

FOOD SUPPLEMENTS FOR WEIGHT LOSS: MONITORING OF METALLIC AND NON-METALLIC IMPURITIES

A. Figueiredo^{a, b, c}, I. M. Costa^{a, b} and J. Brito^{a, b}

^a Instituto Superior de Ciências da Saúde Egas Moniz (ISCSEM), Monte de Caparica, Portugal

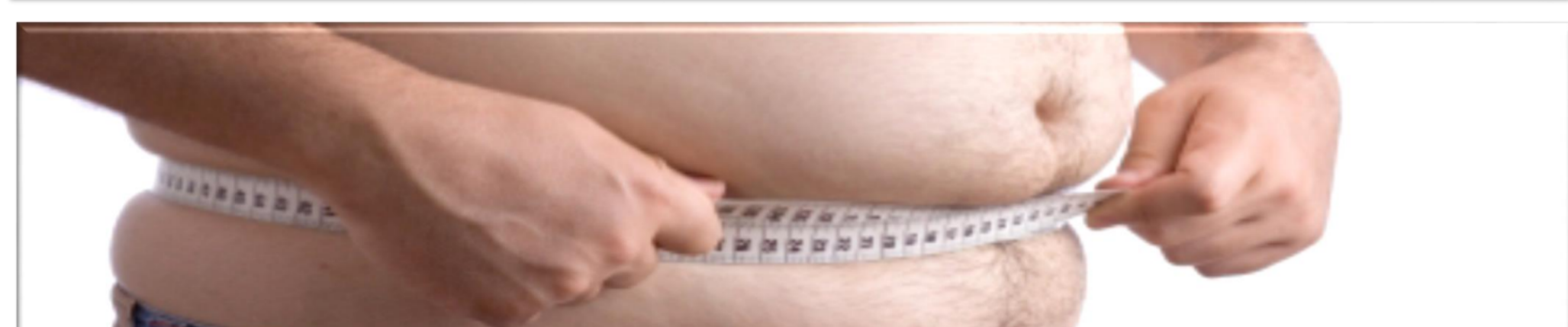
^b Centro de Investigação Interdisciplinar Egas Moniz (CiiEM), Monte de Caparica, Portugal

^c PhD student in Instituto de Ciências Biomédicas Abel Salazar (ICBAS), Porto, Portugal

E-mail: alexandra.f@netcabo.pt



INTRODUCTION



Food supplements for weight loss are widely consumed, often without any control or medical supervision.

Heavy metals can accumulate in medicinal plants growing in nature and impurities may also be incorporated in food supplements during manufacturing, piping and packaging processes.¹

Without any therapeutic benefit but with potential toxic effects, these impurities should be controlled within acceptable limits.

OBJECTIVES

The AIM of this study was to monitor elemental impurities in weight loss supplements.

MATERIAL & METHODS



SAMPLES:

25 different weight loss supplements, randomly purchased from 5 different suppliers, in a total of 75 samples (Figure 1). All dietary supplements have plant-based composition (for confidentiality reasons, the studied products shall not be identified).

ANALYTICAL TECHNIQUE :

Concentrations of elemental contaminants were monitored by Wavelength Dispersive X Ray Fluorescence technique (Figure 1).

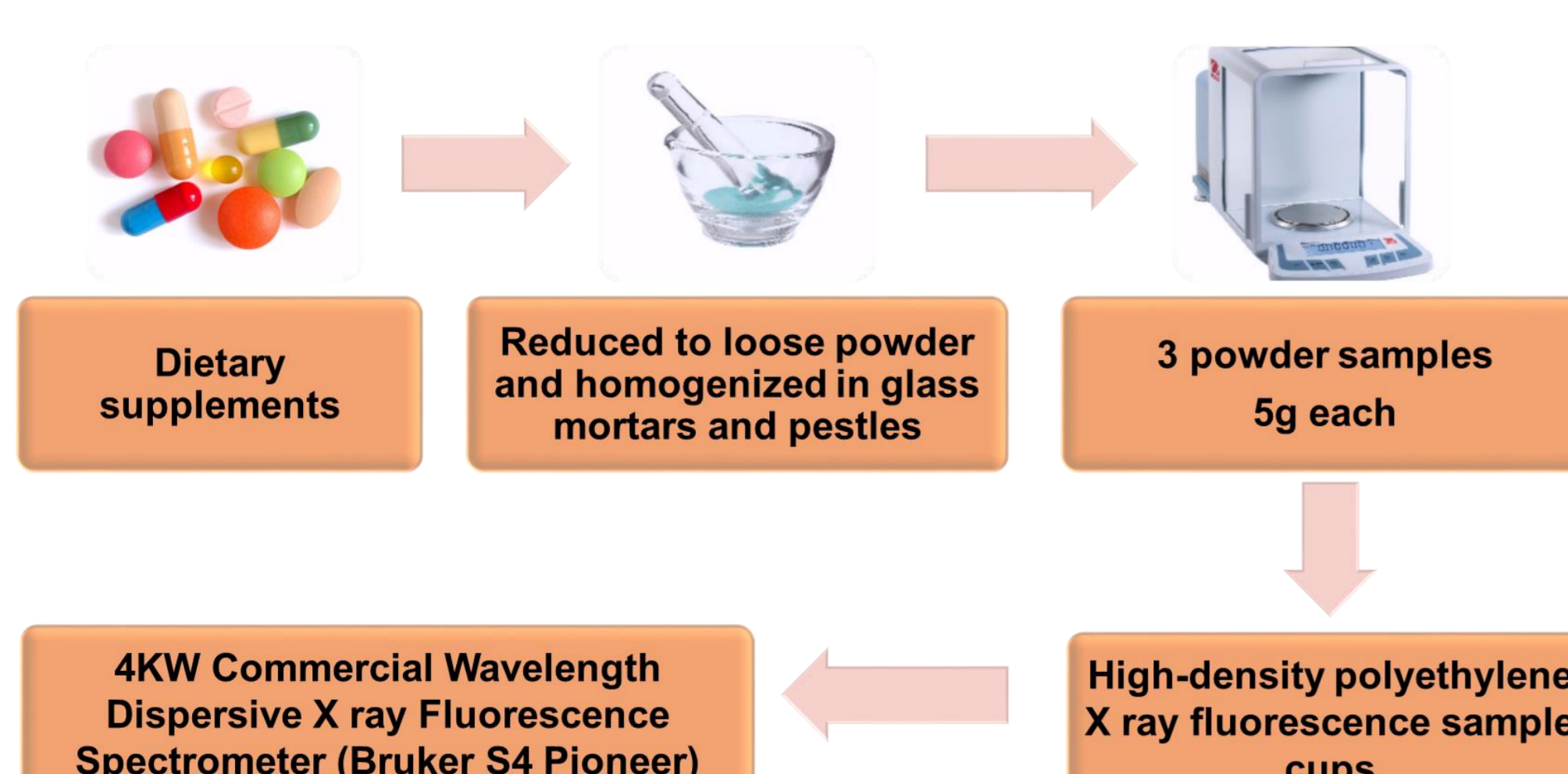


Figure 1. Sample preparation

RESULTS & DISCUSSION

Current requirements for metal impurities in plant-based food supplements imposed by European Commission (EC) and United States Pharmacopeia (USP) only defines limits for As, Cd, Hg and Pb (Table 1).^{2,3} Although, the presence of other elements may have adverse effects and potentially put the product quality and consumer safety in jeopardy. Since USP and European Medicines Agency (EMA) establish limits for several metal impurities in drug products (Table 2), it was decided in this study to extend the monitoring of all these elements also to food supplements.^{1,4}

Table 1. Imposed limit levels of elemental contaminants in food supplements^{2,3}

Element	Concentrations (ppm)	
	EC (629/2008)	USP 36
As ^a	*	1.5
Cd	1.0	0.5
Hg	0.1	1.5
Pb	3.0	1.0

^a inorganic; * not specified (1 ppm = 1 µg/g)

Table 2. Current EMA and USP limits for elemental impurities in pharmaceuticals (oral route)^{1,4}

Classification of elements	Concentration (ppm)	Element Concentration (ppm)	
		EMA	USP 38
Class 1A Pt, Pd	10	As ^b	0.15
		Pb	0.5
		Hg ^b	1.5
		Cd	2.5
Class 1B Ir, Rh, Ru, Os	10 ^a	Ir	10
		Mo	10
		Os	10
Class 1C Mo, Ni, Cr, V	25	Pd	10
		Pt	10
		Rh	10
		Ru	10
Class 2 Cu, Mn	250	V	10
		Ni	50
		Cu	100
Class 3 Fe, Zn	1300	Cr	*

^a Combination of the 4 elements should not exceed the specified limit; ^b inorganic; * not a safety concern

Figures 2 and 3 show the obtained results. In two supplements were detected several elemental impurities above limits: in one sample Cr and Ru; in another sample Mn, Pb and Ru.

Since supplements for weight loss are extensively and chronically consumed, the found elemental impurities in their composition can lead to accumulation over time, leading to possible toxicity^{1,5,6}:

- Pb** • immunological, neurological, reproductive, developmental and genotoxic effects
- Cr** • some studies report some carcinogenic effects, anemia and gastrointestinal effects
- Mn** • related to neurotoxicity and a neurologic syndrome similar to Parkinson's disease
- Ru** • there is insufficient data about Ru toxicity

CONCLUSIONS



- Elemental impurities were found in the analyzed food supplements above the imposed values by international regulatory bodies;
- Other contaminants besides those regulated for food supplements were found in higher levels than the acceptable for drug products;
- It seems important to set the same quality standards for food supplements as for pharmaceuticals;
- According to the authors, the extending of concentration limits to other elements than those already imposed for food supplements should be considered, due to the pernicious effects they may have in consumer's health.

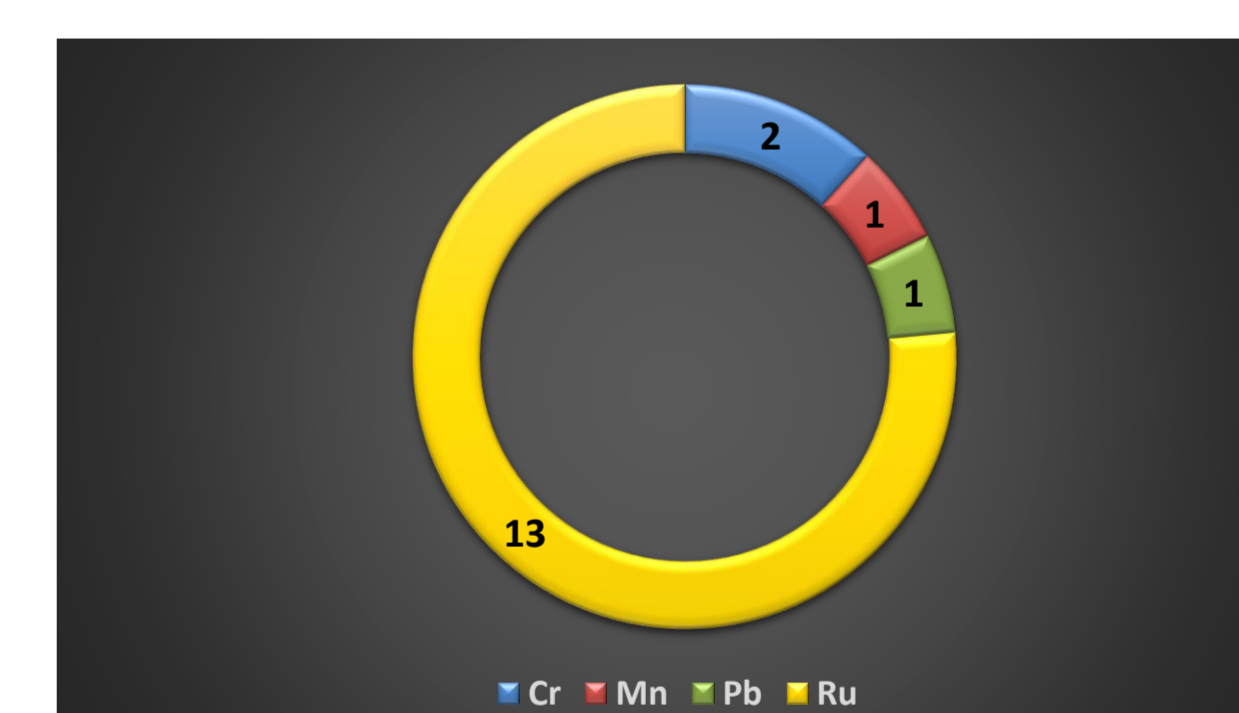


Figure 2. Number of supplements with elemental impurities above limits

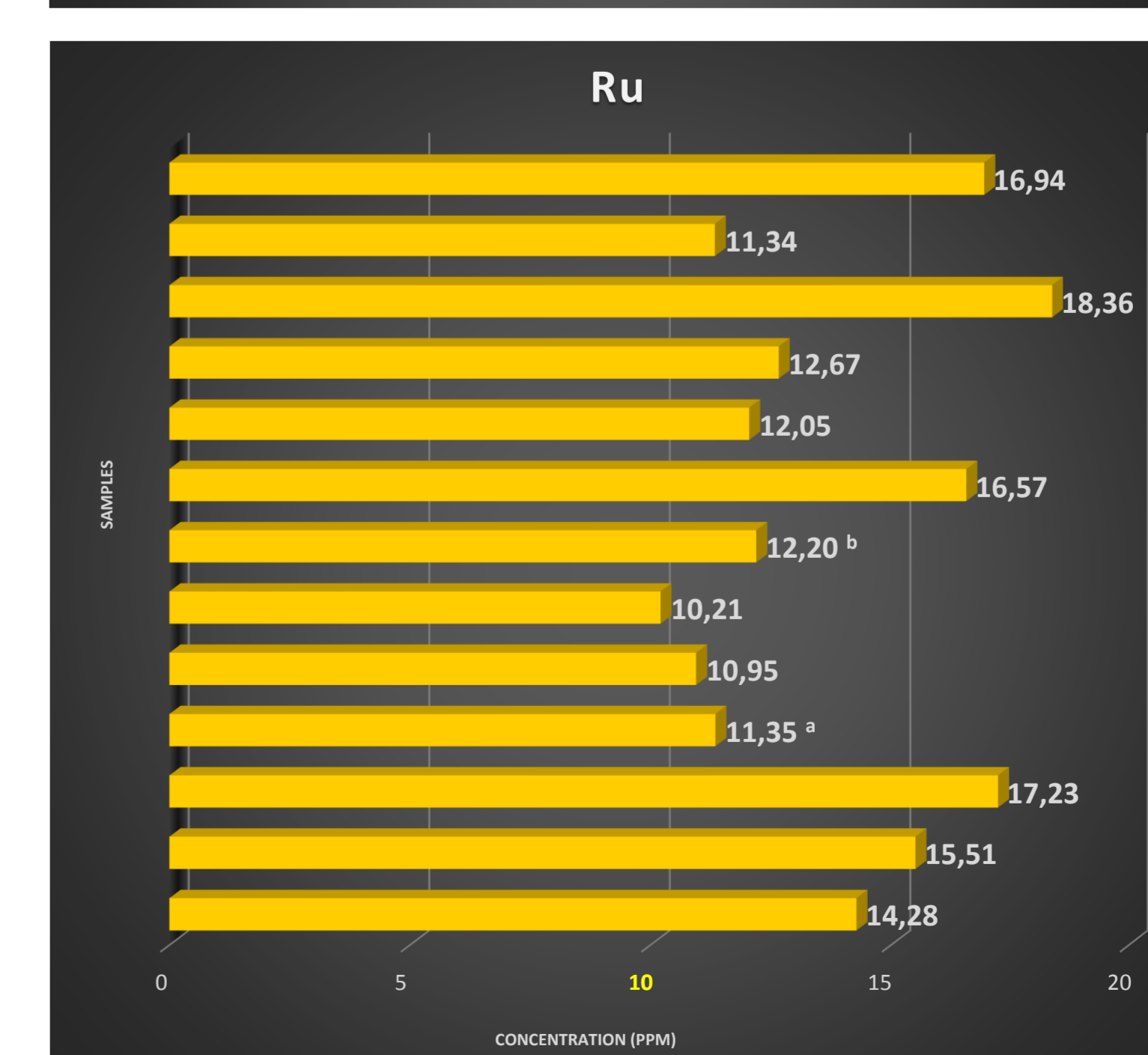
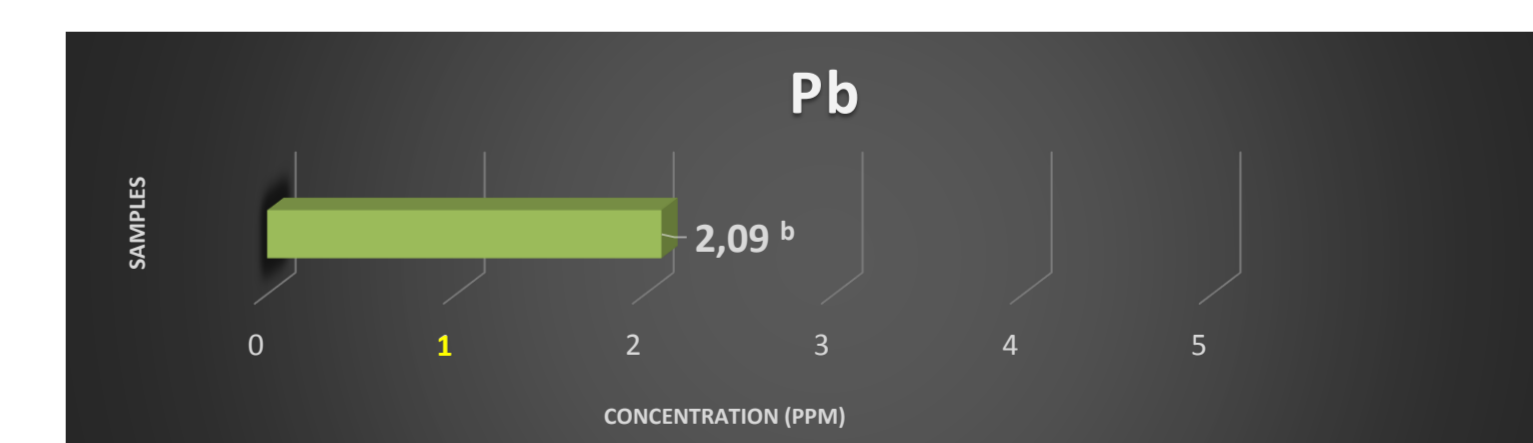
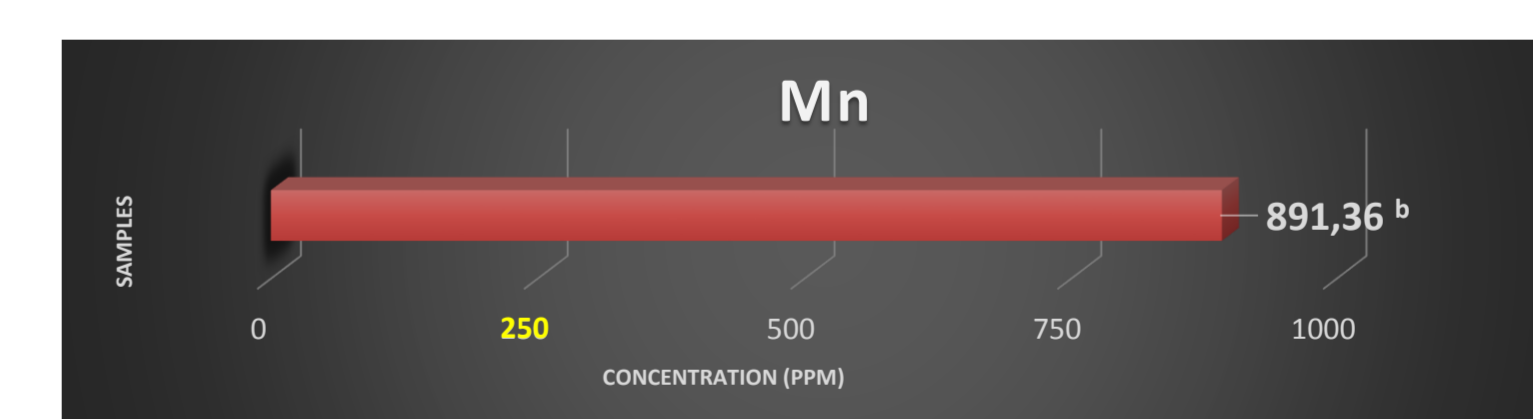
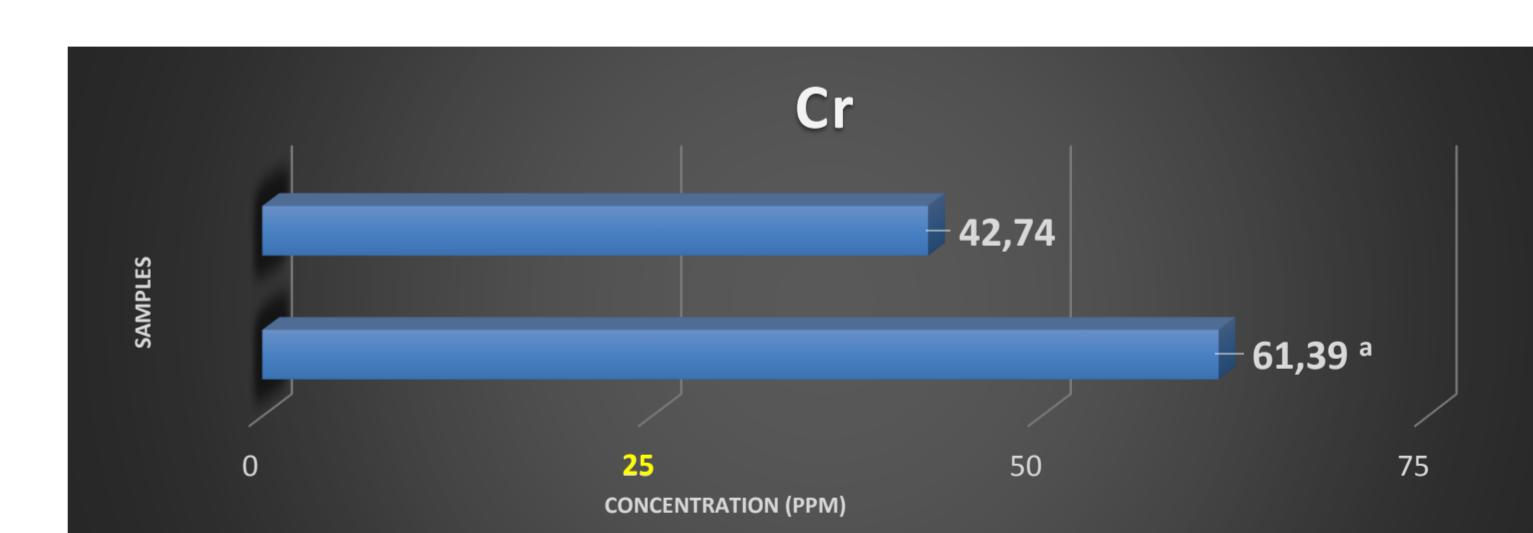


Figure 3. Obtained concentrations for Cr, Mn, Pb and Ru above the imposed limits (in yellow) (^a and ^b represent supplements with multiple contaminants)

REFERENCES

- [1] EMA Doc. Ref. EMEA/CHMP/SWP/4446/2000 (2008)
- [2] (EC) N° 629/2008, Off. J. Eur. Union. 3.7 (2008) 6–9
- [3] USP <232> (2010)
- [4] USP, <232> Elemental impurities- Limits, <http://www.usp.org/usp-Nf/key-issues/elemental-impurities>
- [5] ATSDR, Toxicological Profile for Chromium, Agency Toxic Subst. Dis. Serv. (2012) 592. <http://www.atsdr.cdc.gov/toxprofiles/tp7.pdf>
- [6] ATSDR, Toxicological Profile for Lead, Agency Toxic Subst. Dis. Serv. (2007) 582. <http://www.atsdr.cdc.gov/toxprofiles/tp13.pdf>

Acknowledgements

To Egas Moniz CRL and Instituto de Ciências Biomédicas Abel Salazar for the financial support provided for this study.

Disclosure of Interest: None Declared

Keywords: ELEMENTAL CONTAMINANTS, FOOD SUPPLEMENTS, WEIGHT LOSS SUPPLEMENTS