

## Effect of FULZYME on Cucumber Growth in Greenhouse

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*Bacillus subtilis* and *Pseudomonas putida* have been used widely in crop production to increase crop yields. FULZYME contains both *Bacillus subtilis* and *Pseudomonas putida* and is recommended for agricultural uses. The purpose of this experiment is to investigate the effect of FULZYME on cucumber plants under greenhouse conditions.

### Material and Methods

A greenhouse experiment was conducted in Ventura, California in 2002. FULZYME containing *Bacillus subtilis* and *Pseudomonas putida* was applied as a soil treatment. The material was first diluted with water at 1 kilogram of material per 100 liters of water and then the diluted material was applied to the soil at 1 liter per 5 kilograms of soil. Randomized Complete Block design was employed with 3 treatments and 6 replications. Soils obtained from a vegetable farm were air-dried and crushed to pass a 2 mm screen. Eighteen 30 cm containers were filled with soil at 6 kilograms of soil per container. Cucumber seeds were sowed in silica sand. Twenty days after germination, the seedlings were transplanted to the pots with 2 plants per pot. The treatments included the following:

Treatment	Description
Control	No FULZYME
FULZYME 1	1 application of FULZYME
FULZYME 2	2 applications of FULZYME at 2- week interval

The first treatment of FULZYME was applied to the soil 3 days before transplanting of cucumber plants. The second treatment of FULZYME was applied to the soil 11 days after transplanting. All the plants received the same amount of fertilizers weekly.

Fifty days after transplanting, plants were cut at the soil level and weighed for fresh weight. After washing with distilled water, plants were dried in an oven at 75°C for 24 hours and the weight was recorded as dry weight.

## Results and Discussion

Plant fresh weights were shown in Table 1. Both treatments of FULZYME increased the fresh weight of cucumber plants. However, the increase on fresh weight for plants receiving only one application of FULZYME was not statistically significant.

**Table 1. Effect of FULZYME on the Fresh Weight of Cucumber Plants**

Treatment	Fresh Weight (g/plant)						
	1	2	3	4	5	6	Average*
Control	66.8	93.1	59.5	77.0	81.3	82.5	76.4 b
FULZYME 1	71.6	101.7	65.4	96.2	93.8	86.3	85.8 a b
FULZYME 2	86.1	100.4	79.6	83.4	86.7	109.8	91.0 a
*Means in a column not followed by the same letter differ significantly ( $p \leq 0.05$ ) as determined by DMRT.							

There was no difference on cucumber fresh weight between one and two applications of FULZYME.

Application of FULZYME significantly increased the dry weight of cucumber plants (Table 2). Even though the dry weight of cucumber plants that received two applications of FULZYME was higher than the plants that received one application of FULZYME, however, the increase was not statistically significant.

**Table 2. Effect of FULZYME on the Dry Weight of Cucumber Plants**

Treatment	Dry Weight (g/plant)						
	1	2	3	4	5	6	Average*
Control	9.8	13.6	8.7	11.2	11.6	12.3	11.2 b
FULZYME 1	10.5	15.5	9.8	13.9	14.1	13.2	12.8 a
FULZYME 2	12.5	15.2	11.8	12.8	13.0	16.8	13.7 a
*Means in a column not followed by the same letter differ significantly ( $p \leq 0.05$ ) as determined by DMRT.							

**Table 3. Analysis of Variance of Fresh Weights of Cucumber Plants**

Source of Variation	df	SS	MS	F
Treatment	2	629.20	314.60	5.87*
Block	5	1896.46	379.29	7.07**
Error	10	536.26	53.63	
Total	17	3061.94		

\*significant at ( $p \leq 0.05$ )  
\*\* significant at ( $p \leq 0.01$ )

**Table 4. Analysis of Variance of Dry Weight of Cucumber Plants**

Source of Variation	df	SS	MS	F
Treatment	2	19.11	9.56	9.55**
Block	5	48.17	9.64	9.63**
Error	10	10.00	1.00	
Total	17	77.29		

\* significant at ( $p \leq 0.05$ )  
\*\* significant at ( $p \leq 0.01$ )