

Scanning report (EIP format for practice abstracts)

- *Project title (native language):** EUFRUIT: European Fruit Network, WP4 Potential von neuen Frucht-Sorten
- *Project title (English):** EUFRUIT: European Fruit Network, WP4 Fruit quality, improvement of fruit handling/storage
- *Author/native language editor:** [Dr. Bühlmann Andreas, Agroscope, Plants and Plant Products, andreas.buehlmann@agroscope.admin.ch, +41 58 460 64 24]

Section A. Summary for EIP dissemination

***Keywords:** [fruit quality, post-harvest, microbiology]

***Main geographical location:** Switzerland

Other geographical locations:

***Summary (native language):**

Mikrobielle Lagerschäden können mit bestehenden Methoden (Fungizide, CA-Lagerung, 1-MCP) relativ gut kontrolliert werden. In Hinblick auf die zukünftige Reduktion synthetischer Fungizide (Schweizer NAP Pflanzenschutzmittel, EU-Umfeld) ist mit einer Zunahme von mikrobiellen Lagerschäden und somit vermehrt mit Food Waste zu rechnen. Mit Hilfe neuer Methoden (Metagenomik, molekulare Diagnostik, Sporensampling) soll das Auftreten mikrobieller Lagerschäden besser charakterisiert werden und gezielt Methoden entwickelt werden, um mit reduziertem Einsatz von Pflanzenschutzmitteln eine gleichbleibende Qualität an Lagerobst zu ermöglichen. Zusätzlich sollen bereits bekannte Antagonisten von mikrobiellen Lagerkrankheiten evaluiert (*Aureobasidium*, *Metschnikowia*) und neue potentielle Antagonisten identifiziert werden. Um diese Pathogene, Antagonisten und Mikrobiome zuverlässig zu identifizieren, zu charakterisieren und zu quantifizieren, werden neueste Technologien im Bereich Molekulare Diagnostik (PCR, LAMP) und Sequenzier-technologie (Sequencing-by-Synthesis, Nanopore) evaluiert und an die Bedürfnisse der Schweizer Landwirtschaft angepasst. Um die Qualitätsbeurteilung der Früchte zu gewährleisten, sollen weiterhin physikalische und chemische Analytik durchgeführt und die entsprechenden Methoden weiterentwickelt werden.

Summary (english):

Microbial post-harvest diseases can be controlled using existing methods (synthetic fungicides, CA-Storage, 1-MCP). With the pressure of reducing synthetic fungicides (Swiss action plan in plant protection, EU-regulation), an increase of microbial post-harvest disease and thus an increase in food loss is to be expected. Using state of the art molecular methods (spore sampling, molecular diagnostic assays, metagenomics) microbial diseases can be characterized to a previously unknown resolution and the resulting information can be applied to obtain a high fruit quality with decreased input of synthetic plant protection products. Additionally, existing biocontrol methods (*Aureobasidium*, *Metschnikowia*) are evaluated and novel antagonists are identified. In order to characterize these pathogens, antagonists and complete microbiomes, state of the art technologies in molecular diagnostics (PCR, LAMP) and sequencing (Sequencing-by-synthesis, Nanopore) are evaluated and applied within the Swiss agricultural system. In order to assess the quality of fruits, methods in physical and chemical analytics are applied continuously and novel methods are evaluated.

Section B. Project information

- *Project coordinator:** Michelle H. Williams; Aarhus University, Department of Food, Kirstinebjergvej 10, 5792 Aarslev, Denmark; mw@food.au.dk; +45 25170049
- *Project period:** 2016 - 2019
- *Project status:** Ongoing
- *Funded by:** Horizon 2020
- *Total budget:** €1.8m

***Geographical regions:** DK011 Copenhagen, DK012 Copenhagen and its environs, DK013 North Zealand, DK014 Bornholm, DK021 East Zealand, DK022 West- and South Zealand, DK031 Funen, DK032 South Jutland, DK041 West Jutland, DK042 East Jutland, DK050 North Jutland, BE211 (Arrondissement. Antwerpen), BE212 (Mechelen), BE213 (Turnhout), BE221 (Hasselt), BE222 (Arr. Maaseik), BE223 (Tongeren), BE231 (Aalst), BE232 (Dendermonde), BE233 (Eeklo), BE234 (Gent), BE235 (Oudenaarde), BE236 (Sint-Niklaas), BE241 (Halle-Vilvoorde), BE242 (Leuven), BE251 (Brugge), BE253 (Ieper), BE254 (Kortrijk), BE255 (Arr. Oostende), BE256 (Arr. Roeselare), BE257 (Tielt), BE258 (Veurne), BE310 (Nivelles-Nijvel), BE331 (Huy-Hoei), BE332 (Liège- Luik), BE334 (Wareme-Borgworm), BE335 (Verviers), FR8 Méditerranée; FR81 Languedoc-Roussillon, FR6 SUD-OUEST, FR512 Maine et Loire, FR611 Dordogne, FR812 Gard, DE6 (Hamburg), DE8 (Mecklenburg-Vorpommern), DE9 (Niedersachsen), DEF0 (Schleswig-Holstein), DEE0 (Sachsen-Anhalt), DEA (Nordrhein-Westfalen), DE111, DE112, DE113, DE114, DE115, DE116, DE117, DE118, DE119, E11A, DE11B, DE11C, DE11D, DE121, DE122, DE123, DE124, DE125, DE126, DE127, DE 128, DE129, DE12A, DE12B, DE12C, DE131, DE132, DE133, DE134, DE135, DE136, DE137, DE138, DE139, DE13A, DE141, DE142, DE143, DE144, DE145, DE146, DE147, DE148, DE149, DE600 Hamburg, DE932 Cuxhaven, DE933 Harburg, DE939 Stade, DEF09 Pinneberg, NL1-NL4 + NLZ Holland; NL 224 zuidwest Gelderland, NL 226 Arnhem/Nijmegen, NL230 Flevoland, NL310 Utrecht, NL321 Kop van Noord-Holland, NI322 Alkmaar en omgeving, NL338 oost Zuid-Holland, NL33A zuidoost Zuid-Holland, NL341 Zeeuws-Vlaanderen, NL342 overig Zeeland, NI411 west Noord-Brabant, NL413 noordoost Noord-Brabant, NL414 zuidoost Noord-Brabant, NL421 noord Limburg, NL422 Midden-Limburg, NL423 zuid Limburg, ES620 Murcia, UKG11 Herefordshire, UKG12, Worcestershire, UKH12 Cambridgeshire, UKH16 North and West Norfolk, UKH17 Breckland and South Norfolk, UKJ22 East Sussex, UKJ35 South Hampshire, UKJ36 Central Hampshire, UKJ37 North Hampshire, UKJ41 Medway, UKJ42 Kent, UKJ43 Kent Thames Gateway, UKJ44 East Kent, UKJ45 Mid Kent, UKJ46 West Kent, ES618 Sevilla, ES511 Barcelona, ES512 Gerona, ES513 Lérida, ES514 Tarragona, CH0 Schweiz/Suisse/Svizzera, ITH51-59 Emilia Romagna region, ITH10 Bolzano-Bozen, HU101 Budapest, HU102 Pest, RO111, RO112, RO113, RO114, RO115, RO121, RO122, RO123, RO124, RO125, RO126, RO211, RO212, RO213, RO214, RO215, RO216, RO221, RO222, RO223, RO224, RO225, RO226, RO311, RO312, RO313, RO314, RO315, RO316, RO317, RO321, RO322 RO411, RO412, RO413, RO414, RO415, RO421, RO422, RO423, RO424. HU101, HU102, LT001 Alytaus apskritis, LT002 Kauno apskritis, LT003 Klaipėdos apskritis, LT004 Marijampolės apskritis, LT005 Panevėžio apskritis, LT006 Šiaulių apskritis, LT007 Tauragės apskritis, LT008 Telšių apskritis, LT009 Utenos apskritis, LT00A Vilniaus apskritis.

Project web page: <http://www.eufrin.org/index.php?id=55>

***Project Objectives (native language):**

1. Gründung eines europäischen Netzwerks im Bereich des Fruchtsektors.
2. Entwicklung und Implementierung eines systematischen Ansatzes um bestehendes wissenschaftliches und praktisches Wissen abzufragen und zusammenzufassen.
3. Aufbau eines fortlaufenden Dialogs mit relevanten EU, nationalen und regionalen Interessensvertretern
4. Identifizierung und Unterstützung neuer Prioritätsbereiche durch kontinuierliches Monitoring und Analysieren bestehender und künftiger Forschungs- und Innovationsaktivitäten.

Project Objectives (English):

1. Establish a European network focused on the fruit sector.
2. Develop and implement a systematic approach for scanning and synthesizing existing scientific and practical knowledge.
3. Establish an ongoing dialogue with relevant EU, national and regional policy bodies.
4. Identify and support new priority areas of research by continually monitoring and analysing existing and upcoming research and innovation activities.

***Project partners:**

1. Aarhus University, Department of Food Science (Denmark) • AU
2. Research Station for Fruit npo (Belgium) • Pcfruit
3. Centre Technique Interprofessionnel des Fruits et Légumes (France) • CTIFL
4. Obstbauversuchsanstalt Jork (Germany) • OVA
5. Stichting Wageningen Research (Netherlands) • WR
6. ~~East Malling Research (United Kingdom) • EMR (terminated 08-02-2016)~~
7. Institut de Recerca i Tecnologia Agroalimentàries (Spain) • IRTA

8. Federal Department of Economic Affairs, Education and Research (EAER), acting through Agroscope Institute of Plant Sciences (Switzerland) • Agroscope
9. Laimburg Research Centre for Agriculture and Forestry (Italy) • Laimburg
10. University of Agronomic Sciences and Veterinary Medicine of Bucharest (Romania) • USAMV
11. National Agricultural Research and Innovation Centre Fruitculture Research Institute (Hungary) • NARIC
12. Lithuanian Research Centre for Agriculture and Forestry (Lithuania) • LRCAF
13. Assemblée des Régions Européennes Fruitières, Légumières et Horticoles (France) • AREFHL
14. Variety Innovation Consortium South Tyrol (Italy) • SKST
15. Freshfel Europe (Belgium) • FRESHFEL
16. Elbe-Obst Erzeugerorganisation r.V. (Germany) • EO
17. Fruitconsult BV (Netherlands) • FC
18. University of Greenwich (United Kingdom) • UoG
19. University of Hohenheim (Germany) • UHOH
20. Università di Bologna (Italy) • UNIBO
21. Institut National de la Recherche Agronomique (France) • INRA
22. NIAB EMR (new 09-02-2016)

Section C. Annex: Scanning report¹

Scanning report [Andreas Bühlmann]

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Country: Switzerland

NUTS 3 region(s)²: CH0 Schweiz/Suisse/Svizzera

WP no. and title: 4 – Fruit quality – improvement of fruit handling/ storage

Date: 16052017

Source materials and methodology

Experimental orchards: orchards for pome and stone fruit cultivation, and for vegetable growing. Close collaboration with the Fruit extension group that manages the experimental orchards.

Storage facility Agroscope: 16 independent small CA-containers, which allow serial trials. Two CA-rooms with 3 and 5 tons capacity respectively, more than 12 regular atmosphere storage rooms. Ideal storage conditions are developed for new varieties from the Agroscope breeding program, the variety-testing program and for different Low Input orchard management practices.

Storage methods: Storage of pome fruits, stone fruits and vegetables. Storage under regular atmosphere, CA-storage, ULO-storage and DCA-storage. Storage under modified atmosphere for stone fruit and berries.

Assessment of fruit quality: Measurement of fruit firmness, total soluble solids and titratable acidity with the automatic laboratory Pimprenelle. Analytical lab with LC-MS, GC-MS, FTIR and other analytical instruments. Due to limited personal resources, method development is restricted to NIR methods at the moment.

Microbiology and molecular biology lab: Establishing the apple fruit microbiome for different cultivars and orchard management conditions using classical microbiology methods and amplicon metagenomic sequencing. This is at a research stage, but we are actively updating producers on our results and estimate that the results may be used for disease prediction models, informing growers on how to time plant protection sprays and developing novel biocontrol strategies.

Best practice findings

Recommendations for best practice in CA-storage of pome fruit including optimal, cultivar-specific harvest windows and storage conditions. Published in technical bulletins and orally communicated to growers and agronomy students.

Individual expertise for storage facilities concerning best practice and problem solving in storage, including pre-harvest factors. Upon demand by individual practitioners.

Development of the DCA-storage method in collaboration with international partners, based on the measurement of chlorophyll-fluorescence. Presented at scientific conferences and published in scientific journals.

Energy saving in storage (technical optimization, management of storage rooms, use of alternative methods such as 1- MCP-treatment or DCA in combination with elevated storage temperatures in order to save energy. Published in technical bulletins and communicated to growers.

¹ Equivalent to 'final report' in EIP-AGRI format.

² Please see ec.europa.eu/eurostat/ramon/nomenclatures/ for details on NUTS regions, level 3

Storage of apples and pears, which have been grown under low-input IP or organic conditions (low pesticide residues vs. spoilage of fruit during storage). Published in technical journals and scientific journals.

Evaluation of post-harvest performance of biocontrol sprays using BoniProtect and a novel biocontrol organism developed at Agroscope. Not yet published or presented.

Characterization of the microbiome for different cultivars and orchard management practices. Presented at scientific conferences, communicated to growers, to be published in scientific journals.