

Abstract book



BioSB 2023

9-10 May 2023
Hotel Zuiderduin
Egmond aan Zee

Development of a digital twin for tomato crops

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Digital twin technology is an emerging trend in greenhouse horticulture, which is increasingly data-driven, also due to growing availability and advancements in sensor technology in the area of plant phenotyping. Digital twin can assist with decision making and help determine optimal cultivation strategies to increase the sustainability of crop production. Digital twin of a crop is a virtual representation of a real crop that mirrors its states and behaviour. An essential part of the digital twin is a means to dynamically update the underlying models by data collected by climate and imaging sensors. Here, we present a proof-of-concept digital twin of a greenhouse tomato crop. At the core of the tomato digital twin is a dynamic 3D plant model based on the functional-structural plant (FSP) modelling approach. It can simulate 3D architectural development and functioning of individual tomato plants in response to greenhouse climate conditions. The plant model is linked to a greenhouse climate model, which simulates indoor climate conditions. To calibrate the model, experiments were conducted in 2021 in the Netherlands Plant Eco-phenotyping Centre (www.npec.nl) facility with four tomato cultivars: ‘Merlice’, ‘Brioso’, ‘Moneymaker’, and ‘Gardener’s Delight’. A plant-to-sensor system was used to image all plants approximately every three days to collect information on the status of the plants. Besides the prototype design, the updating procedure, and forthcoming digital twin applications will be presented.