

Effect of Organic and Chemical Fertilizer Applications on Yield And Chlorophyll Content of Yedikule Lettuce (*Lactuca Sativa L.*) Plant

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Abstract

This study was conducted in Erciyes University Agricultural Research and Application Land in 2020 to determine the effects of organic and chemical fertilizers applied from the base to the Yedikule lettuce plant on plant yield and plant chlorophyll content. In the study, solid worm manure (100 kg da⁻¹) was preferred as organic fertilizer, while 15 - 15 - 15 compound bottom fertilizer was preferred as chemical fertilizer. Seedlings of lettuce plants were planted with 16 plants in each plot, with a row spacing of 25 cm and a spacing of 50 cm between rows. In the study, the chlorophyll content of plant leaves (SPAD) was examined, as well as the yield parameters of plant height (cm), plant width (cm) and plant fresh weight (g/plant). As a result of the examination, it was determined that chemical fertilizer application had a positive effect on the fresh weight of the plant, and organic fertilizer application had a positive effect on the chlorophyll content.

Keywords: Organic fertilizer, Chemical fertilizer, *Lactuca Sativa*, Chlorophyll, Yield

Introduction

Lettuce (*Lactuca Sativa L.*) is one of the vegetables widely grown in our country and around the world. Lettuce, whose production history dates back to ancient times, is offered fresh for public consumption in markets and markets all year round (1). However, the increasing population causes a food crisis. It is stated that in order to prevent this negative situation from affecting people, it is necessary to grow more productive and better quality products per unit area when agricultural production is carried out (2). If inorganic fertilizer is applied for a long time to increase the productivity of the lettuce plant, soil fertility will decrease in the future (3). When the soil requirements of the lettuce plant are examined, it is known that it is suitable to grow it in soils that are slightly sandy in texture, have a soil reaction between 5.5 and 7, and are rich in organic

matter (4). However, when the organic matter amounts of arable lands in our country are examined.

it is seen that they are generally insufficient. It is known that applying organic supplements to such soils is a common method to increase soil fertility (5). It is known that soils with low organic matter

levels will have low fertility and productivity. It is known that the use of organic fertilizers available from plant and animal sources positively affects the microbial biomass and activity in the soil and the amount of soil organic matter (6). Organic matter has an effect on the physical, chemical and biological properties of soils (7). In addition to the positive effects of organic fertilizers on plant development, which are beneficial in increasing the amount of organic matter, they also provide an environment richer in nutrients for the plants to be grown later. It is known that these environmentally friendly fertilizers are increasing day by day in the world and

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in our country in terms of the continuity and protection of the ecosystem (8,9,10,11,). It is known that vermicompost, one of the organic fertilizers, provides significant increases in the growth and development of plants even when applied in small amounts per unit area, and these increases can be used effectively in both floriculture and gardening (12). Compost or vermicompost obtained from worms has important properties such as facilitating the intake of macro and micronutrients that plants need during their development, having a porous structure, good ventilation, high water retention capacity and microbial effect (13,14,15,). This study aims to make our country's soil more sustainable by reducing the chemical fertilizer applications used in lettuce cultivation and increasing the amount of organic fertilizer, as well as to produce more productivity and higher quality products per unit area, as worm manure has many benefits in plant cultivation and soil properties.

Material and Method

This study was carried out in the trial land of Erciyes University Agricultural Research and Application Center in the summer season of 2020. Lettuce seedlings were transplanted into the field on 10.06.2020. Seedlings were planted in a way that the distance between rows was 25 cm and the distance between rows was 50 cm. The study was carried out on 3 parcels in total, with 9 plants in each parcel. Plot control, worm manure and chemical fertilizer applications were carried out. The application amounts were 50 kg da⁻¹ of solid worm manure, 15 - 15 - 15 NPK compound fertilizer was applied 40 kg per decare as chemical fertilizer. The effects of fertilizer applications on plant weight, height, width and chlorophyll amounts in the leaves were examined in this study.

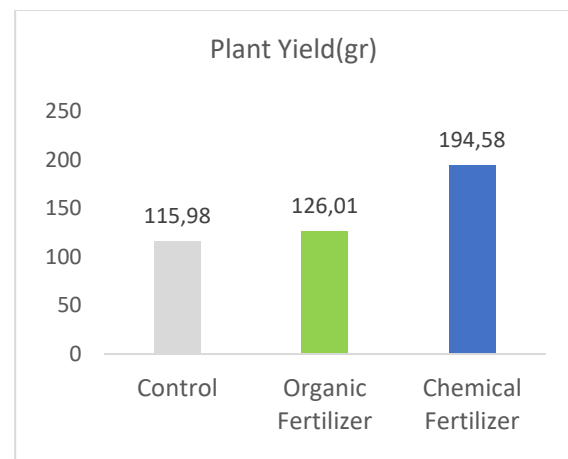
Result and Discussion

Plant Yield(g)

The effects of fertilizers applied to Yedikule lettuce plants on the fresh weight of the plants are given in Chart 1. When Chart 1 is examined, it is seen that the type of fertilizer that has the most impact on wet weight is chemical fertilizer. It was observed that the fresh weights of plants treated with chemical fertilizer increased by approximately 67.7% and 54.4% compared to the fresh weights of control and worm castings-treated plants, respectively. In addition, it was determined that the yield of plants applied with vermicompost was approximately 8.6% higher than the yield of plants in control plots. They found that although the fresh weight of lettuce plants

applied with different doses of vermicompost increased, the application of too much vermicompost also negatively affected the yield and had lower fresh weights than the control plants (16). It was determined that different doses of vermicompost and chemical fertilizer applications on lettuce plants increased the fresh weight of the plant, and when the fertilizers were compared among themselves, they obtained results similar to our study and that chemical fertilizer applications increased the fresh weight of the plant (17).

Chart 1. Average Plant Fresh Weight (gr)



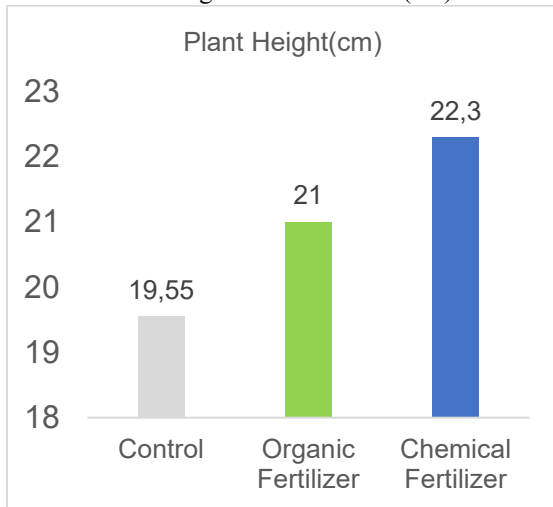
Plant Height(cm)

When the effects of different fertilizer applications on plant height are examined, it can be seen in graph 2 that the plants in the plots where chemical fertilizer was applied developed more. It was determined that the height of the plants treated with chemical fertilizer increased by approximately 14% and 6% compared to the height of the plants in the control and organic fertilizer applied plots, respectively. When the height of the plants to which organic fertilizer was applied was compared with the height of the plants in the control plots, it was determined that the plants achieved better growth by 7.4% with the application of organic fertilizer.

It was determined that there was an increase in plant height with different doses of vermicompost applied to lettuce plants, but when the plants that were applied a large amount of vermicompost were compared with the control plants, it was determined that the highest dose of vermicompost application had no effect on the height development of the plants (16). In a study investigating the effects of different doses of vermicompost applications and chemical fertilizer applications on plant height, they found

that, unlike our study, plants showed better growth in height with vermicompost fertilizer application (17).

Chart 2. Plant Height Measurements (cm)



Plant Width(cm)

The examination of plant height measurements, which is one of the plant development measurements of control, organic and chemical fertilizer applications, is given in graph 3. It has been determined that the most important fertilizer application that affects the development of plants is fertilizer with chemical content. Considering the height measurements of the plants growing in the plots where chemical fertilizer was applied and the plants in the plots where organic fertilizer was applied, it was determined that the chemical fertilizer application showed better development of the plants at approximately 38.5% and 34% rates. In addition, it was determined that the plants in the plots where organic fertilizer was applied showed better development by approximately 3.3% when compared with the plants in the control plots.

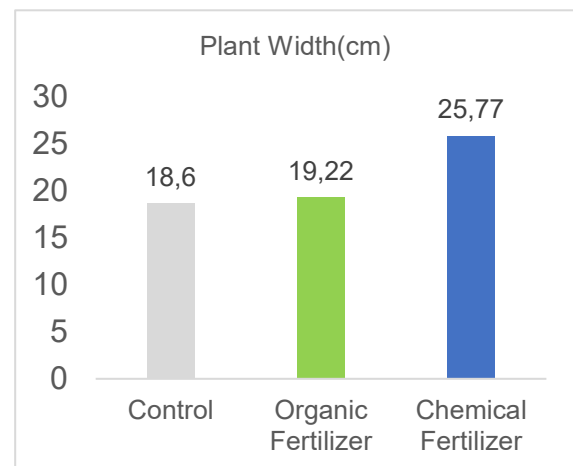
They found that the application of different doses of vermicompost on lettuce plants resulted in better diameter development of the plants compared to the control plots (16). In this study, in which they examined the effects of different doses of vermicompost and chemical fertilizers on the diameter widths of lettuce plants, they stated that, similar to our study, plants applied chemical fertilizers showed better growth than both control plants and plants treated with vermicompost (17).

Amount of Chlorophyll (SPAD)

The amount of chlorophyll contained in the leaves of lettuce plants is given in chart 4. It has been observed that organic and chemical fertilizer applications to plants have an effect on the amount of chlorophyll in the leaves. When the chlorophyll amounts in the

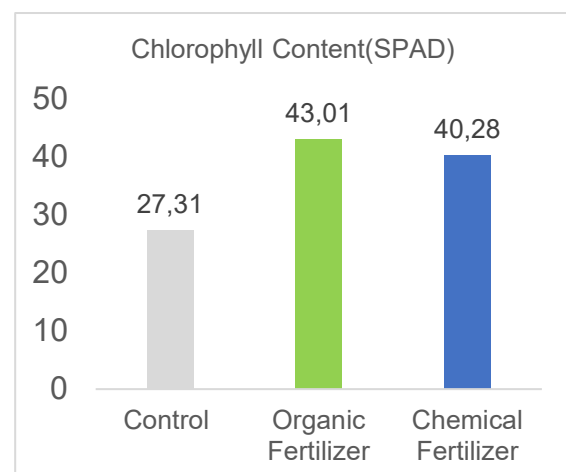
leaves of plants grown in the organic fertilizer application area and the control and chemical fertilizer application areas were compared, it was determined that the plants contained more chlorophyll in the leaves with the organic fertilizer application, at the rates of approximately 57.4% and 6.7%, respectively.

Chart 3. Plant Width Measurements (cm)



When we examined another study showing results similar to our study, when the effects of different doses of vermicompost and chemical fertilizer applications on the amount of chlorophyll in the leaves were examined, it was determined that the plants to which vermicompost was applied contained more chlorophyll than the amounts of chlorophyll found in the leaves of control plants and plants with chemical fertilizer application (17).

Chart 4. Plant Chlorophyll Content (SPAD)



Results

Recently, soil, water and environmental pollution issues have become very important. In order not to negatively affect nature, it is necessary to reduce the use of chemical fertilizers and increase the use of organic fertilizers. In our study, the effects of organic fertilizer and chemical fertilizer applications on lettuce plants were examined. According to the studies, it was determined that organic and chemical fertilizer application had positive effects on plant fresh weight, plant height, plant width and chlorophyll amounts. In addition to the fact that the fresh weight, plant height, plant width and chlorophyll amount of plants applied with organic and chemical fertilizers are higher than the control plants, the measurement parameter that organic fertilizer application has the most effect on is the number of chlorophyll in the leaves. However, since there were no dose differences in our study, another study was conducted to re-apply organic and chemical fertilizers at different doses and in different combinations, ensuring that both dose and combination selection were made correctly, and more effective results could be determined by choosing which dose and which combination to increase the yield and plant quality per unit area. will be reached.

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