# *FUSARIUM* TOXINS IN OATS IN FINLAND SINCE 1999

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## Introduction

The central goal of grain cultivation is the production of high-quality food or feed-related raw materials for the processing industry. To reach the goal safety aspects of cereal grains have to be certify in addition to the high technical quality of grains. For these purposes a continuous grain quality monitoring programme has been carried out as part of a National Quality Strategy in Finland since 1999. The aim of this programme has been the systematic analysis and documentation of grain quality and safety data, including the traceability of each samples. Traceability implies that from the samples studied background factors such as the habitat of a plant, type of soil, variety of the grain, quality of seed and seed dressing, plant rotation, nitrogen fertilization, plant protection procedures during the growing season, growth period, harvesting-related moisture, harvest quantities and harvest drying can be determined. In the monitoring study mycotoxins such as trichothecenes, zearalenone and ochratoxin A have been determined in representative Finnish cereal samples.

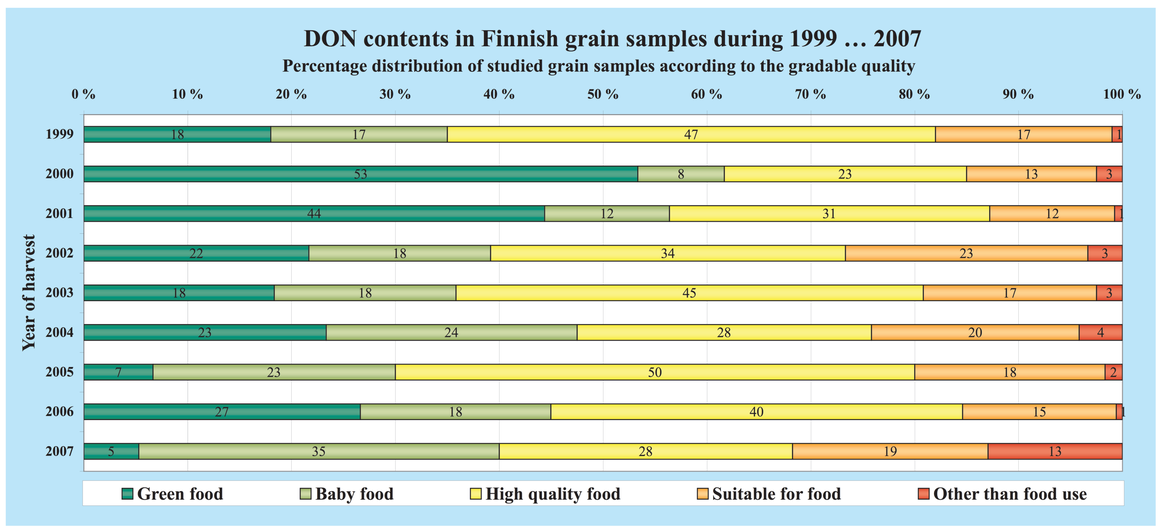
**Formation of *Fusarium* toxins and their toxic effects**

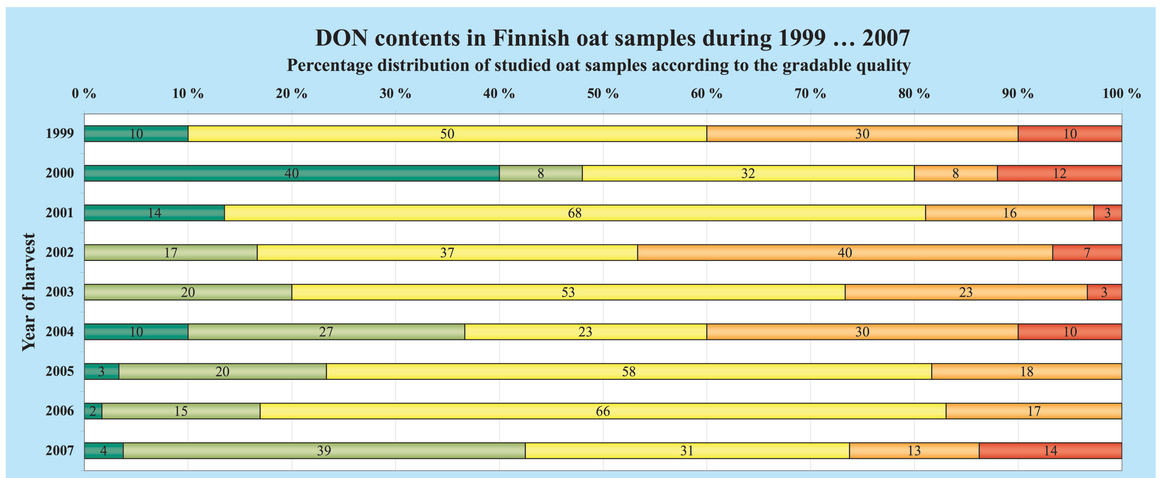
| Contaminant | Source of formation | Toxic effects |
|---|---|---|
| Mycotoxins: *Fusarium* -toxins | Natural toxins in Finnish cereal grains: the most frequently isolated F. species are *F. avenaceum, F. graminearum, F. culmorum, F. poae, F. sporotrichioides, F. langsethiae* | In humans: indisposition, effects of the central nervous system and heaviness of heart<br>in animals: loss of appetite and reduced weight gain, vomiting, heavy diarrhoea, swelling, nervous system disturbances and infertility |

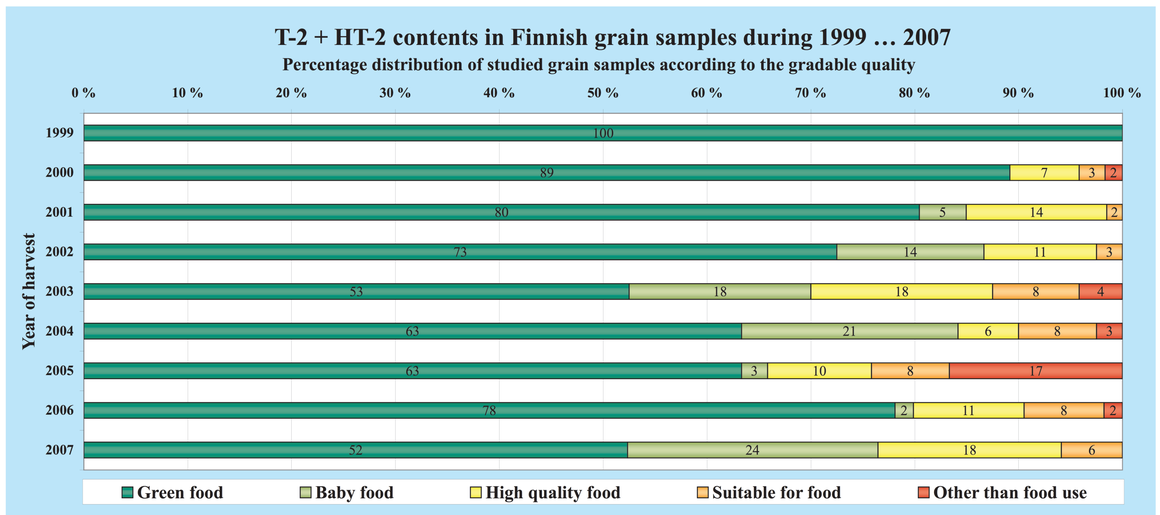
## Materials and methods

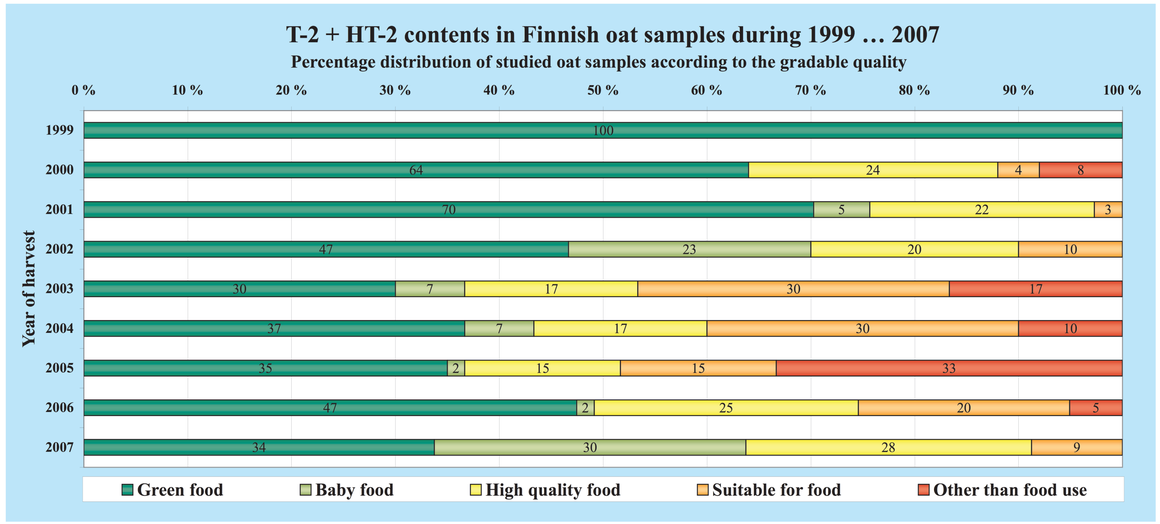
The representative grain samples (120 - 170 samples per year) were collected after harvest from all cultivation zones in Finland. Finnish Food and Safety Authority Evira was responsible for the sample collection. DON, DAS, 3-AcDON, 15-AcDON, FX, NIV, T-2 and HT-2 toxins were determined from the grain samples employing GC-MS technique. Zearalenone and ochratoxin A were identified and quantified by HPLC.

## Results and discussion



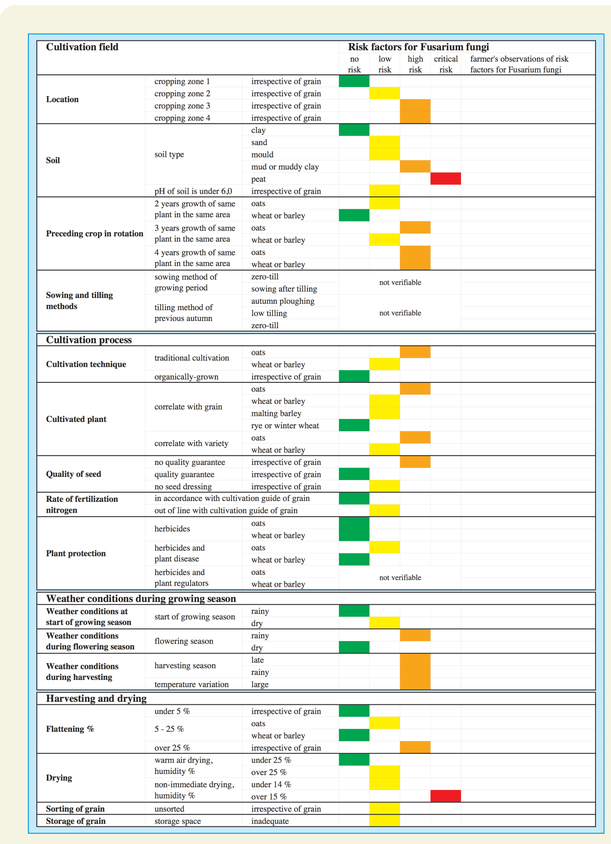

**The upper and lower limits of DON and T-2 + HT-2 concentration values for the colour classification**

| Category of the cultivation factor | | | | | | |
|---|---|---|---|---|---|---|
| Name of the colour classification box | | Green food | Baby food | High quality food | Suitable for food | Other than food use |
| Cultivation factor of the studied grain | Upper limit of DON concentration | < LOD | < 200 µg/kg | < 500 µg/kg | Oat 1750 µg/kg, other cereals 1250 µg/kg | No upper limit |
| | Lower limit of DON concentration | 0 | LOD | > LOD | > 200 µg/kg | Oat > 1750 µg/kg, other cereals > 1250 µg/kg |
| | Upper limit of T-2 + HT-2 concentration | < LOD | < 50 µg/kg | < 200 µg/kg | 500 µg/kg | No upper limit |
| | Lower limit of T-2 + HT-2 concentration | 0 | LOD | > LOD | > 200 µg/kg | > 500 µg/kg |

## Conclusions

According to the results of the monitoring study, the possible risk factors for *Fusarium* fungi contamination and the formation of toxins in Finland have been identified. The following cultivation-related directives have been made for farmers to better control the *Fusarium* contamination:

- rotation, one-sided cultivation of cereals is not recommended
- careful selection of the type of grain and the variety: spring grains are more sensitive to a *Fusarium* contamination than winter grains; late varieties have a higher risk due to the variable weather at the end of August or in the beginning of September
- pay attention to the quality of seed; seed dressing is recommended also for oats
- put effort to the vigorous growth of grains
- careful and fast harvest drying; moisture content < 14 %, also in years of good harvest conditions
- last, but not least, minimize the risks by professional cultivation




## Acknowledgements

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