SUMMARY

Red spinach (Amaranthus tricolor L.) become one of vegetable commodities that are in great proclivity by Indonesian people because of its rich nutritional content. Increase in population has caused increase in food needs, but it is obstacled by land area and fluctuating climate change. Plant factory is one system that can resolve the problem of agricultural crop production because with this system farmers do not need extensive land and controlled so that the plants inside are not affected by environmental instability. The design of a factory plant requires control, including micro environment parameters. The purpose of this study is: 1. to make model of red spinach stomata openings at factory plants with multiple analytical methods, 2. know usage of variable radiation, temperature and humidity to model accuracy.

The research was conducted at the Bio-Environmental Engineering Development and Control Laboratory (TPPBL) Jenderal Soedirman University, Purwokerto in December 2018 to March 2019. The tools used in this study included factory plants, luxmeter, infrared thermometers, digital thermometers, styrofoam, net pots, growlight red and blue LED lights, preparations, microscopes, stationery and laptops. The materials used in this study were red spinach seeds, AB mix, rockwool, and water fertilizer. The measurement variables taken during the study were the upper and lower leaves, temperature and humidity of the factory plant rack, the intensity of light up and down the leaves and the width of the stomata openings. The relationship of the variables of upper and lower leaf intensity, upper and lower temperatures of leaves, and humidity were analysed by multiple regression analysis. While the LAI calculation uses the radiation approach.

The model results show that the addition of the humidity variable increases the value of the relationship (R^2). The blue light model results at 7.00 a.m. Y = 0.11444h - 0.41077T + 0.10895i + 2.50416, the red-light Y = -0.11255h + 0.14093T -1.32592i + 18.51781. Blue light at 12.00 a.m. Y = -0.02153h - 0.335440T-0.27059i + 17.89457, red light Y = 0.14612h + 0.38009T + 0.34390i - 21.41549. Blue light at 9.00 p.m. Y = 0.00238h -0.51710T -0,12582i + 17,12692, red light Y = -0,41283h + 2,16057T -7,23594i + 33,68257. In general, use of blue light is better than red light.

RINGKASAN

Tanaman bayam merah (*Amaranthus tricolor L.*) menjadi salah satu komoditas sayuran yang banyak diminati masyarakat Indonesia karena kaya kandungan gizinya. Peningkatan jumlah penduduk telah menyebabkan peningkatan kebutuhan bahan pangan, namun terkendala luas lahan dan perubahan iklim yang fluktuatif. *Plant factory* merupakan salah satu sistem yang dapat mengatasi masalah produksi tanaman pertanian karena dengan sistem ini tidak perlu lahan yang luas dan bersifat terkontrol sehingga tanaman di dalam tidak terpengaruh ketidakstabilan lingkungan di alam. Perancangan *plant factory* membutuhkan pengendalian dalam banyak hal, diantaranya parameter lingkungan mikro. Tujuan dari penelitian ini adalah 1. membuat pemodelan bukaan stomata tanaman bayam merah pada *plant factory* dengan metode analisi berganda, 2. mengetahui penggunaan variabel radiasi, suhu, dan kelembapan terhadap akurasi model.

Penelitian dilakukan di Laboratorium Teknik Pengembangan dan Pengendalian Bio-Lingkungan (TPPBL) Universitas Jenderal Soedirman, Purwokerto. Penelitian dilaksanakan pada Desember 2018 sampai Maret 2019. Alat yang digunakan dalam penelitian ini meliputi *plant factory*, luxmeter, termometer *infrared*, termometer digital, *styrofoam*, *net pot*, lampu *growlight* LED merah dan LED biru, preparat, mikroskop, alat tulis dan laptop. Bahan yang digunakan dalam penelitian ini adalah benih bayam merah, pupuk AB mix, *rockwool,* dan air. Variabel pengukuran yang diambil selama penelitian yaitu suhu atas dan bawah daun, suhu dan kelembapan rak *plant factory*, intensitas cahaya atas dan bawah daun dan lebar bukaan stomata. Hubungan variabel intensitas cahaya atas dan bawah daun, suhu atas dan bawah daun, dan kelembapan dianalisis dengan metode analisis regresi berganda. Sedangkan perhitungan LAI menggunakan pendekatan radiasi.

Hasil pemodelan menunjukkan bahwa penambahan variabel kelembapan meningkatkan nilai besarnya hubungan (R^2). Hasil pemodelan lampu biru pukul 07.00 Y= 0,11444h - 0,41077T+0,10895i + 2,50416, lampu merah Y= -0,11255h + 0,14093T -1,32592i + 18,51781. Lampu biru pukul 12.00 Y= -0,02153h -0,35440T-0,27059i+17,89457, lampu merah Y= 0,14612h + 0,38009T + 0,34390i -21,41549. Lampu biru pukul 19.00 Y= 0,00238h -0,51710T -0,12582i + 17,12692, lampu merah Y=-0,41283h + 2,16057T -7,23594i + 33,68257. Secara umum penggunaan lampu biru lebih baik dibandingkan lampu merah.