Welcome to the digitized botanical gardens initiative website

Here you can find a pilot project that aim to digitize the Fribourg botanical garden with liquid chromatography extractions and mass spectrometry analyses. The goal of this pilot is to find an easy, normalized way to collect and analyse plants in different environments, to permit a project of untargeted large-scale plant metabolomic library further deployed at a national, whether international scale with a complete taxonomy based on the “Open Tree of Life” one. With these ambitions, the project will be achieved in open science, to provide an easy access to anyone who wants to take part of it.

The open science project

The open science describes a working method in science that share the entire research process and data to the relevant actors (Academia, Industry, Public authorities, citizen groups, …). The goal is to diffuse the latest knowladges and improve the participation, the innovation process, the creativity and the trust in science (EC, 2022).

The pilot presentation

This pilot aim to try different extraction methods, species and plant parts to elaborate a simple way to create a national, whether international metabolomic platform based on the mass spectromety. It will be based on 96 samples that corresponds to a 96 well plate for mass spectrometry to have a sufficient sample pool to determine the best exctraction method and begin with some random species available in the Fribourg botanical garden. All plants will be classified following the Open Tree of Life taxonomy (OTL, 2022).

The methodology

Firstly, we have to clean the plant list of the Fribourg botanical garden to obtain a clear document with all unique species with their informations and locations in the garden. This step is not mandatory but permits to begin with good bases for the future of the project.

Secondly, the 96 well plate will be partly filled with the same specimen, extracted with

different liquid chromatography methods to seclect the best extraction way. Another fraction of the plate will host different parts of the same plant to determine the chemistry differences between them. For instance, it is not clear if we will analyse these different parts separately or alltogether in the same well. If some well are still available, they will be filled with some species, selected randomly or not, in the Fribourg botanical garden.

Finally, the results obtained will be analysed to select the best extraction method and to determine the way to analyse different parts of the same specimen. With these observations, an extraction and analysis protocol will be built to simplify, automatize and coordinate the future data acquisition.

Extraction methods

For instance, the extraction method is not fixed. We will try some and determine the chosen one later as explained above. The idea is at least to try one with liquid nitrogen to obtain the maximum of chemicals and another one with dryed plants to have a facilitated method to collect the plants wolrdwide without the problem of bringing liquid nitrogen in remote areas. The first one with liquid nitrogen seems to be better to capt the chemicals before their degradation (oxydation for example) or disappearence (volatiles) and provide the best quality chemicals detection (De Vos et al., 2007). But for many applications, it is impossible to use liquid nitrogen in the field, in the industry or to conserve these compounds until they get used by privates. That is why a method with dryed plants would be more convenient for the acquisition and the further potential utilisation in the industry or in the private context, thus these volatiles or unstable compounds are not so important to find.

Liquid nitrogen extraction

The acidified aqueous methanol with 75% methanol and 0.1% formic acid seems to be the most efficient solvent for extraction of a large range of compounds (De Vos et al., 2007).

And we have this work which is of interest [[bedigian2005]] ### Dryed plants extraction {#dryed-plants-extraction }

References

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