Design and Development of an Integrated Hydroponic Plant Seedling System
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ABSTRACT

Hydroponics is a method of farming without soil that uses nutrient solutions to grow plants. This technology has become a popular alternative in various parts of the world due to its efficiency in water and space usage. One crucial stage in hydroponics is seed germination, which is the initial process in the plant growth cycle. Good germination ensures that seeds grow into strong and healthy seedlings, which can then be transplanted into the hydroponic system with a high success rate. The design of the seed germination system in this research aims to create a system that can automatically perform germination with programmed timing and watering. The research results show that automatic germination has a faster growth cycle compared to manual germination. From the testing of water spinach, lettuce, and pak choi, the automatic method yielded average growth heights of 8.5 cm for water spinach, 3.6 cm for lettuce, and 4.2 cm for pak choi. These growth results in the germination box were twice as fast as manual germination, with average growth heights of 4.2 cm for water spinach, 1.1 cm for lettuce, and 2.2 cm for pak choi. However, automatic germination must consider the balance of water and light received by the seeds.

Keywords: *Hydroponics, Automatic seedling system, Seed germination*