

Scanning report (EIP format for practice abstracts)

***Project title (native language):** Insektennetz im Apfelanbau

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

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Section A. Summary for EIP dissemination

***Keywords:** side net, microclimate, physiology, apple, pest insects, diseases, insecticides, fungicides, pesticides, fruit quality, photosynthesis, temperature, humidity, wind

***Main geographical location:** CH0

Other geographical locations:

***Summary (native language):**

Zur Produktion von hochwertigem Qualitätsobst soll der Einsatz chemisch-synthetischer Pflanzenschutzmittel künftig weiter reduziert und durch alternative Pflanzenschutzmassnahmen ersetzt werden. Eine mögliche Massnahme zur Reduktion des Insektizideinsatzes stellen Netzabdeckungen zum Schutz vor Schädlingen dar. Ob durch solche Investitionen im Kernobst auch Insektizid- oder Akarizidanwendungen eingespart werden können und wie sich diese technische Aufrüstung auf das Mikroklima auswirkt, wird im Rahmen einer Langzeiterhebung von Agroscope untersucht. Dazu wurde 2012 eine Versuchsparzelle in der Nähe von Wädenswil mit den Sorten Opal und Milwa-Diwa erstellt, welche 16 Spindelbaum-Reihen umfasst. Die Hälfte dieser Reihen ist nur mit einem Hagelnetz überdeckt, während die anderen acht Reihen zusätzlich durch ein seitliches Insektenschutznetz von Blühbeginn bis zur Ernte umschlossen sind. Seit 2016 werden das Auftreten von Schädlingen und Nützlingen, das Fruchtwachstum, die Photosynthese, die Erntemenge, die Fruchtqualität und das Mikroklima in diesen beiden Netzvarianten gemessen.

Erste Ergebnisse deuten auf ein hohes Schutzpotenzial gegen wichtige Schädlinge hin, ohne die Temperatur oder die Erntequalität zu beeinflussen. Gleichzeitig können unerwünschte Nebeneffekte als Folge einer höheren Luftfeuchtigkeit und reduzierten Windstärke auftreten. Eine längere Blattnassdauer innerhalb der Einnetzung könnte Pilzkrankheiten begünstigen und zusätzliche Pflanzenschutzanwendungen erfordern. Neben den bisher durchgeführten Erhebungen wurde daher 2017 auch das Auftreten von Pilzkrankheiten gezielt untersucht.

2018 wurde eine neue Modellanlage mit den Sorten Gala und Bonita gepflanzt. In diesem Versuch wird zusätzlich zum Insektennetz auch eine Regenabdeckung installiert werden, um das Infektionspotential von Pilzkrankheiten zu reduzieren. Mit dieser kombinierten Massnahme sollten nicht nur Insektizide, sondern auch der Einsatz von Fungiziden reduziert werden können.

Summary (english):

Chemical synthetic pesticides are needed to produce high quality fruits. However, the use of pesticides is put more and more into question in Switzerland. Therefore, there is a need for alternative measures to protect orchards from pest insects and fungal diseases. One possible solution to reduce the amount of applied insecticides are side nets to exclude pest insects. To investigate the influence of these nets on pest insects and the microclimate, Agroscope started in 2012 a long-term research project with the varieties Opal and Milwa-Diwa. Out of 16, eight tree rows are only covered with a hail net, whereas the other half is additionally enclosed with a fine-meshed side net from full bloom until harvest. Since 2016, the effects of the side net on pest and beneficial insects, fruit growth, the photosynthetic activity, the amount of fruits harvested, the fruit quality and the microclimate are measured.

First results indicate that side nets successfully protect apple orchards from pest insects without influencing temperature or fruit quality at harvest. However, undesirable side effects may occur as a consequence of increased humidity and reduced wind speed in plots with side nets. If leaves and fruits remain wet for a longer time, fungal infections may increase. This would require additional applications of fungicides compared to plots without side nets. In 2017, therefore, we will also measure if fungal infections are increased in plots with side nets than in those without.

In 2018, a new model orchard with the varieties Gala and Bonita was planted. In addition to side nets to exclude pest insects, we will also install a rain cover to reduce fungal infections and thereafter hopefully apply not only fewer insecticides but also fewer fungicides.

Section B. Project information

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***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) • Pcfuit
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 (Sustainable apple production)

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Country: Switzerland

NUTS 3 region(s)²: CH0

WP no. and title: WP5 secure sustainable fruit production

Date: Y2 report 21/05/2018

Source materials and methodology

It is known from earlier studies that hail nets combined with side nets may exclude insects in orchards, both beneficial and pest organisms. However, the effects of local conditions as well as the long term impact of this passive protection on pest insects still need to be evaluated. Furthermore, not much is known about effects of these fine-meshed side nets on tree physiology, as it is likely that also the microclimate within an orchard is influenced (wind, temperature, humidity, radiation).

To answer these questions, a field trial with the varieties Opal and Milwa-Diwa was established in 2012 close to Wädenswil, using plots with and without fine-meshed side nets. In both treatments, the trees are covered with a hail net. Beneficial and pest insects are continuously monitored in these two treatments. Whereas until 2016 spraying of insecticides was identical in both treatments, we intended, depending on the amount of pest insects, to reduce insecticides in the plot with fine-meshed side nets starting from 2017. In addition to entomological inquiries, we did physiological (fruit size development, photosynthesis, fruit quality at harvest) and meteorological measurements to evaluate the impact of side nets on tree physiology. Starting in 2017, these recordings were completed with observations of fungal infections.

Best practice findings

Bigger insects such as the codling moth and the appleseed moth were successfully excluded from the part enclosed with side nets, whereas the infestation with plant louses was higher in this part of the orchard in 2017. The wooly apple aphid tended to be more frequent in 2015 and 2016 when trees were protected with side nets compared to the part without nets. In summer 2017, parasitisation of the wooly apple aphid increased in the orchard with side nets and reached the same level as in the part without any side nets. This indicates that infestation by parasites could be significantly delayed by side nets. Concerning other beneficial insects, it seems that they appear also to be more frequent in the part without side nets than in that one with side nets. The number of applied insecticides was the same in both treatments in 2017. On the one hand, there was no treatment necessary against the sawfly in the parts enclosed with side nets. On the other hand, there was an additional treatment needed against the plant louse in this part of the orchard.

As expected, wind speed was reduced by the side nets compared to the part without side nets. However, humidity and leaf wetness duration was very similar in these two treatments - apart from 2016 when humidity was slightly increased by the side nets. There was no influence of the side nets on the air temperature since recordings started in 2015. Consequently, the side nets did not influence the infestation with fungal diseases. Moreover, no effects of the side nets were measured on the photosynthetic activity, fruit growth, number of fruits harvested and fruit quality in 2016 and 2017.

Summarising, side nets seems to be a good measure to reduce big pest insects in apple orchards without increasing infections with fungal diseases or affecting fruit quality and crop load, at least in the short term. Concerning smaller pest insects such as the plant louse or the wooly apple aphid, more research is needed. Therefore, more entomological data will be collected in the following growing seasons.

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