FWO 1S27722N DMP

Project Name Development of a rapid multiplex detection method for analysing plant stress hormones ACC and ABA using a fiber-optic SPR biosensor - FWO 1S27722N DMP

Grant Title 1S27722N

Principal Investigator / Researcher Laurien Volkaert

Project Data Contact 0496969313; laurien.volkaert@kuleuven.be

Description Plant hormones play a crucial role in steering developmental processes and controlling responses towards (a)biotic stressors. For example, drought, salinity and flooding stress evoke ethylene (by its precursor ACC) and abscisic acid (ABA) root-to-shoot signalling via the xylem to activate survival responses of the shoot. Especially with the advent of climate change, early stress detection is critical to prevent agricultural losses and breed for stress-resistant cultivars. Therefore, a rapid and cost-effective method to simultaneously detect ACC and ABA in plant extracts or xylem sap exudates would revolutionize the field of plant stress diagnostics. In this project, we will develop an immuno-based multiplex biosensor based on state-of-the-art fiber optic surface plasmon resonance (FOSPR). This technology, proven in medical diagnostics, will be retrofitted for plant applications. We will develop a competitive inhibition bioassay using antibodies against ACC and ABA. This multiplex biosensor will be optimized in buffer conditions and validated in plant extracts. Furthermore, we will develop a noninvasive xylem sap sampling technique to enable picomolar ACC and ABA detection in the transpiration stream of plants facing abiotic stress. This novel FO-SPR hormone biosensor will become a true alternative for cumbersome and expensive analytical techniques (e.g. HPLC-MS/MS) and revolutionize the field of plant hormone biology.

Institution KU Leuven

1. General Information
Name applicant

Laurien Volkaert

FWO Project Number & Title

FWO project 1S27722N

Title: Development of a rapid multiplex detection method for analysing plant stress hormones ACC and ABA using a fiber-optic SPR biosensor

Affiliation

- KU Leuven

2. Data description
Will you generate/collect new data and/or make use of existing data?

- Generate new data

Describe in detail the origin, type and format of the data (per dataset) and its (estimated) volume. This may be easiest in a table (see example) or as a data flow and per WP or objective of the project. If you reuse existing data, specify the source of these data. Distinguish data types (the kind of content) from data formats (the technical format).

WP 1: Development of FO-SPR biosensors for ACC and ABA detection

Includes: T1.1 FO-SPR biosensors optimization, T1.2 Target detection in buffer, T1.3 Target detection in biological samples

Type of data	Origin of data	Format	Estimated volume
Fibers optimisation output	FO-SPR sensor output – White FOx instrument	.xlsx	1 GB
Experimental protocols	Text file	.docx .pdf ELN	10 MB

WP 2: Development of a FO-SPR biosensor for multiplex target detection

Includes: T2.1 Characterization of specificity, T2.2 Immobilization strategies for BSA conjugates, T2.3 Multiplex FO-SPR biosensor development, T2.4 Benchmarking multiplex FO-SPR biosensor

Type of data	Origin of data	Format	Estimated volume
Fiber optimization output	FO-SPR sensor output - White FOx instrument	.xlsx	1 GB
Experimental protocols	Text file	.docx .pdf ELN	10 MB
Benchmark data 1	HPLC-MS/MS	.xlsx	10 MB
Benchmark data 2	ABA ELISA kit	.xlsx	10 MB

WP 3: Deployment of the multiplex FO-SPR biosensor for plant xylem sap analysis

Includes: T3.1 Xylem sap collection methods optimization

Type of data	Origin of data	Format	Estimated volume
Guttation experiments	FO-SPR sensor output - White FOx instrument	.xlsx	500 MB
Xylem probe experiments	FO-SPR sensor output - White FOx instrument	.xlsx	500 MB
Fluorescence microscopy images	Fluorescence microscope	.jpeg	1 GB
Sap flow rates	Heat pulse sap flow sensor	.xlsx	10 MB
Xylem sap osmotic potential	Freezing-point osmometer	.xlsx	10 MB

WP 4: Deployment of the multiplex FO-SPR biosensor for stress diagnostics

Includes: T4.1 Detection of ACC and ABA during abiotic stress

Type of data	Origin of data	Format	Estimated volume
ACC and ABA hormone dynamics analysis	FO-SPR sensor output - White FOx instrument	.xlsx	500 MB
Images plant	Camera	.jpeg	250 MB
Stomatal closure	Stomatal conductivity (SC-1 porometer, ICT International) and leaf photosynthetic rate (LCi, ADC Bioscientific)	.xlsx	10 MB
Epinastic movements	Custom-build angle sensor	.xlsx	10 MB
Areal ethylene production rates	Photo-acoustic laser spectroscopy	.xlsx	10 MB
Plant transpiration	Custom lysimeters	.xlsx	10 MB
Sap flow rates	Heat pulse sap flow sensor	.xlsx	10 MB
Levels of dissolved oxygen	Oxygen sensor	.xlsx	10 MB

General Data:

Type of data	Origin of data	Format	Estimated volume
Lab books	dated written notes associated with carrying out experimental procedures	Electronic lab notebook and paper notes	4 lab books and 1 GB
Text manuscript for publication	Text files associated with submitted publications	.docx / pdf	1 - 10GB

3. Legal and ethical issues
Will you use personal data? If so, shortly describe the kind of personal data you will use. Add the reference to your file in KU Leuven's Register of Data Processing for Research and Public Service Purposes (PRET application). Be aware that registering the fact that you process personal data is a legal obligation.

- No

Privacy Registry Reference:
Short description of the kind of personal data that will be used:

Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? If so, add the reference to the formal approval by the relevant ethical review committee(s)

- No

Does your work possibly result in research data with potential for tech transfer and

valorisation? Will IP restrictions be claimed for the data you created? If so, for what data and which restrictions will be asserted?

- Yes

There is potential for valorisation, but there are no IP restrictions.

Do existing 3rd party agreements restrict dissemination or exploitation of the data you (re)use? If so, to what data do they relate and what restrictions are in place?

- No

4. Documentation and metadata
What documentation will be provided to enable reuse of the data collected/generated in this project?

Protocols, physical labbooks, Electronic Lab Notebook (ELN) documentation, README files for raw datafiles containing information on the content of the dataset (description of variables). Physical data (plant tissue or extracts) will be stored and labeled.

Will a metadata standard be used? If so, describe in detail which standard will be used. If no, state in detail which metadata will be created to make the data easy/easier to find and reuse.

- No

5. Data storage and backup during the FWO project
Where will the data be stored?

OneDrive and the university's central servers.

How is backup of the data provided?

All data is immediately backed up in OneDrive, with a daily back-up to the university's central servers. These servers also have automatic daily back-up procedures.

Is there currently sufficient storage & backup capacity during the project? If yes, specify concisely. If no or insufficient storage or backup capacities are available then explain how this will be taken care of.

- Yes

The lab currently uses 8 GB of the available 2 TB on the server. Physical data (extracts, antibody samples) will be stored in in the lab -80 °C freezer for longterm storage. The lab has sufficient space in the -80 °C freezer. The -80 °C freezer is equipped with an automated temperature alarm, provided by the KU Leuven central dispatch team. A backup contact list is provided in case the -80 °C goes into alarm.

What are the expected costs for data storage and back up during the project? How will these costs be covered?

We don't expect extra cost for data storage. But in case the lab does not have enough storage room, the PI has budget to buy more.

Data security: how will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?

The KU Leuven drives are password protected through the central KU Leuven login. KU Leuven obliges users to update passwords regularly.
The network drive of the shared folder is secured by the ICTS service of KU Leuven with a mirror copy. Only specific lab members will have access to the shared folder. Unauthorized persons do not have access to this system.

6. Data preservation after the FWO project
Which data will be retained for the expected 5 year period after the end of the project? In case only a selection of the data can/will be preserved, clearly state the reasons for this (legal or contractual restrictions, physical preservation issues, ...).

All data obtained during this FWO project will be retained for the expected 5 year period.

Where will the data be archived (= stored for the longer term)?

Where will the data be archived (= stored for the longer term)?

On the university's central service and in the -80°C freezer.

What are the expected costs for data preservation during the retention period of 5 years? How will the costs be covered?

We don't expect extra costs. In case there will be, the PI had budget for this.

7. Data sharing and reuse
Are there any factors restricting or preventing the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)?

- No

Which data will be made available after the end of the project?

We aim to publish all data and make it available for requests afterwards. Until publication the data will be protected.

Where/how will the data be made available for reuse?

- Upon request by mail

When will the data be made available?

- Upon publication of the research results

Who will be able to access the data and under what conditions?

All lab members will have access to the data. The published data will be available upon request for non-lab members.

What are the expected costs for data sharing? How will the costs be covered?

Data sharing is organized by the KU Leuven and are free for the lab.

8. Responsibilities
Who will be responsible for data documentation & metadata?

Laurien Volkaert

Who will be responsible for data storage & back up during the project?

Laurien Volkaert

Who will be responsible for ensuring data preservation and reuse ?

Prof. Bram Van de Poel

Who bears the end responsibility for updating & implementing this DMP?

Prof. Bram Van de Poel