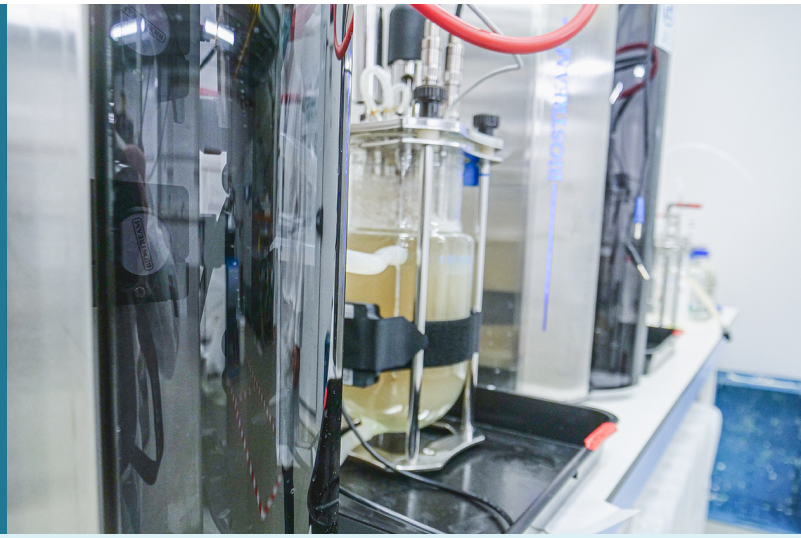
RESEARCH GROUP

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Plant Molecular Farming



The Plant Molecular Farming research group develops new concepts, products and services based on plant bioprocess engineering approaches, as well as synthetic biology using chassis (micro)organisms and integrative biology. The goal is the valorisation of plant biomass as feedstock of molecules for sustainable industrial products and the green biotech sector.
The research team develops a range of technologies for the sustainable production of innovative plant-sourced ingredients. We are using plant cell suspension cultures to provide a safe means for the mass production of specialty molecules and proteins. We screen the phytochemistry of our production with a high-throughput mass spectrometry-based biodiscovery metabolomics platform.

MAIN EXPERTISE FIELDS

• Plant cells

Plants produce a wide array of secondary metabolites with biological activities of high interest for the cosmeceutical, nutraceutical, pharmaceutical and agro-chemical industries. The Plant Molecular Farming research group also promotes the valorisation of plant genetic diversity in compliance with access and benefit-sharing (ABS) principles and valorises agro-industrial by-products as a source of commercially relevant molecules. This includes the upcycling of brewery residual biomass, apple/grape pomaces to a source of bio-active compounds.

• Plant cells cultures

Plants are cultivated both in vitro and as cell suspension cultures to characterise them from the molecular point of view. Among the research activities of the group, there is the study and valorisation of multi-purpose and underutilised crops, such as Cannabis sativa and Urtica dioica, as sources of both fibres and phytochemicals, as well as the cultivation of plant cell cultures, for example apple varieties, for the production of high added-value molecules and the biodiscovery of bioactive molecules of microbial origin for plant protection applications.

• Plant cell suspension in bioreactors

The plant molecular farming research group has a specific expertise in conducting plant production in bioreactor. We benefit from the large set op bioreactors (30+) ranging from lab-scale (1-10L) to pilot-scale (up to 300 L). In this context, we use this specificic technology in the frame of plant cellular farming for the production of specialty molecules and proteins

• Synthetic biology and bioprocess engineering

Metabolic engineering combined with comprehensive chemical characterisation techniques are used to develop chassis organisms, plants and plant cell cultures for the sustainable production of known and novel high-value molecules with new or superior biological activities. Once a cell line is established at the laboratory scale, the Plant Molecular Farming research group develops bioprocess engineering approaches for upscaling.

RESEARCH CHALLENGES

• Plants as phytofactories
• Resilient and sustainable agriculture
• Upcycling
• Bioprospecting (genetic diversity screening, -omics)
• Plant cell suspension culture
• Characterization and quantification of bioactive compounds
• Plant synthetic biology

APPLICATION AREAS

• Cosmetics
• Biostimulants
• Biocontrol
• Biopesticides
• Sustainable agriculture
• Nutraceuticals
• Food industry

MAIN ASSETS

• Innovative high-value cosmetic products from plants and plant cells - INNOCELLS
• Upscaling And Validation Of A Technology Aiming To Produce An Apple Cell Suspension Culture-based Cosmetics Ingredient - ACCEDE
• Production of triterpene Extract from Apple CElls - PEACE
• Production of nutritional supplements using green extraction methods for the upcycling of brewery residues - BEQ-FIT
• Production Of High Added Value Phenolics In Cannabis Sativa Via Salinity Eustress: Focus On Plants And Cell Cultures - HEMPHASE
• Dicarboxylic Acid syNThesis Elucidation - DANTE
• Functionalized Silicon particles application to boost phyto-resilience - SAPPHYRE
• Studying cell wall-associated processes in fibers of nettle - CARENET
• Impact of cadmium and zinc on fiber production in hemp (Cannabis sativa): an integrated approach assessing the protective effect of silicon - HEMPFI

EQUIPMENT

• Bioreactors (0.5 L-300 L, stirred- and wave-tank, with and without illumination)
• Bioreactor for solid state fermentation
• Plant tissue culture facility
• Plant growth chambers
• Plant transformation facility (gene gun, electroporator, qPCR and PCR machines, automated dispensing system for 384 well plates, gel electrophoresis chambers, Bioanalyzer, NanoPhotometer, vacuum infiltration system)
• Bead grinder
• Laboratory blender
• Fluorescence microscope and stereo-microscope
• Phenotyping station
• Microtome/vibratome/cryomicrotome
• Microplate reader
• Ultrasonic bath
• Freeze dryer
• CCD camera
• Turbovap® evaporator
• Ultracentrifugal Mill
• Pilot plant for extraction
• Rotary evaporator
• Vacuum oven
• Table-top Homogenizer
• Table-top vacuum packing machine
• High pressure homogeniser
• Oscillatory rheometer
• 3D printer
• Ultrasound processor

SELECTED PUBLICATIONS

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Partners

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