Initial progress towards the sustainable production of cosmetic ingredients in plants

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: Ginger and aromatic ginger plants grown in hydroponic culture.
Right: Marigold field plot.

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 second in our series of project brochures – describing the initial results of the project in the second year.

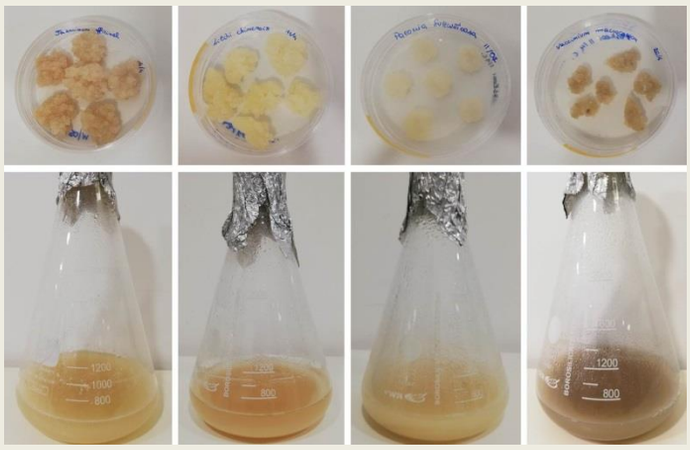
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101000373

The *InnCoCells* project

InnCoCells is a consortium of 17 partners representing European academic and industrial leaders in the development, sustainable production and scientific testing of natural cosmetic ingredients derived from renewable plant-based sources. The project has five technical work packages plus another four focusing on supporting activities: exploitation, commercialisation, dissemination and communication, management, and ethical issues (see diagram opposite). *InnCoCells* has made progress in all active work packages.

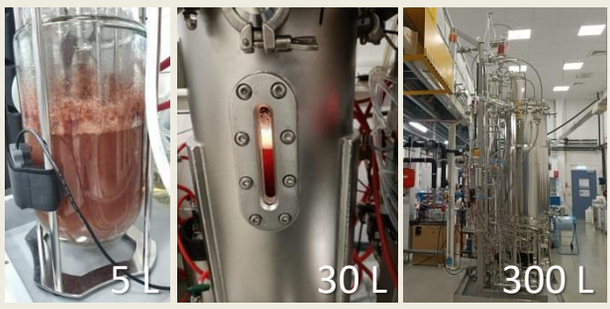
Progress with upstream production

In the technical work packages focusing on upstream production, we have selected 50 plant species with the best potential to produce bioactive ingredients and we have worked to establish cell lines, hairy root cultures, aeroponic systems and greenhouse/field plots. In parallel we are developing generic tools to enhance biomass and metabolite yields in these systems. Cell suspension cultures representing several of these species are currently being optimised for larger-scale cultivation under different conditions that favour the production of specific metabolites.



Callus tissue and cell suspension cultures established from four of our target species (left to right: common jasmine, lychee, tree peony and American cranberry).

We are also scaling up plant cell cultures that are already grown in the laboratory, and several cell lines have been cultivated successfully at scales of 3–300 L.



Dragon fruit cell suspension cultures in large-scale bioreactors, from 5 to 300 litres.

More than 20 species have been cultivated using the aeroponic system, where plants are grown on tables with the roots exposed to the air and sprayed with a nutrient mist. This allows compounds to be extracted directly from droplets that exude from the roots.

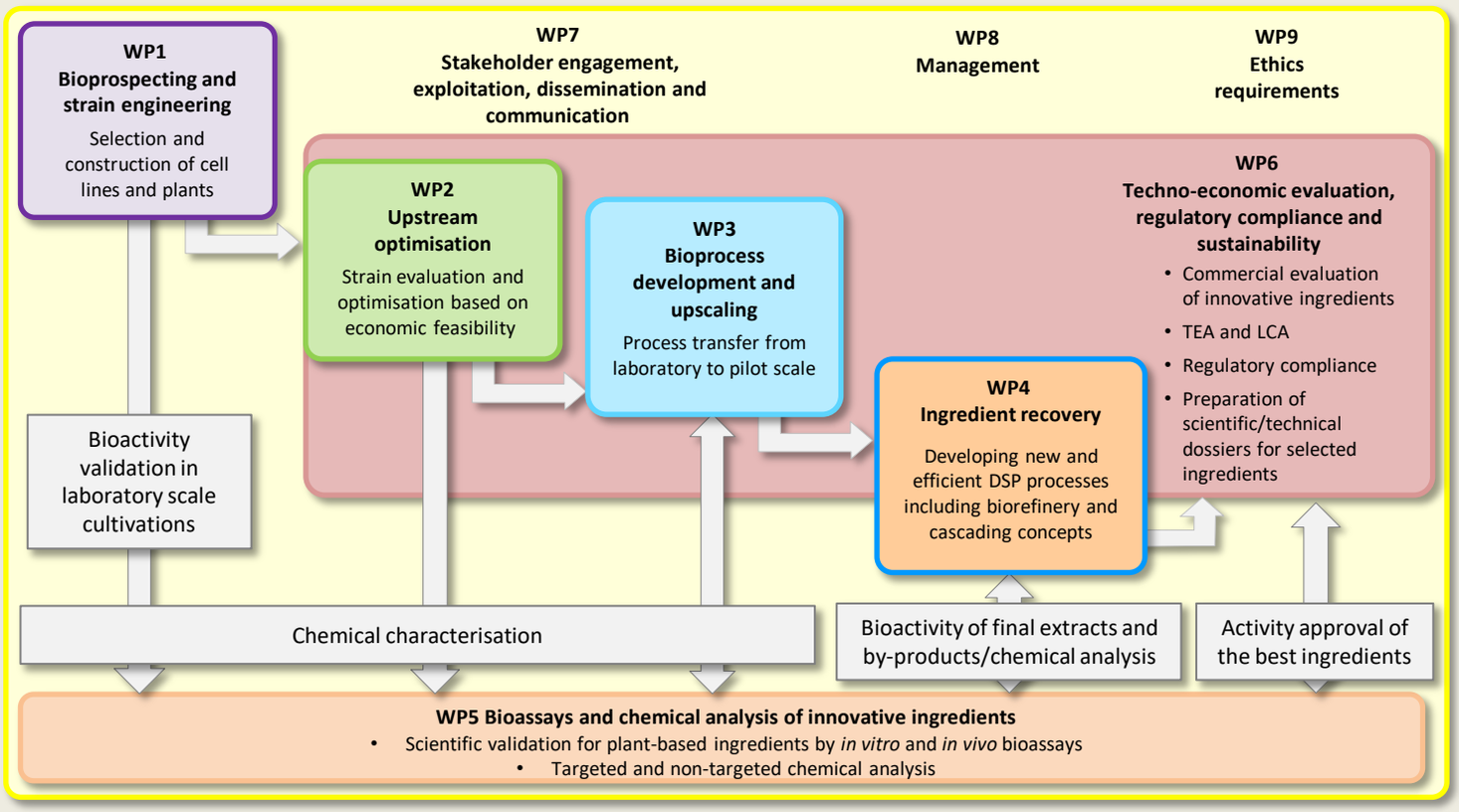
Plants growing in an aeroponic system, with exposed roots.

Progress with downstream processing

In the technical work packages addressing downstream processing, biomass feedstocks have been selected for stabilisation and extraction. Some are based on waste streams, such as clary sage biowaste, and others on cultivated plants or plant cells. We have developed a pilot-scale downstream process for apple cell cultures.

Our pilot-scale spiral filter press, which can process 40 L of apple cell culture and capture 1–2 kg of cell biomass.

We have established standard operating procedures for extraction and bioactivity assays, and sustainable downstream processing methods have been discussed with technology providers. Initially we are focusing on hydrophilic and lipophilic extracts, and supercritical carbon dioxide extraction. The chemical analysis of a series of plant materials to evaluate their bioactive components is already complete, and promising extracts have been identified from (among others) jasmine, pepper and cranesbill, ready for further tests.



The InnCoCells project has nine work packages (WPs) dealing with plant selection and engineering, upstream production and process development (WPs 1–3), ingredient extraction and purification (WP4), ingredient testing (WP5), commercialisation (WP6), exploitation, dissemination and communication (WP7), project management (WP8), and ethical requirements (WP9).

Progress with dissemination activities

InnCoCells has expanded its suite of dissemination activities to engage stakeholders and facilitate the path to commercialisation. As well as our publications, presentations at scientific meetings, and the project website, we have hosted multiple *InnCoCells Academy* events covering a range of topical issues relevant to the project, and we have attended several cosmetic industry exhibitions to share information about the project. We recently convened our first Stakeholder Group meeting, providing an opportunity for the 16 stakeholder organisations to provide useful feedback and guidance for the direction of the project. We have also joined with the three other projects funded under H2020 topic FNR-11-2020 (Algae4IBD, MARBLES and SECRETed) to form the AIMS cluster , which will pursue common dissemination and communication strategies and work together to address common challenges.

The AIMS cluster of projects.

Progress with public communication

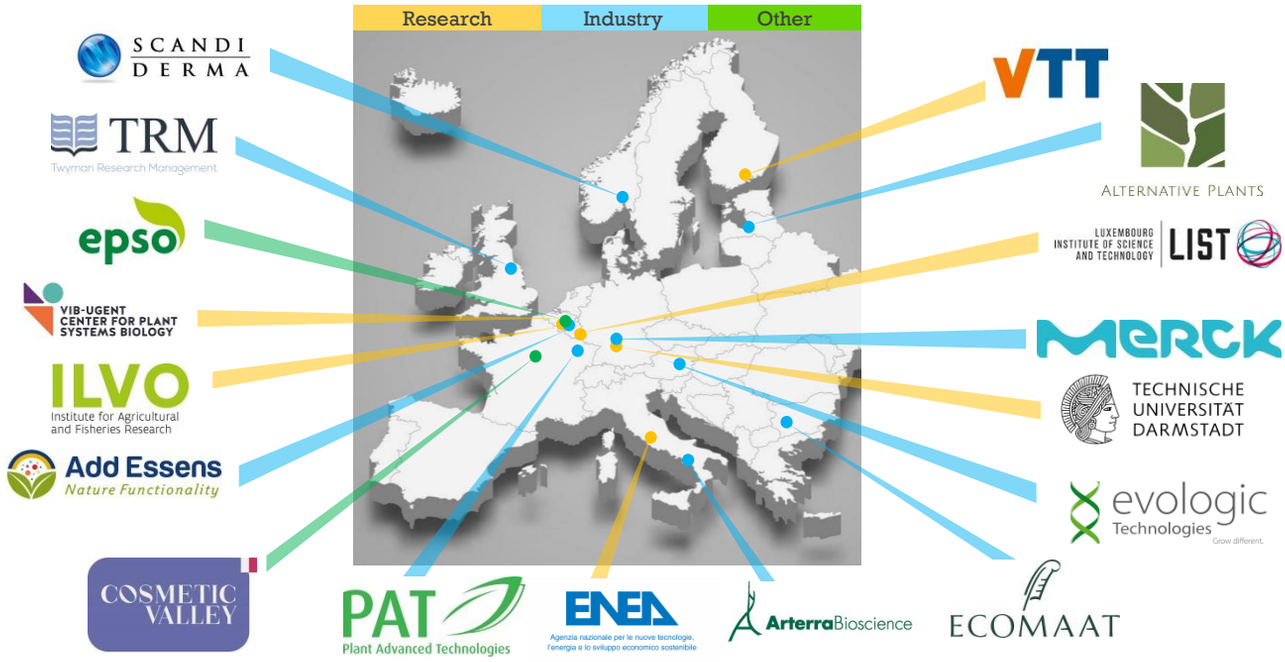
We have a broad and highly active communications package that provides information to the public about the project, the individuals and organisations involved, the aims and objectives, progress thus far, and the benefits for consumers of sustainable and efficacious cosmetic ingredients from plants.

The first InnCoCells promotional video – on YouTube.

In addition to the project website, press releases, and our social media presence, we now have podcasts with members of the consortium in an informal setting, a set of project brochures, and a series of promotional videos to provide an overview of the project and what we are trying to achieve. You can follow the project on Twitter, Instagram and Facebook using these links:

@inncocells @inncocells @InnCoCells

The *InnCoCells* consortium



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