Data acquisition for Monitoring Vapor Pressure deficit in a tropical lowland shelter-house plant production

Abstract

The objective of this study was to monitor air Vapor Pressure Deficit (VPD) in a tropical lowland shelter-house plant production. A custom-designed real-time Data Acquisition (DAQ) system with three independent microcontroller boards and sensors for monitoring aerial parameters was developed, calibrated and tested. Sample temperature and Relative Humidity (RH) data for VPD calculations were continuously collected every 60 sec, for 6 days, inside a 40 m2 shelter-house located at the Universiti Putra Malaysia agricultural experimental field. Preliminary results showed that VPD values varied from 0.16 to 2.51 kPa, with a mean of 0.83 kPa and standard deviation (Std) of 0.6 kPa. Different regression models were used to describe the nonlinear correlation that existed between temperature and VPD data. Results showed that squared polynomial model produced the maximum coefficient of determination (R2) equal to 0.976. This model was successfully used for VPD prediction based on temperature inputs. The hypotheses that collected data follow normal distribution and have different means in the 6 days of experiment were rejected at any significant level. The result of this study can be used in decision support systems' database for controlling tropical lowland plant production environments.

Keyword: Data acquisition; Microcontroller; Plant production; Relative humidity; Shelter-house; Temperature; Tropical lowland Malaysia; Vapor pressure deficit