IMPACTO DE LA AUTOMATIZACIÓN EN EL CRECIMIENTO Y OPTIMIZACIÓN DE RECURSOS EN CULTIVOS HIDROPÓNICOS DE CANNABIS

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RESUMEN

Este estudio evaluó el impacto de la automatización en el crecimiento y optimización de recursos en cultivos hidropónicos de cannabis. El proyecto se llevó a cabo en colaboración con la empresa Healthgrowers, ubicada en Santo Tomás, Atlántico, y se centró en comparar un sistema hidropónico automatizado con un sistema hidropónico manual.

El estudio se dividió en tres objetivos específicos:

1. Diseñar un protocolo de cultivo hidropónico de cannabis soportado en el monitoreo y control de parámetros nutricionales que maximice el tamaño de la flor de cannabis y optimice la utilización de recursos.

2. Implementar un prototipo de automatización en laboratorio y ambiente relevante, que controle pH y riego, monitoree electroconductividad y temperatura, para mejorar el crecimiento y optimización de recursos en cultivos hidropónicos de cannabis.

3. Realizar un estudio comparativo en un entorno real para evaluar el impacto de la automatización en el crecimiento de las plantas y en la eficiencia del uso de recursos, comparándolo con un sistema no automatizado.

Los resultados mostraron que no hubo una diferencia estadísticamente significativa en el crecimiento de las plantas entre el sistema automatizado y el sistema manual. Sin embargo, la automatización mejoró significativamente la eficiencia operativa, reduciendo el tiempo necesario para el mantenimiento diario del cultivo en un 50%. El sistema automatizado también mostró una distribución más uniforme y eficiente del agua, aunque ambos sistemas utilizaron la misma cantidad de agua en términos absolutos.

Durante la etapa final del experimento, un brote de Botritis afectó el invernadero, destacando la importancia de controlar no solo las variables de alimentación, sino también las condiciones ambientales. Las plantas en el sistema automatizado fueron menos afectadas, sugiriendo que una mejor alimentación hace a las plantas más resistentes a plagas y hongos.

Las principales limitaciones del estudio incluyeron el tamaño de la muestra y la elección del sistema de riego por goteo sin recirculación debido a restricciones económicas. Futuros estudios deberían considerar investigar la automatización de otras variables críticas y utilizar tamaños de muestra más grandes para ofrecer una visión más completa de los beneficios de la automatización en la hidroponía.

En conclusión, la automatización en cultivos hidropónicos de cannabis optimiza significativamente el uso de recursos humanos y mejora la gestión del cultivo, aunque no muestra una diferencia significativa en el crecimiento de las plantas en comparación con los sistemas no automatizados en el corto plazo. La integración de tecnología automatizada proporciona una ventaja competitiva en la producción de cannabis, especialmente en términos de eficiencia operativa y resiliencia a enfermedades, contribuyendo a prácticas agrícolas más sostenibles y eficientes.

Palabras clave: Automatización, Hidroponía, Optimización de recursos, Cannabis

ABSTRACT

This study evaluated the impact of automation on the growth and resource optimization in hydroponic cannabis cultivation. The project was conducted in collaboration with the company Healthgrowers, located in Santo Tomás, Atlántico, and focused on comparing an automated hydroponic system with a manual hydroponic system.

The study was divided into three specific objectives:

1. Design a hydroponic cannabis cultivation protocol supported by the monitoring and control of nutritional parameters to maximize the size of the cannabis flower and optimize resource use.

2. Implement a laboratory and relevant environment prototype of automation that controls pH and irrigation, monitors conductivity and temperature, to improve growth and resource optimization in hydroponic cannabis cultivation.

3. Conduct a comparative study in a real environment to evaluate the impact of automation on plant growth and resource use efficiency, comparing it with a non-automated system.

The results showed no statistically significant difference in plant growth between the automated system and the manual system. However, automation significantly improved operational efficiency, reducing the time needed for daily crop maintenance by 50%. The automated system also demonstrated a more uniform and efficient water distribution, although both systems used the same amount of water in absolute terms.

During the final stage of the experiment, a Botrytis outbreak affected the greenhouse, highlighting the importance of controlling not only feeding variables but also environmental conditions. The plants in the automated system were less affected, suggesting that better nutrition makes plants more resistant to pests and fungi.

The main limitations of the study included the sample size and the choice of a non-recirculating drip irrigation system due to economic constraints. Future studies should consider investigating the automation of other critical variables and using larger sample sizes to provide a more comprehensive view of the benefits of automation in hydroponics.

In conclusion, automation in hydroponic cannabis cultivation significantly optimizes the use of human resources and improves crop management, although it does not show a significant difference in plant growth compared to non-automated systems in the short term. The integration of automated technology provides a competitive advantage in cannabis production, especially in terms of operational efficiency and disease resilience, contributing to more sustainable and efficient agricultural practices.

Key Words: Automation, Hydroponics, Resource optimization, Cannabis

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