Nederlandse Vereniging voor Plantenbiotechnologie en -Weefselkweek
Netherlands Society for Plant Biotechnology and Tissue Culture
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Samenvattingen van de lezingen van het NVPW voorjaarssymposium, vrijdag 5 juni 2015,
Summaries of the lectures on the NVPW spring symposium, Friday, June 5th 2015
Hotel de Nieuwe Wereld, Marijkeweg 5, 6709 PE Wageningen.

Cisgene appelbomen: ontwikkeling, karakterisatie en prestaties

dhr. dr. Frans Krens – Wageningen UR – Laboratory of Plant Breeding

Two methods were developed for the generation of cisgenic apples. Both have been successfully applied producing trees. The first method avoids the use of any foreign selectable marker genes; only the gene-of-interest is integrated between the T-DNA border sequences. The second method makes use of recombinase-based marker excision. For the first method we used the MdMYB10 gene from a red-fleshed apple coding for a transcription factor involved in regulating anthocyanin biosynthesis. Red plantlets were obtained and presence of the cisgene was confirmed. Plantlets were grafted and grown in a greenhouse. After three years, the first flowers appeared, showing red petals. Pollination led to production of red-fleshed cisgenic apples. The second method used the pM(arker)F(ree) vector system, introducing the scab resistance gene Rvi6, derived from apple. Agrobacterium-mediated transformation, followed by selection on kanamycin, produced genetically modified apple lines. Next, leaves from in vitro material were treated to activate the recombinase leading to excision of selection genes. Subsequently, the leaf explants were subjected to negative selection for marker-free plantlets by inducing regeneration on medium containing 5-fluorocytosine. After verification of the marker-free nature, the obtained plants were grafted onto rootstocks. Young trees from four cisgenic lines and one intragenic line, all containing Rvi6, were planted in an orchard. Appropriate controls were incorporated in this trial. We scored scab incidence for three consecutive years on leaves after inoculations with Rvi6-avirulent strains. One cisgenic line and the intragenic line performed as well as the resistant control. In 2014 trees started to overcome their juvenile character and formed flowers and fruits. The first results of scoring scab symptoms on apple fruits were obtained. Apple fruits from susceptible controls showed scab symptoms, while fruits from cisgenic and intragenic lines were free of scab.

Moleculaire aspecten van kolomgroei in appel

dhr. dr. ir. Jaap Wolters – Wageningen UR – Laboratory of Plant Breeding

‘Wijcik’ is een somatische mutant van het appelras ‘McIntosh’ met een bijzondere, ‘kolomachtige’ groeiwijze. Deze manier van groeien is interessant voor appeltelers, aangezien kolombomen haast niet gesnoeid hoeft te worden, deze dicht op elkaar gezet kunnen worden en omdat de appels gemakkelijk geoogst kunnen worden. Ons onderzoek heeft ervoor gezorgd dat de genetische ‘columnar’ (*Co*) regio voor kolomgroei voldoende verkleind kon worden om deze te kunnen sequensen. Door de sequenties van de *Co* regio van ’McIntosh’ en ‘Wijcik’ te vergelijken kon de mutatie in ‘Wijcik’ geïdentificeerd worden. Dit heeft geleid tot de ontwikkeling van een genetische merker die 100% gekoppeld is aan het gen dat verantwoordelijk is voor kolomgroei in appel. Bovendien werd een zeer aannemelijk kandidaat voor dit *Co* gen gevonden.

Youthful decisions - growth and pattern formation in the early plant embryo

dhr. prof. dr. Dolf Weijers - Wageningen UR - Laboratory of Biochemistry

Growth and development of plants depends on the repeated formation of organs throughout life. Normal development, optimal crop yield and in vitro propagation require the establishment of tissues within new organs, as well as the specification of stem cells that maintain the organ. In order to optimise efficiency of in vitro propagation, and to rationally improve crop traits, it is therefore important to understand the basic principles underlying tissue and stem cell formation. However, plant development is notoriously plastic and adaptive, and thus intrinsically unpredictable at cellular scale. We use the early Arabidopsis embryo as a model to dissect mechanisms underlying growth and pattern formation in plants. In a predictable series of events, the zygote develops into a simple structure with a small number of cells, yet containing the major tissue types, as well as their stem cells. In this lecture, I will introduce the Arabidopsis embryo model, and will highlight several recent studies that reveal cellular and molecular mechanisms that control tissue and stem cell formation.

Elucidating the mechanism of bulblet regeneration in lily bulb-scales

mrs. Natalia Moreno Pachon, MSc. - Wageningen UR – Laboratory of Plant Physiology

Lily bulbs are compact plants in which the stem is compressed and the leaves are modified into bulb-scales. Detached lily bulb-scales have the striking ability to regenerate new bulblets in warm and moist conditions without exogenous hormonal application. Ectopic bulblets initiate along the proximal-adaxial side of the excised explant and regeneration capacity diminishes in distal explants excised

from the apex of the bulb-scale, showing position dependency. This positional effect might be caused by endogenous hormonal gradients. Previous studies indicate that regenerated shoots in Arabidopsis originate from the pluripotent pericycle-like cells, which are present around the vasculature of multiple organs. Here we demonstrate that contrary to Arabidopsis, regeneration in lily does not originate from vascular cells but from differentiated parenchyma tissue. Furthermore, we showed the importance of the epidermal cells for initiation of bulblets. We are currently investigating the exact histological origin of the ectopic bulblets.

Roots of rooting; mechanisms underlying adventitious root formation.

mr. Mehdi Massoumi Bagherabadi, MSc - Wageningen UR - Laboratory of Plant Breeding

Adventitious root (AR) formation is a complex genetic trait and is regulated by the interaction of environmental and endogenous factors. Although significant progress has been made in the understanding of the molecular control of root and lateral root development, it is still poorly understood how endogenous and environmental factors interact to control AR formation.
In the current research, we have investigated the influence of two mother plant pre-treatments (etiolation and double layer culture) and their underlying mechanisms on AR formation in Arabidopsis and apple. We have also examined the effect of phase change from juvenile to adult in Arabidopsis cultured in vitro. The transition from juvenile to adult causes a dramatic decline of rooting ability. The hypomethylating agent, 5-azacytidine, significantly increased rooting of adult plant materials but not of juvenile ones indicating that reduced rooting upon phase transition is accompanied by increased DNA methylation. We have also showed that the loss of rooting competence during phase change is accompanied by a drop in miR156 levels.

Potato breeding in a changing world.

dhr. dr. ir. Nick de Vetten – Averis Seeds B.V.

Classic breeding and selection approaches for potato breeding are more and more improved by advanced marker assisted breeding and evaluation systems. As breeders we recognize that subjective breeding steps need to be improved and combined with novel technologies to reach for a structural genetic gain in potato. Especially, breeding for resistance traits is strengthened by the availability of know-how on variation in resistance genes and how they operate. Explaining the genetic variation of quality traits such as dry matter content or cold sweetening by candidate genes or molecular markers is still a route to pave. Present approaches as GWAS in combination with QTL analyses of segregating populations give promising results. Future breeding will be more directed along the genotypic scale and will increase the chance of developing successful varieties from the breeding programme.

Stuurlicht: hoe werkt het en hoe reageren gewassen erop?

dhr. dr. ir. Sander Hogewoning - Plant Lighting B.V.

Groene planten *in vivo* worden middels de fotosynthese van energie voorzien. Licht fungeert zo dus als energiebron voor de plant. Daarnaast voorziet licht planten ook van informatie. Via kleurgevoelige pigmenten, de zogenaamde fotoreceptoren, ontvangen planten signalen over hun omgeving. Die signalen hebben effect op de aanmaak van verschillende planthormonen, welke vervolgens weer invloed hebben op vele processen. Onder daglicht is ‘shade avoidance’ een bekend voorbeeld hiervan: Planten die in de schaduw van andere bladeren groeien, worden aan licht met relatief veel verrode golflengten blootgesteld. Dit komt doordat de beschaduwende bladeren o.a. rode en blauwe golflengten sterk absorberen en vooral veel verrood doorlaten. Zo signaleert de plant schaduw en reageert met een relatief sterke stengelstrekking, zodat zijn bladeren in een lichtere, gunstigere positie kunnen komen. De verschillende fotoreceptoren (fytochromen, cryptochromen, fototropinen) reguleren behalve strekking ook o.a. scheutuitloop, bloei, verdeling van assimilaten tussen plantorganen, groeirichting en veroudering. In beschermde teelten kan daarvan worden geprofiteerd door toepassing van de juiste belichting. Plant Lighting BV is gespecialiseerd in fotosynthese en belichting van planten *in vivo*. In deze lezing wordt een overzicht gegeven van de werking van stuurlicht met voorbeelden van toepassingen voor de tuinbouw.

E-Brida, Software voor de plantenveredelaar. Join the next Generation Breeders!

dhr. ir. Berno van der Geest - Agri Information Partners B.V.

Agri Information Partners is dé IT-specialist voor veredelingsbedrijven. Een van de producten is E-Brida. E-Brida is een veredelingssoftware pakket voor plantenveredelaars. De kracht van Agri Information Partners is dat we veredelaars begrijpen. We weten waar veredelaars elke dag tegen aan lopen. Simpelweg omdat we zelf uit de praktijk komen. E-Brida helpt de veredelaar om betere beslissingen te maken in het veredelingsproces. Dit uit zich door snellere marktintroducties en tijdsbesparing in de veredelingsadministratie. E-Brida ondersteunt het volledige proces wat de plantenveredelaar doorloopt bij de ontwikkeling van een nieuwe variëteit. E-Brida is geschikt voor uiteenlopende gewassen, vegetatief- dan wel generatief vermeerderd. Ook is er uitgebreide ondersteuning voor het ontwikkelen van lijnen. De lezing biedt overzicht op de belangrijkste E-Brida functies. Tevens wordt een doorkijk gegeven naar de nog te ontwikkelen functionaliteit in (nabije) toekomst.