UNIVERSITI TEKNOLOGI MARA

EFFECTS OF PHOTOPERIOD WITH BLUE AND RED LED ON FUNCTIONAL PROPERTIES OF *Lactuca sativa* cv. FIRE RED UNDER CONTROLLED ENVIRONMENT

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ABSTRACT

Application of Light Emitting Diode (LED) in agricultural sector has recently been studied for indoor vegetable and ornamental plants as a supplemental light source. Several studies had been carried out by researchers to explore the appropriate light spectrum for the optimum growth of specific plant species, especially the high values crops, under controlled environment. This current research work was, hence, conducted to determine the effects of narrowed wavelength of Red (R) LED and Blue (B) LED, and their combinations at 1:1, 1:2 and 2:1, at 18W and 240V, on production of *Lactuca sativa* cv. Fire Red (lettuce) in laboratory at total absence of natural light. Each LED irradiation treatment was assigned as sub plot with photoperiods (PPs) ranging from 12 h to 18 h as main plots in a split plot design to study their combined effects on the growth, pigment and ascorbic acid contents of this attractive red colour vegetable. Three different types of hydroponic solutions were used in this research work, i.e. Experiment 1: Hoagland nutrient solution, Experiment 2: compost tea prepared from compost with cocopeat as bulking agent and Experiment 3: compost tea prepared from compost with shredded coconut waste as bulking agent. According to this research work, monochromic R was not appropriate for growing this vegetable. On the other hand, monochromic B promoted the greatest plant height but resulted in the lowest leaf number. When B was combined with R in 1:1, 1:2 or 2:1 under PPs of 15 h and 18 h, the internode length, leaf area and fresh weight of this crop were enhanced in comparison to monochromic B. Such growth performance was also better as compared to the reference plant grown simultaneously in the greenhouse in each experiment mentioned above. Growth and production of *L. sativa* cv. Fire Red with Hoagland nutrient solution was better than those cultivated using organic compost tea. Chlorophyll and carotenoid contents of this red colour vegetable cultivated using Hoagland nutrient solution were not significantly affected by the different LED treatments and PPs, while PP of 12 h enhanced the accumulation of chlorophyll and carotenoid contents in this red colour vegetable cultivated with compost tea in Experiment 2 and 3 in relative to those recorded in Experiment 1. Combination of B and R under longer PP promoted the anthocyanin accumulation in all the three experiments, as compared to monochromic B, respectively. Any of the under studied PP and LED treatment, however, did not affect the ascorbic acid content of this vegetable significantly in all three experiments. It is concluded that production of this colour vegetable needs both B and R in 1:1, 1:2 or 2:1 at 15 h or 18 h PP, despite differences in nutrient solutions used for this purpose. It is, hence, hoped that this research work can contribute to the improvement of the use of LED for indoor growth of this attractive red colour lettuce.

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