Nederlandse Vereniging voor Plantenbiotechnologie en -Weefselkweek
Netherlands Society for Plant Biotechnology and Tissue Culture
KvK nr. 40121960 NL42INGB0004240007 www.nvpw.nl info@nvpw.nl

NVPW spring symposium

Friday, June 14th, 2019

Wageningen International Congress Centre (WICC, ir. Haakzaal), Lawickse Allee 9, 6701 AN, Wageningen

09:30 **Registration and coffee / tea**

09:55 **Opening**

10:00 **Mrs. Friederike von Rundstedt Dipl. Ing. Agr. (Univ.) – Bock Bio Science GmbH**
RoBoCut©_Plant Tissue Culture 4.0: Creating a new Agricultural Industry Standard for Autonomous Plant Production

10:35 **Dr. Ric de Vos – Wageningen Plant Research – Wageningen UR**
Unlocking the metabolite biodiversity in tuber-bearing Solanaceae

11:10 **Elevator pitch by exhibitors**

11:15 **Coffee / tea break**

11:30 **Prof. dr. ir. Ben Scheres - Rijk Zwaan Breeding B.V.**
Defence by Growth: plant regeneration upon damage perception

12:05 **Dr. Rumyana Karlova – Wageningen UR – Department of Plant Sciences**
From anthocyanins towards salt stress resilience in tomato

12:40 **Lunch**

13:10 **Optional: General members meeting**

13:40 **Dr. Gerard van der Linden – Wageningen UR – Department of Plant Breeding**
Visualizing plant performance: plant phenotyping at WUR

14:15 **René Boesten MSc. – Wageningen UR – Department of Plant Sciences**
Copy number variations in plants

14:50 **Coffee / tea break**

15.05 **Dr. Ruthger van Zwieten – Amphasys AG (Switzerland)**
Pollen quality and the seed industry: the Ampha Z32 by Amphasys

15:40 **Huayi Li MSc. – Wageningen UR – Department of Plant Breeding**
The relation between transpiration and growth in in vitro micropropagation, exemplified in Malus domestica cv. 'Gala' plantlets

16:15 **Closing drinks**

The costs for attending the symposium are € 30, to be paid in cash. This includes the lunch, coffee/tea and closing drinks. The printed day programme and abstracts will be handed out at the symposium.

Please subscribe **before Wednesday, June 12th, 2019** via **info@nvpw.nl**

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Summaries of the lectures on the NVPW spring symposium, Friday, June 14th, 2019
Wageningen International Congress Centre (WICC, ir. Haakzaal), Lawickse Allee 9, Wageningen

RoBoCut©_Plant Tissue Culture 4.0: Creating a new Agricultural Industry Standard for Autonomous Plant Production

Mrs. Friederike von Rundstedt Dipl. Ing. Agr. (Univ.) – Bock Bio Science GmbH

The family owned business Bock is known as a pioneer in the field of Plant Tissue Culture (PTC). Since the PTC technology has become too expensive for European producers, Bock has been developing a fully integrated and autonomous processing method for PTC: RoBoCut©. Until now, there has been no sterile automation in the biotechnical propagation of plants, since the programming of robots has not yet been successful due to the lack of algorithms for multidimensional recognition and processing, especially in the area of objects with highly differentiated surface structures and textures. Also new in this technique are the processing of non-standard living material and the robot construction in the clean room. Deep Learning and Big Data are two of the "hottest" trends in the fast-growing digital world. While Big Data has been used in various ways over the Internet for several years now, it is still difficult, or even impossible, to manage and analyze these "large data volumes" using conventional software tools and technologies. In horticulture, there are hardly any three-dimensional image recognition systems used in processing machines and there has been so far no automation with self-learning programming (AI) that allows autonomous propagation of living, individually grown plants. RoBoCut© will enable a competitive European production of all kind of crops on an industrial scale, in reasonable time and with high efficiency.

Unlocking the metabolite biodiversity in tuber-bearing Solanaceae

Dr. Ric de Vos – Wageningen Plant Research – Wageningen UR

Determining metabolite biodiversity within tuber-forming Solanacea species is a valuable step in breeding for new varieties with improved attributes in which phytochemicals play a key role, including resistance of plants and quality-related characteristics of tubers such as colour, flavour, nutritional health, etcetera. At Wageningen Plant Research (WPR) a large collection of 534 tuber-forming wild Solanacea genotypes representing 139 species is present. To explore the metabolic diversity in their tubers, this collection supplemented with a series of diploid lines, cultivars and parents of crossing populations was subjected to microtuber-induction in vitro. In the end, micro-tubers of 220 responsive genotypes were analysed using several complementary targeted and untargeted platforms, resulting in the relative or absolute levels of about 1850 compounds in each genotype, including metabolites known to be involved in, for instance, browning, colour and nutritional quality. Clustering of the genotypes based on their micro-tuber metabolite profiles strongly resembles their proposed phylogenetic classification. This unique, large-scale phytochemical profiling study indicates substantial genetic variation in a large number of tuber compounds, thus providing a valuable basis for both breeding towards new varieties and identifying new compounds and their biosynthesis pathways playing a key role in tuber quality traits.

Defence by Growth: plant regeneration upon damage perception

prof. dr. ir. Ben Scheres - Rijk Zwaan Breeding B.V.

Plants are well known for their regenerative capacities, in which few or single cells may give rise to a completely new plant. This phenomenon has been studied extensively in vitro and forms the basis of plant propagation practices in horticulture. Despite considerable knowledge on molecular mechanisms of plant development, a conceptual framework for how plants initiate development to repair tissue upon damage had been lacking. We investigated the connection of Jasmonate wound signal perception to the activation of stem cells (Zhou et al, Cell, 2019). We show that wounding signals do not under all circumstances inhibit growth, as in classical growth-defence trade-off, but they also stimulate regeneration. The identification of a signalling network that connects tissue damage to regenerative growth opens up the possibility to understand in vitro regeneration from the perspective of pathways that are relevant in vivo.

From anthocyanins towards salt stress resilience in tomato

dr. Rumyana Karlova , dr. Jules Beekwilder and prof. dr. Christa Testerink – Wageningen UR – Department of Plant Sciences

Agriculture will have to feed an increasing world population, using a decreasing arable land surface. Salinity is an increasing problem, in particular in coastal or irrigated areas. Due to climate change, these traditionally fertile areas suffer from increases in soil salinity, reaching concentrations higher than tolerated by current cultivation practices. In the near future these areas will no longer be suitable for cultivating food unless we adopt novel production practices, including the use of novel resilient plant varieties. For plants to be resilient to abiotic stresses like salinity and drought, the root system is of vital importance. Roots are the primary organs that adapt their architecture and physiology to drought and salt stress. Their performance is key to the ability of the whole plant to recruit nutrients and water. However, we have limited knowledge of how the root functions and this translates into a limited capability to control plant resilience to abiotic stress. Many plant species accumulate anthocyanins upon stresses in their vegetative tissues probably to scavenge reactive oxygen species. Recently we showed that upon producing anthocyanins, plant roots displayed a number of profound physiological and architectural changes, with respect to root branching and root epithelial cell morphology. The link between the changes of root architecture upon salt stress and anthocyanin accumulation will be discussed together with its importance to understand salt tolerance in tomato.

Visualizing plant performance: plant phenotyping at WUR

dr. Gerard van der Linden – Wageningen UR – Department of Plant Breeding

In plant breeding, being able to select plants that perform better than other plants is essential. Knowing why these plants perform better can help us to select plants for specific environments, cultivation conditions and to select traits that contribute to better performance; deeper roots protect against drought, higher transpiration improves growth, plant shape can improve disease resistance. New techniques are developed to efficiently measure the traits that contribute to yield, and do these measurements fast, often, and in many plants. This presentation will give an overview of techniques and facilities that Wageningen UR is investing in to better understand plant behavior and improve selection for optimal plant performance under various conditions.

Copy number variations in plants

René Boesten MSc. – Wageningen UR – Department of Plant Sciences

Copy number variation (CNV) is a form of intraspecific genetic variation that involves the gain or loss of genomic DNA fragments in the 50 bp – 100 kbp range. CNV acts as a major component underlying phenotypic variation in many organisms, and is an abundant type of genetic variation among plants. Often CNVs are linked to adaptation and evolution of plants, especially in response to suboptimal or adverse environmental conditions. This will be exemplified by two Brassicaceae species with extreme traits: Noccaea caerulescens, a heavy metal hyperaccumulator species, and Hirschfeldia incana, a species with extremely high photosynthesis rates under high light conditions. Both species have acquired additional gene copies related to their specific adaptations. Apart from these two extremophiles, I will also discuss the prevalence and relevance of CNV in a local Dutch population of about 200 natural Arabidopsis thaliana accessions.

Pollen quality and the seed industry: the Ampha Z32 by Amphasys

dr. Ruthger van Zwieten – Amphasys AG (Switzerland)

The Ampha Z32, a one-of-a-kind high throughput instrument based on the Coulter counter principle, measures pollen cells in label-free fashion. Adapted by all major seed companies, it offers a great tool to analyze pollen viability, number, size, ploidy, and developmental stage. Since previous viability measurements with staining or germination media were quite cumbersome, the current technique offers unique insights in plant and pollen behavior/dynamics thanks to its high throughput capability and quick sample preparation. Many of our customers are now seeing gains in seed-set and quality and experience a reduction in resources needed for their production processes. This seminar will focus on these pollen applications in the seed industry and the technology behind the instrument.

The relation between transpiration and growth in in vitro micropropagation, exemplified in *Malus domestica* cv. 'Gala' plantlets

Huayi Li MSc. – Wageningen UR – Department of Plant Breeding

Micropropagation enables vegetative production of large numbers of plantlets in a short period of time. A major question is how medium components are translocated to the areas of growth. In our experiments, shoot cultures of Malus domestica cv. 'Gala' were used to test the relationship between transpiration and growth. The hypothesis is that an increased transpiration potential might lead to improved growth of plantlets in high humidity. High gas replacement filters and concentrated potassium chloride solution were attempted to increase plant growth. Fuchsine acid was used to confirm transpiration occurred in vitro. Opening the stomata and inhibiting cuticle formation were also tested for promotion of growth. Our results demonstrated the potential of modulating transpiration to optimize biomass accumulation in vitro. A similar technique might also be applied to other species or cultivars growing poorly in tissue culture.

Exhibitors:

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Bronson Climate B.V.: dhr. Rob Hoogenboom, Valeton 19, 5301 LW Zaltbommel, climate@bronson.nl, www.bronson.nl, www.bronsonclimate.nl

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