

**REKAYASA LINGKUNGAN TERMAL LARUTAN NUTRISI PADA
BUDIDAYA TANAMAN TOMAT SECARA HIDROPONIK**
(Design of Thermal Environment of Nutrition Solution for Tomato
Plants Cultivated in Hydroponic)

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ABSTRAK

Zone cooling diterapkan untuk mendinginkan suhu pada daerah perakaran pada tanaman tomat yang dibudidayakan secara hidroponik. Percobaan dilakukan dengan tiga perlakuan, yaitu pendinginan larutan nutrisi siang malam, pendinginan malam dan tanpa pendinginan. Pengamatan dilakukan terhadap pertumbuhan tanaman tomat dan kualitas buah tomat yang dihasilkan serta perubahan suhu larutan nutrisi harian selama pertumbuhan tanaman. Pada penelitian ini dilakukan juga analisis pindah panas pada pendinginan siang malam larutan nutrisi. Disamping itu dikembangkan juga sistem monitoring lingkungan mikro dengan menggunakan *field server* (FS) untuk menentukan kebutuhan air dan nutrisi. Hasil pengamatan menunjukkan bahwa perlakuan pendinginan siang malam menunjukkan pertumbuhan tanaman yang relatif lebih cepat, dan buah tomat yang dihasilkan mempunyai kadar gula relatif lebih tinggi dibanding perlakuan yang lain. Analisis keseimbangan termal dan pindah panas terhadap model yang dikembangkan diselesaikan dengan metode numerik beda hingga Euler (*finite difference method*). Hasil validasi model diperoleh nilai koefisien determinasi pada tangki larutan nutrisi sebesar 0.748 dan pada bedeng tanaman sebesar 0.733. Dengan menggunakan IP Public pada monitoring dengan *field server*, parameter radiasi matahari, suhu udara dan kelembaban relatif dan kondisi tanaman bisa diketahui dan diakses secara online dengan jaringan internet.

Kata kunci : Pendinginan siang malam, *zone cooling*, larutan nutrisi, hidroponik, tomat.

ABSTRACT

Zone cooling was applied to reduce the temperature in the root zone of tomato plants cultivated in hidroponic. The experiment was carried out into three different treatments, namely day night cooling, night cooling and without cooling. Observation was carried out for the growth of tomato plant, the quality of tomato fruits, and the changes in suhue of nutrition solution daily during the plant growth. In this study, a heat transfer of nutrition solution during day night cooling was also analyzed. It was also demonstrated the monitoring system of micro environment using field server to monitor the water and nutrition requirement of tomato plant. The results showed that for day night cooling treatment, the growth rate of tomato plant as well as the total soluble solid of tomato fruits was better than that other treatments. For the development of heat transfer model, the analysis of thermal equilibrium and heat transfer were solved by Euler finite different method. The validation of the model resulted that the value of coefficient of determination for nutrition solution in tank and plant shed were 0.733 and 0.748. It was demonstrated that by using IP public on the field server, the changes in value of of solar radiation, ambient temperature, RH as well as tomato plant condition was able to be monitored and accesed through internet network.

Keywords : Day night cooling, zone cooling, nutrient solution, hydroponics, tomato.