

### Annual progress report 2019

The projects (public-private partnerships or PPP's) that are running under the responsibility of the topsectors need to report annually on the progress concerning content and finances. For the progress concerning content the format underneath needs to be used. For the financial progress an Excel spreadsheet is available. You are asked to report on the whole PPP: input and results of both public and private parties.

### Approval project coordinator / consortium

The annual progress report needs to be discussed with the project coordinator / the consortium. If the consortium has any remarks about the progress report, the TKI's would like to be informed.

The project coordinator has approved the progress report on behalf of the consortium	X approved <input type="checkbox"/> not approved
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Any remarks about the progress report:	
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### General information

PPS-number	1605-106
Project title	Role of helper microbes enhancing downy mildew on leafy vegetables
Topsector and innovation theme	Tuinbouw en Uitgangsmaterialen
Project leader (research institute)	Prof. Dr. Guido Van den Ackerveken
PPS-coordinator (on behalf of the private parties involved)	Dr. Adriaan Verhage
Government contact person	Clemens Stolk
Status (running or completed)	Running
Type of research (F, S or A)	F (F=fundamental, S=strategic, A=applied/valorisation)
True starting date	01-06-2017
True end date	31-05-2021 (extended to 31-8-2021)
Brief description of project content (preferably about 4 lines, max 0.5 page).	Downy mildews are host-specific obligate-biotrophic pathogens belonging to the Oomycetes, that cause major crop loss worldwide. Strategies to prevent disease mainly involve breeding for downy-mildew resistance. Although this is a highly effective strategy, turnover rate of resistance genes is high due to the rapid adaptation of the pathogen. In this project, we explore the leaf microbiome to discover microbes that can influence the downy mildew infection process. These microbes could be considered new targets for the control of these notorious pathogens.

### Planning and progress (please elaborate in case there are modifications compared with the approved project plan)

Is the project running according to plan?	<b>Yes</b>
Are there any changes with respect to the consortium/the project partners?	<b>No</b>
Is there any delay or postponement in the delivery date of the project?	<b>Yes, 3-month extension due to break down in plant-growth facilities.</b>

**Highlights: please provide a brief description of the most important results obtained in 2019** (this description will be published online on the Topsector website)

Using bacterial community analyses, we have shown a consistent enrichment of specific bacteria in geographically separated Arabidopsis downy mildew cultures. Among these are known plant-beneficial bacteria, for which we show that the presence of downy mildew positively affects proliferation, suggesting that the plant promotes growth of beneficial bacteria in the leaf environment (phyllosphere) upon downy mildew infection. Current work regarding these bacteria concerns the assessment and characterization of any impact they have on pathogen virulence in the phyllosphere and comparative genomics among downy-mildew-associated bacteria to pinpoint genes that may contribute to fitness in the downy-mildew-diseased system.

Similar experiments are currently being analysed regarding potential spinach-downy-mildew-associated bacteria. These data are supplemented with bacterial community data from field-grown spinach for which natural downy mildew infections were observed.

**Bottlenecks: please provide a brief description of any bottlenecks that may have occurred in 2019**

Break down of plant-growth facilities.

**Number of delivered products in 2019** (please provide in a separate attachment the titles and/or description of the products or a link to products on public websites)

Scientific articles (*)	Reports	Articles in trade journals	Introductions / workshops / invited lectures	Patent applications /first filings	Spin-offs (**)
	2				

(\*) Reminder: in case your project is financed via the so called TKI-allowance ("TKI-toeslag"), the TKI needs to be mentioned in your scientific publications as financier. In case of publications in journals with a very high impact factor, the TKI's would like to be informed on beforehand.

(\*\*) Spin offs are: additional contract research that is a direct result of the project, additional grants that have been obtained, and spin off companies.

Do you expect a patent application in 2019?	NO
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**Appendix: Titles of the products or a link to the products on a public website**

If applicable, please provide an explanation on:

- Deviation in delivered products
- Reason why product has not yet been placed on a public website