COMPARISON OF ICP-OES AND GFAAS TECHNIQUES FOR DETERMINATION MINERAL CONTENT IN WHEAT AND WHEAT PRODUCTS MATRIX

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The aim of the study was to determine Fe and Zn in wheat grain and milling streams by GFAAS and ICP-OES to compare them.

Three old wheat cultivars Rumska crvenka (DOI: 10.18730/ZAEHP), Crnozrna (DOI: 10.18730/ZAFXX) and Stara Banatka (DOI: 10.18730/ZAG0) was first milled in a Bühler pneumatic laboratory mill MLU 202 (Uzwil, Switzerland). The eight milling streams were obtained six flours and two by-products. Fe and Zn content of twenty seven samples (24 samples of milling streams and 3 of wheat grain) was determined by GFAAS and ICP-OES techniques.*

Zn content in wheat milling streams and grain measured by GFAAS and ICP-OES techniques

r=0.9447

The mean values of Zn content (ppm) in wheat milling streams and grain measured by GFAAS and ICP-OES techniques analyzed by one-way ANOVA

Zn	GFAAS	ICP-OES
B1	0.31[b]	12.86[a]
B2	3.85[b]	9.36[a]
B3	8.23[b]	12.17[a]
M1	3.79[b]	7.58[a]
M2	1.57[b]	8.97[a]
M3	1.31[b]	5.67[a]
Shorts	36.14[a]	27.04[b]
Bran	48.27[a]	40.98[b]
grain	17.35[a]	16.52[b]

Means with different letters in the same row are significantly different according to Tukey's test (P < 0.05).

The mean values of Fe content (ppm) in wheat milling streams and grain measured by GFAAS and ICP-OES techniques analyzed by one-way ANOVA

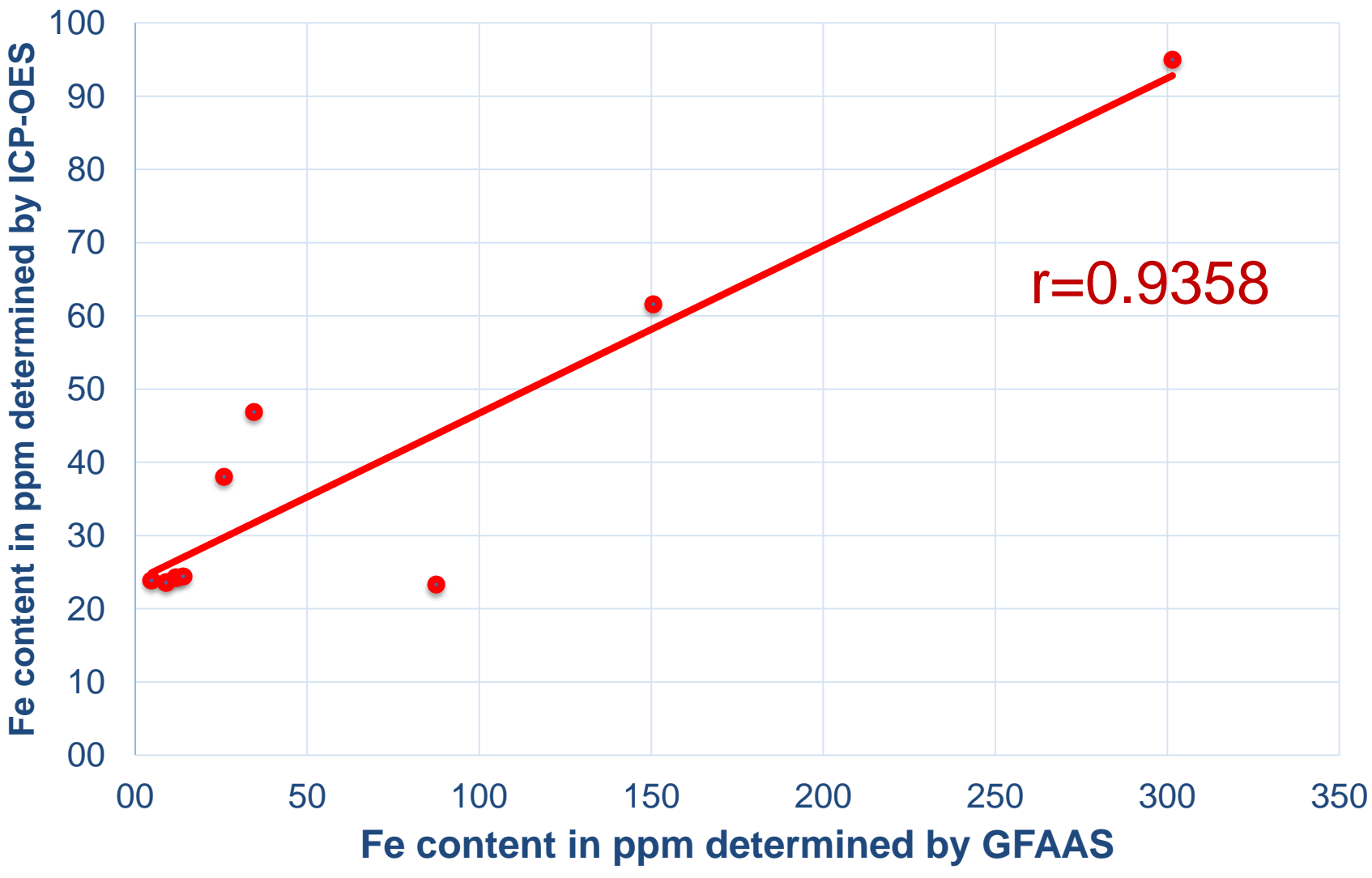| Fe	GFAAS	ICP-OES
B1	4.78[b]	23.84[a]
B2	9.02[b]	23.60[a]
B3	25.83[b]	38.05[a]
M1	11.83[b]	24.25[a]
M2	14.03[b]	24.41[a]
M3	87.45[a]	23.27[b]
Shorts	150.57[a]	61.58[b]
Bran	301.47[a]	95.00[b]
grain	34.49[a]	46.84[a]

Means with different letters in the same row are significantly different according to Tukey's test (P < 0.05).
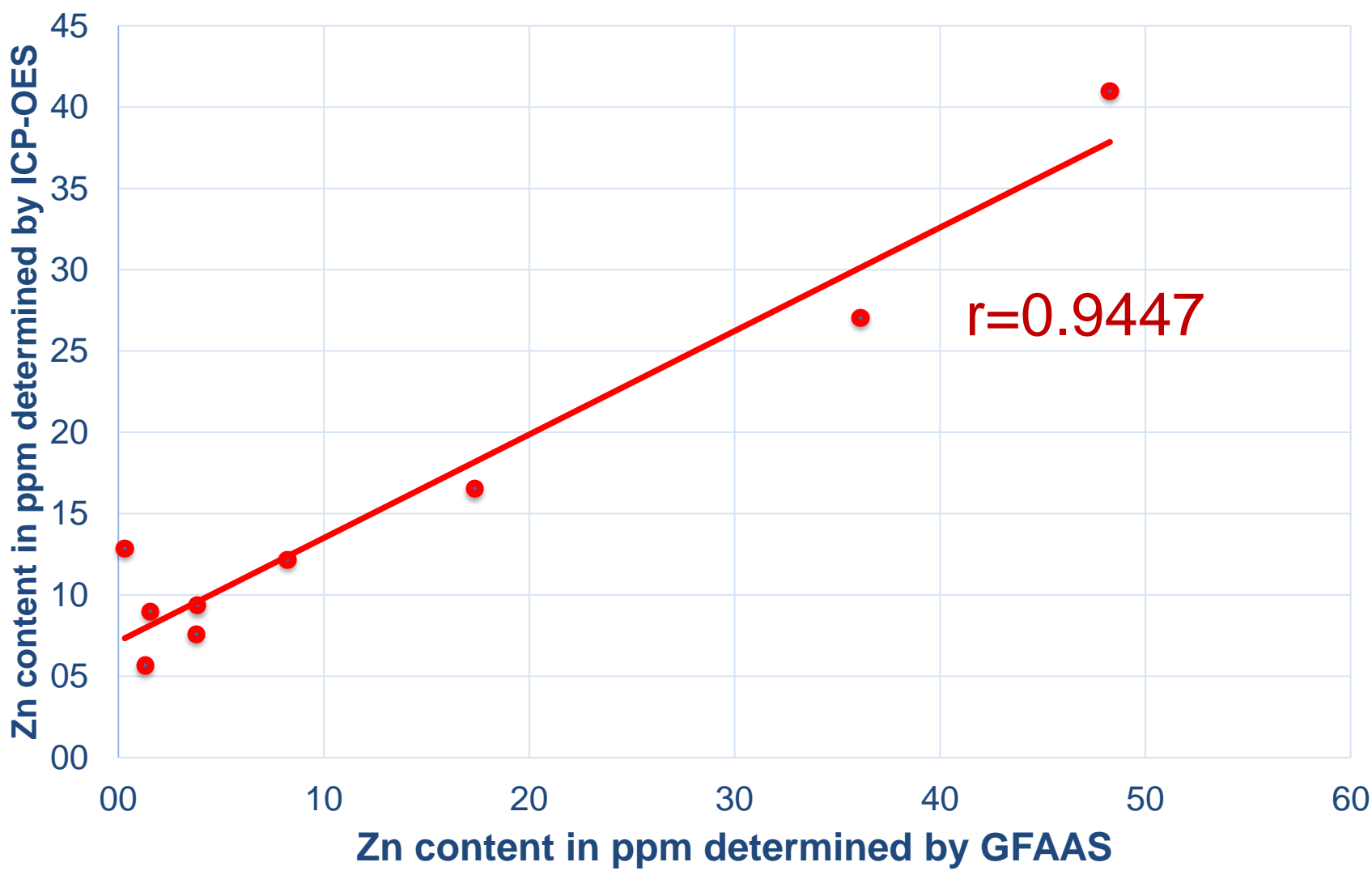
Fe content in wheat milling streams and grain measured by GFAAS and ICP-OES techniques

r=0.9358

Introduction

- One part of the nutritional value of food is micronutrients, especially minerals. They can be determined by different analytical techniques such as inductively coupled flame atomic absorption spectroscopy (FAAS), graphite furnace atomic absorption spectrometry (GFAAS), plasma-optical emission spectroscopy (ICP-OES) and inductively coupled plasma-mass-spectrometry (ICP-MS).
- These techniques differ according to the number of elements that can be determined, the levels of determination, the number of samples that can be determined and the sample volume. Wheat contain substantial share of minerals iron (Fe) and Zinc (Zn). A lot of human population especially woman and children's in poor countries suffers from deficient of these micronutrients. Therefore is necessary to measure their content in wheat and wheat products such as different kinds of bread that are staple food.

Results and discussion

- The results of the study showed that the correlations between GFAAS and ICP-OES techniques for determination of Fe and Zn were positive and statistically significant. The higher correlation (r=0.9447) was gained for determination of Zn content, whereas for Fe content was a little bit lower (r=0.9358).
- Furthermore, analysis of variance (ANOVA) showed statistical differentiation among the results of mineral content in milling streams determined by two techniques. The values of both minerals determined by GFAAS in the milling streams of grain endosperm were lower than the values obtained by the ICP-OES technique, while in the milling streams from the outer parts of the grain they were higher.

Conclusion

- From results it can be concluded that is better to use GFAAS technique for determination of minerals if necessary to evaluate nutritive value of wheat and wheat products.

a) ICP-OES, and b) GFAAS

a)

b)