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Earth\_Environ.\_Sci.\_1059\_01201  
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**Submission date:** 14-Oct-2022 09:09AM (UTC+0800)

**Submission ID:** 1924796286

**File name:** Awalina\_2022\_IOP\_Conf.\_Ser.\_Earth\_Environ.\_Sci.\_1059\_012014.pdf (487.33K)

**Word count:** 2175

**Character count:** 10965

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To cite this article: R Awalina *et al* 2022 *IOP Conf. Ser.: Earth Environ. Sci.* **1059** 012014

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## Lettuce (*Lactuca sativa* L) Growth in Aeroponic Systems with Differences in Nutritional Time

Awalina R<sup>1</sup>, Erona M<sup>1</sup>, Rusnam<sup>1</sup>

<sup>1</sup> Department of Agricultural Engineering and Biosystems, Andalas University

Corresponding author's email address: rahmiawalina@ae.unand.ac.id

**Abstract.** Lettuce is one of the vegetables that are often found and consumed by the people of Indonesia, but the demand for lettuce is always not fulfilled because the low production. Aeroponic system is one of the alternatives to solve this problem, because the aeroponic system has many advantages and does not require a large area of land. The purpose of this study was to observe differences in the timing of nutrition in lettuce plants with an aeroponic system. The study used a randomized block design (RBD) with a single factor, consisting of 6 treatments with 5 replications, so there were 60 experimental units. [t1= 30 seconds (on) : 10 minutes (off)]; [t2= 30 seconds (on) : 15 minutes (off)]; [t3= 30 seconds (on) : 20 minutes (off)]; [t4= 30 seconds (on) : 25 minutes (off)]; [t5= 30 seconds (on) : 30 minutes (off)]; [t6= (Non-Stop)]. The results showed that the difference in time of giving nutrition to lettuce in the aeroponic system affected the growth of lettuce and resulted in differences in plant height, number of leaves, stem diameter, leaf area and fresh weight for each lettuce plant. Treatment t6 (continuous nutrition / Non Stop) was known to be the optimum treatment which produced lettuce with a fresh weight of 207.5 g.

**Keywords:** aeroponics; time difference, nutrition, lettuce

### 1. Introduction

The agricultural sector is one of the businesses for the community which is growing in line with the increasing demand for food sources. The existence of technological developments in the current agricultural system provides many conveniences in farming, even farming without using soil media such as an aeroponic system.

Aeroponics is a cultivation method by empowering the air to increase the productivity of agricultural land. One of the advantages of aeroponics is the oxygenation of each fine mist of nutrient solution so that root respiration is smooth and produces a lot of energy. Aeroponics is a method of growing crops with air media. Aeroponics comes from the word *aero* which means air and *ponos* which means power. This method is very appropriate for plant cultivation in a place with limited land. Aeroponics system in principle with the roots hanging in the air and nutrients are given in the form of mist to the root area according to the needs of the plant. Some of the advantages obtained from the aeroponic method include: ease of harvesting, controllable nutrition, shorter harvest time, efficiency in land use and sufficient oxygen levels in the nutrient solution so that it is very beneficial for plants and produces a lot of energy [1].

The use of an aeroponic system has special advantages, namely the combination of nutrient solution can be circulated in the form of mist on plant roots and the volume of nutrient solution required is lower. However, the drawback of this system is that the investment cost is quite expensive. Aeroponics methods can be used to grow various types of vegetables. One of them is lettuce (*Lactuca sativa*). Lettuce can



live in the lowlands and highlands at an altitude of 5-2000 mdpl with a soil pH of 5.6-6.5. Good humidity for lettuce growth is between 65% to 78% while the ideal temperature is at 25° to 28°C [2].

Lettuce is one type of vegetable plant whose leaves are consumed. The prospect of market absorption of lettuce commodities will continue to increase in line with the increase in population, increase in public education, increase in income and community welfare, and increase in people's preference for lettuce. In addition, many food businesses use lettuce as a complementary material to the type of food being marketed. During the planting period, plants need nutrients. The nutrients provided are in the form of water mixed with macro and micro nutrients. Macro nutrients are nutrients needed in large quantities, consisting of C, H, O, N, P, K, Ca, Mg and S, while micro nutrients are nutrients needed in small quantities but still affect plant growth. . The nutrients of this type are Mn, Cu, Fe, Mo, Zn and B [3].

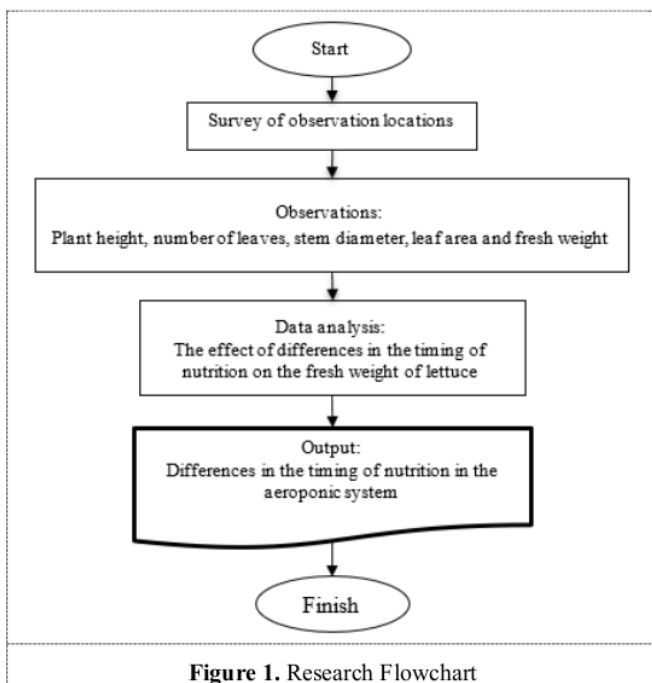
To make it easier for aeroponic farmers to supply plant nutrients, a timer system is used which is connected to a sprayer. The sprayer will supply plant nutrients according to the specified time. However, the provision of nutrition with this system still has several shortcomings, namely, plant growth is not perfect due to uneven nutrition.

The aeroponic system for increasing lettuce production can be done by giving the time of giving nutrients by misting the plant root area. Spraying nutrients for 30 seconds and the time off for 15 minutes can supply nutrients to the plant root area, resulting in significant growth every day with an average plant height of 2 mm and a leaf length of 1 mm [4]. The purpose of this study was to observe differences in the timing of nutrition in lettuce plants with an aeroponic system.

## 2. Materials and Methods

This research was carried out in one of the lands located at Street Koto Kaciak, RT 04 RW 10, Mata Air Village, Padang City. The main materials needed in this research are lettuce, nutrients and the tool used is a ruler to measure the growth of lettuce. Research data collection was carried out for 60 days, starting from July 1 to August 31, 2021. Data collection was carried out through direct observations in the field. The study used a single factor Randomized Block Design (RAK), consisting of 6 treatments with 5 replications, so there were 60 experimental units. [t1= 30 seconds (on): 10 minutes (off)]; [t2= 30 seconds (on) : 15 minutes (off)]; [t3= 30 seconds (on) : 20 minutes (off)]; [t4= 30 seconds (on) : 25 minutes (off)]; [t5= 30 seconds (on) : 30 minutes (off)]; [t6= (Non-Stop)].

The stages of the research carried out can be seen in Figure 1.



### 3. Results and Discussions

The results showed that the difference in time of giving nutrition to lettuce in the aeroponic system affected the growth of lettuce and resulted in differences in plant height, number of leaves, stem diameter, leaf area and fresh weight for each lettuce plant as shown in table 1.

**Table 1.** The mean value of productive tillers in the observation area

Treatment	Age 45 Days After Planting (DAT)				
	Plant Height (cm)	Number of Leaves (pieces)	Rod Diameter (mm)	Leaf Area (cm <sup>2</sup> )	Fresh Weight (g)
t1	17.05 b	7.33 b	6.34 b	91.55 b	84 b
t2	17.35 b	7.45 b	6.57 b	105.18 b	92.5 b
t3	18.15 b	7.56 b	7.37 b	122.62 b	105.4 b
t4	18.25 b	8.23 b	7.42 b	122.74 b	122.7 b
t5	18.55 b	8.35 b	8.56 b	122.96 b	125.5 b
t6	31.10 a	16.27 a	14.25 a	187.45 a	207.5 a

Note: The average value marked with the same letter in each of the same column shows a significant difference in DMRT 5%.

Table 1 showed that the difference in the time of giving nutrition gave a significantly different effect on the average height of green lettuce plants aged 45 days in the Aeroponics system. The provision of nutrition that was carried out continuously (non-stop) was able to produce the highest lettuce plant, which was 31.10 cm and was significantly different from other treatments. If the plant's nutritional needs are met adequately, the plant can grow well [5].

The difference in the time of giving nutrition gave a significantly different effect on the average number of lettuce leaves aged 45 sickles in the Aeroponics system. The t6 treatment was able to give the highest number of leaves, which was 16.27 sheets and was significantly different from other treatments. Provision of appropriate nutrition will accelerate the rate of leaf growth, because the plant's need for adequate nutrients plays a major role in the vegetative phase [6].

The difference in the timing of nutrition also gave a significantly different effect on the average diameter of lettuce stems aged 45 days after planting in the Aeroponics system. T6 treatment was able to give the highest stem diameter of 14.25 mm, significantly different from other treatments. Available and appropriate nutrients will provide optimal growth results in hydroponic growth of red lettuce stems [7].

The results of the data analysis showed that the difference in the time of giving different nutrients gave a significantly different effect on the average leaf area of lettuce aged 45 days in the Aeroponics system. T6 treatment was able to give the highest leaf area of 187.45 cm<sup>2</sup>, significantly different from other treatments. Leaf area is influenced by the number and size of leaves, the more the number of leaves and the wider the size, the larger the leaf area.

The difference in the time of giving different nutrients gave a significantly different effect on the average fresh weight of lettuce plants in the aeroponic system. T6 treatment was able to give the highest fresh weight of 207.5 g, significantly different from other treatments. The increase in plant fresh weight is directly proportional to the increase in growth components including plant height, number of leaves, stem diameter and leaf area.

#### 4. Conclusion

Based on the results of the study, it can be concluded as follows: provision of nutrients with different time differences in the aeroponic system gave different effects on the average plant height, number of leaves, stem diameter, leaf area and fresh weight of lettuce plantations. Then, treatment t6 (continuous / non-stop nutrition) was the optimum treatment which produced lettuce with the highest fresh weight of 207.5 g.

#### Acknowledgments

The authors would like to thank LPPM Andalas University as a source of research funding through Research for Beginner Lecturers in 2021, Contract Number: T/55/UN.16.17/PT.01.03/Pangan - RDP/2021.

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