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EFFECT OF MARINE WASTE ON GROWTH AND YIELD OF ROSE AND CHILLI PLANTS

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ABSTRACT In the present study marine based biofertilizer prepared form crab and prawn shells were used to study the growth and yield of rose and chilli plants. The result showed that plants treated with crab fertilizers had significant effect on growth and yield. The plants were healthier than those treated with only prawn shells.
Keywords **:** Biofertilizer, prawn waste, crab waste, plant growth and yield

Introduction

Marine fish wastes are a rich source of nutrients. A much promising way to dispose this marine waste is to prepare compost. Not much work has been done in composting marine waste. The present study was carried out to standardize the use of marine waste as biofertilizer and to study the effect on the growth of rose and chilli plants. Marine waste is a rich source of chitin which is reported to be active against fungal, bacterial and viral pathogens. This has led to the development of agricultural systems to control and manage diseases and to enhance the growth and yield of crops (Surya Anjani Kumar Sarva and Archana Giri, 2014; Bhuiya, 2009). The crab and prawn waste were found to enhance the germination and growth of seedlings of tomato, green peas and green gram (Jeyanthi Rebecca *et al*, 2014). Fish extract and pineapple waste were used to prepare a bio-extract after fermentation which was to be used as a biofertilizer (Sudarut Tripetchkula *et al*, 2010; Jeyanthi Rebecca *et al*., 2012a). Fish waste fermented faster than pineapple extract. Marine waste was also used to produce industrial enzymes (Jeyanthi Rebecca *et al*., 2012a, Jeyanthi Rebecca *et al*., 2012b). Bioconversion of shellfish chitin waste into enzymes and bioactive material has been studied (San-Lan-Wang, 2011; Sukhdev, 2013; Vishal Gupta, 2013, Preetmonider Lidder, 2012).

Materials and Methods

In the present study an attempt was made to study the effect of marine waste based biofertilizer on the growth and yield of plants.

Preparation of marine waste biofertilizer

The marine waste biofertilizer was prepared by the standard protocol using prawn and crab shells (Jeyanthi Rebecca *et al*, 2014).

Selection of Plants

Chilli (Bird's Eye Chilli), 20 days old and one-month old Rose plant (Bangalore Rose) were selected. The plants were selected before the flowering stage. Plants were kept for 1 week more so to utilize the nutrient already present in it the soil. Table 1 shows the composition of pot mixture used for the treatments.

Table 1: Soil composition for rose and chilli plants (%)

River soil	50
Cow dung manure	30
Coconut coir	20

Treatments

The rose and chili plant contained ½ kg and 1 kg soil mixture respectively. The rose plant was treated with 3 gm prawn, 3 gm crab and (1.5+1.5)gm prawn crab mixture. The chili plant was treated similarly with 5 gm prawn, 5 gm crab and (2.5+2.5) gm prawn crab mixture

Methods used for testing the composition of prawns and crab shell

Estimation of Sodium and Potassium

The sodium and Potassium content in prawn and crab shells were estimated using the EPA method 3050-B-1996 (EPA Method, 1996; IS Method, 1982; FAO, 2007). It is an acid digestion method.

Estimation of Phosphorus, Calcium, Magnesium and Sulphur

Phosphorus content was estimated using the standard method IS 10158-1982. The Ca and Mg content were estimated using the EDTA Titrimetric method. Sulphur content was estimated using Turbidimetric method.

Estimation of pH by EPA Method

The pH of the crab and prawn shell powder was estimated using the EPA method (Raghavan and Raga, 1991, EPA method, 2004; Meersmans, 2009).

Result and Discussion

The chilli and rose plants responded well in the marine waste based growth medium.

Fig. 1 : Initial stage of Chilli plant

Fig. 2 : Initial condition of rose plant

Table 2 Chilli plants (Bird's Eye Chilli)

Treatment	1st week	2nd week	3rd week
Control	1 fruit	1 fruit	1 fruit
Prawn (5g)	1 bud	1 fruit	1 fruit
Crab (5g)	1 bud	1 fruit	2 fruits
Prawn+ Crab (2.5 g+ 2.5 g)	No	1 bud	1 fruit

Fig. 3: Chilli plants one week after adding of Fertilizer
(Note: From the left control, prawn crab mixture, crab, prawn)

Fig. 4: Chilli plants two weeks after adding of fertilizers
(Note: From the left prawn crab mixture, prawn, control, crab)

Fig. 5: Chilli plants three weeks after adding of fertilizers
Note: From the left prawn crab mixture, prawn, control, crab

On the 1st week it was observed that the control plant had one fruit, the plant treated with prawn fertilizers had one bud, the plant treated with crab fertilizer also had one bud while the plant treated with prawn crab mixture had no bud (Table 2). On the 2nd week fruiting was observed in all the plants except for the plant treated with prawn crab mixture. On the 3rd week all the plants had one fruit except for the plant treated with crab fertilizers which had two fruits.

Table 3 : Rose Plants (Bangalore Rose)

	1st week	2nd week	3rd week
Control	Buds	Bud	Bud
Prawn (3g)	Bud	Bud	Died
Crab (3g)	Buds	Flowered (1)	Flowered (1+1)
Prawn+ Crab (1.5+ 1.5)	Bud	Flowered (1)	Flowered (1)

Fig. 6 : First-week after adding fertilizers
Note: From the left prawn+ crab mixture, crab, control and prawn

Fig. 7 : Two weeks after adding fertilizers
Note: From the left prawn, control plant, crab fertilizers and crab +prawn mixture

Fig. 8 : Three weeks after adding of fertilizers.
Note: From the left prawn, control plant, crab +prawn and crab.

On the 1st week it was observed that all the plants had buds. On the 2nd week the control plant and the plant treated with prawn fertilizer had buds but the plants treated with crab fertilizer and prawn crab fertilizer mixture flowered (Table 3). On the 3rd week the control plant still did not flower, the plant treated with prawn died, the plant treated with crab yielded two flowers while the plant treated with prawn crab mixture still had one flower.

Table 4 : Mineral Composition of Crab and prawn shell

S.NO	Parameters	Method	Unit	Crab shell	Prawn shell
1.	Na	EPA Method	%	0.55	0.17
2.	K	3050-B-1996	%	0.11	0.12
3.	P	IS 10158-1982 RA(2003)	%	2.40	3.04
4.	Ca	FAO Method(2007)	%	0.22	0.10
5.	Mg	EDTA Titrimetric Method	%	12.70	4.82
6.	S	Turbidometric Method	%	0.20	0.25
7.	pH	EPA Method 9045	%	8.3	7.9
8.	Total Organic carbon	FAO Method 2007 (Walkey Black Wet combustion Method)	%	1.59	4.98

The % of Na was found to be more in crab shell than in prawns while K was slightly more in prawn shells (Table 4). P % was more in prawn shell. The % of Ca and Mg was more in crab shell. The value of S was greater in prawn shell. The pH was found to be more in crab shell and total organic carbon was present more in prawn shell.

The yield and growth of control plants were compared with the plants with prawn, crab and prawn+ crab mixture in different ratio of 5g, 5g, and (2.5+2.5) g, respectively listed in Table 2 for Chilli plants. It was seen that the plants provided with crab grew faster and yielded more fruits than control plant, Prawn+ crab mixture and prawns. The same experiment was also carried out in different ratio of 3g prawn,3g crab, and (1.5+1.5) g of prawn+ crab mixtures listed in Table 3 for Rose plant. While it was seen that Rose plant provided with Crab yielded good flower color, growth and are healthier when compared to prawn + crab, control and that with prawn.

Chitin has outstanding effect on cucurbitaceae controlling plant diseases, growth enhancement increasing size, colour, vigour of the plant and its fruits and leaves.Chitin is reported to be active against viruses, bacteria and other pests. Accumulation of phytoalexins, pathogen related (PR) proteins and proteinase inhibitors, lignin synthesis, and callose formation.

Conclusion

Comparing all the results it was concluded that plants provided with crab and crab+ prawn mixtures grew faster and yielded more when compared to all other plants under experimentation. It was estimated that the reason for this success is due to presence of more Na, Ca and Mg in crab shell when compared with prawn shell listed in Table 4.

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