

Abstract

The scarcity of water resources is expanding worldwide due to the continuous growth of the imbalance between the availability and utilization of freshwater. This motivates researchers to find new water-saving methodologies and water management tools responding to future demands.

The general objective of this project consists of the development of novel and low-cost material based on alginate and biochar functionalized with metal oxides and its application for the treatment of contaminated water, to support the implementation of strategies for mitigation of hydro-climatic extreme events, especially droughts in the catchment of different sources of irrigation water. Also, the material will be investigated for water saving and soil fertilization. The influence of this new material on bean crops will be studied, bean being widely used food due to their high protein content and vitamins. The specific objectives of the research are:

Preparation and characterization of cost-effective new superabsorbent materials based on alginate and biochar functionalized with metal oxides. Assessment of the efficiency of recycling and reusing the superabsorbent material.

Evaluation of the removal efficiency of organic pollutants from polluted water (including desalinated effluent) using the superabsorbent material.

Testing the attenuation of antibiotic resistance genes and bacteria by the new adsorbent from greywater effluents using established molecular methods (qPCR and c sequencing).

Assessment of the impact of the superabsorbent material on the physical, chemical, and biological properties of soil and its effects on growth-development, yield, and crop quality in agricultural plants under current and predicted climate change scenarios.

The current project is pertinent to the work program topic, contributing to the management of water resources by adaptation and mitigation to hydroclimatic extreme events and management tools by preparation of new materials that will be used for water decontamination thus increasing the water reserve that can be used for irrigation. Also, these superabsorbent materials can be used to store and gradually release water during droughts. The project, by its objectives, fits the following topics of the call:

- Topic 1. Resilience, adaptation, and mitigation to hydroclimatic extreme events – by developing a mitigation strategy to cope with hydro-climatic extreme events, especially drought.
- Topic 2. Tools for water management - in the context of hydroclimatic extreme events – by developing tools (e.g. superabsorbent material, multi-risk approach) to support the design and implementation of strategies for mitigating droughts in a catchment to sea perspective.

In addition, following the influence of the superabsorbent materials prepared in the project on bean cultivation under current and future climate change conditions of temperature and CO₂ concentration in the atmosphere will provide knowledge on how the proposed solution will perform today and in the foreseeable future. (This is also addressed in Topic 2).

Because the countries involved in the project (Romania, Italy, Moldova, Turkey, India) have different climates, it can also fit with Topic 3: Improved water governance in the context of hydroclimatic extreme events and international contexts - Addressing and encouraging international cooperation in the field of water, including management of transboundary water resources and contribution to Water Diplomacy.

The novelty of the project: i) the material prepared; ii) 3 simultaneous applications of the same material: pollutants removal, swelling, and drought stress mitigation under current and predicted climate change scenarios for crop cultivation as model plant bean crop and soil properties; iii) the application of the material prepared for the elimination of ARGs and ARBs.



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► Project partners

- BEN-GURION UNIVERSITY OF THE NEGEV - ISRAEL
- RAIT88 SRL - ITALY
- TECHNICAL UNIVERSITY OF MOLDOVA - MOLDOVA
- UNIVERSITY OF CUKUROVA - TURKEY

► Funding organisations

UEFISCDI (ROMANIA) / MOE (ISRAEL) / MUR (ITALY)
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► Duration

3 years

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