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Research Article

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Effect of marine waste on seed germination

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ABSTRACT

A biofertilizer means use of living organisms to continuously supply nutrients to the soil. It maintains the natural habitat of the soil. Biofertilizers are cost-effective compared to chemical fertilizers. It was prepared from fish waste (prawn and crab shell).The shells were removed from the meat part and properly cleaned with water and dried and was grind to make it to powdery form for easy use. Later different experiment on pea, gram and tomato plants was carried out in different ratios of prawn, crab and prawn+crab mixtures to see the growth and anatomy of the plant. Neem powder along with the fish waste was applied to the soil to keep the worm away. The fish waste contained minerals, proteins, carbohydrates and moisture which provides nutrient to the soil. The results obtained were compared and found that growth of plants in crabs were faster, greener, healthier and worm free as compared to prawn bio fertilizers. When again it was compared to the control plants with and without neem it was found that the growth was fast in the crab fertilizer and it was worm free.

Keywords: biofertilizer, marine waste, crab, prawn, seed germination

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INTRODUCTION

Fertilizer is any organic or inorganic material of natural or synthetic origin that is added to a soil to supply one or more plant nutrients essential to the growth of plants. Fertilizers typically provide, in varying proportions six macronutrients: nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulfur (S); eight micronutrients: boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), zinc (Zn) and nickel (Ni). Chemical fertilizers have aided farmers in increasing crop production since the 1930's. While chemical fertilizers have their place increasing plant nutrients in adverse weather conditions or during times when plants need additional nutrients, there are also several harmful effects of chemical fertilizers. Some of the harm chemical fertilizers may cause include waterway pollution, chemical burn to crops, increased air pollution, acidification of the soil and mineral depletion of the soil**.** The effects of organic manure application with chemical fertilizers on nutrient absorption and yield of rice in Hunan province of Southern China was studied [1, 2].

A biofertilizer is a substance which contains living microorganisms which, when applied to seed, plant surfaces, or soil, colonizes the rhizosphere or the interior of the plant and promotes growth by increasing the supply or availability of primary nutrients to the host plant. Biofertilizers add nutrients through the natural processes of nitrogen fixation, solubilizing phosphorus, and stimulating plant growth through the synthesis of growth-promoting substances. Biofertilizers can be expected to reduce the use of chemical fertilizers and pesticides.Enhancement of phenolics, flavonoids and glucosinolates of Broccoli (Brassica olaracea, var. italica) as antioxidants in response to organic and bio-organic fertilizers [2, 3].

Marine fish wastes are a rich source of nutrients. Disposing of this waste is a problem for anyone who cleans and processes fish, from big commercial food processors to small sport-fishing operations. A promising solution is composting, just like the process home gardeners use to make their own soil enhancer. Not much work has been done on composting fish waste and seaweed to produce a fertilizer for use in organic agriculture [3]. The present study was carried out to standardize the use of marine waste as biofertilizer and to study the effect on seed germination.

Due to tropical monsoon climates and problems in soil management with total rainfall in Bangladesh, the organic matter contents in soil are very less. So to return the life of the soil Z.H.Bhuiya (2009), used some chemical fertilizers such as urea, triple superphosphate and muriate of potash and biofertilizers such as farm manure, vermicompost, nitrogenous organic materials-crushed bones, fish wastes, mustard, sesame, castor cakes etc [4]. They utilized wastes being generated from virgin coconut, i.e., coconut pulp and wasewater containing coconut creme along with other wastes such as Fish and Pineapple peel waste for bioextract production. The chemical, physiochemical, biological changes including phytotoxicity of the fermented mixture was analyzed and it was found that fermentation of bioextract obtained from fish wastes completed within one month while for pineapple it complete after eight months [6]. It was observed that the total bacteria and lactic acid bacteria present in pineapple bioextract were higher than those of the fish bioextract.

Chitinous materials are rich in carbon sources, so it has various potential applications in the field of food, agriculture and pharmaceuticals industries. The preparation of chitin involves demineralization and deproteinization of shellfish waste with the use of strong acids and base. Research has been done to investigate the bioconversion of shellfish chitin wastes such as from shrimps and crab shell and squid pen for the production of enzymes and bioactive material [6, 7] For a better human health food produced from organic production system is healthier than food produced from inorganic system. Nutrients deficiencies are a major factor for sustainable yields under organic cropping systems, because synthetic fertilizers/chemicals are not permitted. So to return the nutrients lacked by the soil they [8] practiced applications of compost/manure, thin silage, distiller grain and fish food additives which can provide Nitrogen, Phosphorus and other important nutrients and minerals.

Cyanobacteria are gram negative oxygenic photosynthetic prokaryotes they have applications especially in agriculture as nutrients supplements in agriculture and industry. They are known to produce wide array of bioactive compounds with diverse biological activities-including antiviral, antibacterial, antifungal, antimalarial and anti-inflammatory properties having therapeutic, industrial and agricultural significance. [6].

EXPERIMENTAL SECTION

In the present study an attempt was made to prepare a marine waste based biofertilizer and to study its efficiency with respect to seed germination.

Collection of samples

The fish waste (prawns and crab shell) was collected from the fish market in Tambaram, Chennai, India. The shells were separated from the meat, washed properly, dried under sunlight for few days and was made into a complete powder and was stored.

Neem leaves

Neem leaves were collected from our college campus. It was dried under sunlight for a day and was then made into powder and stored. This was used to prevent the growth of harmful microbes and insects.

Soil sample

The soil sample was collected from a nursery. It contained river soil, peat and compost.

Seeds

Three varieties of seeds i.e., tomato, pea and gram was taken to carry out the experiments.

Procedure

About 75 gms of soil was taken in each plastic cups. Holes were made in the plastic cups to prevent from water clogging. First control plant with neem and without neem was prepared. About1gm neem was added to each 75 gm

soil. Then 1gm of prawn and 1.5 gm neem was mixed and added to the soil then seeds were sown about a cm deep. This was done for pea, gram and tomato. The same procedure was then continued with 1gm crab and 1.5 gm neem, 3 gm prawn and 3.5 gm neem, 3 gm crab and 3.5 gm neem, 5gm prawn and 5.5gm neem, 5 gm crab and 5.5 gm neem, 1 gm prawn and crab together and 1.5 gm neem, 3 gm prawn and crab and 3.5 gm neem and finally 5 gm prawn and crab and 5.5 gm neem.

RESULTS AND DISCUSSION

The results of germination in the presence of the crab and prawn waste biofertilizer are tabulated in Tables 1-5.

Table 1: Days of germination of control plant with neem and without neem

S.No	Plants	Control without neem	Control with neem
1	Pea	3	3
2	Green gram	3	3
3	Tomato	4	7

Table 2: Effect of prawn and crab (1 g) on seed germination

S.No	Plants	Prawn (1 g), Neem (1.5 g)	Crab (1 g), Neem (1.5 g)
1	Pea	3	3
2	Green gram	3	3
3	Tomato	7	6

Table 3: Effect of prawn and crab (3 g) on seed germination

S.No	Plants	Prawn (3 g), Neem (3.5 g)	Crab (3 g), Neem (3.5 g)
1	Pea	4	2
2	Green gram	2	2
3	Tomato	8	7

Table 4: Effect of prawn and crab (5 g) on seed germination

S.No	Plants	Prawn (5 g), Neem (5.5 g)	Crab (5 g), Neem (5.5 g)
1	Pea	2	2
2	Green gram	2	2
3	Tomato	9	9

Table 5: Effect of prawn and crab mixture (1, 3, 5 g) on seed germination

S.No	Plants	Prawn +crab (1g)+neem (1.5)	Prawn +crab (3g)+neem (3.5)	Prawn +crab (5g)+neem (5.5)
1	Pea	2	2	2
2	Green gram	2	2	2
3	Tomato	6	9	8

The germination of control plants were compared with and without neem and it was found that the plants without neem germinated before the plants with neem (Table 1) which shows that neem may have some factors to delay the seed germination. The plants with prawns and crab were then compared in different ratio of 1g, 3g, and 5g listed in Table 2, 3, 4. It was seen that the plants provided with crab grew faster than that with prawns and it was worm free. But tomato plants germinated very slowly in all the treatments. The same experiment was again carried out in mixtures of prawn and crab in different ratios of 1g, 3g, 5g listed in Table 5. Due to the presence of marine waste there was a problem of infestation by ants and maggots so an attempt was made to incorporate the media with neem at different concentration. It was observed that all plants grew except tomato which grew in 1g (prawn+crab) mixtures and all plants are worms free.

CONCLUSION

Comparing all the results it was concluded that plants provided with crab and crab+ prawn mixtures germinated faster and were much healthier and greener and had no signs of worms compared to the plants which was supplied with only prawn waste which had worms. It was assumed that the presence of worms was due to presence of some proteins and collagen present in the prawn shell which provided suitable conditions for their growth. We have planned to standardize the use of marine waste as a rich source of nutrients to plants.

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