

## Macro and Micronutrients Assessment in Transgenic and Non-Transgenic Soybean Seeds by Inductively Coupled Plasma Optical Emission Spectroscopy

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### Abstract

The main goal of this work was to evaluate macro (Ca and P) and micro (Cu, Fe and Zn) nutrients in transgenic (T) and non-transgenic (NT) soybean seeds by inductively coupled plasma optical emission spectroscopy. A multi-elemental method was developed, using a certified reference material (tomato leaves 1573a) for checking the accuracy, and rhodium as internal standard. The method was efficient to determine the analytes, allowing the comparison among different soybean seeds samples.

*Soybean seeds, Multi-elemental analysis, ICP OES*

### Introduction

Comparative studies between transgenic and non-transgenic soybean have suggested changes in proteome, metalome and enzymes of transgenic soy. This indicates that the genetically modified organism can present other features beyond tolerance to glyphosate, as well as changes in all its metabolism.<sup>1, 2, 3</sup>

Thus, comparative studies are necessary involving T and NT soybean, regarding the concentration of macro and micronutrients. For this task, a multi-elemental method was carried out helping the evaluation of genetic modification.<sup>4</sup>

### Results and Discussion

ICP OES parameters were optimized using a standard solution of each analyte. The optimized conditions are shown in Table 1.

**Table 1.** Operating conditions for ICP OES.

Spray Chamber	Cyclonic
Nebulizer	Concentric
RF incident power (W)	1300
Nebulizer Ar flow (L.min <sup>-1</sup> )	0.5
Auxiliary Ar flow (L.min <sup>-1</sup> )	0.5
Replicates	3
Plasma view	Axial
Line, $\lambda$ (nm)	Zn 213.856; Fe 273.074; Cu 324.754; P 185.942; Ca 184.006

The method was assessed using the certified reference material tomato leaves (CRM 1573a). Approximately 0.25 g of material was decomposed with 1 mL of H<sub>2</sub>O<sub>2</sub> and 6 mL of HNO<sub>3</sub> sub-boiled, using a microwave oven. The program

used was: 5 min @ 400 W, 20 min @ 790 W, 3 min @ 320 W, 3min @ 0W.

After decomposition, samples were evaporated until ca. 1 mL. After filtration, samples were transferred to a 10 mL volumetric flask and diluted with HNO<sub>3</sub> 0.2% (v/v). The results are showed in Table 2.

**Table 2.** Recovery of analytes in CRM, and limits of detection and quantification using ICP OES.

Element	Recovery (%)	LD ( $\mu\text{g.L}^{-1}$ )	LQ ( $\mu\text{g.L}^{-1}$ )
Ca	95.4 $\pm$ 0.8	1.0	4.0
P	111.5 $\pm$ 0.3	12.4	41.2
Cu	96.1 $\pm$ 0.9	0.5	1.7
Fe	79.2 $\pm$ 1.2	52.5	174.9
Zn	95.7 $\pm$ 0.2	0.2	0.8

### Conclusions

The multi-elemental method was efficient to determine Ca, P, Cu, Fe and Zn, since the results obtained using the standard reference material was satisfactory, in terms of accuracy.

Data obtained from the analysis of transgenic and non-transgenic soybean samples are being processed and will be presented later.

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<sup>4</sup> Suliburska, J. and Krejpcio, Z. *J. F. Scie. Tech.* **2014**, 51, 589-594.