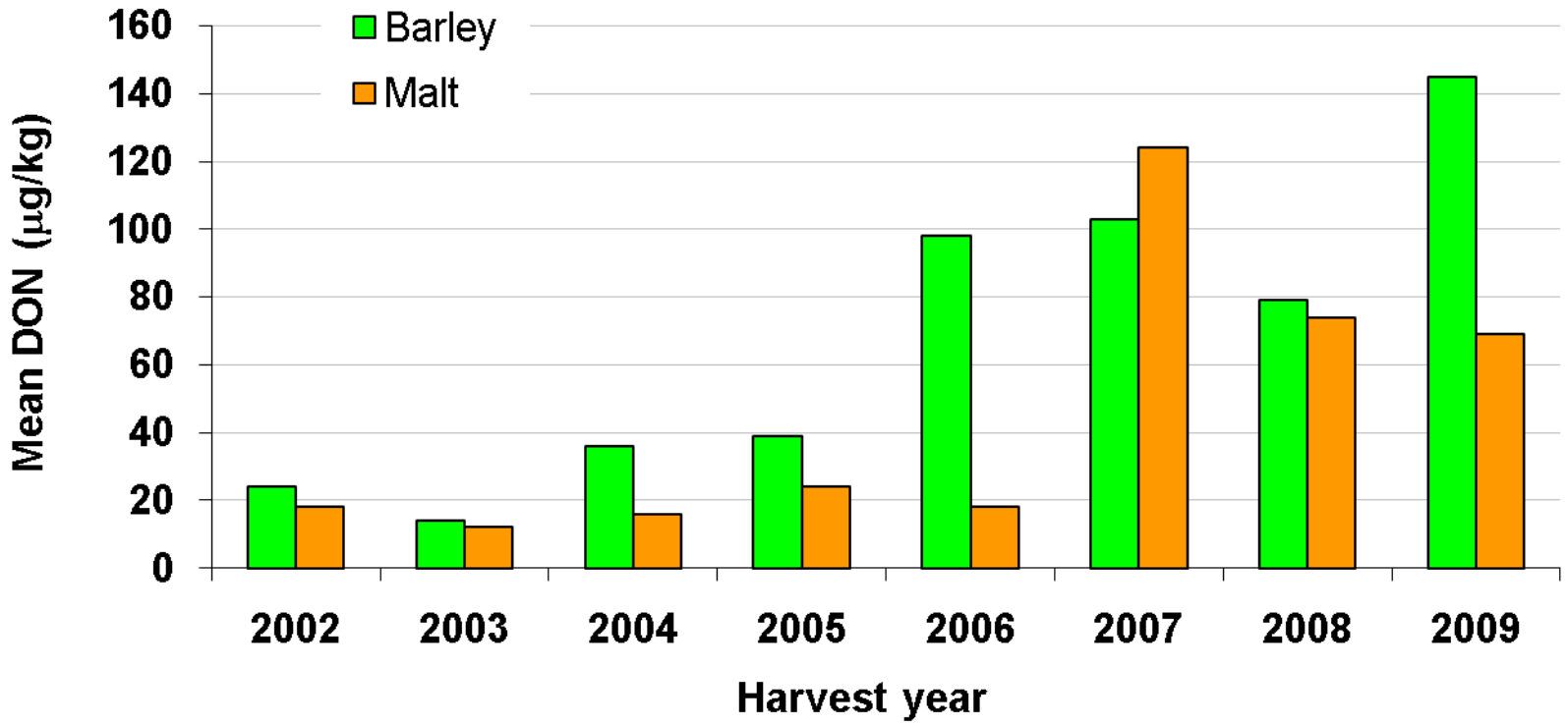
Mean [DON] in barley and malt: 2002-2009 harvests



77 to 95 barley & malt pairs per year

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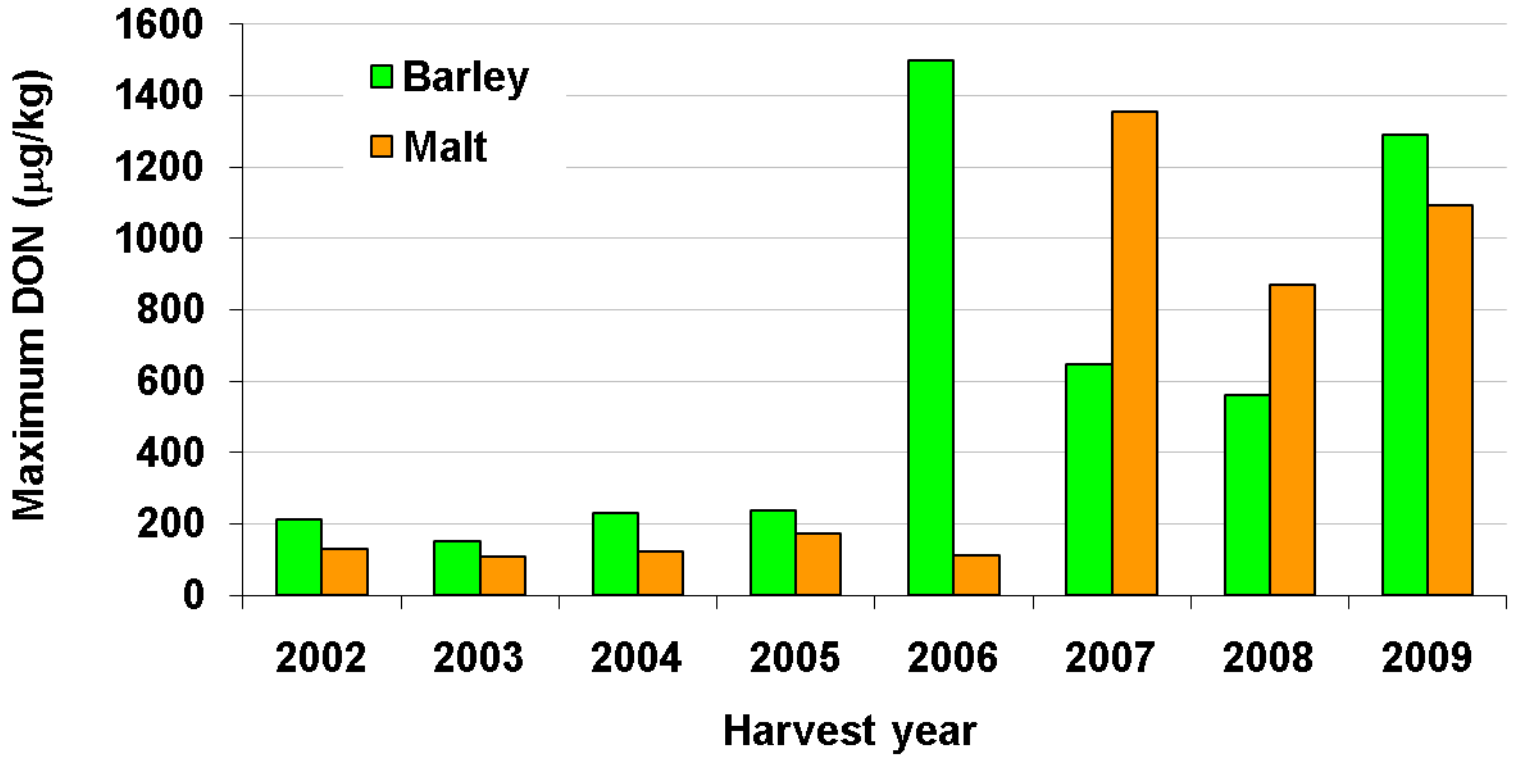
Maximum DON in malting barley: 2002-2009 harvests



80 to 95 barley & malt pairs per year

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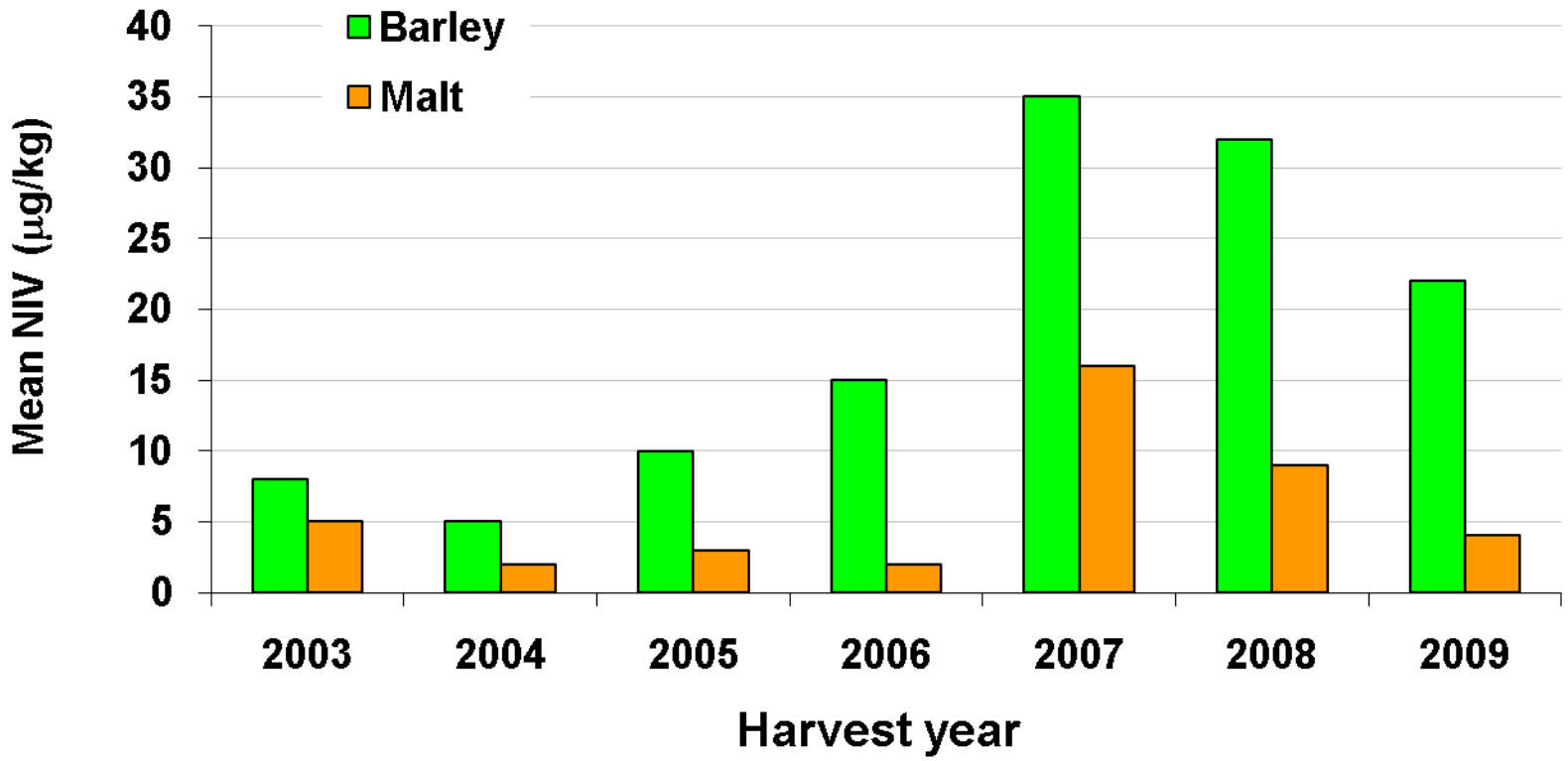
Mean NIV in malting barley: 2002-2009 harvests



77 to 95 barley & malt pairs per year

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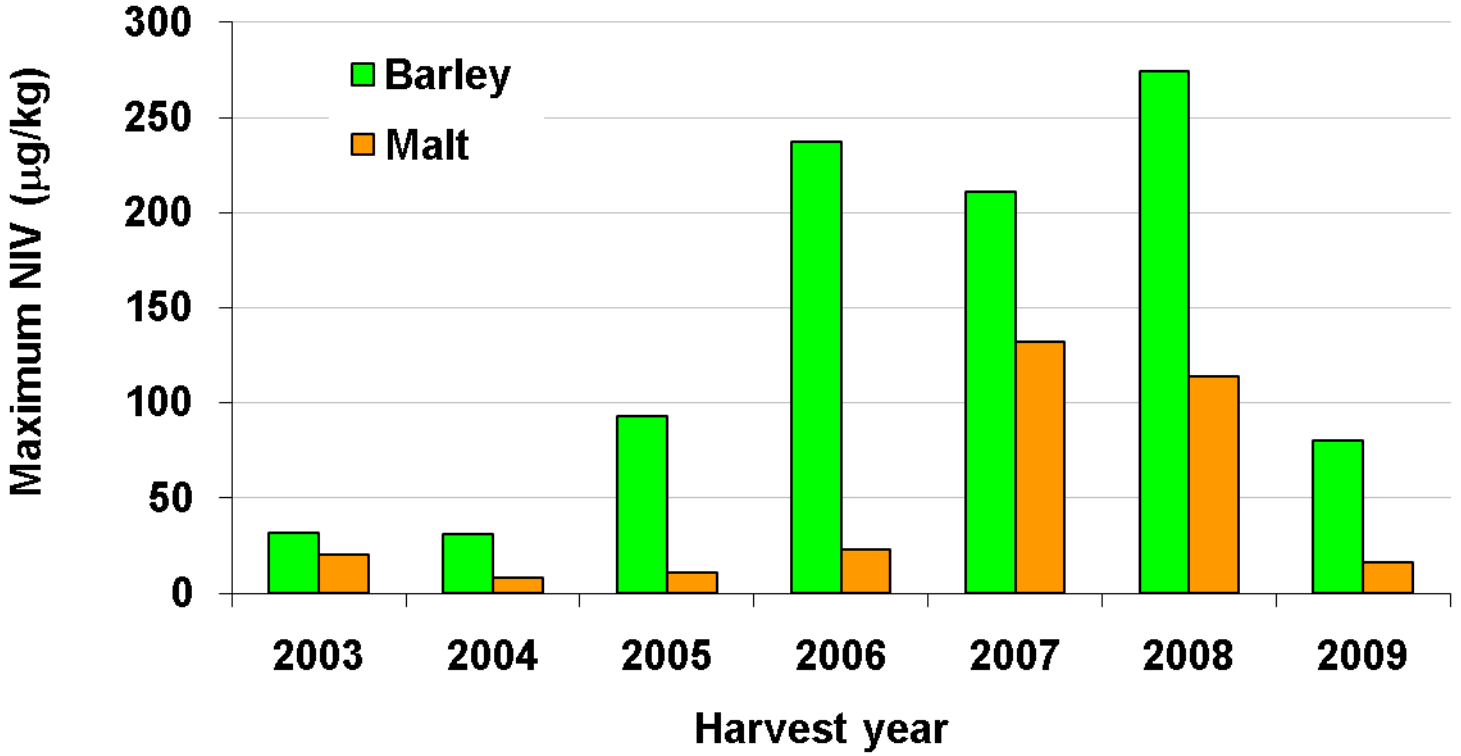
Maximum NIV in malting barley: 2002-2009 harvests



77 to 95 barley & malt pairs per year

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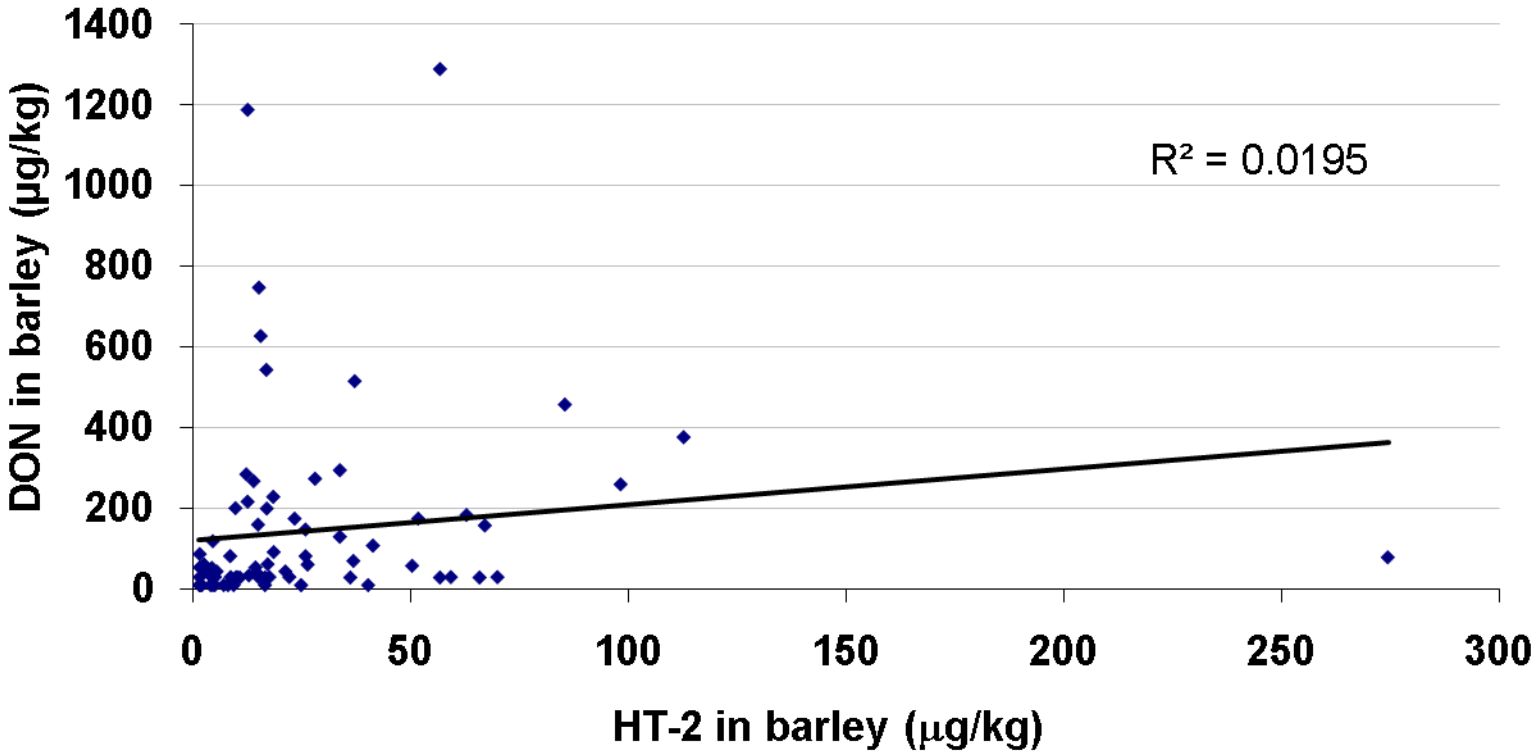
Correlation between [T-2 + HT-2] and [DON] in barley: 2009 harvest



77 samples from the 2009 harvest

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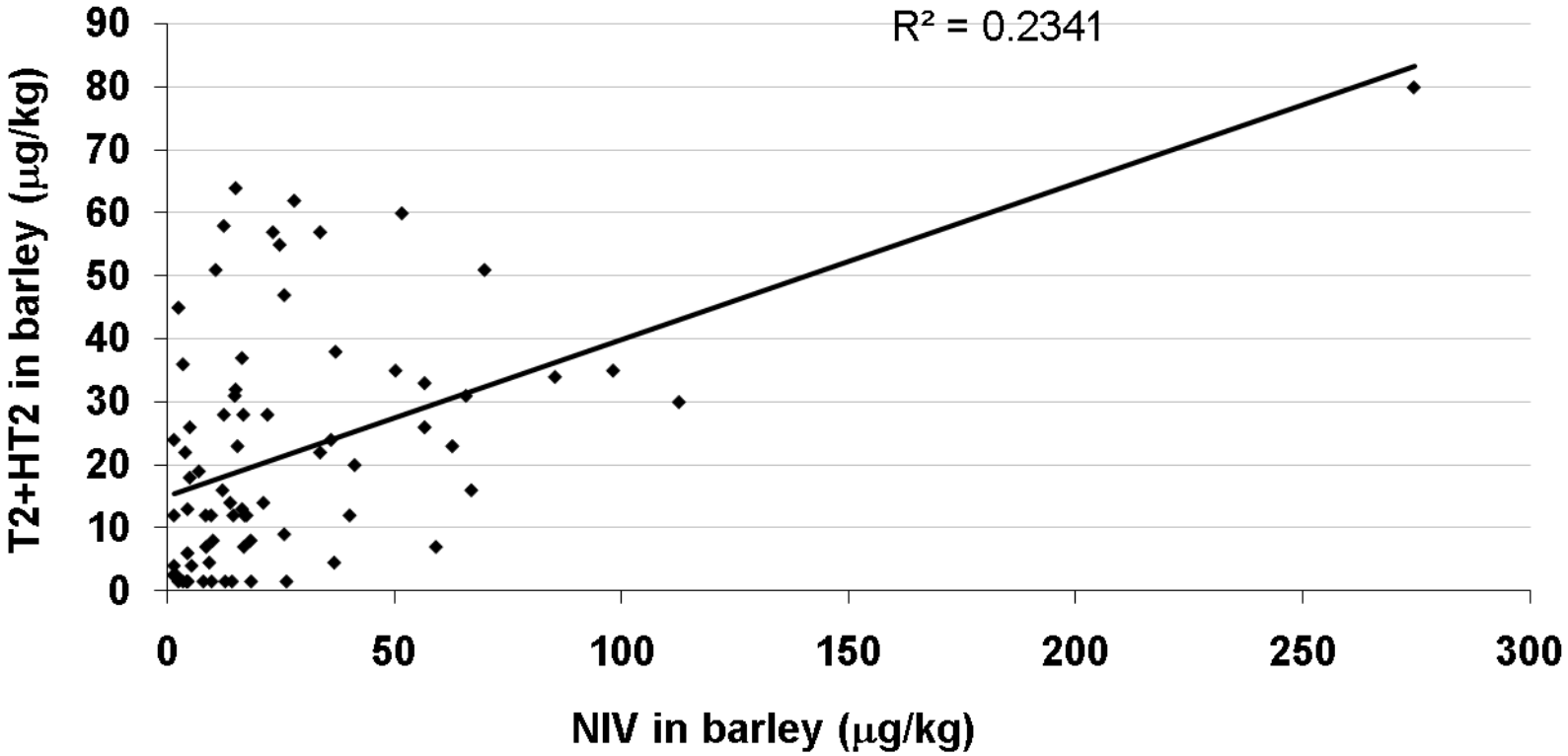
Correlation between [T-2 + HT-2] and [NIV] in barley: 2009 harvest



77 samples from the 2009 harvest

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Conclusions from the 2009 survey

- Upward trend in the incidence of T-2 and HT-2 toxins observed until 2006 but this has since stabilised;
- Incidence of DON does not parallel that of T-2 + HT-2
  - DON varies from year to year; related to climatic conditions
  - T-2 + HT-2 not significantly higher in wet years
- Sample set is too small to pick up significant differences between regions or countries

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Conclusions from the 2009 survey

- Mean and maximum concentrations of T-2 + HT-2 are significantly lower in malt than in the starting barley
- There is no reliable correlation between [T-2 + HT-2] in barley and that in the corresponding malt
- Barley samples are taken and malted shortly after harvest –fusarium toxins decline during prolonged storage, hence levels of toxins in these samples may be relatively higher than barleys and malts over the whole year

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General conclusions

- The available evidence from the past few years demonstrates that T2 and HT2 content in malting barley is highly unpredictable;
- The variation on a year to year basis is such that the supply chain operators have difficulty in managing the risk;
- At the same time, due to the very poor understanding of the causes of fungal infestation in the field, operators do not have the background tools to forecast the risks;
- Euromalt is very concerned that new legal levels for certain mycotoxins in grain could compromise the supplies of our raw material, malting barley. **This is why Euromalt is passionately committed to working with the EU authorities, as well as our barley growers, to find pragmatic solutions to avoid finding ourselves in a situation whereby the very future of our industry is threatened.**

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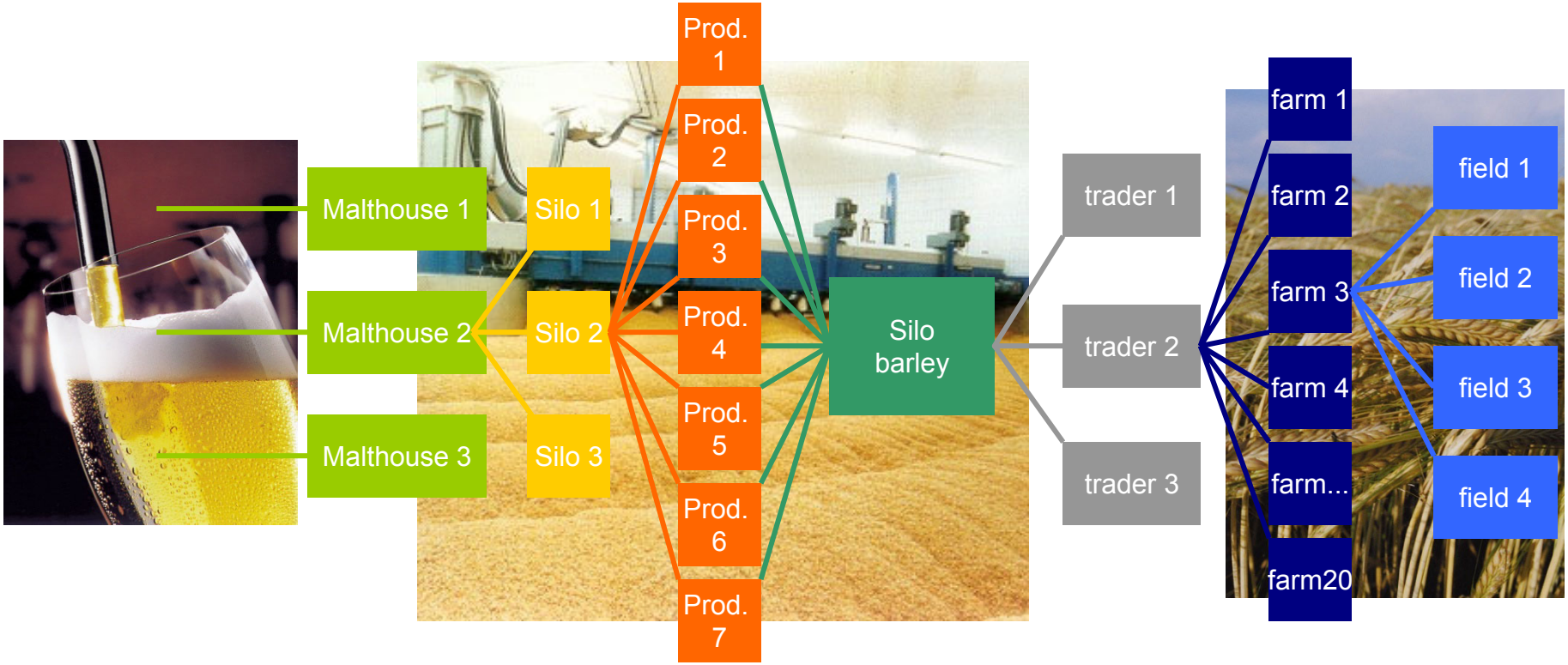
Food safety and traceability

Possible toxin dilution from grain to glass



3 Malthouses x 3 Malt silos x 1 Barley silos x 3 Barley originators x 20 Farmers

540 Farmers - 2160 Fields

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Euromalt supports:

Study on the origins as well as means of controlling the development of these toxins, if there are any, in the field:

- To assess why the incidence of *F. langsethiae* is increasing in Europe (biology of the strain, fungi population's ecology in barley fields)
- To identify the main agronomic factors contributing to this increase (tillage, pre-crop, others?)
- To find out if there are any resistant varieties available
- To study what can be done to reduce *F. langsethiae* infection and toxin production in the field (natural and artificial antagonisms, fungicides)

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