



PPP Annual Report 2019

PPP projects which are under supervision of the "Topsectoren" must report annually on the scientific content and financial progress. This form is used to report the progress of the content of the project. PPP projects that finish in 2019 should make use of a different form: "PPP-final report."

The annual report will be published on the TKI / topsector website. Therefore, please ensure that there is no confidential information in the annual report.

The PPP-annual report must be sent, at the latest, by the 1st of March 2020 to the "TKI's": info@tkitu.nl or info@tki-agrifood.nl. For Wageningen Research, the report has to be sent to the "Topsector secretary" of your respective institute.

General information	
PPP-number	TU18075 / TU-2018-027
Title	A new method for potato breeding: the "Fixation-Restitution" approach
Theme	Duurzame Plantaardige Productie
Implementing institute	Plant Breeding Wageningen University
Project leader research (name + e-mail address)	Herman J. van Eck Herman.vaneck@wur.nl
Coordinator (on behalf of private partners)	Remko Koeman, IJsselmeerpolders BV. r.koeman@denhartigh-potato.nl
Project-website address	n.v.t.
Start date	01-02-2019
Final date	31-01-2023

Approval by the coordinator of the consortium

The annual report must be discussed with the coordinator of the consortium. The "TKI's" appreciate additional comments concerning the annual report.

Assessment of the report by the coordinator on behalf of the consortium:	<input checked="" type="checkbox"/> V Approved <input type="checkbox"/> Not approved
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Additional comments concerning the annual report:	
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Summary of the project

Problem definition	Conventional potato breeding relies on heterozygous tetraploid parents. During meiosis the genetic quality of these parents disperse across gametes, leading to a segregating offspring with very few desirable individuals. True seed F1 hybrid breeding is promising, but requires high investments in development of suitable material, while success is not yet guaranteed.
Project goals	The project aims to solve the most important limitation of traditional breeding. With self-compatible diploids we can reach fixation of many beneficial traits, but without the need of 100% homozygosity for F1 hybrid uniformity. This alleviates the loss of vigour and fertility due to inbreeding depression. With 2n gametes by First Division Restitution (FDR) all fixed alleles are transferred to tetraploids. This method circumvents the many unsolved issues with inbreeding depression, combining ability and heterotic groups.

Results

Planned results 2019	<p>These six bullet points are work packages for the entire project, but in 2019 we planned to work on all aspects.</p> <p>WP1) Develop all components of a new potato breeding method and disseminate unique material to breeders.</p> <p>WP2) Understand the inheritance of SC and deliver predictive DNA marker assays</p> <p>WP3) Understand the inheritance of 2n FDR gametes and deliver predictive DNA marker assays</p> <p>WP4) Expand the diploid gene pool with new primary dihaploids that contribute trait alleles unavailable at the diploid level.</p> <p>WP5) Identify recombinant diploids with trait alleles linked in cis-configuration (coupling phase).</p> <p>WP6) Develop and disseminate progenitors with self-compatibility, 2n-gametes, homozygous for a multitude of pyramided disease resistance genes in a series of ideotype backgrounds (fresh market, starch, export, crisps, French fries).</p>
Achieved results 2019	<p>WP1) Unique material was shared with breeders. Breeding companies have grown seedlings of our seed collection of self-compatible material. The tubers have been selected for visual appearance.</p> <p>WP2) Understand the inheritance of SC and deliver predictive DNA marker assays During 2019 we were very lucky with the research progress and could draw generic conclusions. We could develop markers. BEJO converted our data into KASP markers. Validated markers were shared among breeders for marker assisted selection. We finished a first manuscript "The origin and widespread occurrence of <i>S/i</i> based self-compatibility in potato", which is ready for submission upon approval by companies</p> <p>WP3) Understand the inheritance of 2n FDR gametes and deliver predictive DNA marker assays During 2019 phenotypic and genotypic data were collected. The preliminary data analysis does not yet provide clear answers. To be continued in 2020</p> <p>WP4) Expand the diploid gene pool with new primary dihaploids that contribute trait alleles unavailable at the diploid level. Four companies and WUR have been active to induce new primary dihaploids. Seeds were cleaned and counted and ready for sowing in 2020</p> <p>WP5) Identify recombinant diploids with trait alleles linked in cis-configuration (coupling phase). Three regions on chromosome 5, 9 and 11 have been selected for this task. Progress was made to combine and to recombine trait alleles. Therefore new marker data were collected and shared with breeders. Ongoing...</p> <p>WP6) Develop and disseminate progenitors with self-compatibility, 2n-gametes, homozygous for a multitude of pyramided disease resistance genes in a series of ideotype backgrounds (fresh market, starch, export, crisps, French fries). A preliminary start can be reported on this work package, albeit this WP6 is ongoing and reaching its full potential by the end of the project.</p>

Planned results 2020	<p>WP1) The planning of 2020 field experiments, intended crosses, raising of seedlings was discussed in febr 2020.</p> <p>WP2) Understand the inheritance of SC and deliver predictive DNA marker assays Finished when the article is published, but markers will be employed during the project.</p> <p>WP3) Understand the inheritance of 2n FDR gametes and deliver predictive DNA marker assays We planned another two populations to unravel the inheritance of 2n gametes. We plan to develop new phenotyping protocol to increase accuracy and reduce labour. To be continued in 2020</p> <p>WP4) Expand the diploid gene pool with new primary dihaploids that contribute trait alleles unavailable at the diploid level. Continuation of the work in this work package</p> <p>WP5) Identify recombinant diploids with trait alleles linked in cis-configuration (coupling phase). In 2020 we plan to continue this work package. Specifically for the R-genes on chromosome 5, 9 and 11 more accurate positions will be determined to design efficient recombination strategies. Ongoing...</p> <p>WP6) Develop and disseminate progenitors The 2020 planning includes quite some material development and sharing of progenitors.</p>
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<p>Deliverables/products in 2019 (provide the titles and /or a brief description of the products/deliverables or a link to a website.</p>
<p><u>Scientific articles:</u> Draft version completed: "The origin and widespread occurrence of Sli based self-compatibility in potato"</p>
<p><u>External reports:</u> none</p>
<p><u>Articles in professional journals/magazines:</u> none</p>
<p><u>(Poster) presentations at workshops, seminars, or symposia.</u></p> <ul style="list-style-type: none"> - PhD student presented WP2 during Theme 4 day of graduate school EPS - Project leader presented the project during seminar of chairgroup
<p><u>TV/ radio / social media / newspaper:</u> none</p>
<p><u>Remaining deliverables (techniques, devices, methods, etc.):</u></p> <ul style="list-style-type: none"> - Protocol to breeders on KASP markers for Self-Compatibility