

## Innovative method for plant biostimulants production

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Biostimulants have a high economic value and the global market is continuously expanding since their use contributes to increasing the production, yield and quality of plants with great advantages in the agri-food sector. Development of biostimulants from waste has an important valorization potential in a context where there is ever-increasing research of eco-sustainable cultivation methods, combined with the concept of circular economy which has the purpose of converting waste materials and by-products into new valuable resources.

Recently, we have filed a patent application (No. 102024000012364) disclosing a system for the innovative use of aquatic mosses secretion as plant biostimulant to be used in agriculture and *in vitro* culture. We observed how the biomasses of aquatic mosses grown in temporary immersion bioreactors or open vessels, actively secrete into the water several molecules that we characterized as different classes of phytohormones, small amounts of peptides and other secondary metabolites with biostimulatory effects on several plant species.

After growth cycle in bioreactors, the basic culture medium, a byproduct to be discarded, was instead used in several experiments also in complex formulations. For example, we observed an increase in root length of 35% and fresh weight of 43% in *Nicotiana tabacum* plants treated in *in vitro*. Experiments had excellent results even under stress conditions. In greenhouses experiments, carried out on various vegetables such as *Foeniculum vulgare*, we recorded an increase of 64% in fresh weight and 51% in dry weight, while, in field experiments on *Zea mays*, final productivity was 34% higher in dry grain weight compared to the untreated control.

The entire production line is a zero-waste process opening very interesting perspective in the industrialization of an innovative method to produce phytohormones to be used as biostimulant and beyond.