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To Study the Effect of Microorganisms on Solanaceae, Apiaceae, and Fabaceae Family to Stimulate Germination of Seeds

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Abstract: Germination is the process by which an organism grows from a seed or similar structure in to a plant. The microbial inoculant was acting as a fertilizer for seeds. Fertilizer can be used as means of biological control of plant pathogens and can help to increase plant resistance. The objective of the study was to determine the effect of microorganisms on the process of seed germination of the different plant family like, Solanaceae, Apiaceae and Fabaceae. Three types of study was carried out like seeds without treatment of microbial consortium, seeds with treatment of microbial consortium and seeds treated with Microbial consortium with addition of cow dung as biofertilizers. After the sowing of seeds, sunlight and water was daily applied for seed germination. After seed germination at regular interval different parameters like number of plants, length of roots, length of shoots were measured. In the present study the use of Microbial consortium with the addition of cow dung shows the highest plant growth.

Keyword: Microorganisms, Seed germination, Biofertilizer, Solanaceae family, Apiaceae family, Fabaceae family.

I. INTRODUCTION

Environmental protection and the need to enhance agricultural output have made research in new sustainable technologies necessary. Rhizosphere is the narrow region of soil that is directly influenced by root secretions and associated soil microorganisms. Beneficial association of microbes with roots may be bacterial, *Actinomycete*, *Cyanobacterial* or fungal symbiosis. *Rhizobacteria* is a group of bacteria with plant roots habitat area (rhizosphere) which has been researched and proven to improve soil fertility, increase plant resistance and can suppress plant pathogens. *Rhizobacteria* act directly as biological fertilizer. A pre-sowing inoculation of planting material as well as the planting medium with the consortia of beneficial microorganisms is an innovative approach for production of quality and healthy seedlings in horticultural production. The Solanaceae, or nightshades, are an economically important family of flowering plants. The Fabaceae or Leguminosae, commonly known as the legume, pea, or bean family, are large and economically important family of flowering plants. Apiaceae or Umbelliferae, is a family of mostly aromatic flowering plants commonly known as the celery, carrot or parsley family. A microbial consortium is a carrier based product containing nitrogen fixing, phosphorus and potassium solubilising and plant growth promoting microorganisms in a single formulation.

The synergistic effect of the formulated microbes can help in providing healthy and vigorous seedlings and considerably reducing the cost of cultivation by reducing fertilizer requirement of vegetables. Global increases in food production achieved in recent decades have required large (15–20 times) increases in the use of synthetic pesticides to control pests, pathogens and weeds of crops (Oerke 2006) but the increasing use of synthetic pesticides is no longer sustainable. The microbial colonizing rhizosphere includes bacteria, fungi, actinomycetes, protozoa, and algae. However, bacteria are the most abundant microbial present in the rhizosphere (Kaymak, and *et al.*, 2010).

The search for alternative solutions for agriculture has prompted researchers to take a second look at the range of microorganisms long known to provide benefits to agricultural production and is driving rapid growth in markets for biopesticides (Lehr 2010) and plant growth-promoting microorganisms (Berg 2009). The aim of the presented studies was to assess the effect of the application of Effective Microorganisms on changes in contents of available forms of nutrients in the peat substrate, as well as growth, development and yielding of different family plants.

II. MATERIALS AND METHODS

A. Sample Collection

In the present study, for the seed germination purpose the seeds, i.e., *Solanum lycopersicum L.* (tomato) seeds, *Solanum melongena* (brinjal) seeds, *Capsicum annum L.* (chilli) seeds, *Daucus carota* (carrot) seeds, *Foeniculum vulgare* (fennel) seeds, *Coriandrum sativum* (coriander) seeds, *Trigonella Foenum-gracium* (methi) seeds, *Vigna radiata* (green moong) seeds, *Lablab purpureus* (papdi) seeds were collected from local market of Valsad.

B. Culture Collection

For the preparation of microbial consortium the bacterial organisms like *Bacillus subtilis*, *Lactobacillus spp.*, *Actinomycetes*, fungal species like *Rhizopus* and *Mucor* were taken from the Microbiology laboratory of Dolat-Usha Institute of Applied Sciences, Valsad.

C. Preparation Of Microbial Consortium

For the preparation of microbial consortium all the five types of isolated organisms, *Bacillus subtilis*, *Lactobacillus spp.*, *Rhizopus spp.*, *Mucor spp.* and *Actinomycetes* were mixed in 250 ml sterile distilled water.

Three types of study was carried out.

D. Seed Germination By Pot Experiment Method

Plastic cups of capacity of 100 gm were taken for the pot experimental study.

- 1) *Seeds Without Treatment Of Microbial Consortium:* In this, all the different type of seeds were not treated with microbial consortium, and directly were sowed in plastic glasses which were filled with soil.
- 2) *Seeds with Treatment of Microbial Consortium:* All the different type of seeds were treated with microbial consortium. For the treatment the seeds were soaked in microbial consortium for about 30 minutes. After 30 minutes of soaking, treated seeds were sowed in plastic glasses which were filled with soil. (Siqueira *et al.*, 1993).
- 3) *Seeds Treated With Microbial Consortium With Addition Of Cow Dung As Biofertilizers:* All types of seeds were first treated with microbial consortium. For the treatment the seeds were soaked in microbial consortium for 30 minutes. The cow dung was mixed with soil in ratio of soil and cow dung (4:1) and the mixture of soil and cow dung was filled in plastic glasses. After 30 minutes of soaking, the treated seeds were sowed in the plastic glasses which were filled with soil and cow dung mixture.

After the sowing of seeds sunlight and water was daily applied for seed germination. After seed germination at regular interval different parameters like number of plants, length of roots, length of shoots were measured.

III. RESULT AND DISCUSSION

In the present study the seeds Figure 1, Figure 2 and Figure 3 shows the 1st day of seed sowing.



Fig.1 seeds sowed without treatment of microbial consortium.



Fig.2 seeds sowed with microbial consortium.



Fig.3 seeds with microbial consortium and cow dung.



Fig.4 plant growth of seeds without treatment



Fig.5 plant growth of seeds with microbial consortium.



Fig.6 plant growth of seeds with microbial consortium and cow dung.

The figure 5, figure 6, and figure 7 shows the plant growth after 28 days of seeds sowing.

Table 1. standard deviation plants measurement after 28 days of seed germination

Standard deviation after 28 days of seed germination						
Type of Treatment	Only Seeds		Seeds + Microbial Consortium		Seeds + Microbial Consortium + Cow Dung	
Name of Plants	Length of Root (cm)	Length of Shoot (cm)	Length of Root (cm)	Length of Shoot (cm)	Length of Root (cm)	Length of Shoot (cm)
Tomato	1.56 ±0.39	6.05 ±0.75	2.13 ±0.60	6.62 ±0.88	2.26 ±0.65	6.11 ± 0.78
Brinjal	2.15±0.47	3.68 ±0.37	2.26±0.72	3.5 ±0.47	2.45 ±0.74	3.94 ± 0.59
Chili	1.0 ±0.32	4.34 ±0.82	1.72 ±0.58	4.97 ±0.75	1.55 ±0.39	5.81 ± 0.84
Carrot	1.22 ±0.55	2.39 ±0.73	1.27 ±0.42	2.81 ±0.68	1.36 ±0.49	2.93 ± 0.59
Fennel	1.08 ±0.40	2.89 ±0.95	1.07 ±0.43	2.92 ±0.58	1.15 ±0.46	3.1 ± 0.76
Coriander	1.2 ± 0.62	4.08 ±1.17	1.54 ±0.79	4.26 ±0.92	1.29 ±0.44	5.3 ± 1.09
Lablab (papdi)	2.06 ±0.70	9.89 ±1.12	2.02 ±0.50	10.74±1.08	1.83 ±0.46	11.62±1.26
Green moong	1.84 ±0.19	8.8 ±0.55	1.65 ±0.41	8.49 ±0.87	2.33 ±0.90	9.77 ± 0.78
Methi	2.53 ±1.28	8.46 ±0.84	3.37 ±1.08	9.19 ±0.84	3.64 ±1.31	10.25±0.87

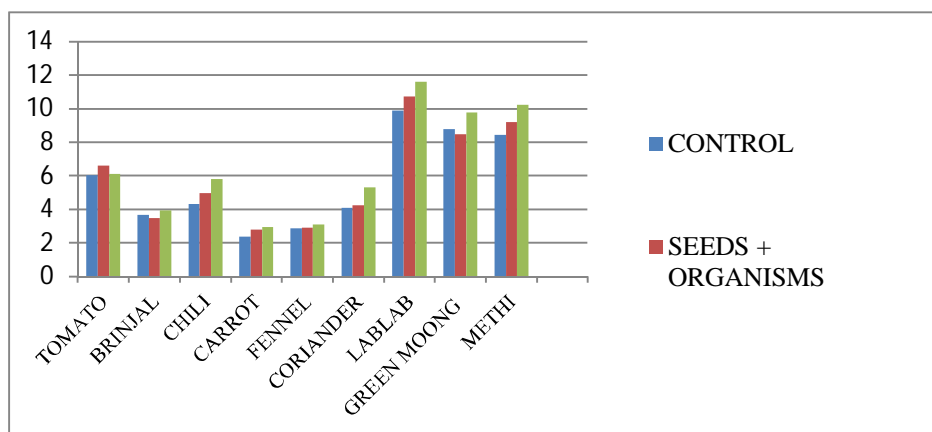


Fig.7 standard deviation plants measurement after 28 days of seed germination

in the present study, after 28 days of seeds sowing the seed germination and plant growth was observed. In this study, for the tomato plant the seeds treated with microbial consortium shows the highest plant growth than the control and use of cow dung with microbial consortium. For the brinjal plants addition of cow dung is beneficial for the plant growth. It shows the more effect than the control and seeds with microbial consortium. The chilli plants shows the highest plant growth rate with the seeds with microbial consortium and addition of cow dung, the microbial consortium without addition of cow dung is also increase the plant growth. The highest seed germination and plant growth of carrot plants were shows in the microbial consortium and addition of cow dung in the soil, the microbial consortium without addition of cow dung also shows positive growth rate than the control. The effect of microbial consortium with cow dung on the carrot is nearly similar to the effect of microbial consortium. The fennel plants also shows the better growth with the microbial consortium with addition of cow dung than the seeds treated with microbial consortium and seeds without treatment. For the coriander plant the seeds treated with microbial consortium and the addition of cow dung with the soil is shows highest plant growth than the control and seeds treated with microbial consortium. The lablab (papdi) plants shows the better growth with the microbial consortium with the addition of cow dung in the soil. The seeds treated with microbial consortium is also shows better growth rate than the seeds without treatment. The highest plant growth of green moong also shows with the applying microbial consortium with the addition of cow dung in the soil. For the green moong plant, seeds treated with microbial consortium shows the decrease plant growth than the control. For the methi plants the seeds treated with microbial consortium with the addition of cow dung in the soil shows highest plant growth than the seeds treated with microbial consortium.



IV. CONCLUSION

The seeds from solanaceae family, apiaceae family and fabaceae family were treated with microbial consortium and observed the growth of seed germination by pot experiment method. In this study the microorganisms treated seeds were show better growth than the control. The length of plant roots and shoots of treated plants were greater than the control plants. The cow dung is also used as a biofertilizer . The growth of microorganisms treated plants were similar to the plants with organisms and cow dung . The effect of microorganisms is beneficial to the growth of plants.

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