Nederlandse Vereniging voor Plantenbiotechnologie en -Weefselkweek
Netherlands Society for Plant Biotechnology and Tissue Culture
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Summaries of the lectures on the NVPW spring symposium, Friday, June 9th 2017
Hotel de Nieuwe Wereld, Marijkeweg 5, 6709 PE Wageningen.

Control of anthocyanin biosynthesis by anthocyanin-regulating MYB and bHLH transcription factors in *N. bethamiana* and *Lilium* sp. flowers

Mrs. Hasan Nudin Nur Fatihah, MSc. – Wageningen UR – Laboratory of Plant Breeding

The activity of anthocyanin biosynthesis genes is regulated at the transcriptional level, thus manipulation of transcription factors (TFs) is an ideal strategy to alter the expression of multiple target genes. However, selection of appropriate TFs from appropriate source is crucial for successful production of desirable phenotype. In this study, we investigated the effect of introducing ROSEA1 (ROS1, a MYB-type) and DELILA (DEL, a bHLH-type) TFs genes from snapdragon under a control of a flower specific promoter, Floral Binding Protein 1 (FBP1) from petunia into *Nicotiana benthamiana* and the Oriental hybrid lily cultivar 'Perth'. As a result, the ROS1 and DEL TFs, expressed by pFBP1 are functional in flowers and able to regulate biosynthetic pathways leading to delphinidin or cyanidin accumulation in flowers of *N. benthamiana* and the Oriental hybrid lily cultivar 'Perth', respectively. Furthermore, we showed the usefulness of pFBP1 by the generation of purplish flowers in *N. benthamiana* normal growing plants. The use of CaMV35S promoter for expression led to the development of stunted plants with anthocyanins in all parts.

Molecular engineering of plant development using Agrobacterium-mediated protein translocation

Mr. prof. dr. Remko Offringa – Institute of Biology – Leiden University

Agrobacterium tumefaciens is well characterized for its ability to transfer DNA to plant and fungal cells, but the fact that it also translocates proteins to its host cells was only revealed more recently. It was demonstrated that Vir protein translocation can be used to introduce heterologous DNA modifying proteins such as Cre recombinase to plant cells. Here, we show that *A. tumefaciens* can also be used to translocate plant developmental key regulators such as BABYBOOM (BBM) and REJUVENATOR/AT-HOOK CONTAINING NUCLEAR PROTEIN-LIKE 15 (RJV/AHL15) to cells of *Arabidopsis thaliana* and *Nicotiana tabacum*. *Agrobacterium*-mediated translocation of BBM-dVirF and AHL15-dVirF fusion proteins slowed down the senescence process of the infiltrated leaf discs, and also significantly enhanced tobacco shoot regeneration. Moreover, using a new generic reporter system, we could provide evidence for efficient protein translocation to the crop species *Capsicum annuum* and *Tulipa gesneriana*. In conclusion, *Agrobacterium*-mediated protein translocation (AMPT) can be used as a non-GMO approach to induce developmental changes in plant cells.

A new tool in pollen analysis

Ms. dr. Iris Heidmann – Acepo (Analysis & Advices around Cells and Pollen)

Pollen quality defined by viability and germination capacity is essential for fruit and seed production in commercial and breeding industries. The classical methods estimating pollen quality are based on various staining methods or classical in vitro germination protocols that are not easily applied across species, time consuming, and not always related to each other. This presentation will show how pollen quality is analysed by an impedance flow cytometer using the natural cellular reaction to an electric field. This method does not require staining, is reliable, species independent, and standardisable. It can be used to detect pollen developmental defects, discriminate between dead and viable cell, and even to predict pollen germination.

From seed potatoes to potato seeds, the hybrids are coming!

Mr. dr. ir. Sjaak van Heusden – Solynta

Solynta is a leading potato seed breeding company based in Wageningen (NL) which has developed an innovative technology for targeted breeding of one of the world's most important staple crops, potatoes. Our award-winning hybrid true potato seeds will transform the way potatoes are grown and distributed worldwide.

Morphotype Diversity and Convergent Crop Domestication in *Brassica rapa* and *Brassica oleracea*

Ms. dr. ir. Guusje A.B. Bonnema - Wageningen UR – Laboratory of Plant Breeding

Brassica rapa and *Brassica oleracea* species have diversified into a large number of morphotypes due to domestication and further breeding. Surprisingly a similar range of morphotypes, like cabbages and Chinese cabbages, kohlrabi and turnips, is present in both species although a common origin seems unlikely as the two species diversed long before they were domesticated for agriculture. As expected from this convergent domestication, many of the genes that were under selection in both species by showing a reduced DNA variation in the derived morphotype, were syntenic orthologs, proving convergent domestication at the molecular level. An additional finding was that for several loci evidence was provided for a parallel selection among the three subgenomes. A number of candidate genes that are responsible for the cabbage and the tuber forming morphotypes in both species were identified. Early events in leafy head formation in Chinese cabbages and tuber formation in turnips are identified and the function of some genes in these extreme phenotypes are presented.

Listen to the genes: gene activity measurements as a tool in agriculture

Mr. dr. Frank Hoeberichts – NSure B.V.

Gene activity measurements provide early and quantitative information on plant responses. They can be used to monitor plant development, or obtain insight in the crop's response to for example pathogens, agrochemicals, or biostimulants. Identified indicator genes are used in practical tests that enable one to optimize cultivation, harvest, storage, or treatments. During the presentation, various case studies will be presented.

Physiological and anatomical factors determining the water balance and hyperhydricity in Arabidopsis seedlings

Ms. Nurashikin Kemat, MSc. – Wageningen UR – Laboratory of Plant Breeding

Hyperhydricity refers to a frequent abnormality in tissue-cultured plants. The addition of cytokinins is a common practice to increase axillary branching of shoots, but it increases the risk of hyperhydricity. Although the occurrence of hyperhydricity has been studied in many plant species, the underlying mechanism of how cytokinins lead to the morphological abnormalities is still unknown. Hyperhydric leaves showed that the water saturation of the apoplast reduced the volume of apoplastic air on gelrite and gelrite supplemented with cytokinins as compared to normal leaves. Furthermore, the hyperhydric leaves showed a reduction of stomatal aperture and stomata density which demonstrates a decreased transpiration rate. The hyperhydric leaf was also characterized by poor differentiation between the palisade and spongy mesophyll with larger intercellular spaces. UV/vis lignin analysis provided evidence of hypolignification in hyperhydric leaves compared with normal leaves.

The PLETHORA gene regulatory network guides growth and cell differentiation in Arabidopsis roots

Mr. dr. ir. Renze Heidstra – Wageningen UR – Laboratory of Plant Developmental Biology

Organ formation in animals and plants relies on precise control of cell state transitions to turn stem cell daughters into fully differentiated cells. PLETHORA (PLT) transcription factor gradients are unique in their ability to guide the progression of cell differentiation at different positions in the growing *Arabidopsis* root. The PLT proteins promote transcription of cell division and growth related genes in their expression domain and repress differentiation genes. Induced targets include major patterning genes and autoregulatory feedback components, enforcing their role as master regulators of organ development.

Exhibitors:

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