The effects of Effective Microorganisms™ on the growth of *Brassica rapa*

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In cooperation with EMRO, Effective Microorganisms™

Introduction

Microbial fertilizer is one way of Organic Farming which is now considered as sustainable agriculture to develop farming systems that have the same stress placed upon the use of renewable resources like waste treatment, conservation of resources, and the maintenance of environmental quality without using chemical inputs by enhancing the population and diversity of microorganisms in soil (Pham, 2004 & Poincelot, 1986).

The purpose of this research is to observe the effects of microbial fertilizer on the growth of *Brassica rapa*, and on the microbial density in soil.

EM•1® and EM Bokashi, are commercial products marketed by EMRO (EM Research Organization), are used for this experiment as a microbial fertilizer. EM•1® contains *Lactobacillus plantarum, Lactobacillus casei, Lactobacillus Fermentum, Lactobacillus delbrueckii, Saccharomyces cerevisiae, and Rhodopseudomonas palustris*. Bokashi is a product made of organic matter, generally rice bran or wheat bran. In Hawaii, Mil run (left over from flour mill) is used.

Method

- Wisconsin Fast Plants were grown in 5 groups of 4 pots each.
  1. A negative control with only water added.
  2. A second control treated only with 30 mL of sterilized EM solution.
  3. A treatment given a standard dose of EM solution (0.001%) every week.
  4. A treatment given manufacturer's recommend dose of a chemical fertilizer;
  5. A treatment given EM solution plus 1g of bokashi on the surface of the soil.
- Artificial soil made from mixing equal amounts of small and fine perlite, and fine peat moss was used, and sterilized by heating.
- All pots received equal amount of light and water.
- Plant height, diameter of stem, biomass of seed pod and plant, and the population of general microorganisms in soil were measured in order to be compared statistically by ANOVA and Dunnett test.

Results

Plant height

Table 1: The means of plant height in centimeters measured at day 7, 14, 21, 28, and 35.

	Mean (st.dev)				
	Day7	Day14	Day21	Day28	Day35
Group 1 (negative control)	4.15 (1.12)	13.25 (3.77)	19.00 (3.56)	18.42 (6.35)	18.67 (5.92)
Group 2 (control)	4.10 (1.10)	12.75 (3.92)	17.00 (3.54)	17.28 (4.99)	19.25 (5.70)
Group 3 (EM treatment)	4.09 (0.94)	13.75 (3.01)	16.40 (0.54)	15.75 (2.37)	16.80 (2.49)
Group 4 (Chem. Fertilizer)	3.50 (1.22)	10.00 (2.88)	16.00 (2.58)	12.75 (3.30)	15.00 (3.01)
Group5 (EM bokashi)	2.81 (1.31)	8.83 (3.12)	15.5 (6.22)	18.2 (6.22)	18.88 (6.44)

By one-way repeated-measures ANOVA, there was no significant difference ($p=0.162$) of the plant height among those 5 groups throughout this study.

Diameter of Stem

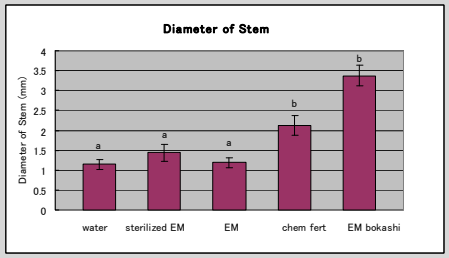

Figure1: The average diameters in mm of stems

The plants treated with EM bokashi ($p=0.000528$) showed the thickest diameters of mature stems (3.38mm), followed by group 4 treated with chemical fertilizer ($p=0.0210$, 2.13mm) .

Biomass of seed pod

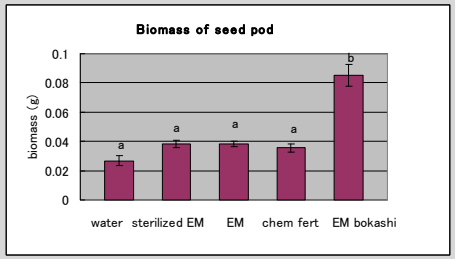

Figure 2 : The average dry weight biomass (grams) of seed pod

The plants treated with EM bokashi ($p=0.000246$) showed the heaviest biomass of seed pods (0.0852g) and were significantly heavier than the other four groups.

Biomass of plant

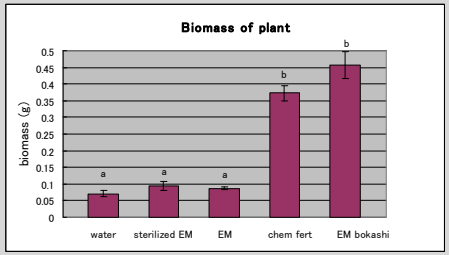

Figure 3 : The average dry weight (gram) of biomass of plants

The plants treated with EM bokashi ($p=0.000151$) showed the heaviest biomass (0.458g) followed by the plants treated with chemical fertilizer ($p=0.00126$, 0.373g).

Microbial density

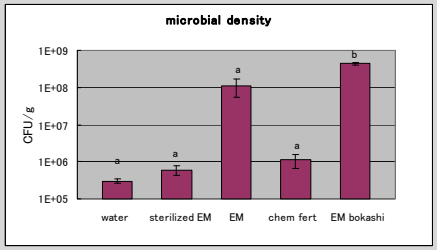

Figure 4 : The average microbial density in soil

Only EM bokashi plus EM solution significantly increased the microbial density (435000000CFU) in the soil ($p=0.000992$).

Conclusions

Both chemical fertilizer and EM bokashi plus EM solution generated thicker stems and heavier plant biomass than controls and EM solution only. Since treatment with EM bokashi plus EM solution resulted in the maximum biomass of seed pod, it also enhanced the increase of seed yield. Moreover, EM plus bokashi had the highest microbial densities through a stimulation of the soil microflora since the observed soil-bokashi mixtures density (435000000 CFU per gram) was considerably higher than an arithmetic density of bacteria in the initial soil-bokashi mixture (600000 CFU per gram),

Over all, EM solution did increase the soil microbial density, but did not significantly change the growth of *Brassica rapa* over the controls. EM combined with organic matter such as EM bokashi or other compost which is an important source of nutrients usable by microorganisms for improving the plant growth did increase plant growth biomass. When EM solution was used with EM bokashi, it enhanced the plant growth equally to using chemical fertilizer (13-13-13 slow release).

Literature Cited

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