Scanning report (EIP format for practice abstracts)

***Project title (native language):** **EU FRUIT europæisk netværk**

***Project title (English):** **EUFRUIT: European Fruit Network**

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Section A. Summary for EIP dissemination

***Keywords:** Physical barriers, scab, unsprayed production, light under barriers, triggering ascospore release, irrigation against scab infections

***Main geographical location:** [[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]

Other geographical locations: No

***Summary (native language):**

Alternativer til sprøjtning i økologisk produktion af æbler og pærer

Økologisk produktion er for mange forbrugere synonym med usprøjtet produktion. Det er imidlertid ikke tilfældet for økologisk produktion af høj-værdig afgrøder som fx æble og pære. Begge er mangeårige, og det giver skadevoldere gode vilkår for opformering, samtidig er vækstsæsonen lang, og kravene til frugternes kosmetiske udseende høj. Alt dette nødvendiggør sprøjtning imod både svampesygdomme og insekter. For at bringe den økologiske produktion mere i overensstemmelse med forbrugernes forventninger, arbejdes der på at udvikle alternativer, som kan reducere eller helt overflødiggøre sprøjtning. Overdækning med et plastik regntag er en sådan foranstaltning. Ved Institut for Fødevarer, AU har vi tidligere vist at et regntag er effektivt til at forhindre angreb af skurv, der er den alvorligste sygdom på æble, og den der hyppigst sprøjtes imod. I nye forsøg har samme reducerende effekt på skurv i pærer kunne dokumenteres og det åbner mulighed for en økologisk pærer produktion. Trods skyggeeffekt af regntaget, har der ikke kunne påvises negative konsekvenser for hverken udbytte, frugtstørrelse eller frugtkvalitet.

Ved AU-BIOS er det undersøgt om myrer kan bruges til bekæmpelse af frostmålere og andre larver i æbler. Tilstedeværelsen af myre førte til forøget forekomst af bladlus. Det blev observeret at myrerne brugte svampe som fødekilde og det kan have potentiel interesse, hvis myrenes beskyttelse af bladlus kan bringes under kontrol ved at tilbyde supplerende sukker.

Ved KU har man i et 4 årigt projekt arbejdet med at fremprovokere sporeudslyngning af skurvsvampens sporer i tørre perioder, hvor en infektion ikke kan finde sted. På trods af at op imod 70% af sporerne kan bringes til udslyngning har der ikke kunne konstateres reduceret skurvangreb, og metoden er også så vand krævende at den ikke skønnes brugbar i praksis.

Summary (english):

Organic production is for many consumers equal to unsprayed production. When it comes to high-value crops like fruit in particular pome fruits, this is not the case. Pome fruit are a stationary, long-lived culture with high demands for blemish-free fruit which necessitates spraying. In order to reduce spraying and bring organic production more in line with consumer expectancies alternative strategies are investigated. Covered production using a plastic rain roof is one such strategy. At AU-FOOD we have previously documented that rain roofs are highly efficient in reducing scab and rots in apple. A recent three-year study document the same effect in scab susceptible pears. Despite reduced light levels under the roof, no detrimental effects on neither yield, fruit size, fruit colour nor internal quality of fruit could be documented.

At AU-BIOS ants have been tested as biological control agent of winter moths, but despite feeding the ants with sugar, increased aphid damage was seen. The ants, however, used fungus an alternate food source, which could hold potential for further investigation.

Experiments Copenhagen University aimed at triggering ascospore release of the scab fungus during dry spells where infection cannot take place proved unsuccessful. Up to 70% of spores were released, but high water volumes were necessary and the effect was too small to warrant the costs.

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 (Waremme-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, Nl322 Alkmaar en omgeving, NL338 oost Zuid-Holland, NL33A zuidoost Zuid-Holland, NL341 Zeeuws-Vlaanderen, NL342 overig Zeeland, Nl411 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 Hamphshire, 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. Etablere et europæisk netværk med fokus på frugtsektoren
2. Udvikle og implementere en systematisk fremgangsmetode til at scanne og syntetisere eksisterende videnskabelig og praktisk viden til gavn for frugtsektoren i Europa
3. Løbende dialog med faglige politiske miljøer i EU-kommissionen, nationalt og regionalt
4. Identificere og støtte op om nye forskningsområder ved vedvarende afdækning og analysering af eksisterende og kommende forsknings- og innovationsaktiviteter.

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 report[1]

Scanning report
Marianne Bertelsen, AU

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Country: Denmark

NUTS 3 region(s)[2]: [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]

WP no. and title: WP3 – Reduction in pesticides residues

Date: 10-5-2017

[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

Source materials and methodology

Consultations with colleagues at Aarhus University, Dept. Food Science to identify staff involved in research on relevant topics. The collection of publications and disseminations from the last approximately one year to provide a start for the state of art. The personal database over publications/disseminations (PURE database) for each scientist was used as basis.

Best practice findings

Alternatives to chemicals

Physical barriers update

The apple production in Denmark constitutes about 1400 ha, of which app. 20% is grown with organically. However, due to low yields in the organic production less than 10% of the apples sold are of organic origin. The main obstacles for the organic production are losses due to fungal disease, particular apple scab and fruit rots, but also insects are detrimental to production. The small acreage combined with restrictive environmental regulations limits the number of compounds available for pest management in the Danish organic apple production. Hence research has focused on alternative strategies. Also from a political point of view the organic movement is encouraging research into alternative solutions in order to bring the organic production in line with what the consumers perceives as organic, namely 'unsprayed'.

Since 2012, experiments have been conducted with protected production of apples and since 2015 with pears. At the end of 2017 the results of the three-year study of pears trees covered by a narrow rain roof (1.6 m) can be evaluated. Pear scab in the experiments was initially slow to develop, but in the third experimental year 75% of unsprayed pears of the scab-susceptible cultivar 'Clara Frijs' had to be discarded due to scab, whereas only 1% of the likewise unsprayed, but covered pears were discarded. The pear varieties 'Alexander Lucas' and 'Concorde' were also tested under cover, but due to their higher tolerance against scab the results were not as striking. In apples, the cover had a profound effect on reducing fruit rots, but in pear no significant effect was found due to a general low rot incidence in all three experimental years. Internal fruit quality was little affected by the cover, but in years of large crop load fruit size was marginally smaller under cover. Light measurements documented that although light was reduced by up to 30% on days with high light intensity, the effect of photosynthesis was not as detrimental as expected. Trees received more diffuse light, and responded by producing more efficient shade leaves. Trees were less stressed during under the hot mid-day sun causing the mid-day depression of the photosynthesis to be less under the covered trees. Microclimate was not significantly affected by the cover due to the construction of the cover, which include flaps that can open during wind, and less than half of the orchard area being covered.

Bio-control using ants

At AU-BIOS a pilot study has been conducted to explore the potential of using ants as an IPM-tool to reduce pest insects and plant diseases in Danish fruit production. Apples was used as model crop and the primary target were winter moths and other caterpillars. Ants were offered a sugar solution to divert them from milking and protecting aphids. The results showed some predation on larvae but also a significant increase in aphid population. An interesting side effect was ant predation on scab, and monilia may also be used as a food source by the ants. This could be of potential interest if the sugar solution offered can be can optimized to deter the ants from cultivating aphids.

Triggering ascospore release

At Copenhagen University a four year study of the possibility of triggering ascospore release from scab infections in overwintering leaves have been studied. Several methods involving sprinkler spraying, sound as well as broad scale watering (using a water wagon) was applied to trigger the ascospore release during dry periods in the primary scab season where a subsequent infection could not take place. The study showed that big droplets and 1.6 mm 'rain' were needed for a sufficient spore release. It was possible in all years to identify 2-4 periods during spring with sufficient stable weather to run the risk of triggering spore release without getting an infection. Spore traps documented a spore release of up to 70% of the mature spores in response to broad scale watering, but it was not possible to document a significant reduction in scab occurrence in 7 out of 8 experiments. It was concluded that the method was not practical applicable due to the large amounts of water needed and the insignificant effect.

The study used the RIMPRO scab warning program to estimate the risk of scab infections, and a good correlation between actual and predicted spore release dates were found. The predicted amount of spores released, however, did not show a good correlation with actual spore release.