25th INTERNATIONAL SYMPOSIUM "ENVIRONMENT AND INDUSTRY
29th SEPTEMBER 2022 BUCHAREST, ROMANIA

A SUMMARY OF PROCEDURES USED IN PHOSPHORUS DETERMINATION FROM ORGANIC INPUTS

ROXANA MARIA MADJAR, GINA VASILE SCĂEȚEANU*

University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania, 59 Marasti Blvd, District 1, 011464, Bucharest, Romania;

*Corresponding author: ginavasile2000@yahoo.com

INTRODUCTION

Nowadays, it has been observed an intensive effort to employ ecological farming practices, this trend being related with restriction to apply chemicals and pesticides and which, consequently, will minimize pollution effects. The challenge is to find and to use accepted inputs, to adopt or to develop strategies that assure environmental sustainability and high yields. The accepted inputs for ecological agriculture are listed by Commission Regulation (EC) No 889/2008 and by Regulation (EC) No 2003/2003 of the European Parliament and of the Council.

Lately, many types of inputs have been promoted, in some cases the quality of them being questionable. As these products have to obey strict standards, development of analysis methods for inputs' chemical characterization is an important step which will assure providing high quality organic products.

METHODS USED FOR PHOSPHORUS QUANTIFICATION FROM ORGANIC INPUTS

Due to necessity to conform to environmental quality standards and also to obey to the rules of ecological agriculture, accurate determination of phosphorus in various inputs has gained importance. Accurate analysis of phosphorus beside quality control of the ecological input is associated with its' effective use in the field.

Methods used for total phosphorus contents from inputs destined to ecological agriculture

does not provide information regarding chemical forms of phosphorus found in inputs

SPECIATION of phosphorus in complex matrices as agricultural inputs

- X-ray absorption near-edge structure (XANES)
- ^{31}P-NMR spectroscopy

- **Spectrophotometric method**
- digestion with acids (HNO_3/$HClO_4$), mixture of H_2SO_4 and H_2O_2 or after dry combustion;
- for compost from food market waste and urban gardening, fresh and composted manures, animal manure compost, compost from fish waste and seaweed.

- **ICP-OES** *(inductively coupled plasma - optical emission spectrometry)*
- mineralization in aqua regia or using acids (HNO_3/$HClO_4$);
- for compost from municipal waste, inorganic phosphorus fertilizers.

- **ICP-MS** (*inductively coupled plasma mass spectrometry*)
- digestion with different mixtures (H_2O_2 with HNO_3 or H_2SO_4 with $HClO_4$);
- suitable for vegetable waste and sewage sludge.

- **XRF** (*X-ray fluorescence*)
- recommended for phosphorus from biomass ashes.

- **AAS** (*atomic absorption spectrometry*)
- quantification of phosphorus in commercial phosphorus fertilizers.

- **MP-AES** (*microwave plasma atomic emission spectrometry*)
- new analytical technique that use microwave assisted acid digestion for phosphorus input.

CONCLUSIONS

Consequently, evaluation of phosphorus (total form or after speciation) from inputs used in ecological agriculture it could be performed through different methods and procedures chosen in accordance with their advantages and disadvantages, time of analysis, financial possibilities of the laboratory. Also, in many cases reported analysis protocols must be amended and adapted since new formulations of organic inputs with various compositions and matrices are produced all the time.

REFERENCES

1. Toor G., Peak D., Sims T., **2005**. Phosphorus speciation in broiler litter and turkey manure produced from modified diets. Journal of Environmental Quality, 34 (2), 687-697.

2. Babos D.V., Castro J.P., Andrade D., Pereira-Filho E.R., **2019**. Determination and speciation of phosphorus in fertilizers and mineral supplements by cattle by X-ray absorption near edge structure spectroscopy: a simple nondestructive method. Analytical Methods, 11, 1508-1515.

3. Catrina G.A., Kim L., Serbanescu A., Cernica G., Cristea I., Barbu M., Nicolescu I., Vasile G.G., **2020**. Determination of phosphorus in different types of waste using the ICP-MS technique. Romanian Journal of Ecology & Environmental Chemistry, 2(2), 138-144.

Acknowledgments

This work is consistent with research directions and guidelines specified by Ministry of Agriculture and Rural Development in project ADER 1.4.4. Identification, evaluation, testing, development and validation of analysis methods of nutrients and contaminants from inputs usable in organic agriculture.