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Leaf wetness distribution within a potato crop

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The Netherlands has a mild maritime climate and therefore the major interest in leaf wetness is associated with foliar plant diseases. During moist micrometeorological conditions (i.e. dew, fog, rain), foliar fungal diseases may develop quickly and thereby destroy a crop quickly. Potato crop monocultures covering several hectares are especially vulnerable to such diseases. Therefore understanding and predicting leaf wetness in potato crops is crucial in crop disease control strategies. A field experiment was carried out in a large homogeneous potato crop in the Netherlands during the growing season of 2008. Two innovative sensor networks were installed as a 3 by 3 grid at 3 heights covering an area of about 2 hectares within two larger potato crops. One crop was located on a sandy soil and one crop on a sandy peat soil. In most cases leaf wetting starts in the top layer and then progresses downward. Leaf drying takes place in the same order after sunrise. A canopy dew simulation model was applied to simulate spatial leaf wetness distribution. The dew model is based on an energy balance model. The model can be run using information on the above-canopy wind speed, air temperature, humidity, net radiation and within canopy air temperature, humidity and soil moisture content and temperature conditions. Rainfall was accounted for by applying an interception model. The results of the dew model agreed well with the leaf wetness sensors if all local conditions were considered. The measurements show that the spatial correlation of leaf wetness decreases downward.