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Bio-conversion of Shell waste and Seaweed Extract into Compost Preparation and its Plant Development

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ABSTRACT

Bio-composts are minimal expense, biodegradable manures, which are being utilized to work on the quality and ripeness of the dirt. They are utilized as an option for chemical composts. Lately, bio-energizers, for example algal extracts, have a ton of consideration in the last rot since it goes about as manufactured items that is competent to invigorate plant development, stress obstruction and increment yield, subsequently being Integrated agriculture system. Marine debris contains proteins, carbohydrates and raw materials which give supplement to the top soil. In the present work comparative study on shell waste and seaweed extract mixed with vermi compost were used as nutritional enhancements to plants. A plastic pot arrangement with mud was utilized to decide the impacts and effectiveness level of vermi-manure on the development and yields of coriander. This study was directed through impact of expanding grouping of vermi-fertilizer (P0 = control (Vermi manure), P1= shell waste+ vermin manure, P2=seaweed extract + vermin fertilizer) in target plant development. The acquired outcomes from the current exploration showed that vermi-manure + seaweed extract had essentially further developing impacts on better development and advancement of plant contrasted with control and shell waste. Consequently, it might be proposed that treated plants, with this vermi-fertilizer and seaweed extract expanded the development, yield and the above biochemical compositions and also pH of the mud. In conclusion, this study exhibits the significance of seaweed extract to increase growth and quality of coriander plants.

Keywords: *Marine waste, Vermi compost, and plant growth.*

Introduction

The utilization of natural substance, for example, domestic fertilizers, human waste, food and yard, sewage slop and manures has for quite some time been perceived in agriculture as valuable for plant development and yield and the support of soil richness. These rubbish should initially be cleaned and handled then be utilized in cultivating land. The new ways to deal with the utilization of natural changes in cultivating land have demonstrated to be compelling method for further developing soil structure, improving soil richness and expanding crop yields. Fertilizing the soil has been perceived as a minimal expense and naturally sound interaction for the treatment of numerous natural wastes (Hoitink, 1993).

Vermicompost is a natural fertilizer. Vermi-manure, as a meso-philic biodegradation item is becoming popular because of associations among worms and microorganisms in the breakdown of natural waste (Edwards *et al.*, 2010), are humus-like materials which could go about as appropriate substitutes of synthetic compost. Vermi composts are wealthy in microscopic organisms, actinomycetes and parasites (Edwards, 1983; Tomati *et al.*, 1983) and cellulose-

corrupting microbes (Werner and Cuevas, 1996).

Likewise, fabrication capability of food crops is still low and thus makers are presently searching for different options in contrast to these manures. Hence, to lessen costs and take on more harmless to the ecosystem rehearses, research on elective substrates is of extraordinary interest, and a few choices have been proposed. Natural horticulture has been perceived to support expanding crop creation and guaranteeing quality crop. It includes the utilization of yard waste, metropolitan and modern e-waste as wellspring of supplements for crops being raised.

Coriander (*Coriandrum sativum L.*) is one of the most imperative of vegetable, flavour and therapeutic plant which belongs to the family Apiaceae (Umbelliferae) is mostly cultured from its seeds throughout the year. India is the foremost manufacturer, consumer and exporter of coriander in the world with a twelve-monthly production. All portions of plant are palatable, fresh leaves can be used for garnish and remain common ingredient in many foods like gravy, biryani, chutneys and bread salads. The green herb is also involved for the preparation of both steam purified essential oil or the flush extracted oleoresin (Mhemdi *et al.,* 2011).

Many reports referenced that alga extricates are environment arranged items that expansion development and natural yield of various vegetable species (Sharma *et al.,* 2014) by expanding plant opposition against stresses and sicknesses. Similarly, multicellular alga "Kelp" is one of the most marine assets that have been utilized as a biofertilizer since sixteen's of this century and also beautiful photosynthetic groups (Zodape *et al.,* 2001). Likewise, kelp has been utilized as excrement or soil conditioner (Hong *et al.,* 2007). It contains numerous bioactive substances and plant development controllers like auxins, cytokinins, and betaines (Zhang and Ervin, 2008), just as thinks about a practical hotspot for minerals and micronutrients (Reitz and Trumble, 1996).

Waste management the board is a significant viewpoint that has been broadly contemplated lately. The Department of Science and Technology, Government of India, had called for recommendations in the space of waste administration by August 2015, as it has been the significant justification for contamination particularly in significant urban communities. An endeavour was made in concentrating on the impact of germination of seeds utilizing crab and prawn squander.

The present investigation is to comparative study on expanding the group of vermi-fertilizer such as seaweed extract and marine shell waste for target plant development.

Materials and Method

Collection of marine waste

The shells of *Scylla serrate* (mud crab) and *litopenaeussetiferus* (white shrimp) were collected with the help of the local fisherman from manora coast, Pattukkottai taluk of Thanjavur district, Tamilnadu (10^{o}162N,79^{o}192E) The collected shells were scraped free of slack tissue, washed with water, boiled and dried under the sun for 8 hrs. Afterward shells were pulverized and sieve (60.80 mesh) for the powder extraction of chitin and chitosan. The samples were stored in a closed container prior to use.

Preparation of Vermi-compost

Organic manure was prepared by using *Eudriluseugenia* species of earthworms with poultry waste and fish waste as substrate at the Organic farm, Rajapalayam, Virudhunagar District. (Plate 1) Scientific Classification of selected earthworm

Plate:1 *Eudriluseugeniae* –organic manure

Plate 2. *Eudriluseugeniae*-Worm

Kingdom	:	*Animalia*
Phylum	:	*Annelida*
Class	:	*Clitellata*
Subclass	:	*Oligochaeta*
Order	:	*Haplotaxida*
Family	:	*Eudrilidae*
Genus	:	*Eudrilus*
Species	:	*E. eugeniae*

Preparation of seaweed extract

The seaweed *(Gracilariaedulis)* samples were collected fromwere collected with the help of the local fisherman from manora coast, Pattukkottaitaluk of Thanjavur district, Tamilnadu,(10^{O}162N,79^{O}192E) India. The live and healthy macro algal sample was collected by handpicking method at a depth of 1-2m during the month DEC 2021.

Preparation of powder

The collected sample was washed well with seawater to eliminate every one of the superfluous pollutions like epiphytes,sand particles, stones, and shells and brought to the research laboratory in plastic packs aseptically in iceboxes. The samples were then completely washed with tap water followed by refined water. Washed macro algae were Smeared on the smudging paper, and then cut into small pieces, shade dried for two weeks at surrounding temperature and the samples were groundedin to a fine powder utilizing tissue blender. The powdered samples were then stored in the cooler for additional utilization.

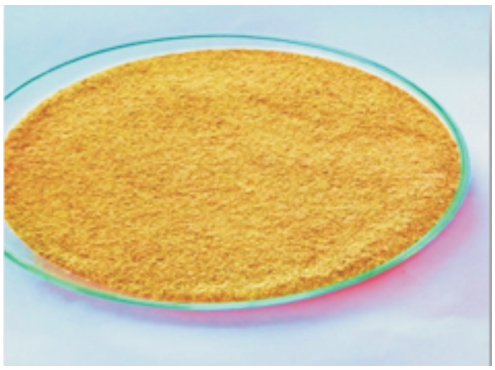

Plate 3. *Gracilariaedulis*

Experimental setup

Coriander (*Coriandrum sativum L.*)was selected to carry out this experiment. The soil sample was collected from a native nursery. It contained an equal proportion of river soil, peat and compost. The soil (100 g) was taken in 5 small pots each. Take 100gm of soil and mixed 10gm of vermin compost as a control (T1). In pot (T2) add 100gm of soil and mixed with 10gm seaweed extract. Similarly third pot contain (T3) 10 gm of marine shell waste with 100 gm. of soil. In pot 4 (T4) 10g of vermin-compost with 100 gm of soil were added. Pot 5(T5) contains 100 g of soil with the addition of 10gm of seaweed powder and 100gm of soil were added. In pot 6(T6) 10 gm of marine shell waste were mixed with 100 gm of soil. The shoot and root length was measured by 15^{th} and 30^{th} days. The research consists of six treatments as trails:

Treatment design

Treatment	Combination
T_1 – Control	No treatment
T_2 – SW	seaweed Powder
T_3 – MW	Marine shell waste
T_4 – VC	Vermicomposting
T_5 – VC+SW	Vermicomposting + seaweed powder
T_6 – VC + MW	Vermicomposting + Marine shell waste

To decide the following characters from each experimental pot – plant height, root length, number of leaves per plant, fresh weight and dry weight of plants on 15^{th} and 30^{th} day of planting. The roots were gutted prudently to remove following soil spots. Later the harvest the plants were dehydrated in oven at 65ˆC for 72 hours and dry hefts were documented in all the treatments. Total yield was restrained based the total fresh weight of herbal after the harvest (30th day).One-way ANOVA and Duncan's t multiple ranged test were used to classify the standardized type of the data sets among different treatments for dissimilar plant parameters in different treatments.

Results and Discussion

The growth parameters were examined in the effect of organic waste. Neem powder (1 g) was added to the development medium as a sanitizer and pesticide. The growth parameters such as herbal height, number of leaves, root length, fresh weight, and dry weight of the coriander plant in different treatments were provided in Table 1 and 2.

Among the different treatment, the highest mean

plant height was recorded in T5 (12.66±2.52) and T4 (10.62±2.34) and lowest plant height in T1 (4.54±0.92) was observed in coriander plant. The mean length of root varied significantly among different treatments, when compared to control T4 and 5 get maximum length in 30th days. The maximum root length was T5 (6.06±0.40) and minimum root length were measured in T1 (1.60±0.49) control. Duncan's multiple range tests on mean maximum number of leaves was found from T5 (6.41±1.95) in 15 days whereas in 30th day is (10.56±2.54). The minimum number of leaves were found in control(2.24±0.47).

The ANOVA based Duncan test showed the highest fresh weight (g) of plant were obtained in 5 treatments (T2= 0.78±0.09; T4= 0.85±0.13; T5 =0.80±0.00; and T6=0.77±0.05 followed by T1 (0.62±0.34). The lowest fresh weight of plant T2 (0.78±0.09) was obtained in T1 (Control). Substantialrise in dry weight of herbal was experimental among the different treatments. The highest dry weight of plant (g) was obtained in T5 with a mean value of (0.80±0.00) g and less in the control treatment (T2) with value of (0.78±0.09) (Table 2).

Maya and Samish (2015) presented that the important growth was experimental in the brinjal plants which were sprayed with vermin-wash and also added in the soil treatment. Ravimycin (2016) reported that application of vermicomposting increased all the morphological, colour, protein and nutrient contented in coriander plants when compared to FYM and control treatment. Gandhi and Siva Kumar (2010) described that the mutual form of immunisation of vermicomposting augmented the in rice grain eminence like hulling ratio, milling percentage of grain and water application, work development, elongation ratio, protein and amylase of rice kernel.

A similar experiment was again completed in combinations of marine shell waste and vermicomposting in various proportions. It was seen that the development of plants was more when it was provided with the combination of shell waste and vermin compost. The outcomes have underlined that seaweed extract was more powerful than shell waste. It was additionally found that the germination and development was quelled when more seaweed extract was added (Fallahi *et al*., 2008).

Conclusion

The outcomes have shown that seaweed and vermin compost (T5) gave excellent results on the plant growth, T5>T4>T2>T3>T6>T1 when compared with other treatments. This was as per our past work on the impact of marine waste on seed germination. More research must be done to highlight this proclamation. Consequently, the vermicomposting and

Table 1. Effect of organic waste on growth parameter of coriander (15 days)

Treatment	Plant Height (cm)	Root Length (cm)	N.o of Leaves Per Plant
T1 – Control	4.54±0.92^{d}	1.60±0.49^{d}	2.24±0.47^{c}
T2 – SW	9.70±2.85^{b}	2.39±0.92^{bc}	4.20±1.71^{b}
T3 – MW	7.23±1.86^{c}	2.11±0.49^{c}	3.15±0.68^{c}
T4 – VC	10.62±2.34^{a}	3.64±1.98^{b}	5.74±0.89^{a}
T5 – VC+SW	12.66±2.52^{a}	5.30±0.84^{a}	6.41±1.95^{a}
T6– VC+MW	7.97±2.08^{c}	2.27±0.73^{c}	4.99±0.76^{b}

Mean ± SD(P<0.05)

Table 2. Effect of organic waste on growth parameter of coriander (30 days)

Treatment	Plant Height (cm)	Root Length (cm)	No. of Leaves Per Plant	Fresh Weight (g)	Dry Weight (g)
T1 – Control	12.43±1.12^{d}	3.17±0.23^{d}	5.24±0.47^{c}	0.62±0.34^{c}	0.11±0.02^{d}
T2 – SW	18.20±2.41^{b}	5.03±0.18^{bc}	9.63±1.29^{b}	0.78±0.09^{b}	0.24±0.08^{b}
T3 – MW	15.23±1.86^{c}	4.06±0.17^{c}	7.77±1.33^{c}	0.72±0.02^{b}	0.16±0.01^{c}
T4 – VC	18.54±1.28^{a}	5.64±1.38^{b}	10.21±1.70^{a}	0.85±0.13^{a}	0.29±0.00^{a}
T5 – VC+SW	21.66±1.30^{a}	6.06±0.40^{a}	10.56±2.54^{a}	0.80±0.00^{ab}	0.34±0.07^{a}
T6– VC+MW	15.97±2.29^{c}	4.99±0.88^{c}	7.92±0.58^{b}	0.77±0.05^{b}	0.19±0.07^{bc}

improved with seaweed powder may be used as plant growing media for sustainable coriander crop production. As of now we are attempting to concentrate on the impact of this loss on plant yield.

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