GoodBerry

www.goodberry-eu.eu

Improving the stability of high-quality traits of berry in different environments and cultivation systems for the benefit of European farmers and consumers

GoodBerry Newsletter // Issue N° 2 // July 2018

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In this issue:

Editorial

After two years, the work in GoodBerry has come a long way. The populations are planted in all different locations and currently the second year of harvesting is in progress. In the meantime, last year's data is being evaluated and first insights are being shared via scientific publications, at conferences and events as well as at our annual berry school.

Since the integration of early researchers is at the heart of GoodBerry, the second newsletter highlights their role in the project. Four young scientists in their twenties and thirties share their perspective in short interviews and hopefully inspire others to get involved in similar international research consortia. GoodBerry includes many activities dedicated especially to teaching and the support of young researchers one of which is our annual berry school. To give you an impression, two participants of the latest berry school in Bordeaux share an insiders' account.

Next to numerous scientific and industrial events at which partners presented the project, an animated clip was recently finalized and is now available on our website. It presents the key facts in a very simple and concise form providing not only background information but also explaining the project´s approach and goals.

Our newsletter is published annually and contains up to date information on the project progress, output and events as well as on related topics. If you have suggestions for our newsletter or general questions regarding GoodBerry, we are happy to receive your feedback. Please find our contact details at the end.

Enjoy reading!

GoodBerry – Work Progress

While work in project year one was concentrated on the development of harmonized standard operating procedures (SOPs) as well as on the establishment of the first cultivars in the different locations across Europe, Chile and China, year two saw the entire segregation population of strawberry successfully planted and focused on the collection of data and the evaluation of first results. Especially the experiments on raspberry and blackcurrant cultivars successfully kicked-in in 2017.

Once the fruit harvest was realized, the samples were shipped to the different laboratories involved in performing the analytical experiments where currently the data is being consolidated and evaluated.

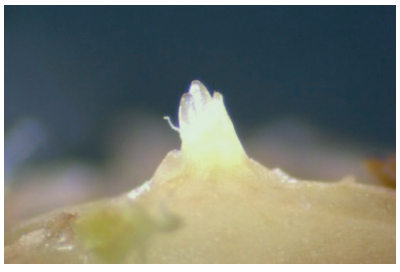
In order to guarantee the comparability of the analysis multiple workshops were organized regarding for example sensory analysis and ring testing between the different laboratories.

Furthermore, during a phenotyping workshop the partners used microscopy specimens to discuss flower formation from the vegetative stage and the stage with the first visible floral organs through to the stages with highly differentiated flower buds. These lively knowledge-sharing workshops result in a better, standardized assessment procedure and thus in a more secure data situation for all subsequent analyses and comparisons.

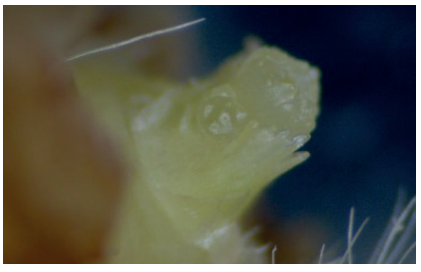
Within GoodBerry, all measurement data and metadata, as well as analysis results are being deposited into a central database. This will allow for flexible querying and interactive visualization of both analysis results and the underlying primary data and thus aid in data quality control. Since spring 2018 the database has successfully been established. It already allows browsing for data and analyzing datasets using visualization modules and some simple statistics as well as visualization of the first RNAseq datasets.

Once the data is analyzed, validated and metadata has been corrected, it will be made openly available.

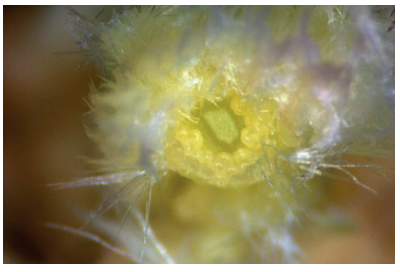
Development of the strawberry rhizome from August to November (images by the Institute of Pomology, HGU)



mid-August
flower organs not yet developed

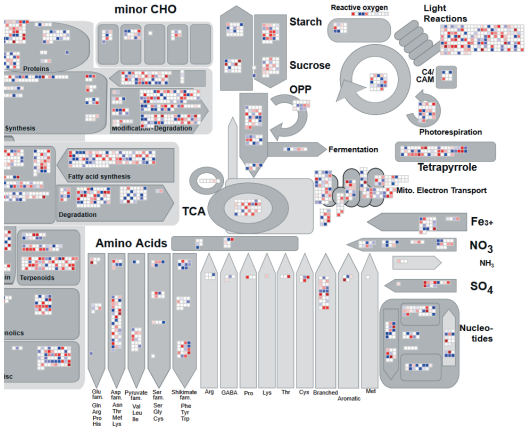


September
inflorescence emerge



November
flower organs almost completely developed

Visualization examples for GoodBerry omics data



Sunburst chart for functional categories and web only MapMan component developed for GoodBerry:

(sourcecode: https://usadellab.github.io/MapManJS/ultramicro.html)

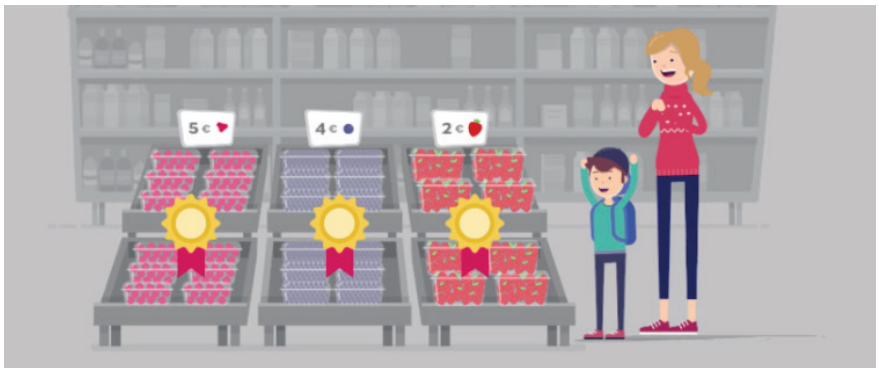
Take a look at the new GoodBerry project movie!

The new GoodBerry animated clip presents the key facts of the project within 2 minutes in a very simple and concise form. It does not only provide background information about the motivation but also explains the project´s approach as well as its goals. The movie is presented at scientific events, fairs and open days in order to communicate the key project ideas to a diverse audience. It is available via the project website and media channels such as YouTube.

The movie shows very vividly the consequences of climate change on berry production and consumption as weaker and less productive plants lead to higher prices and lower availability.

It describes the joint effort of berry producers and scientists to identify berry fruit crops that are most suitable for quality cultivation in different environments with more stable and controllable characteristics.

As a unique international consortium with partners from all over the world GoodBerry has the best prerequisites to introduce new varieties, cultivation methods and technologies for the different climatic zones.

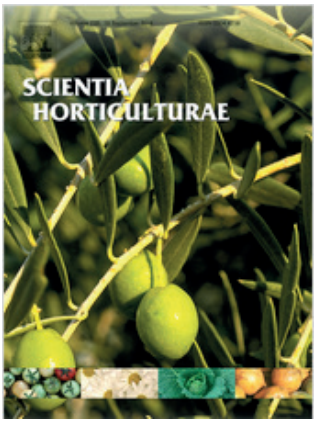


The project holds benefits for different stakeholders, not only increasing the berries market value and the competitiveness of the European berry production but also leading to healthy, tasty and affordable berries for the European consumers.

GoodBerry Publications

Even though most of the data generated in GoodBerry is still being produced and evaluated, the partners have already been committed to disseminating their results openly (OpenAccess) to the scientific community. Some examples are highlighted below.

Investigating growth cessation and floral initiation



Aiming to assess and compare the environmental limits for growth cessation and floral initiation in a range of new and established biennial-fruiting red raspberry (*Rubus idaeus L.*), cultivars of diverse origin have been cultivated in a phytotron as well as under field conditions.

The investigation has confirmed that both growth cessation and floral initiation are jointly controlled by the interaction of low temperature and short days. Results obtained in the field under decreasing autumn temperature and day length conditions agreed closely with the results in the phytotron. We therefore conclude that results obtained with raspberry in properly controlled daylight phytotron experiments are generally applicable to field conditions. The full article is available in Scientia Horticulturae.

Hodnefjell et al.: Control of growth cessation and floral initiation in red raspberry (Rubus idaeus L.) cultivars of diverse origin in controlled and natural environments, Scientia Horticulturae. 2018; 233. https://doi.org/10.1016/j.scienta.2018.02.011

Strawberry extract can activate AMPK

Regulation of lipid metabolism is essential for treatment and prevention of several chronic diseases such as obesity, diabetes, and cardiovascular diseases. While it has been demonstrated that the AMP-activated protein kinase (AMPK) has a direct impact on lipid metabolism, this study shows that a treatment with strawberry extract can stimulate the AMPK expression which in turn inhibits the proteins involved in fatty acids and cholesterol synthesis. These findings support the further employment of strawberry fruits as functional foods and a potential hypolipidemic agent. The full article is available in Nutrients.

Forbes- Hernández et al.: Lipid Accumulation in HepG2 Cells Is Attenuated by Strawberry Extract through AMPK Activation. Nutrients 2017; 9(6): 621. doi:10.3390/nu9060621

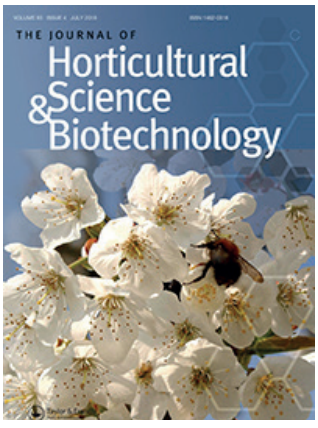
Deeper insight into the regulation of anthocyanin biosynthesis

SCIENTIFIC REPORTS

Strawberry fruits are valued for their sweet fruity flavor, juicy texture, and characteristic red color caused by anthocyanin pigments. To gain a deeper insight into the regulation of anthocyanin biosynthesis, a comparative metabolite profiling and transcriptome analyses of one red-fruited and two natural white-fruited strawberry varieties in two tissues and three ripening stages have been performed. This study provides new information about polyphenol biosynthesis regulators in strawberry, and reveals genes unknown to affect anthocyanin formation. The full article is available in Scientific Reports.

Härtl et al.: Early metabolic and transcriptional variations in fruit of natural white-fruited Fragaria vesca genotypes. Sci Rep. 2017 Mar 22; 7:45113. doi: 10.1038/srep45113.

Testing for flowering and yield potential of different cultivars



In order to test for flowering and yield potential, plants of six different strawberry cultivars have been raised under controlled conditions. The results have shown that berry yield varied in parallel with flowering in the field and was always higher in plants raised under short day conditions. The traditional cultivars 'Florence' and 'Sonata' out-yielded the more recent cultivars. Some cultivars lost more than two thirds of their initiated flowers during the winter with obvious consequences for their yields. With proper raising management, acceptable yields were obtained after autumn planting even in a cool Nordic climate. The article is available in The Journal of Horticultural Science and Biotechnology.

Sønsteby and Heide: Flowering performance and yield of established and recent strawberry cultivars (Fragaria × ananassa) as affected by raising temperature and photoperiod. The Journal of Horticultural Science and Biotechnology. 2017; 92(4). https://doi.org/10.1080/14620316.2017.1283970

Predicting strawberry flavour

Flavor improvement is currently one of the most important goals for strawberry breeders. At the same time, it is one of the most complex traits to improve. Natural variation in mesifurane and γ-decalactone, two key volatile compounds providing sweet and fresh notes to strawberry fruits, is controlled by the FaOMT and FaFAD1 genes, respectively. In this study, we have optimized a simple PCR test for combined analysis of these genes and determined a prediction accuracy above 91% using a set of 71 diverse strawberry accessions. This high accuracy with the simplicity of the analytical methodology makes this DNA test an efficient tool for its implementation in current strawberry-breeding programs for the selection of new strawberry cultivars with superior flavor. The article is available in Molecular Breeding.

Cruz-Rus et al: Validation of a PCR test to predict the presence of flavor volatiles mesifurane and γ-decalactone in fruits of cultivated strawberry (Fragaria × ananassa). Mol Breed. 2017; 37(10):131. https://doi.org/10.1007/s11032-017-0732-7.

Interviews with Young Researchers

The integration of young researchers is at the heart of the GoodBerry project, thus it is time to highlight their role and share their view on EU collaborative research, hopefully inspiring other young scientists to get involved. Silke Lesemann (Hansabred GmbH & Co. KG), Lidia Jimenez (Universidad de Málaga), Rodmar Rivero (Norwegian Institute of Bioeconomy Research) and Luca Mazzoni (Università Politecnica delle Marche) are Ph.D students and Postdocs working at different GoodBerry partners and bringing different expertise to the project.

Providing an insight into their work and experiences, we sat down with them for a short interview:

How did you get involved in GoodBerry?

Lidia: I started to work in Sonia Osorio's group before the start of GoodBerry. Since I had already worked in strawberry and experience with the techniques used to analyze the samples in GoodBerry, I was given the opportunity to join the international research project at the beginning of my Ph.D.

Silke: After obtaining my Ph.D. in 2011 I joined Hansabred as junior researcher. Hansabred has been involved in the preparation of GoodBerry from the beginning and once funded, I was glad to join this collaborative project.

What are your tasks within the project?

Lidia: Within the University of Málaga´s tasks, I help collecting field samples to quantify primary metabolites in berry extracts by GC/MS. Along with Delphine Pott we quantify volatile compounds of the different GoodBerry samples. At the moment I am extracting RNA to perform an RNAseq analysis.

Luca: My main responsibility in GoodBerry is the analysis of the bulk parameters of the strawberry seedling population at our station. I am in charge of analyzing the folic acid derivatives of all the berry samples cultivated by the various project partners and I am the panel leader for the sensorial analysis at Ancona. Finally, I am involved in the dissemination and scientific publication activities of the project.

Silke: At Hansabred we have conducted the cross for the segregating population which is analyzed in detail in the GoodBerry project. I have been involved in all steps from raising the seedlings, propagation of the plants, planting, scoring the plants on the field, harvest, lab work and sensory analyses.

Rodmar: My main tasks within the project are the phenotyping of plants, including growth measurements, dissection of strawberry plants and sampling for transcriptome analyses. In

Lidia Jimenez
Ph.D. candidate

Universidad de Málaga

Luca Mazzoni
Post-doctoral researcher

Università Politecnica delle Marche

Silke Lesemann
Post-doctoral researcher

Hansabred GmbH & Co. KG

Rodmar Rivero
Ph.D. candidate

Norwegian Institute of Bioeconomy Research

addition, I have been responsible for organizing and digitalizing the data collected.

What is the biggest challenge?

Lidia: The most challenging part is the collaboration between different countries and researchers, as well as the coordination that this requires. Generating a huge amount of data, we need to integrate all the information to achieve a thorough perspective of how the variability of the climate and location affect fruit quality.

Luca: Without any doubt, the most challenging part of the project is to fix standard protocols for all the different partners, in order to perform the analysis in the same way at the different stations. Much effort has been devoted to this purpose and I think that the homogenization level that was reached through the different laboratories is high.

What is the most exciting part of the project?

Silke: The most exciting part for us is to see the same breeding population at different geographical regions. The opportunity of such detailed analyses as carried out in GoodBerry is a major advantage. From simple bulk parameters and sensorial analyses to detailed analyses of vitamins and aroma compounds combined with transcriptome analyses every detail is evaluated.

Rodmar: In my opinion, the most exciting part of the project is to see how the varieties selected react differently to the local climatic conditions where they are kept. In the two years I have been doing the sampling, I have seen how varieties from different geographic locations in Europe react differently to the Nordic climate, compared with the ones cultivated in Norway. In addition, it is also interesting to see how the different parts of the project come together to achieve common goals.

What do you personally gain from participating in GoodBerry also looking at your future career?

Luca: The participation to collaborative projects such as GoodBerry is clearly a great opportunity for young researchers. From my point of view, the main advantage is to have the possibility to join the network of the main berry-experts in Europe and beyond, and to establish collaborations and develop new ideas for future research projects. Furthermore, the great number of analyses planned in GoodBerry requires good organizing skills. My involvement in the project will give me the opportunity to increase this capacity, acquiring experience and a sense of responsibility to reach specific results.

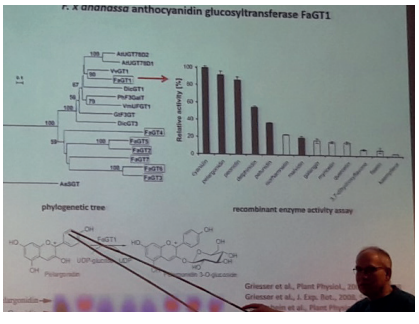
Rodmar: I gain professional experience by expanding my knowledge and acquiring new skills. Because work carried out nowadays is increasingly project based, my participation in GoodBerry gives me an insight into the work within an international research team. In addition, I have the opportunity to expand my academic and professional network across Europe for future cooperation and consulting. More specifically, I have met other young and senior researchers at the two berry schools organized by the project. I have had the opportunity to discuss the challenges I am currently facing within my experiments and received feedback on how to interpret some of the results obtained and how to overcome the challenges.

Gaining new knowledge, expanding my professional network, acquiring new skills and gaining experience with project-based research will definitely be positive for my future career as a researcher in the area of plant science. My participation in GoodBerry may open doors for future cooperation in other multidisciplinary, international projects.

Berry School Impressions

The second berry school took place on 13th-16th of March 2018, as part of the GoodBerry project. It was organized in Bordeaux (France) by INRA and Ciref, bringing together people of all generations and stages of careers. Among the audience were Master and PhD students, but also postdocs and scientific employees of universities, technicians and breeders of different companies from all over the world.

The topic of the berry school was the current research on berries including the latest breeding and growing techniques, but also cutting-edge analytical methods to simplify the breeding process or determine fruit quality.
The talks, given by consortium members of the GoodBerry project and researchers from INRA, Ciref and Invenio provided interesting insights to their current work and led to lively discussions.



A highlight was the field trip to two field stations of Invenio and Ciref in Sainte-Livrade-sur-Lot and Douville. Linking theory and practice, several experiments on strawberry breeding and production in soil and soilless conditions as well as a virtual tour through the new micropropagation laboratory were presented.

The great impression of French strawberries was completed by tasting the soft and fruity 'Gariguette'.

Special thanks to Aurélie, Béatrice, Eva, Phillippe, and Sonia for organising and hosting this workshop!

#BerrySchool #GoodBerry #H2020

Overview Past & Upcoming Berry Events

2017

JANUARY

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MARCH

1st GoodBerry Progress Meeting & Berry School in Málaga

60th anniversary of the signing of the Treaty of Rome

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MAY

Macfrut 2017 in Rimini

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JUNE

VIII ISHS Symposium on Mineral Nutrition of Fruit Crops in Bolzano

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AUGUST

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SEPTEMBER

Open Campus in Geisenheim

3rd International Strawberry Congress in Antwerp

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NOVEMBER

GoodBerry partners meet in Chile

GoodBerry Review Meeting in Brussels

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2018

JANUARY

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Sixteenth Plant and Animal Genome Conference (PAG) in San Diego

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2nd GoodBerry Progress Meeting & Berry School in Bordeaux

MARCH

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AgriResearch Conference in Brussels

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GoodBerry workshop in Geisenheim

JUNE

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International Blackcurrant Conference in Angers

JULY

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XXX International Horticultural Congress (IHC2018) in Istanbul

AUGUST

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2nd GoodBerry virtual meeting

OCTOBER

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Please find more details about the events under goodberry-eu.eu.

Upcoming Berry Events in 2019/2020

Save the date!

XXVII International Plant and Animal Genome Conference
January 12 – 16 2019, San Diego, USA
http://www.intlpag.org/

Sival 2019
January 15-17 2019, Angers, France
https://www.sival-angers.com/en/

Fruit Logistica
February 6-8 2019, Berlin, Germany
https://www.fruitlogistica.de/en/

3rd GoodBerry Progress Meeting
March 2019, Aachen, Germany

Macfrut 2019
May 8-10, 2019, Rimini, Italy
https://www.macfrut.com/news/2207/macfrut_2019_presentato_alla_farnesina

5th International Conference on Plant Genomics
June 13-14 2019, Berlin, Germany
https://plantgenomics.euroscicon.com

XII. Rubus and Ribes Symposium
June 25-28, 2019, Zurich, Switzerland
www.ishs.org/symposium/614

9th International Strawberry Symposium
May 03-06, 2020, Rimini, Italy
en.riminipalacongressi.it/strawberry_symposium

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