Automated Supplementary Greenhouse Lighting Controller

Dorminy, Rebekah (School: Sola Fide Home School)

In order to extend the growing seasons, crops are grown in greenhouses year round using a combination of sunlight and artificial lighting. Some growers measure light and manually operate the lights as needed to increase yield. This increases labor costs which they hope to offset with greater yield. Alternatives like timers or constant artificial light add expense without optimizing production and may waste electricity. The researcher created a device to control power to current greenhouse lighting, requiring a minimal investment by the grower. The researcher programmed an Arduino to ensure operation of the growing lights until the daily light integral (DLI) was met. The device's light sensor was placed under fluorescent growing lights on a growing rack in place of the crop. A lux data logger was placed beside the light sensor for data collection. The Arduino powers a motor which changes the lighting once the daily lighting goal is met. For testing, the light was run for an hour to simulate sunlight on a cloudy day entering a greenhouse. After the light was turned off manually, the light was operated by the device and ran until 3 mol·m-2·d-1 was reached. These tests lasted 13 hours, each on a different day. The device was then programmed to control lighting indefinitely, with the unit comparing the DLI once sunset begins. Tests ran over two complete daylight cycles, with both meeting the DLI goal. This provides growers an inexpensive way to optimize greenhouse lighting through an accessory device without replacing existing equipment.