# THE DEVELOPMENT AND THE OPTIMIZATION OF THE POROUS CERAMICS MANUFACTURING TECHNOLOGY USED IN HORTICULTURE - CERAM-FRTICLE TITLE

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***Abstract***

*Porous ceramic granules are one of the most efficient products used in soil conditioning.*

*The purpose of this project is to increase the performance and competitiveness of the economic agent (Chemi Ceramic F LTD), using the existing expertise of the public organizations partners in this project (UBB and INCDCP - ICECHIM) for the development and optimization of the modern technology of macro-porous ceramics production, in order to obtain products with increased nutrient load and a significant bio-stimulant effect due to gradual release of soluble silicon.*

*The successful implementation of the project will have a significant impact on increasing the performance and competitiveness of economic operators and farmers users. The project will provide a framework for strengthening the practical training of master and Ph.D. students from the science and engineering environment areas, contributing to the development of the involved researchers' entrepreneurial skills. The project will increase the cooperation between UBB, INCDCP - ICECHIM and economic agent.*

**Key words:** macroporous ceramic nutrients, horticulture, polyoxometalates, biostimulant silicon, internships.

## INTRODUCTION

Porous ceramic granules are one of the most efficient products used in soil conditioning (Li et al., 2000).

Their porous structure, associated to a high hydrophilicity, determines the porous ceramics characteristics to be similar to an ideal soil (Heinse et al., 2015).

Soil conditioning products based on porous ceramic determine: an optimal maintenance of the air, water and nutrients in the area of radicular system, it reduce the compaction, improve the drainage and soil structure (Figure 1).

Due to these characteristics, porous ceramics determine a stimulation of the growth of plants radicular system, it improves the resistance to the water stress (Millet, 2000; Li et al., 2008) and a greater resistance to the stepping and detachment, ideal for sports grounds green spaces (Bigelow et

al., 2013). A product accessible for the soils conditioning / substrates of growth is important not only for horticulture intended for recreational use but also for the production of the vegetables and flowers seedlings or for vegetables cultivation in protected areas (Okuya et al., 2014).

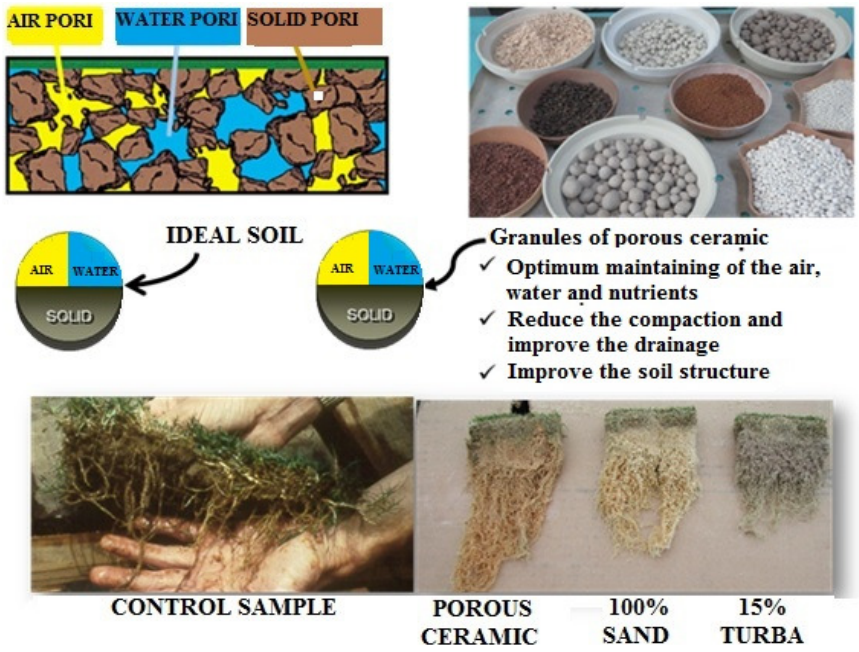


Figure 1. The beneficial characteristics of the porous ceramic granules for the soil and / or plants.

The need of the economic agent Chemi Ceramic F is to develop and to optimize the technology of ceramic grain production in order to fully exploit their potential through:

• Functionalization with polyoxometalates type Keggin, in order to increase the loading of nutrients / beneficial elements for the plants and

• The use of biosilica to produce the porous ceramics, in order to stimulate the gradual release of small amounts of silicic acid with bio-stimulant effect.

Nanosized inorganic molecules belonging to the polyoxometalate have the ability to form nano structures (cavity, porous, hot) with a high load capacity with different ions, including nutrients / beneficial elements for plants. Such structures have been successfully used to fertilize and / or plant biostimulation (Petrehele et al., 2012; Petrehele et al., 2014).

A beneficial element for plants is the soluble silicon or silicic acid, which has all the characteristics of a biostimulant for plants (Savvas and

Ntatsi, 2015). Soluble silicon primes in a balanced way the different metabolic pathways involved in plant defence response (Bockhaven et al., 2013).

The objective of the project: the purpose of this project is to increase the performance and competitiveness of the economic agent (Chemi Ceramic F LTD Sf. Gheorghe), using the existing expertise of the public organizations partners in this project (UBB and INCDCP - ICECHIM) for the development and optimization of the modern technology of macro-porous ceramics production, in order to obtain products with increased nutrient load and a significant bio-stimulant effect due to gradual release of soluble silicon.

The specific objectives of the project: • The transfer of knowledge from UBB and INCDCP - ICECHIM to the economic agent, in order to optimize the production technology of the macro-porous ceramics for obtaining products with high nutrient load (ionic) and a significant bio-stimulant effect; • Strengthening the cooperation between UBB, INCDCP - ICECHIM and Chemi Ceramic F and strengthen the practical training of students for developing a system for quality assurance of porous ceramics with high nutrient load and bio-stimulant effect; • The development of the researchers entrepreneurial skills through substantiation based on the results scientific of the marketing strategy / communication of the products with high nutrient load and bio-stimulant effect.

## MATERIAL AND METHODS

During the macro-porous ceramic production technology, two innovative products will be used: polyoxometalates with high capacity of nutrients load and biosilice for silicic acid release. The development of the quality assurance system will provide opportunities for practical training for both master and Ph.D. students, during the research activities from the analytical laboratory and during the manufacturing process. The products marketing campaign / communication, will development the researcher entrepreneurial skills.

## RESULTS AND DISCUSSION

The successful implementation of the project will have a significant impact on the economic agent Chemi Ceramic F, in whose development strategy is the increasing market share as regards the products of horticultural use.

## CONCLUSIONS

The project will provide a framework for strengthening the practical training of master and Ph.D. students from the science and engineering environment areas, contributing to the development of the involved researchers' entrepreneurial skills. The project will increase the cooperation between UBB, INCDCP - ICECHIM and economic agent. The cooperation will continue even after the project ends.

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