

Effect of FULZYME on Bean 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 the growth of bean 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. Eighteen 20 cm pots were filled with soil at 1 kilogram of soil per pot. The treatments included the following:

Treatment	Description
Control	No FULZYME
FULZYME 1	1 application of FULZYME
FULZYME 2	2 applications of FULZYME: one before planting, one at 1 week after germination

The first treatment of FULZYME was applied to the soil before sowing the bean seeds. After applying the treatments, eight bush bean seeds were planted in each pot. After germination, the seedlings were thinned to 4 plants per pot. One week after germination, FULZYME was applied to pots receiving two applications of FULZYME.

All the plants received the same amount of fertilizers weekly.

Bean plants were grown in the greenhouse for 45 days. At 45 days after germination, the plants were cut at the soil level, washed with distilled water, dried in an oven at 75°C for 24 hours and the weight was recorded as dry matter.

Results and Discussion

The dry matter of bean plants from each pots and the average weight for each treatment are shown in Table 1. Analysis of variance of the dry matter yields of the bean plants is shown in Table 1. Analysis of variance of the dry matter yields of the bean plants is shown in Table 2.

As shown in Table 1, application of FULZYME to the soil significantly increased the dry matter yield of bean plants. Plants receiving two applications of FULZYME have higher dry matter yield than those receiving only one application of FULZYME. However, the increase in dry matter yield over those receiving only one application of FULZYME is not statistically significant.

The results of dry matter yields of bean plants indicate that FULZYME can promote plant growth. The promotion effect may be due to increases in soil biological activities resulting from the application of FULZYME.

Table 1. Effect of FULZYME on Beans Grown in Greenhouse

Treatment	Dry Matter Yield (g/pot)						Average*
	1	2	3	4	5	6	
Control	7.63	6.83	8.46	6.38	7.85	9.34	7.58 b
FULZYME 1	8.95	7.32	10.05	7.21	8.95	9.65	8.69 a
FULZYME 2	9.31	8.95	8.86	8.73	10.85	9.47	9.36 a

*Means in a column not followed by the same letter differ significantly ($p \leq 0.05$) as determined by DMRT.

Table 2. Analysis of Variance of Bean Dry Matter Yield

Source of Variation	df	SS	MS	F
Treatment	2	9.69	4.85	11.65**
Block	5	9.29	1.86	4.47*
Error	10	4.16	0.42	
Total	17	23.15		

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