

RINGKASAN

RANCANG BANGUN SISTEM PENGENDALI EC DAN PH AIR PADA TANAMAN HIDROPONIK BERBASIS IOT

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Melon (*Cucumis melo* L.) merupakan salah satu jenis buah yang termasuk dalam famili Cucurbitaceae atau suku labu-labuan. Buah ini dikenal kaya akan kandungan air, vitamin, dan mineral yang bermanfaat bagi kesehatan. Tanaman melon idealnya tumbuh pada ketinggian 300–900 meter di atas permukaan laut, dengan suhu optimal berkisar antara 25°C–30°C dan kelembapan udara 50%–70%. Pertumbuhan tanaman melon sangat bergantung pada kesesuaian kondisi lingkungan serta kecukupan nutrisi yang diberikan. Selain suhu dan kelembapan, parameter penting lain dalam budidaya melon secara hidroponik meliputi kadar pH dan konsentrasi nutrisi terlarut dalam air.

Penelitian ini dilakukan dengan merancang sistem pengendali EC (Electrical Conductivity) dan pH air secara otomatis menggunakan mikrokontroler ESP32 berbasis Internet of Things (IoT). Pengukuran kadar nutrisi dilakukan menggunakan sensor EC DFR0300, sedangkan kadar pH diukur menggunakan sensor pH SEN0161. Penyesuaian nutrisi dan proses penyiraman dilakukan dengan bantuan pompa yang dikendalikan oleh mikrokontroler ESP 32.

Berdasarkan hasil pengujian, sensor EC DFR0300 memiliki galat sebesar 1,51% pada larutan standar 1,413 mS/cm dan 4,57% pada larutan 12,88 mS/cm. Sementara itu, sensor pH SEN0161 menunjukkan galat sebesar 5,11% pada larutan buffer pH 4,01, 3,35% pada buffer pH 8,68, dan 2,29% pada buffer pH 9,18. Sistem yang dirancang berhasil melakukan penyiraman otomatis pada pukul 08.15 dan 10.15 WIB. Sebelum penyiraman dilakukan, sistem akan menyesuaikan terlebih dahulu kadar nutrisi dan pH air sesuai dengan kebutuhan tanaman. Selain berfungsi secara otomatis, sistem ini juga dapat dioperasikan secara manual melalui *dashboard* aplikasi Blynk. *Dashboard* Blynk menampilkan pembacaan sensor EC dan pH, serta menyediakan tombol pengaturan mode otomatis/manual, kontrol pompa penyiraman, pompa pH up, pompa pH down, dan pompa nutrisi.

Kata kunci : *EC*, *pH*, Hidroponik, Melon, *IoT*

SUMMARY

DESIGN OF IOT-BASED EC AND PH WATER CONTROL SYSTEMS FOR HYDROPONIC PLANTS

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Melon (*Cucumis melo* L.) is a type of fruit that belongs to the Cucurbitaceae family, commonly known as the gourd or squash family. This fruit is known for its high content of water, vitamins, and minerals that are beneficial to health. Melon plants ideally grow at an altitude of 300–900 meters above sea level, with optimal temperatures ranging from 25°C to 30°C and air humidity between 50% and 70%. The growth of melon plants greatly depends on suitable environmental conditions and adequate nutrient supply. In addition to temperature and humidity, other important parameters in hydroponic melon cultivation include the pH level and the concentration of dissolved nutrients in the water.

This study was conducted by designing an automatic control system for water EC (Electrical Conductivity) and pH using an ESP32 microcontroller based on the Internet of Things (IoT). Nutrient concentration was measured using the EC sensor DFR0300, while the pH level was measured using the pH sensor SEN0161. Nutrient adjustment and irrigation processes were carried out using pumps controlled by the ESP32 microcontroller.

Based on the test results, the EC sensor DFR0300 showed an error rate of 1,51% in a standard solution of 1,413 mS/cm and 4,57% in a solution of 12,88 mS/cm. Meanwhile, the pH sensor SEN0161 had an error rate of 5,11% in buffer solution pH 4,01, 3,35% in buffer pH 8,68, and 2.29% in buffer pH 9,18. The system successfully performed automatic irrigation at 08:15 and 10:15 AM (WIB). Before irrigation, the system first adjusted the nutrient concentration and water pH to meet the plants' requirements. In addition to automatic operation, the system can also be manually controlled via the Blynk application dashboard. The Blynk dashboard displays real-time readings from the EC and pH sensors, and provides buttons to switch between automatic and manual modes, as well as to control the irrigation pump, pH up pump, pH down pump, and nutrient pump.

Keywords : EC, pH, Hydroponic, Melon, IoT