

## 유효 미생물과 바이오 비료로 재배한 상추의 특성

### Characteristic of Lettuce (*Lactuca sativa* L.) Grown with Effective Microorganism and Bio-fertilizer

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#### 〈Abstract〉

The purpose of this study was to evaluate the growth of lettuce last for 36 days. Lettuce planted on the same medium with different treatment. The first treatment watering using bio-fertilizer (farmer) and second watering using effective microorganism. Lettuce grown in greenhouse with temperature 18-32°C. Characteristic observed that growth in height and weight of the plants. From the observations that can be generated at high observation, treatment 1 had a higher than treatment 2. On the last day treatment plant with treatment 1 had a 99.8 mm high while treatment 2 has height of 90.7 mm. Observation on severe treatment 1 has a heavier weight than treatment 2. Plants with treatment 1 have a weight on the last day of 0.15665 grams while in plants with treatment 2 weights are 0.11365 grams.

*Keywords : Lettuce, Effective Microorganism, Bio-Fertilizer*

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## 1. INTRODUCTION

Naturalness and healthiness are generally demanded (Lusk and Briggeman, 2009). An improvement in nutritional quality of organic foods is one of the expectations of consumers not always confirmed by science. According to Rembiakowska (2007), organic crops contain more mineral compounds and usually have better sensory and long-term storage qualities. Other studies that compared the nutritional quality of conventional and organic foods have not reported increased nutrient contents, organic acids or poly phenol compounds in organic foods (Winter and Davis, 2006). Furthermore, non-significant increases were observed in the amount of protein and some heavy metals in organic crops compared to the conventional crops. Effective microorganisms (EM) technology improves crop quality and has great potential to improve chemical and physical properties of the soil. It can improve decomposition of organic amendments and release of plant available nutrients, increase nutrient availability in the rhizosphere of plants, enhance seed germination, emergence and seedling growth, improve bio control of plant diseases and pathogens through antagonism and antibiosis, increase plant growth from microbial synthesized hormones (e.g., auxins) and growth factors, detoxify residual phytotoxic substances, and increase production of antioxidants that suppress the adverse effects of free radicals in plant metabolism (Higa, 2004; Javaid, 2006; Hu and Qi, 2013).

Bio fertilizers are produced through fermentation of the residues of biomass or manures, and are environmental friendly as well as economically feasible (Fernandes et al., 2003). This class of fertilisers is associated with a good control of insect-induced plagues (Bettiol et al., 1998). Lettuce (*Lactuca sativa* L.) is the most important salad vegetable grown in Korea. This experiment compares from spray with effective microorganism and spray with bio-fertilizer like farmer fertilizer.

## 2. Materials and Methods

### 2.1 Experimental Design

The experiment was carried out in the spring at a greenhouse, located in the Bio Industrial Mechanical System Laboratory. Plots were arranged in a completely randomized design with five replicates. Treatments consisted of spraying with effective microorganism and farmer fertilizer. Before planting, soil chemical analysis was determined according to Cottmenie et al (1982) and presented in Table 1

Table.1. Chemical properties of the used soil

	$HCO_3^-$ + $CO_3^{2-}$ (mg/kg)	Cl <sup>-</sup> (mg/kg)	$SO_4^{2-}$ (mg/kg)	Ca <sup>2+</sup> (mg/kg)	Mg <sup>2+</sup> (mg/kg)	Na <sup>+</sup> (mg/kg)	K <sup>+</sup> (mg/kg)	N (mg/kg)	P (mg/kg)
pH	7.2	204.8	317.1	438	93.1	39.1	3.7	28.9	18.7

## 2.2 Treatments and Analysis

The lettuce plants watered three days once. First plant with bio-fertilizer 40 ml can be seen in fig 1 and Magnetic hexagon water 1800 ml (treatment 1). Second plant sprayed with effective microorganism 40 ml can be seen in fig 2 and magnetic hexagon water 1800 ml (treatment 2).



Fig.1. Treatment 1 (Bio-fertilizer)



Fig.2. Treatment 2 (effective microorganism)



Fig.3. Calipers



Fig.4. Analytical Balance

Every three days, one of the plants in the box measured the length and weight of the plant. In measurement used an analytical balance and calipers (can be seen in fig 3 and 4)

## 2.3 Growing

Seeds were shown in box (0.5 m in long, 0.3 m in width, and 0.25 m in height) can be seen in fig 5 and placed on greenhouse can be seen in fig 6. The temperature in greenhouse range was 18-32°C.



Fig.5. Box for seeds



Fig.6. Greenhouse

### 3. Result and Discussion

Every three days, one of the plants in the box measured the length and weight of the plant. In Fig 7 we can see in treatment 1 and treatment 2 the average height of the plants increase. In the day-0 to day-3, treatment 1 increased more significant than treatment 2. In day-3 treatment 1 has a height of 40.9 mm while on day-3 of treatment 2 has a height of 31.2 mm. Day-21 to day-30 for the treatment 2 experienced stable growth curve as shown by the stable, while on treatment1 on day 15 until day-24 have a relatively stable growth.

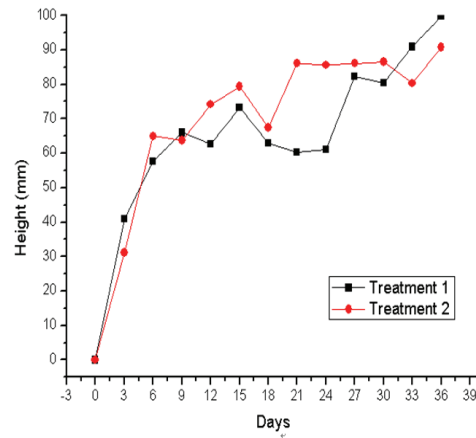


Fig.7. Height of Lettuce during watering.

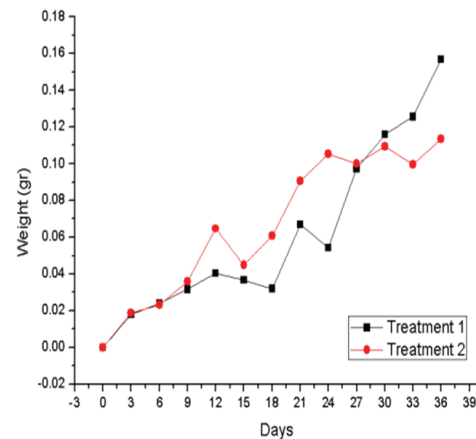


Fig.8. Weight of Lettuce during watering

On the last day, treatment 1 has a height of 99.8 mm, and

In fig 8 we can see graph of weight plant. On the measurement of weight for treatment 1 and treatment 2 has a different weight. On day-0 to day-9 growth for treatment 1 and treatment 2 a same increase. On day-12 to day-27, treatment 2 has an average heavier than treatment 1. On day-30 until last day, weight of plants for treatment 1 more heavy

than treatment 2. On the last day, treatment 1 weights 0.15665 gram and treatment 2 weights 0.11365 gram. Fig 9 and Fig 10 can be seen spread the number planted on the same media. In treatment 2 we can see plant many more grown than treatment 1. The growth of plants for treatment 1 resulted in plants that are relatively larger than treatment 2.

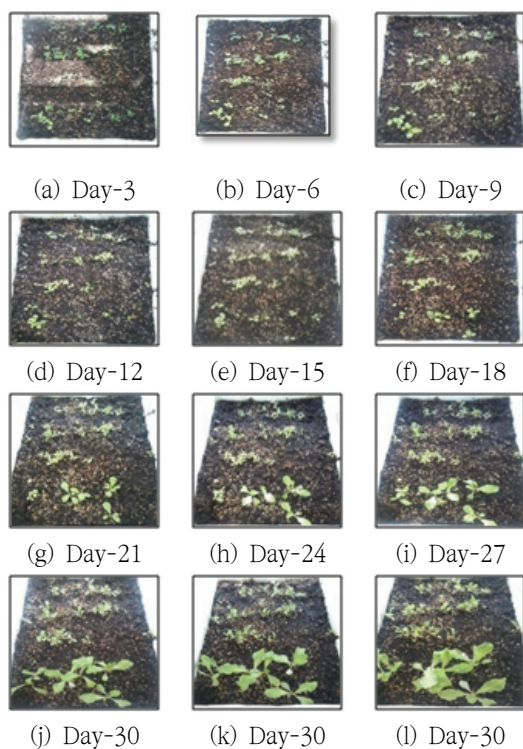


Fig.9. The appearance of lettuce (*Lactuca sativa* L.) with treatment 1

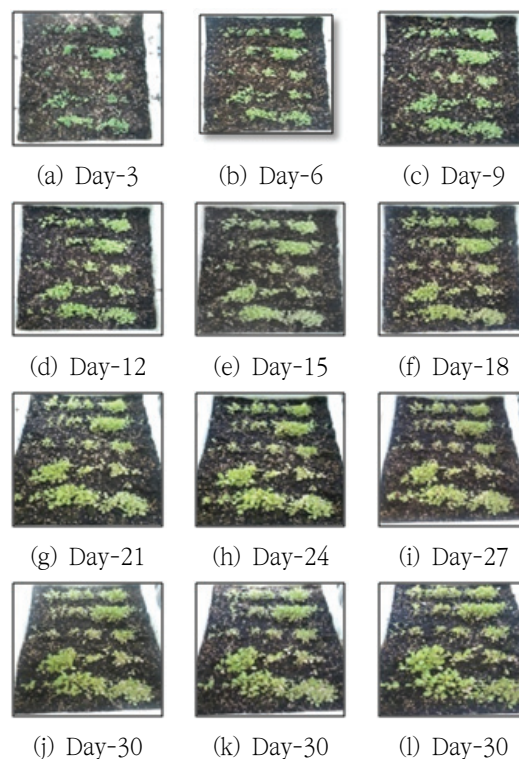


Fig.10. The appearance of lettuce (*Lactuca sativa* L.) with treatment 2

#### 4. Conclusions

The spray treatments with treatment 1 (bio-fertilizer) and treatment 2 (effective microorganism) have different results when viewed from height plants and weight a plant for 36 days. On the last day treatment plant with treatment 1 had a 99.8 mm high while treatment 2 has height of 90.7 mm. Observation on severe treatment 1 has a heavier weight than treatment 2. Plants with treatment 1 have a weight on the last day of 0.15665 grams while in plants with treatment 2 weights are 0.11365 grams. In treatment 1,

height and weight plants measurement have better results than using the treatment 2. This can be seen in higher plants in treatment 1 more height than treatment 2. On observation of weight a plants, plants watered with treatment 1 tend heavier than treatment 2.

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