ABSTRACT BOOK

SEB VIRTUAL CONFERENCE 2021
29 JUNE - 8 JULY 2021

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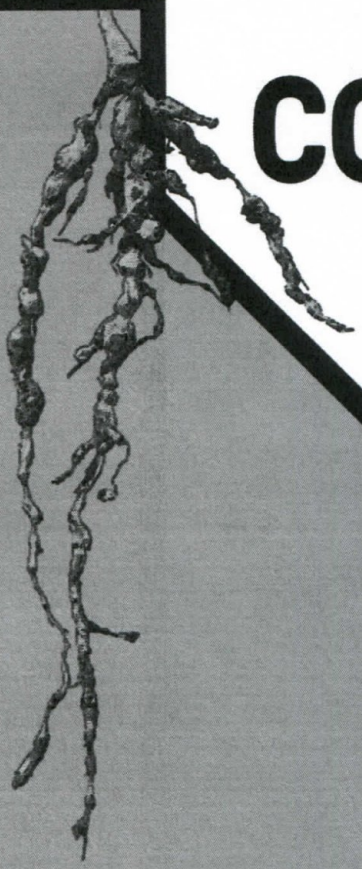

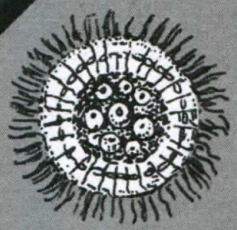

SOCIETY FOR EXPERIMENTAL BIOLOGY

P5.3 PHENOTYPING DROUGHT AND METABOLIC STRESS RESPONSES IN GLASSHOUSE- AND FIELD-GROWN CROPS, USING HYPERSPECTRAL REFLECTANCE AT LEAF AND CANOPY SCALES

Tuesday 6 July 2021 **11:45**

Angela C Burnett (University of Cambridge, United Kingdom), Shawn P Serbin (Brookhaven National Laboratory, United States), Kenneth J Davidson (Brookhaven National Laboratory, United States), Kim S Ely (Brookhaven National Laboratory, United States), Alistair Rogers (Brookhaven National Laboratory, United States)

acb219@cam.ac.uk

Biotic and abiotic stresses place severe constraints on plant growth and therefore on crop yield. Understanding the physiological and biochemical responses to stress and – crucially – how these can be phenotyped in a high-throughput manner is therefore vital for improving crop yield. This presentation will discuss the results of two studies examining different plant stresses. In the first study, we exposed a range of glasshouse-grown agronomic species to a full drought treatment. We demonstrated the use of hyperspectral reflectance data to detect the drought phenotype via the underpinning biochemical mechanisms, including estimation of phytohormone concentration. We validated our results in an independent field trial. In the second study, we imposed a metabolic stress (carbon sink removal) on field-grown courgette plants and used hyperspectral reflectance data to measure the underlying biochemical differences in stressed and unstressed plants. We performed measurements at the leaf scale using proximal hyperspectral reflectance sensing, and at the canopy scale using remote hyperspectral data collection. To our knowledge this is the first time that the source:sink balance of field-grown plants has been measured with hyperspectral data. We showed that both leaf- and canopy-scale hyperspectral data are able to rapidly and accurately measure the phenotypes of agronomic species exposed to biotic and abiotic stress.

P5.4 A TECHNICAL WORKFLOW ANALYSIS FOR HYPERSPECTRAL PLANT SCREENING IN GREENHOUSES

Tuesday 6 July 2021 **12:05**

Stefan Paulus (Institute of sugar beet research, Germany), Anne-Katrin Mahlein (Institute of sugar beet research, Germany)

paulus@ifz-goettingen.de

Hyperspectral imaging has become a reliable tool for analysing the state of plants in greenhouses. These cameras spatially measure the plant reflectance in the area of 400-1000nm and thus extend the visible spectrum of RGB cameras. The non-visible spectrum is of importance as plants there reflect a lot better than in the visible area. Smallest changes in the plant health state effect a change of the plant spectrum and especially in the NIR area.

Imaging plants in greenhouses needs effort on camera calibration and data normalization. The most influence is coming from the measuring setup, the artificial illumination, the camera calibration and the plants itself. Light absorption, mixed pixels and the preparation for adequate machine learning is essential to provide reliable experiment results.

In this contribution the data flow in a hyperspectral imaging experiment is shown and the single steps for data acquisition, calibration, processing, masking and preparation for machine learning is shown. Single steps were explained and in the end different application scenarios were shown. Furthermore a general trait description is presented that introduces a level based description based on the complexity of measuring and analysis.

This contribution defines a general workflow for the acquisition and processing of hyperspectral imaging data for the demands of plant phenotyping and plant monitoring on the laboratory and greenhouse scale.

VIRTUAL POSTER SESSION

Tuesday 6 July 2021 **12:40 – 13:10**

P5.7 HEAT STRESS TOLERANCE OF WHEAT (TRITICUM AESTIVUM L.) AT DIFFERENT DEVELOPMENTAL STAGES

Tuesday 6th July 2021 **POSTER SESSION**

Ankica Kondic-Spika (Institute of Field and Vegetable Crops, Serbia and Montenegro), Sanja Mikic (Institute of Field and Vegetable Crops, Serbia and Montenegro), Dragana Trkulja (Institute of Field and Vegetable Crops, Serbia and Montenegro), Milan Mirosavljevic (Institute of Field and Vegetable Crops, Serbia and Montenegro), Vesna Zupunski (Institute of Field and Vegetable Crops, Serbia and Montenegro), Carl-Otto Ottosen (Aarhus University Department of Food Science, Denmark)

kondicspika@gmail.com

The objective of this study was to analyse the effect of heat stress on morphological and physiological traits of 12 wheat cultivars (10 cultivars from Serbia, cv. Gladius as a heat tolerant and cv. Paragon as a heat susceptible check) at flowering and grain filling stages. The experiment was conducted at the Aarhus University in Denmark using Dynapheno phenotyping facilities. Four sets of the cultivars with five replications were denoted as control treatment plants (T1), heat-stressed plants at the flowering stage (T2), heat-stressed plants at the grain filling stage (T3) and heat-stressed plants at the both stages (T4). The following measurements were performed on flag leaves one day before heat stress started and on the first, the third, the fifth and the seventh day of heat stress: chlorophyll content using SPAD chlorophyll meter, photosynthetic parameters using MiniPAM II photosynthesis yield analyzer and leaf temperature with infrared thermometer. Four cultivars were subjected to further CIRAS-2 measurements, as well as carbohydrate and chlorophyll analysis. All measured values significantly decreased after the third, fifth and seventh day after heat stress at flowering, heat stress at grain filling and especially after the double stress. The heat stress affected more severely the wheat cultivars during grain filling stage in comparison to the stress during flowing time, while the combined stress at both stages was the most detrimental. The results enabled identification of the genotypes with promising level of heat tolerance, which could be used in breeding process for further improvement of heat tolerance in wheat.