International Journal of Enhanced Research in Science, Technology & Engineering
ISSN: 2319-7463, Vol. 11 Issue 3, March-2022, Impact Factor: 7.957

A Review on Automatic Led Lighting System for Plants

Aiswarya Suresh[1], Anjali J[2], Aswathy J[3], Devika Krishnan[4], Lekshmi P Govind[5]

[1,2,3,4]U.G. Student, Department of Electronics & Communication Engineering, UKF College of Engineering & Technology, Kollam, Kerala, India
[5]Assistant Professor, Department of Electronics & Communication Engineering, UKF College of Engineering & Technology, Kollam, Kerala, India

ABSTRACT

Light emitting diode (LED) technology is paving the way to increase crop production efficiency with electric lamps. Nowadays agricultural sector is facing challenges to ensuring food security. According to the study, within the agricultural sector, 42% of assessed loses were to crops with flood being the main culprit, responsible for 60% of crop damages, followed by storms (23% of crop damages). In 2021, extreme weather events wrought yet another distressing year of Indian farmers. Cyclone Yaas wreaked havoc in several states in the first few months, especially in Odisha, West Bengal and Karnataka were lives and livelihoods were affected beyond redemption. In July, floods in Maharashtra damaged standing crops. This was followed by a 24% nationwide rain deficit in August and 35% excess rain in September. In October, heavy rains destroyed harvest-ready crops in many districts of Kerala. The devastation continued even towards the end of the year. In November, unprecedented rainfall causes huge loss of life and property in South Indian states of Andhra Pradesh, Tamil Nadu, Kerala and Karnataka.

Keywords: Light Emitting Diode, Sensors

INTRODUCTION

Climate variation is the main limitation for outdoor planning. Agricultural sector is mostly affected during flood. Water fogging in the cropping area is the foremost adverse effect of flood on agriculture. Diminishing amount of farmable land also affect it. Indoor planting with LED lighting helps to overcome it. This is an automatic LED lighting system used in plant factories. Through this, automatic dimming can be achieved. According to the properties of the plant, both color and light intensity can be adjusted. External natural light source can be automatically detected. In addition to this RHT03 Sensor is also used to sense temperature and humidity.
This paper is organized as follows. Section II describes the literature survey for the paper. Finally, section III presents the conclusion.

LITERATURE REVIEW

B. Heffernan (2007) proposed LED replacement for fluorescent tube lighting which describes the LED efficiencies that are set to exceed those fluorescent tube, with dimming and controllable color rendering readily achievable. With latest advances, efficiencies of Light Emitting Diode (LEDs) have extended to degrees drawing near the ones of fluorescent tubes and are anticipated to surpass them inside the close to destiny.

J. Carney (2015) presented LED lighting in Controlled Environment Agriculture which describes the importance of LED to improving energy utilization and production for greenhouse and controlled crop environment. The purpose of this research was to compare and characterize the performance of commercially available LED and adaptive lighting system designed specifically for greenhouse. It also demonstrates that despite higher first cost, LED technology could be the least cost lighting solution from a total life cycle cost stand point.

D. Singh (2015) proposed LEDs for energy efficient greenhouse lighting which focuses on the potential of LEDs to exchange traditional light sources within the greenhouse. Within the field of sunshine source technologies recent developments have opened new perspectives for sustainable and highly efficient light within the sort of LEDs for greenhouse lighting. Light is required for plants throughout their whole life-span from germination to flower and

seed production. Using LEDs as a lighting source, it's possible to optimize the spectral quality for various physiological processes and various plants, also to make an energy efficient and digitally control lighting system.
FengLi (2021) proposed spectral design of LED for plants photosynthesis based on quantum dots for artificial lightening plant factories are mainly used intelligent and programmable. LEDs to save energy. Luminescent spectrum of LEDs grounded on quantum dot (QD) material is designed and optimized based on the photosynthetic actions spectrum (PAS) of plants by considering both photosynthetic and visual performance. Three-band-QD-based LEDs show a highest photosynthetic action factor (PAF) of 8.088 and the highest induced photosynthetic index (IPI) of 4.012. The four band QLED shows a highest PAF of7.689 and highest IPI of3.818. The four band QLED shows improvement than those of these three bands ones, they still need to be improved to offer better visual experience for human eyes.

K. H. Lin (2013) presented Effect of red, blue and white LED on the expansion development which was to research the influence of three different qualities of sunshine on plant biomass. Plant development is strongly influenced by the sunshine quality which refer to the colour or wavelength reaching a plant's surface. Red and blue lights have the best impact on plant growth because they are the main energy sources for photosynthetic CO2 assimilation in plants.

Neermalsing Sewraj (2020) conferred tunable multiple LEDs combination spectrum for plants based on McCree PAR spectrum is developed in order to match the plant's spectrum supported the relative quantum potency (RQE) projected by McCree as reference curve. Numerous semiconductor diode spectra with completely different peak wavelength are combined into one. Three completely different semiconductor diode combinations are used. The obtained spectrum is matched with the McCree target spectrum, so that the acceptable spectrum for plant is known and it is used for the assembly of plants.

Yasmin Auchour (2020) proposed supervisory model predictive control for optimal operation of a greenhouse environment in which the system for greenhouse indoor environment controller based on MPC. This system optimally maintains artificial lighting levels, CO2 rate, indoor temperature and humidity level with acceptable limits. The objective function and the mathematical model of power generators and each energy consuming components were included.

Kankar Bhattacharya (2014) presented optimal energy management of greenhouses in smart grids" In greenhouses, artificial lighting. CO2 production, and climate control systems consume considerable energy: thus, a mathematical model of greenhouses appropriate for their optimal operation is proposed, so that it can be implemented as a supervisory control in existing greenhouse control systems. This also proposed an energy hub management system (EHMSs) in the context of smart grids to optimize the operation of their energy systems. Here the proposed model incorporates weather forecasts, electricity price information, and the end-user preferences to optimally operate existing control system in greenhouses.

Jun Jiang (2021) presented an intelligent IOT-enabled lighting system for energy-efficient crop production. An intelligent lighting instrumentation and automation system is presented with the objective of achieving high energy efficiency in greenhouse supplemental lighting based on the Internet of Things (IOT) technology. The system runs on a Raspbian operating system which interacts with wireless-enabled LED fixtures of plant growth, an online data saver, and different light sensors including RGB and quantum sensors .The communication is achieved through UART. This system can achieve a highly uniform light distribution under unpredictable natural lighting conditions while saving energy due to supplemental lighting.

K Krishna Kishore (2017) proposed Automatic plant monitoring system is employed to reinforce the performance of existing techniques or to develop and style new techniques for the expansion of plants. This system is useful for watering the plants and to watch few parameter for growth of plants. During this system a mechanism is established to seek out the moisture content within the soil with the help of a soil moisture sensor and depending upon the condition of the sensor the water is controlled. Using an Arduino interfaced camera ,it capture the image of the plants and processing the image by using image processing to research and determine the disease effected by creating the feature vector database .This system helps to water logging and a few situation like mud cracks.

CONCLUSION

Sunlight is the perfect balance of wavelengths necessary for plant growth and blooming, but plants at different growth stages have special requirements of light. Plant lighting system is required to provide the proper amount of lighting to plants. Here sunlight can be replaced with automatic LED light. It is unaffected by adverse weather condition and it is also highly energy efficient. RHT03 Sensor is also used to sense temperature and humidity.

REFERENCES

[1]. B. Heffernan, L. Frater and N. Wostan, “LED replacement for fluorescent tube lighting”, Power Engineering Conference, p. 1-6, Dec. 2007.
[2]. J. Carney, P. Venetucci, E. Gesick, “LED lighting in Controlled Environment Agriculture”, Outsourced Innovation, 2015.
[3]. D. Singh, C. Basu, M. Wollwever, B. Roth, “LEDs for energy efficient greenhouse lighting”, Renewable and Sustainable Energy reviews, 2015.
[4]. Feng Li, “Spectral Design of LED for Plants Photosynthesis Based On Quantum Dots”, in IEEE ACCESS, January 27, 2021.
[5]. K. H Lin, M. Y. Huang, M. H. Hsu, Z. W. Yang, and C. M. Yang, “The effects ofred, blue and white light emitting diodes on the growth, development, edible quality of hydroponically grown lettuce (Lactuca sativa L. var. capitata)”, Hortic., vol. 150, p. 86-91, Feb. 2013.
[6]. Neermalsing Sewraj and Laurent Canale, “Tunable multiple-LEDs combination spectrum for plants based on McCree PAR spectrum,” Aug. 2020.
[7]. A. Ouammi, Y. Achour, D. Zejli, and H. Dagdougui, “Supervisory model predictive control for optimal energy management of networked smart greenhouses integrated microgrid,” IEEE Trans.Autom. Sci. Eng., vol. 17, no. 1, pp. 117-128, Jan. 2020.
[8]. Claudio A. Canizers and Kankar Bhattacharya, “Optimal energy management of greenhouses in smart grids,” IEEE Access May 2019.
[9]. Jun Jiang and Youbin Zheng, “An intelligent IoT-enabled lighting system for energy-efficient crop production,” IEEE Access Aug 2019.
[10]. K. Krishna Kishore and M H Saikumar, “Automatic plant monitoring system,” in IEEE, 2017