ABSTRACT

Two identical gable-even-span greenhouses were designed, constructed, and installed at EL-Sabahia Horticultural Research station, Alexandria Governorate. They were utilized to grow and produce cucumber crop during summer season of 2005. Each greenhouse was equipped by 72 pots as a cultivation system for protected cropping, drip irrigation system for watering pots of crop, evaporative cooling system using two different cooling pads (one of locally available materials, and the other of cross-fluted cellulose pads) for removing the exceeding heat, and microclimate control board for operating the evaporative cooling system (extracting fan and water pump). A microcomputer based data-logger system was used to read, display, and record (from sensors) various temperatures, solar radiation, and air relative humidity.

The two different cooling pad materials were functioned to compare weather the two materials differed significantly in the cooling system effectivness. The effectivness of evaporative cooling which used two different cooling media A (from locally available materials) and B (from cross-fluted cellulose pads) was 69.25% and 74.71%, respectively. Consequentially, the cooling media B was more efficient than the cooling media A by 5.56%. The ambient air temperatures surrounding the cucumber plants were uniform inside the two greenhouses, due to the inside air was continuously moved by extracting fans. The temperature of the cucumber plant leaves during the majority of day light time was lower than the ambient air temperature inside the greenhouses

which prevented occurrence of plant thermal stress and consequentially reduced the risk of plant water stress and fungal diseases.

Due to control and maintain the microclimatic conditions inside the two greenhouses at desired level particularly during day light in hot summer season, the total fresh yield of cucumber crop for greenhouse A and greenhouse B was 259.2 and 298.7 kg, respectively. There for, greenhouse B was found to be on average 39.5 kg (15.24%) more productive than greenhouse A.

Ultimately, to improve the cooling performance and minimize the total costs of cooling media A (from locally available materials), the number of air stream holes should be increased by 25% to provide and maintain the same rate of air flows as the cooling media B (from cross-fluted cellulose pads). As a result of this points the electrical power consumed to operate the extracting fan will be reduced, resulting in decrease the total costs.

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