Trace element content in Swiss cereal grains

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Introduction

Trace elements, such as copper (Cu), iron (Fe), manganese (Mn), zinc (Zn) and selenium (Se) are essential for living organisms. The knowledge of their content and variability in feed ingredients is necessary for precise feed formulation.
The aim of this study was to determine the content of Cu, Fe, Mn, Zn and Se in Swiss cereal grains commonly used in animal nutrition. This, in order to update the national database of nutrient composition of feeds.

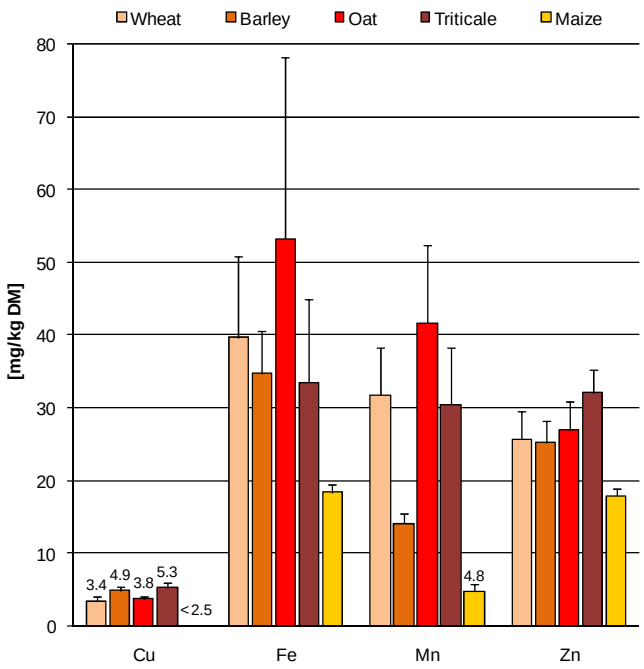
Material and method

Origin of samples: From 20 cereal collecting centers, attributed to one of 5 defined geographical regions.
Date of sampling: Between july and november 2007.

Cereals: Wheat (n=26); Barley (n=27); Oat (n=19); Triticale (n=25) and maize (n=22)
Analyses: Cu, Fe, Mn, Zn (ICP-EOS, limit of determination: 2.5 mg/kg DM) and Se (GF-AAS limit of determination: 0.012 mg/kg DM)

Results

Trace element contents:



Se	Wheat	0.031 ± 0.034
[mg/kg DM]	Barley	0.023 ± 0.016
	Oat	0.014 ± 0.011
	Triticale	0.014 ± 0.012
	Maize	< 0.012

Regional effects (P<0.05) on trace element contents (difference with mean value):
Wheat: «Central and eastern Plateau» - 2.9 mg **Zn** /kg DM
Barley: «Chablais» + 1.1 mg **Cu** / kg DM
Triticale: «Seeland» - 5.8 mg **Zn** /kg DM
Maize: «Tessin» + 1.1 mg **Mn** /kg DM
«Chablais» - 1.4 mg **Mn** /kg DM

Relative difference between mean trace element contents in Swiss cereal grains and values from INRA and NRC nutritional tables:

		Cu	Fe	Mn	Zn	Se
Wheat	INRA, 2002	60%	73%	81%	82%	22%
	NRC, 2001	69%	55%	76%	64%	11%
Barley	INRA, 2002	47%	19%	76%	73%	18%
	NRC, 2001	81%	50%	64%	66%	21%
Oat	INRA, 2002	111%	44%	92%	103%	6%
	NRC, 2001	47%	50%	97%	66%	3%
Triticale	INRA, 2002	77%	50%	133%	140%	n.d.
	NRC, 2001	66%	108%	71%	100%	n.d.
Maize	INRA, 2002	< XX	50%	52%	82%	< XX
	NRC, 2001	n.d.	34%	43%	66%	n.d.

in green: analyzed values more than 30% above INRA or NRC nutritional values
in red: analyzed values more than 30% below INRA or NRC nutritional values
< XX: analyzed values below determination limits
n.d.: not described by INRA, 2002 or NRC, 2001

Conclusions

Copper, manganese and zinc contents in the Swiss cereals grains were relatively homogenous. Iron and Selenium contents were however highly variable (mean coeff. of variation of 26% and 87%, respectively).

Maize presented the lowest trace element contents.

Trace element contents in Swiss cereal grains were lower than standard values published by INRA 2002 or by NRC 2001. This especially for Cu, Fe and Se.
The use of local nutritional values for trace elements is therefore of advantage, when precise feed formulation is aimed.

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