PART 4 – Progress in the *InnCoCells* project after 3 years

InnCoCells

Innovative high-value cosmetic products from plants and plant cells

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InnCoCells – **Innovative high-value cosmetic products from plants and plant cells**
EU Horizon 2020 Research and Innovation Action, 2021–2025

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Left: Plant growth room at ENEA, with controlled-wavelength illumination. Right: Research laboratory at Arterra Bioscience.

InnCoCells is a Horizon 2020 project launched in 2021 aiming to develop innovative plant-based production processes for the commercial exploitation of scientifically validated cosmetic ingredients using profitable and sustainable plant cell cultures, aeroponic cultivation, and plants grown in the greenhouse and field.

This is the fourth in our series of project brochures – describing our progress as we head into the fourth year.

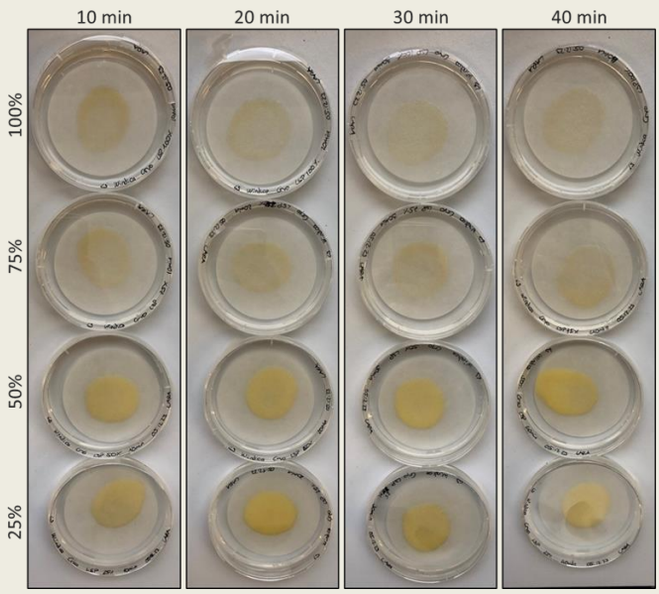
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101000373

The *InnCoCells* project

InnCoCells is a consortium of 17 partners representing European academic and industrial leaders in the discovery, sustainable production and scientific testing of natural cosmetic ingredients sourced from plants. The project is now in its fourth year and continues to make strong progress towards all its objectives.

Progress with upstream production

Important work is still ongoing in the work packages dealing with upstream production. We have tailored cultivation processes that optimize biomass production and the accumulation of specific metabolites, making them suitable for the most advanced plants in our portfolio of plant species. Elicitor compounds and genetic engineering tools developed for model species have also been adapted to promote growth or the accumulation of target compounds in these species.



Cryopreservation tests for cells of the tropical shrub Waltheria indica, revealing the effects of different concentrations of the cryoprotectant and the duration.

We have developed optimal growth conditions for a further 17 cell cultures and three hairy root lines, some of which have been scaled up to multi-litre bioreactors growing in the dark or with illumination. We have also improved the growth and metabolite production of three aeroponic systems by combining nutrition and elicitation. Four cell lines have been scaled up to 300 L and one to 1000 L, and technical runs were completed for one hairy root line at the 1000-L pilot scale. Two species were scaled up to 100 m^2 in aeroponic units. Biomass from two fields of plants has been recovered. Cryopreservation and storage methods that preserve biomass were evaluated for several species (see picture above). Reserve stocks of plant cells can be kept in the freezer and used to start new production campaigns if cryopreservation keeps them viable.

Pilot-scale (100 m^2) aeroponic plots of Pogostemon cablin.

Progress with downstream development

Our latest data show that the pre-treatment of plant material with enzymes and pulsed electric fields improves the yield and functionality of the resulting extracts. Laboratory-scale extraction protocols have been scaled up and the stability of the extracts has been studied and documented. Further work has also been carried out to optimize the use of by-products and waste fractions, such as the aerial plant parts left over from aeroponic cultivation, as shown above.

Apple cells grown at the 300-L scale are processed to produce dried biomass that is a rich source of bioactive molecules suitable as cosmetic ingredients.

More than 100 hydrophilic and lipophilic extracts, such as those derived from the lyophilized apple cells shown above, have been tested for a range of properties including anti-inflammatory, anti-ageing, antioxidant and antimicrobial activities. The composition of extracts with the most promising cosmetic-related bioactivities has been assessed in detail by targeted and untargeted metabolomics. As more ingredients come through the pipeline, we focus more on regulatory compliance, life cycle assessment and the evaluation of product/process sustainability. This requires extensive documentation and the assessment of techno-economic viability. Regulatory compliance has already been evaluated for selected ingredients, and we are working on the preparation of safety and technical data sheets, scientific dossiers, and the pre-commercial evaluation of efficacy claims.

In addition to plant cells, hairy roots and aeroponic systems, InnCoCells is looking at the large-scale cultivation of plants in the field as a source of cosmetic ingredients. The image above shows the harvest of chrysanthemum petals from experimental field plots. These will be extracted and tested for bioactive properties that are relevant in the cosmetics industry. Similarly, we are extracting ingredients from plant-based processing side-streams, adding value to waste and creating a circular bioeconomy.

Progress with dissemination activities

InnCoCells has continued to expand its dissemination activities by publishing 10 peer-reviewed scientific articles, presenting more than 50 posters and talks at scientific conferences, and participation in many industry fairs and exhibitions, most recently including Cosmetic 360, Paris, October 2024 (pictured below). We have hosted more *InnCoCells Academy* events and webinars, and have continued to engage with our growing Stakeholder Group, which provides assistance with the selection of extracts and ingredients. We also benefit from guidance provided by our three-member scientific advisory panel. We have continued to work with the Algae4IBD, MARBLES and SECRETed project as part of the AIMS cluster funded under Horizon 2020 topic FNR-11-2020, most recently in a special session of the International Congress On Natural Products Research, Kraków, July 2024.

InnCoCells at Cosmetic 360, Paris, 16-17 October 2024.

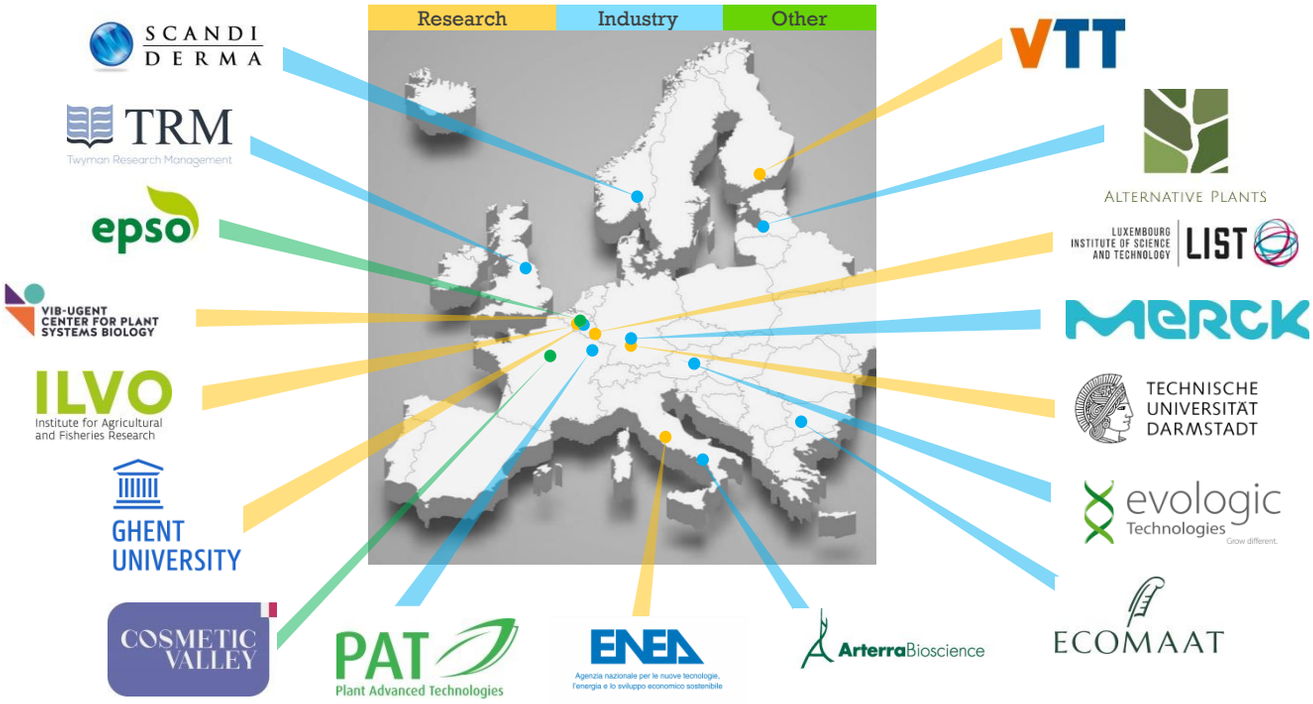
Progress with public communication

Our communications package provides information for the public about the project and the organizations involved. This includes a content-rich project website, social media, press releases, promotional videos and podcasts, informative brochures, newsletters and magazine articles, and joint activities with the AIMS cluster. Our latest videos cover the structure and role of the Stakeholder Group (pictured below), including interviews with Stakeholder Group members. Our podcasts feature informal discussions with *InnCoCells* personnel talking about their roles in the project.

InnCoCells video discussing the Stakeholder group presented by the InnCoCells Exploitation Manager.

Follow us on X, Instagram, Facebook and LinkedIn for regular progress updates and access to our literature, as well as our extensive audio and video resources.

The *InnCoCells* consortium



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