

A Controlled Environment Agriculture Greenhouse for the Caribbean Region

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Abstract: *A prototype Controlled Environment Agriculture (CEA) greenhouse, designed to suit the climatic conditions of Trinidad and Tobago was constructed and tested alongside a non-controlled prototype greenhouse with natural ventilation. In the CEA greenhouse, fan and pad type evaporative cooling were used to reduce temperature; circulating air combined with natural ventilation to reduce the humidity and provide air movement. LED lights were used to extend day length and supplement photons delivered to the plants. The effect of these control measures, in the CEA greenhouse, was evaluated by measuring temperature and humidity variations. Plant growth parameters (plant height, stem diameter, and leaf surface area) were evaluated for the two greenhouses. The mean saturation effectiveness of the coconut fibre cooling pad material used in the evaporative cooler was found to be 25.3%. While, the temperature and relative humidity in the non-controlled greenhouse were higher; those in the CEA greenhouse were lower than the ambient temperature. The CEA greenhouse had significantly higher growth rates in all plant growth parameters (about two and a half times on the average) than the non-controlled greenhouse. The combination of blue LED light, evaporative cooling, and air circulation fans coupled with natural ventilation resulted in a significant increase in plant growth rates in the CEA greenhouse compared to the greenhouse with only natural ventilation as the weather control measure.*

Keywords: *Greenhouse, controlled, environment, Trinidad and Tobago*