Influence of Effective Microorganisms on Seed Germination and Plantlet Vigor of Selected Crops

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Abstract.

Seeds were inoculated with Effective Microorganisms (EM) to investigate possible effects on germination and vigor. In preliminary tests, seeds were dipped for 10 minutes in Vairo (a biofertilizer produced by anaerobic fermentation of cow manure), distilled water (DW), and in concentrated EM solution, 1.0 percent EM, and 0.1 percent EM for 30 minutes and then planted in sand in a greenhouse. Germination, plant vigor and weight were evaluated. In a randomized experimental design, data showed statistically significant differences indicating that EM increased seed germination and vigor in carrot, cucumber, pea, beet, and tomato.

Introduction

Most Brazilian farmers use poor quality seed, caused by improper storage conditions, that result in low yields and make crop management difficult. In order to minimize this problem, some farmers from the State of Rio de Janeiro have started to use low cost products in an attempt to improve germination, including Vairo (a biofertilizer produced by anaerobic fermentation of cattle manure) (Santos, 1992), and Effective Microorganisms (EM) (a microbial inoculant comprised mainly of lactic acid bacteria, photosynthetic bacteria, yeasts, and actinomycetes that are commonly found in soil (Higa, 1991)). Since EM is a product of organic matter fermentation and its effects are similar to some biofertilizers, research was conducted to compare seed germination and vigor of the treated plants.

Materials and Methods

The experiment was conducted in a greenhouse at the Plant Pathology Department of the Federal Rural University of Rio de Janeiro. Seeds of cucumber (Aodai), carrot (Brasilia), beet (Wonder), tomato (Angela 1-5100), pepper (Agronomico G-10), corn (46D), pea (Torta), burdock (Crioula) and bean (Roxinho) were tested. The treatments included immersion of seeds for 10 minutes in undiluted EM, Vairo (a biofertilizer), or water (control) with 3 replications of 40 seeds each.

After immersion, the seeds were dried in the shade and then were sown in washed sand in plastic trays of 30 x 20 x 10 cm without drainage. Trays without drains were selected to keep the fermentation products near the seeds during the test period. The trays were maintained in the greenhouse without temperature control; water was applied whenever it was necessary.
Plantlets were collected, washed in running water, dried in tissue paper and weighed individually with a digital precision balance; root lengths were measured with a ruler. Plant counts were made daily. Analysis of variance and Tukey's Test were performed on the data (Ferreira, 1991).

Results and Discussion

There were significant differences among treatments in the germination percentage of pea, beet, pepper, tomato, cucumber, corn, carrot, beans and burdock (Table 1). The EM treatment showed the greatest number of germinated seeds.

The plantlet root lengths for cucumber, beet, pea, pepper and carrot were significantly greater than the control; the root lengths of tomato plantlets with the EM treatment were similar to those with the biofertilizer (Vairo) and control treatments. The roots of the cucumber plantlets were similar to the biofertilizer treatment. Total weight of plantlets of pea, beet, carrot, bean, burdock and corn were significantly higher with EM treatment than the control; however, pepper, cucumber and tomato were not different from the control. The weights with EM were greater for pea, corn and beet than with the biofertilizer treatment. Thus, for most crops tested the root length and total plantlet weight were greatest for the EM treatment compared with the control and the biofertilizer treatment at the 5% level of probability.

Seed treatment with microbial inoculants such as EM may increase the rate of germination so that weakened seeds may survive to produce normal plantlets. Under field and greenhouse conditions, good quality seeds may not exhibit the beneficial effect of EM treatment; internal and external conditions may be favorable for germination regardless of treatment.

Table 1. Percentage Seed Germination for Selected Crops Treated with Effective Microorganisms (EM) and a Biofertilizer[1].

Crop	Germination Percentage With;		
	EM	Biofertilizer[2]	Control[3]
Tomato	66a	46b	6c
Pea	93a	81b	58c
Pepper	67a	42b	16c
Cucumber	87a	82b	62b
Beet[4]	146a	92b	83c
Burdock	86a	77a	35b
Carrot	78a	68b	68b
Bean	92a	91a	89a
Corn	94a	79b	72b

[1]Averages for a crop with the same letter are not significantly, different at 5% probability level by Tukey's test.

[2]The biotertilizer was Vairo, a commercial product derived from anaerobic fermentation of cow manure.

[3]Control seeds were immersed in water.

[4]Seeds with more than one embryo.

References

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