Hijacked by nature's genetic engineer: unraveling novel interactions between Agrobacterium effectors and plant proteins

A Data Management Plan created using DMPonline.be

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Funder: Fonds voor Wetenschappelijk Onderzoek - Research Foundation Flanders (FWO)

Template: FWO DMP (Flemish Standard DMP)

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Grant number / URL: G031624N

ID: 209093

Start date: 01-01-2024

End date: 31-12-2027

Project abstract:

Agrobacterium is a captivating bacterial plant pathogen renowned for its ability to transfer genetic material into the plant genome. Humans harnessed this unique capability to create plants with desirable agronomic traits. Plant-pathogen interactions are typically determined by complex interaction networks involving both bacterial effectors and plant host proteins. While research on bacterial DNA transfer and integration has dominated the Agrobacterium field, there is a lack of knowledge on how effectors hijack plant defense responses. This is highlighted by the fact that for many plant species, notably monocots, genetic transformation remains challenging. To address this knowledge gap, we will utilize new techniques in proteomics, based on proximity-dependent labeling, to identify novel effector-host protein interactions within the host cellular environment. Concurrently, we will employ two high-end approaches to identify potential novel effectors. We will characterize proteins translocated by the secretion system within Agrobacterium and identify bacterial proteins in planta. Finally, we will functionally characterize novel host proteins in both maize and Arabidopsis and study the importance of both novel effectors and host proteins in infection. Our comprehensive approach will undoubtedly provide a deeper understanding of this intriguing natural interkingdom interaction and may lead to improvements in biotechnological applications.

Last modified: 15-07-2024

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DPIA

Have you performed a DPIA for the personal data processing activities for this project?

- Not applicable

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GDPR

Have you registered personal data processing activities for this project?

- Not applicable

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GDPR

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Application DMP

Questionnaire

Describe the datatypes (surveys, sequences, manuscripts, objects …) the research will collect and/or generate and /or (re)use. (use up to 700 characters)

Origin (digital):

- Type: experimental data and laboratory records (interaction studies, disease assays, microscopy data, images)
  - Format: Logging will be done using physical lab notebooks (KU Leuven) and electronic notebooks (UGent). Notes will be handwritten, typed when necessary and digitized as scans or photos when key data collected. Logging will be done using electronic notebooks (UGent). Digital data will be stored on the OneDrive system provided by KU Leuven. KU Leuven ICTS provides standard back-up. UGent data will be stored and backed-up at the VIB-UGent Center for Plant Biosystems Biology servers (.xlsx, .doc, .ppt, .pdf, .txt, .jpeg, . png, .cvs, .tif, .lif, .lsm)
- Type: DNA/RNA sequencing data
  - Format: raw and processed data will be stored (.gb, .fasta, .gff, .bam)
- Type: Mass spectrometry data
  - Format: raw and processed data will be stored (.raw, .xlsx)

Origin (physical):

- Type: plasmids
  - Format: plasmids will be stored at -20°C
- Type: bacterial wild-type/overexpression/mutant strains
  - Format: Agrobacterium and E. coli strains will be stored at -80°C as glycerol stocks
- Type: transgenic plant lines
  - Format: overexpression and mutant lines will be stored as seeds.

The research will re-use plasmids, transgenic lines, calli, cell cultures and bacterial strains available within the project partners' lab. No personal data will be collected or used

Specify in which way the following provisions are in place in order to preserve the data during and at least 5 years after the end of the research? Motivate your answer. (use up to 700 characters)

Designation of responsible person (If already designated, please fill in his/her name.)

- KU Leuven: During data collection the PhD researcher will be the main
  persons responsible for data collection and preservation. Prof. De Coninck is co-responsible for the data storage and KU Leuven ICT is responsible for backup of the server.
- UGent: During data collection the postdoctoral researcher Catherine Doorly will be the main persons responsible for data collection and preservation. Prof. Inge De Clercq and Prof. Laurens Pauwels are co-responsible for the data storage and UGent-PSB is responsible for backup of the server.

Storage capacity/repository (during the research and after the research)

- Electronic data will be stored in a dedicated Agro-effector folder on a secured KU Leuven/UGent-PSB server with limited digital access for personnel involved in the Agro-effector project. Final data for the different experiments will be collected in a shared Agro-effector folder on the KU Leuven server to which UGent-PSB researchers will have access.

Upon openaccess publishing, the data will be made available via an Open Access Repository and metadata will be published.

What's the reason why you wish to deviate from the principle of preservation of data and of the minimum preservation term of 5 years? (max. 700 characters)

We do not anticipate deviating from the minimum 5 year preservation term.

Are there issues concerning research data indicated in the ethics questionnaire of this application form? Which specific security measures do those data require? (use up to 700 characters)

We do not anticipate ethical issues arising.

Which other issues related to the data management are relevant to mention? (use up to 700 characters)

no other issues are relevant to mention

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FWO DMP (Flemish Standard DMP)

1. Research Data Summary

List and describe all datasets or research materials that you plan to generate/collect or reuse during your research project. For each dataset or data type (observational, experimental etc.), provide a short name & description (sufficient for yourself to know what data it is about), indicate whether the data are newly generated/collected or reused, digital or physical, also indicate the type of the data (the kind of content), its technical format (file extension), and an estimate of the upper limit of the volume of the data.

Dataset Name	Description	New or reused	Digital or Physical	Only for digital data Digital Data Type	Only for digital data Digital Data format	Only for digital data Digital data volume (MB/GB/TB)	Only for physical data Physical volume
		Please choose from the following options: • Generate new data • Reuse existing data	*Please choose from the following options:* • Digital • Physical	*Please choose from the following options:* • Observational • Experimental • Compiled/aggregated data • Simulation data • Software • Other • NA	*Please choose from the following options:* • .por, .xml, .tab, .csv,.pdf, .txt, .rtf, .dwg, .gml, … • NA	*Please choose from the following options:* • <100MB • <1GB • <100GB • <1TB • <5TB • <10TB • <50TB • >50TB • NA	
Agro-effector - methods and protocols	Associated data	Generate new data and reuse existing data	Digital	Textual	.doc, .pdf, .xls	<1GB	
Agro-effector communicative data	Scientific reports, presentations, papers, theses, media	Generate new data	Digital	Textual, audiovisual	.doc, .pdf., .ppt, .mp4	<100GB	
T1.1/1.2/1.3/3.1/3.2 Agro-effector Interactomics	Effector-target identification through PDL and mass-spectrometry ()	Generate new data	Digital	Experimental and computational	.raw, .xls	<100GB	
T2.2/3.3 Agro-effector Transcriptomics	Transcriptomics in plants and Agrobacterium	Generate new data	Digital	Experimental and computational	.fastq, .fasta, .gff, .gtf, .bam	<100GB	
T2.1/2.2/4.1 Agro-effector Microscopy	Microscopy of interaction studies	Generate new data	Digital	Observational	.png, .tiff., jpeg, .lif, .lsm	<1TB	
T2.1/2.2/4.2 Agro-effector In planta functional data	Susceptibility phenotyping	Generate new data	Digital	Observational and experimental	doc, .txt, .xls, .jpeg, .cvs, .png	<1GB	
Agro-effector Bacterial strains	WT, mutant strains (Agrobacterium) and helper strains (E. coli)	Generate new data and reuse existing data	Physical			~50 strains	
Agro-effector Arabidopsis/maize lines	Transgenic and genome-edited lines of Arabidopsis and maize	Generate new data and reuse existing data	Physical			~20 lines	
Agro-effector plasmids	entry and destiny vectors for Agrobacterium/Arabidopsis/maize transformation	Generate new data and reuse existing data	Physical			~40 plasmids	

If you reuse existing data, please specify the source, preferably by using a persistent identifier (e.g. DOI, Handle, URL etc.) per dataset or data type:

We will reuse published protocols, plasmids (https://vectorvault.vib.be/), Agrobacterium strains and Arabidopsis lines

Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? Describe these issues in the comment section. Please refer to specific datasets or data types when appropriate.

- No

Will you process personal data? If so, briefly describe the kind of personal data you will use in the comment section. Please refer to specific datasets or data types when appropriate.

- No

Does your work have potential for commercial valorization (e.g. tech transfer, for example spin-offs, commercial exploitation, …)? If so, please comment per dataset or data type where appropriate.

- No

Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material/Data transfer agreements/ research collaboration agreements)? If so, please explain in the comment section to what data they relate and what restrictions are in place.

- No

Are there any other legal issues, such as intellectual property rights and ownership, to be managed related to the data you (re)use? If so, please explain in the comment section to what data they relate and which restrictions will be asserted.

- No

2. Documentation and Metadata

Clearly describe what approach will be followed to capture the accompanying information necessary to keep data understandable and usable, for yourself and others, now and in the future (e.g., in terms of documentation levels and types required, procedures used, Electronic Lab Notebooks, README.txt files, Codebook.tsv etc. where this information is recorded).

Protocols for laboratory procedures will be documented, digitized and stored on the Agro-effector folder on the server (managed by KU Leuven) . Handwritten lab notebooks (KU Leuven) or digital lab books (UGent-PSB) will be retained. readme.txt files will be used to guide interpretation and use of datasets in the future. A clear coding for all data files/folders related to the project will be used. These will have the form: WPX_TaskY_ddmmyyyy_researcherinitials.
Once published, DNA/RNA sequences will be published on domain-specific repositories such as National Institute of Health (NIH) RefSeq or GenBank.

Will a metadata standard be used to make it easier to find and reuse the data? If so, please specify (where appropriate per dataset or data type) which metadata standard will be used. If not, please specify (where appropriate per dataset or data type) which metadata will be created to make the data easier to find and reuse.

- Yes

A standard metadata will be used in compliance with the FAIR principles. Metadata with experimental procedures (including sampled species, sampling location, date and handling person, etc.), preparation information, storage, etc. will be provided.

3. Data storage & back-up during the research project

Where will the data be stored?

The data will be stored on the university's central server with automatic daily back-up procedures. In case data is linked to publications, it will be also made available on public
databases which have their own storage facilities (e.g. Sequence Read Archive, Genbank of NCBI). Biological data will be stored at 4°C fridges and -20°C and -80°C freezers with limited access. A copy of the bacterial database will be kept at each project partner. Freezers with biological data are located in the labs which have restricted access for unauthorized personnel (e.g. by means of a badge-system).

How will the data be backed up?

KU Leuven and UGent-PSB server has a an automatic back-up procedure

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

Sufficient storage is available during the course of this project.

How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?

Research group folders are only accessible by registered personnel. Authentication takes place with a personal username and password. KU Leuven and UGent-PSB user accounts are created/managed by the IT department. Access rights to study data are provided upon decision by the head of the research group. Freezers with biological data are located in the labs which have restricted access for unauthorized personnel (e.g. by means of a badge-system).

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

No costs expected during the research project.

4. Data preservation after the end of the research project

Which data will be retained for at least five years (or longer, in agreement with other retention policies that are applicable) after the end of the project? In case some data cannot be preserved, clearly state the reasons for this (e.g. legal or contractual restrictions, storage/budget issues, institutional policies...).

All data will be retained for at least five years after the end of the project.

Where will these data be archived (stored and curated for the long-term)?

Data will be archived on the server of the research group and on the domain-specific repository selected.

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

No costs expected.

5. Data sharing and reuse

Will the data (or part of the data) be made available for reuse after/during the project? In the comment section please explain per dataset or data type which data will be made available.

- Yes, in an Open Access repository

After publication, the data will be made available through domain-specific open access repository.

If access is restricted, please specify who will be able to access the data and under what conditions.

We do not anticipate access will be restricted after publishing. Before publication of research, the data will be available to researchers in the Agro-effector project.

Are there any factors that restrict or prevent the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)? Please explain in the comment section per dataset or data type where appropriate.

- No

Where will the data be made available? If already known, please provide a repository per dataset or data type.

Data can be made available in the general database ZENODO or DRYAD or more domain specific repositories.

When will the data be made available?

Data will be made available following publication of research findings in a peer-reviewed journal.

Which data usage licenses are you going to provide? If none, please explain why.

A general license such as CC BY may be selected.

Do you intend to add a PID/DOI/accession number to your dataset(s)? If already available, you have the option to provide it in the comment section.

- Yes

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

No costs are expected

6. Responsibilities

Who will manage data documentation and metadata during the research project?

KU Leuven: PhD student; UGent-PSB: Catherine Dooly

Who will manage data storage and backup during the research project?

KU Leuven: Barbara De Coninck; UGent-PSB: Inge De Clercq, Laurens Pauwels

Who will manage data preservation and sharing?

KU Leuven: Barbara De Coninck; UGent-PSB: Inge De Clercq, Laurens Pauwels

Who will update and implement this DMP?

KU Leuven: Barbara De Coninck; UGent-PSB: Inge De Clercq, Laurens Pauwels

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