HYDRION-LINE, A PROTOTYPE CROP LIGHT INTERCEPTION SENSOR IN GREENHOUSES

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Abstract

The most important factor for plant growth is the amount of light that is intercepted by the crop. The amount of intercepted light depends on the incoming radiation in the greenhouse and the percentage of interception by the crop, which is directly related to the leaf area. At present growers are familiar with radiation but not with the amount of intercepted radiation. A proper crop management requires the measurement of the most important growing factors. In case of application of crop growing models the simulation of the leaf area (light interception) is one of the biggest uncertainties in the results of the models. Automatic calibration of the model based on radiation interception increases the accuracy of the model results. For the determination of radiation interception of the crop in a greenhouse a radiation sensor is used which determines the ratio of the incoming radiation from the upper side and the reflection from lower side. The principle behind the reflection measurement is simple. The crop has a low reflection in the blue spectrum (~5% at 460 nm) and the white plastic on the floor has a high reflection (~90% at 460 nm). The sensor sees a relation between the high and low reflection which decreases with the covering of the soil by the plant leaves. This ratio can be related to the light interception by the crop. The Hydrion-line project is a multi-disciplinary research project, where a large number of researchers of different science groups of Wageningen UR co-operate with commercial business partners. At the end of the project, as a result, Hydrion-line should produce prototypes of directly applicable products. The paper describes the algorithms and boundary conditions to take account of for proper results. Time series measurements of incoming, reflecting and global radiation are used to design a radiation interception sensor. Data are shown of the algorithm to calculate the radiation interception. With the developed algorithm it is possible to create a simple and robust sensor that can measure the light interception in a greenhouse. The sensor is tested on a cucumber crop in a practice greenhouse.