



Fifth Annual Report

July 2015 - June 2016

PlantLink is a competence resource in the area of plant science in Southern Sweden. PlantLink was formed in 2011 as an alliance between Lund University (LU) and the Swedish University of Agricultural Sciences in Alnarp (SLU Alnarp) with support from the Skåne Regional Council (Region Skåne). Our ambition is to stimulate and coordinate plant research and higher education in the region.

PlantLink bridges the gap between basic and applied plant research with the objective to improve crops and food products, and to enable production of materials, medication and energy from plants in a sustainable way. Associated to PlantLink are several within their field world-leading research groups.

PlantLink strives to increase the interest and competence in plant science through education and information. Our goal is to create an environment that promotes research and innovation and leads to dynamic interactions between the universities, companies and the general public.

Research

PlantLink Focus Areas

- Plant Breeding research, modeling and engineering
- 'Post-harvest' – product quality and new products
- Abiotic stress
- Plant–microbe interactions
- Plant–plant and plant–insect interactions

Major research projects associated with researchers in PlantLink

- Future oil crops (SSF)
- Production of a blood substitute (SSF)
- ICE3 — Insect Chemical Ecology, Ethology and Evolution (Linnaeus project)
- TC4F Theme 4
- STEPS (Mistra)
- Mistra Biotech

Focus on bioinformatics and new Biotron

The PlantLink bioinformatician has been in place since June 2012 with the aim to strengthen the bioinformatics competence in plant research in Southern Sweden. The bioinformatician is part of NBIS (former BILS) national network of bioinformaticians, which partly supports the position. The bioinformatician is placed both in Alnarp and Lund to be close to the researchers in need of bioinformatics support. In Lund the bioinformatician is currently relocating to an environment consisting of both senior and junior bioinformaticians at the faculty of natural sciences.

Except for providing support the bioinformatician has established the PlantLink server, which is mainly used for the analysis of sequence data, and provided training in workshops and courses. In 2015, the back-up system of the PlantLink server was extended. Over 20 larger bioinformatics projects have been supported, leading to more than 15 publication.

In August 2015 Jakob Willforss started as the PlantLink bioinformatician and has since then given support to projects concerning apple, potato, sugarbeet, barley, pine tree among others. He has also participated in bioinformatics cafés giving researchers the opportunity to drop in with their questions.

In 2014 SLU took the decision to build a new Biotron facility in Alnarp. The construction is now almost completed and the facility will be taken into use during the fall 2016. It will be inaugurated November 7, followed by a scientific seminar day on November 8 arranged by PlantLink. The Biotron has been identified by PlantLink as one of seven important regional platforms for plant research.

New Leadership for PlantLink



New Director, Erik Alexandersson



New Assistant Director, Tina D'Hertefeldt

From the 1st of July 2016 there will be new leadership structure of PlantLink where the coordinator roles will be replaced by a Director and Assistant Director. Previous coordinator, Erik Alexandersson (SLU), takes over from Leif Bülow as the new Director. Leif has lead the work at PlantLink since the start in 2011 and will continue as steering committee representative for Lund University. Tina D'Hertefeldt based at Lund University will start as the new Assistant Director. Mariette Andersson (SLU) is the new Deputy Director.

Tina D'Hertefeldt is a plant ecologist at the unit of Biodiversity at the Department of Biology. She has a broad interest in plant traits and currently works with plant/soil interactions under increased rainfall variability,

and with ecological impacts of biomass production for bio-energy.

The new steering committee will have the following representatives: Erik Andreasson, Mariette Andersson and Jens Sundström (SLU), Allan Rasmusson, Rajni Hatti-Kaul and Leif Bülow (LU), Annette Olsen (Lantmännen Lantbruk) and Marianne Sommarin as external representative and chair. The regional council, Region Skåne, and students from both LU and SLU will be represented as well. New for this three-year term is that Svend Christensen from PLEN and Copenhagen Plant Science Center at University of Copenhagen and Paul Jensén (SLU) will have permanent observatory places in the steering committee.

PlantLink seed money projects

During its four first years, PlantLink announced four rounds of 'seed money' projects for smaller, one year-long projects establishing new collaborations between the two universities. In all, 18 projects have been supported with ca 7.5 million SEK.

The following three projects were supported in 2015:

Aboveground-effects of volatiles produced by *Streptomyces* soil bacteria on plants and insects

Paul Becher (SLU), Klas Flärdh (LU), Allan Rasmusson (LU)

Genetic variation and gene expression analysis of tolerance to infection by *Phytophthora infestans* in a wild *Solanum* species

Lars Råberg (LU), Åsa Lankinen (SLU)

Evaluating a multi-scale structural-mechanistic modeling approach of plant protein based materials with interesting properties: tuning structure with functionality

Henrik Jönsson (LU), Ramune Kuktaite (SLU)

Four rounds of seed money projects

Through four rounds of targeted research calls for shorter one-year projects the interactions between LU and SLU Alnarp have strengthened significantly. These annual so called PlantLink seed money projects ran over four years starting in 2011. Approximately 50% of PlantLinks funding has been allocated to these, which corresponds to almost 8 million SEK. Cooperation between research groups at the universities were previously sporadic and the seed money has helped to create new networks, also including regional business partners.

Many of these new interactions are still in their early stages, but nonetheless the quality of the joint publications that are now starting to come out is of high to very high impact. For example one of the first publications appeared in Nature Communications (Ding, B-J et al. „A plant factory for moth pheromone production.“ Nat commun 5 2014). Another very important outcome is that two SSF projects call for the biological production system and a Formas grants based on three of the PlantLink's seed money projects received funding equivalent to approximately 75 million SEK. Read more about the projects and their outcome on our homepage www.plantlink.se

PlantLink's first five years at a glance



Highlights

- 18 supported seed money projects leading to 3 major grants (ca 75 Million SEK) and more than 10 publications
- Bioinformatics support to over 20 projects with more than 15 publications
- Platform for networking with 26 meetings and workshops, social media, homepage
- Interaction with Swedish and international plant organisations
- PhD Education: Supported PCLS and 10 plant-specific PhD course and the start of an Industrial mentorship programme for PhDs/Post Docs
- Master Education Euroleague of Life Science (ELLS) with over 90 students
- Formation of the Swedish Oat Centre

Last year's publications

- Andreadis et al. (2015). **Survey of arthropod assemblages responding to live yeasts in an organic apple orchard.** *Front Ecol Ev*, 3, 121.
- Burra et al. (2015). **Salicylic and jasmonic acid pathways are necessary for defence against *Dickeya solani* as revealed by a novel method for Blackleg disease screening of in vitro grown potato.** *Plant Biology*, 17(5), 1030-1038.
- Ding et al. (2016). **The yeast ATF1 acetyltransferase efficiently acetylates insect pheromone alcohols; implications for the biological production of moth pheromones.** *Lipids*, 51(4), 469-475.
- Frades et al. (2015). **A novel workflow correlating RNA-seq data to *Phytophthora infestans* resistance levels in wild *Solanum* species and potato clones.** *Frontiers in plant science*, 6.
- Hofvander et al. (2016). **Potato tuber expression of *Arabidopsis* WRINKLED1 increase triacylglycerol and membrane lipids while affecting central carbohydrate metabolism.** *Plant Biotech J*
- Kuktaite et al. (2016). **Monitoring Nanostructure Dynamics and Polymeriz-**

- ation in Glycerol Plasticized Wheat Gliadin and Glutenin Films: Relation to Mechanical Properties.** *ACS Sustainable Chem & Engineering*, 4(6), 2998-3007.
- Kushwaha et al. (2015). **NBSPred: a support vector machine-based high-throughput pipeline for plant resistance protein NBSLRR prediction.** *Bioinformatics*, btv714.
- Manoharan et al. (2015). **Captured metagenomics: large-scale targeting of genes based on 'sequence capture' reveals functional diversity in soils.** *DNA Research*, dsv026.
- Lankinen et al. (2016). **Nongenetic Inheritance of Induced Resistance in a Wild Annual Plant.** *Phytopathology*, PHYTO-10.
- Roy et al. (2016). **Diet dependent metabolic responses in three generalist insect herbivores *Spodoptera* spp.** *Insect biochemistry and molecular biology*, 71, 91-105.
- Volkova et al. (2016). **Combination of modern plant breeding and enzyme technology to obtain highly enriched erucic acid from Crambe oil.** *Sustainable Chemical Processes*, 4(1), 1.

Education

PhD Education

During the last year PlantLink has supported two PhD courses: "Plant Imaging Techniques" (12-16 October 2015) in Lund together with TC4F and "Biometrical and Statistical Theory and Practice in Plant Breeding" (9-13 November 2015) in Alnarp together with SLU Alnarp. Together the courses attracted more than 40 participants.

The cooperation with Post Graduate Courses in Life Science (PCLS) at Lund University will continue for a fourth time during the fall 2016, giving PhD students at SLU Alnarp full access to about 15 PhD-courses in molecular biology at Lund University.

Master studies

A master student's summer school within ELLS (Euroleague for Life Sciences), with the name „Genetic Resources in Plant Breeding: Conservation, Characterization and Utilization“, was arranged 17-28 August in Alnarp by PlantLink. 33 master students from 14 countries attended the summer course, whereof 11 from LU and SLU. Members from the ELLS subject area 'Plant Molecular Breeding and Biotechnology' met in November 2015 in Prague. The subject area was formed three years ago after an initiative from PlantLink and includes five of the six ELLS universities with Lund University as an associated university. This year's summer school will be held at University of Copenhagen and for 2017 Hohenheim University is the planned host.

PlantLink Mentorship Program



On the 8th of April a second round of the PlantLink mentorship program kicked off with a meeting between mentors and students. The program is aimed at graduate students in plant biology or related research. New for this year was that we also invited post doctoral students. The mentor should work in a company or institu-

tion in the plant and agricultural area outside Lund University and SLU.

The mentorship program is based on the personal relationship between mentor and student, with the goal of creating a mutually beneficial relationship in which experiences, thoughts and ideas are exchanged. The program runs a little more than half a year. During the program, meetings and inspirational lectures as well as study visits in the region for stu-

dents and mentors are arranged. This time we for example visited Borgeby Fältdagar. The student gets a chance to visit the mentor's working place. The idea is that the student and mentor meet every other month during the program. In total, 14 students have attended the program. Mentors have kindly been provided by Bona, DuPont, Hushållningssällskapet, Lantmännen, Lindesro, Nordgen and Syngenta.

Budget and organization

PlantLink had an annual budget of 2,2 million SEK, with SLU and LU contributing 1 million respectively, and ca 0,2 million from BILS (Bioinformatics in Life Sciences).

From July 2015 to June 2016 the total salary costs was SEK 1,063,000. Positions funded were one director (20%), one coordinator (30%) and one bioinformatician (100%). Other costs include information and outreach events, seminars, website and travels.

PlantLink Personnel 2015-16

Leif Bülow (director)
Erik Alexandersson (coordinator from 1 September)
Dennis Eriksson (coordinator until 31 August)
Jakob Willforss (bioinformatician from 1 August)
Knut Wålstedt (administrator until 31 December)
Thomas Welwert (administrator from 1 January)

Steering committee, 2015-2016

Marianne Sommarin, Umeå University, chair
Erik Andreasson, SLU
Leif Bülow, LTH (director)
Jeanette Flodqvist, Region Skåne
Pål-Axel Olsson, LU
Annette Olesen, Lantmännen Lantbruk
Allan Rasmusson, LU
Jens Sundström, SLU
Li-hua Zhu, SLU
Emelie Ivarson, PhD representative, SLU
Lotta Oskarsson, student representative, LU

Steering committee meetings

12 October 2015, Alnarp
4 March 2016, Lund
27 May 2016, Alnarp



Josefin Persson, one of two high school students who did a summer internship related to plant research, see next page.



Outreach

Social media

PlantLink has continued its extensive work with social media for the spreading of plant science related news, information, upcoming events etc. On Twitter we have more than 800 followers representing important organizations in plant science such as journals, institutes and companies. Over 1200 people like our Facebook page. Nine newsletters are distributed per year and our homepage (www.plantlink.se) which carries information on PlantLink's work and structure, associated researchers, relevant courses etc., was visited on average by over 400 unique visitors per month.

Interactions

PlantLink has continued to interact with several partners both in- and outside of our region, such as Copenhagen Plant Science Center, The Linnean Centre for Plant Biology, Umeå Plant Science Center, EPSO, Mistra Biotech and Partnership Alnarp.

In collaboration with "Forskningsnätet Skåne" two high school students did a summer internship in research groups related to plant research. A number of guided visits for high school students as well as other groups from the Skåne region have been done upon request.

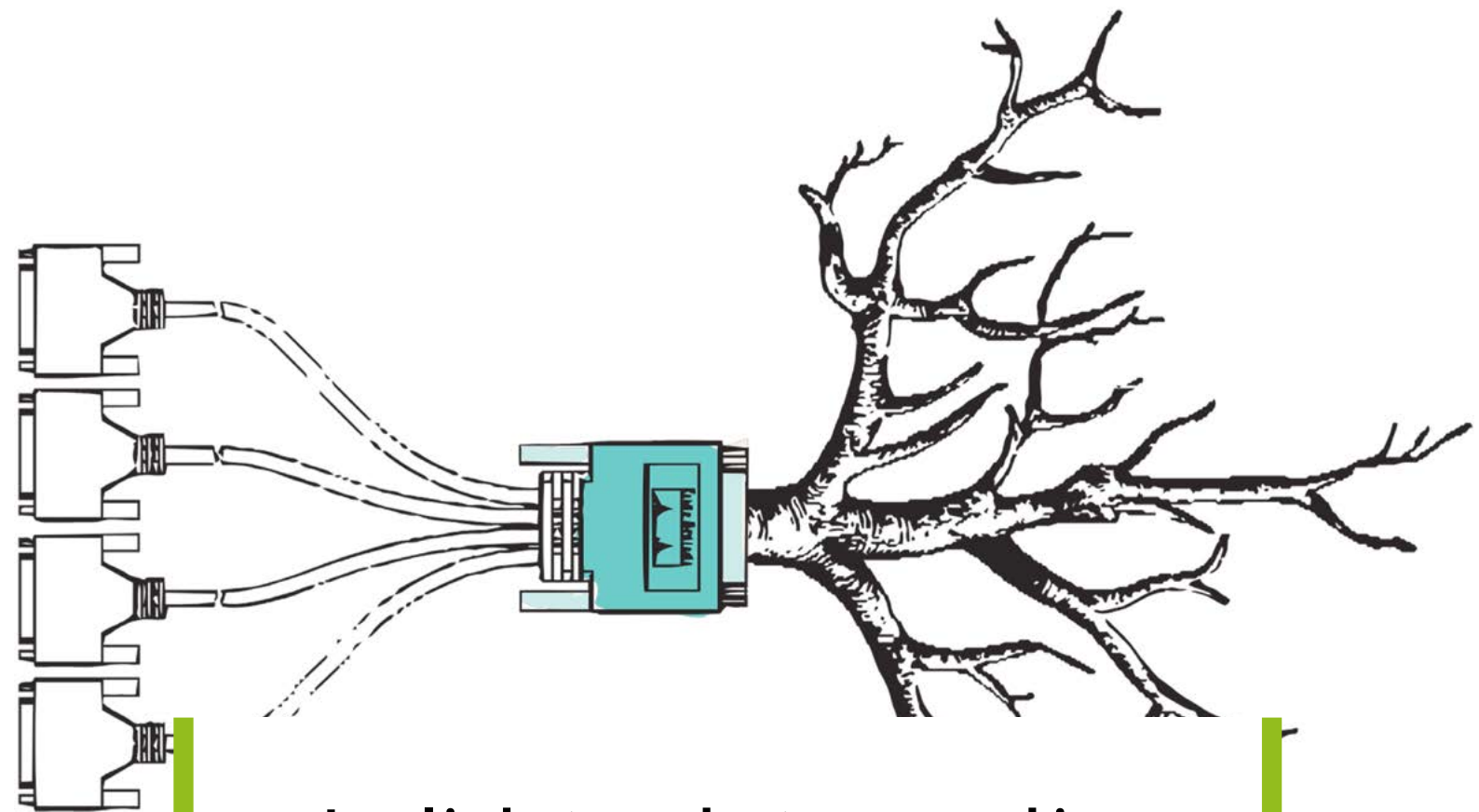
EPSO Cluster Expanded and Mistra Intern

In September 2014 PlantLink joined the European Plant Science Organisation (EPSO) together with The Linnean Center for Plant Biology in Uppsala as the SLU-Lund-Uppsala University cluster. In the beginning of 2016 this network was expanded to include Gothenburg and Stockholm University. This university cluster operates under the name of SLUGS (the first letters of the universities, nothing else!). Researchers at these universities can join EPSO for free as an individual member via EPSO's homepage.

EPSO is an independent academic organisation representing more than 220 research institutes, departments and universities. Its mission is to improve the impact and visibility of plant science in Europe. EPSO initiated Fascination of Plants Day, in which PlantLink has participated

three times. They are actively working with EU's framework program Horizon2020.

In September 2015, PlantLink's former coordinator Dennis Eriksson started a nine-month Mistra Fellow position at EPSO in Brussels. In this position, he worked with representatives of the European Commission (EC) and the European Parliament (EP) to increase the awareness of the importance of plant research and breeding, mainly by organising workshops and producing information material. He also coordinated consultations on selected topics to the EC, assisted the expansion of the PlantLink-Linnean EPSO member cluster to include also Stockholm University and Gothenburg University, and is currently coordinating a COST Action proposal on the topic of plant biotech regulation.



Local industry and entrepreneurship

Several of PlantLinks research activities are in close collaboration with local businesses, for example, in crop protection and plant breeding. One important outcome is the PlantLink PhD/Post Doc Industrial Mentorship Program (see box previous pages). During the year, the work continued to create a Swedish oat center. An application together with industry and universities has now been sent to establish an SSF Industrial Research Center focusing on oats.

PlantLink events 2015 - 2016

(number of attendees in brackets)

- Joint meeting LCPB/UPSC/PlantLink, 13 August in Stockholm in conjunction with the SPPS meeting (70)
- ELLS MSc Summer course : „Genetic resources in crop breeding“ 17-28 August in Alnarp (33)
- PlantLink Day, 1 October in Alnarp (80)
- Introductory course to Unix, together with NBIS, 18-20 April in Lund (20, max number)
- Joint workshop on plant interactions, together with Copenhagen Plant Science Center, 3 May in Copenhagen
- 2nd round of PlantLink Industrial Mentorship, first meeting 8 April in Lund (16)
- „Meet Tomorrow’s Plant Researchers – PhDs and Post Docs in the PlantLink Industrial Mentorship Program at Lund University and SLU Alnarp“ seminar with students in the PlantLink Industrial Mentorship Program at Borgeby Fältdagar, 30 June (30)

Upcoming events 2016

- **ELLS Master’s student course in Plant Molecular Breeding to Meet the Challenges of Climate Change**, 21 - 27 August in Copenhagen, Denmark
- **PhD course: Plant Protection Biology**, 5-16 September in Alnarp
- **PlantLink Day**, 6 October in Lund
- **Biotron inauguration seminar day**, 8 November in Alnarp

Contact and more information

Follow us on Facebook and Twitter to get continuous updates from PlantLink.
For more information check our homepage: www.plantlink.se

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