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Cadmium and other hazardous elements in phosphatic fertilizers in conformity to the new European Regulation 2019/1009

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The current European Fertilizers Regulation EC n. 2003/2003 does not include any direction for the content in cadmium [1]. On 25 June 2019, the new EU Fertilizing Products and Amending Regulation (EU-FPR) 2019/1009 was promulgated by the European Parliament and the Council, fixing an initial and temporary limit for Cd content in inorganic macronutrient fertilizer to $60 \text{ mgCd} \cdot \text{kg}^{-2}$ [2]. The new European limit for Cd would be the most stringent in the world and only 15% of the phosphorite deposits currently exploited exhibits a low cadmium content complying with the new standard once processed to fertilizer. Since there are no substitutes for phosphate rock in phosphatic fertilizer production [3,4], the outcome of the new standard application would make unsustainable the supply of phosphatic fertilizers. This will result in a short-term measure that goes beyond the long-term sustainability objective of the proposal. In addition, the new standard will inevitably and disproportionately penalise some producers, mainly from developing countries in North Africa. It is therefore important to investigate for Cd and other hazardous elements content in fertilizers used for food production. The present research has analysed a total of 41 samples of fertilizers both for hobby and professional use obtained from the Italian market. Producers of Western and Middle Eastern Europe use the same phosphorite deposits to obtain fertilizers, thus the results of this investigation can be extended to the whole area. Obtained samples were initially pulverized in a ball mill and subjected to acid digestion in a microwave oven. Different acid digestion methods (HNO_3 - HF - *aqua regia* - H_2O_2) were developed and tested for processing phosphate rock, inorganic and organo-mineral fertilizers to optimize the dissolution of different matrices. Standard reference materials, NIST SRM-695 (NPK fertilizer) and BCR-032 (Morocco phosphate rock), were processed using the same methods. Elemental analyses were performed in ICP-OES (Na, Mg, Al, Si, P, S, K, Ca, Fe, Se, Hg) and ICP-MS (Li, Be, Ti, V, Cr, Mn, Co, Ni, Cu, Zn, As, Sr, Cd, Sn, Sb, Ba, Tl, Pb, Bi, U). The first results showed very low Cd concentrations in hobby products. This commercial sector is known to import low-cost phosphate rock from Russia or Cola Peninsula, with a lower nutrient quality, but also a lower Cd content in comparison with professional products. Uranium content was found in relatively high concentrations and a radioactivity study has been considered as a logical extension of this research. The next analysis of more samples collected in spring will account for different fertilizer types used in distinct agricultural phases.

[1] European Union. *Off. J. Eur. Union*. **2003**, EUR-Lex - 32003R2003.

[2] European Union. *Off. J. Eur. Union*. **2019**, EUR-Lex - 32019R1009.

[3] Mar, S.S., Okazaki, M. *Microchem. J.* **2012**, 104, 17–21.

[4] Ulrich, A.E. *Sci. Total Environ.* **2019**, 650(1), 541–545.