JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

A STUDY ON THE EFFECT OF SOIL AMENDMENT WITH CRAB SHELL POWDER ON THE GROWTH AND NUTRITIONAL STATUS OF Raphanus sativus

Mageshwari V[1] and Thiripurasundari B [2]

[1] PostGraduate Student, [2]Assisstant Professor , Department of Biochemistry ,Valliammal College for Women, Annanagar East, Chennai 600102. Affiliated to The University of Madras, Chennai 600005 , Tamilnadu, India.

- **Corresponding Author : Thiripurasundari B,** *Assisstant Professor , Department of Biochemistry ,Valliammal College for Women, Annanagar East, Chennai 600102.*
- **Mail id : sudhamphil2003@gmail.com**

ABSTRACT

The aim of the present study was to investigate the effect of amendement of crabshell powder as an organic fertilizer to enhance the growth and nutritive value of Raddish.The experiment on Rhaphanus sativus was conducted with and without the addition of crab shell powder as an organic fertilizer to examine the plant's growth, nutritional status and chemical composition of soil.Minerals, proteins, carbohydrates, and moisture are found in marine waste, which offer nutrients to the soil that helps to grow plants more healthier. The crab shell was collected at a local market, washed properly, dried in the sun for a few days, powdered, and then added to one pot labelled 'Test' and another pot without crab shell amendment labelled 'Control', the plant growth in the following weeks noted and the mineral content in both plants, tubers and soil were analyzed.The number of seeds germination, plant height, minerals content in soil, leaves, and tubers were all higher in the crab shell amendment pot labelled 'Test' when compared to the pot without crab shell amendment labelled ‘Control’. The results showed that adding crab shell powder to soil improves mineral quality of soil and makes plants healthier, and acts as the greatest organic fertilizer.As a result of the findings of this study, it may be concluded that crab shell is an effective organic fertilizer for improving soil quality, plant growth and mineral quality.

Keywords: Crab shell powder, Rhaphanus sativus, organic fertilizer , mineral .growth and amendment.

INTRODUCTION

Plants, like all living things, require substance in order to grow and develop. Man and other animals can only live on organic food, which is food made from plant or animal materials. Plants, on the other hand, have the ability to create organic tissues from inorganic components. They take up water and mineral ingredients from the soil, carbon dioxide from the air, and energy from the sun to build plant tissues, which they use to live, develop, and reproduce. Carbon, hydrogen, and oxygen are obtained from the air and soil water, while nitrogen, phosphorus, potassium, calcium, magnesium, sulphur, iron, zinc, manganese, copper, boron, molybdenum, and chlorine are obtained from soil reserves or by the application of manures and fertilisers. Furthermore, the presence of cobalt, sodium, silicon, and potentially vanadium has been demonstrated to benefit specific plant species, but these elements are not considered necessary nutrients.

All of the essential plant nutrients should be present in appropriate quantities and in balanced proportions in a productive soil. Before plants can utilise nutrients, they must be present in an accessible form. Each necessary nutrient serves a distinct and distinct purpose in plant growth and development, and a shortage in any of them results in abnormal or restricted growth [Roy.R.N, Finck.A, Blair.G.J et al.,2006].Thus, even if soil nutrient status is maintained at its current level, fertilisers must be applied to the soil to compensate for these losses. Many, if not all, soils require the addition of one or more nutrients to allow crops to reach their maximum development and yield potential. Fertilizers and organic manures are therefore required to keep cultivated soils, such as arable, tree crops, and grassland, in a high condition of fertility and to obtain high crop yields.

A commercial fertiliser containing one or more known plant nutrients and used primarily for its plant nutrient content is referred to as fertiliser material. Fertilizers are sold in solid, liquid, and gaseous forms and are derived from a wide range of natural and artificial ingredients. These compounds are intended for use in soils to promote plant growth or increase plant-available nutrient levels [Roy.R.N, Finck.A, Blair.G.J et al.,2006]. Remains of plants, animals, and humans are organic sources of plant nutrients.Farmyard manure, compost, green manure, and various animal wastes are some of the more important sources of plant nutrients. It enhances the structure, aeration, and water holding capacity of the soil, allowing it to respond better to contemporary inputs such as fertilisers, improved crop types, and irrigation. It also provides micronutrients and aids in the availability of phosphate in the soil to plants. [Krishan Chandra, Handbook of production and quality control of organic inputs, 2005].

Sustainable agriculture is defined as the efficient production of safe, high-quality agricultural products in a way that protects and improves the natural environment, as well as the social and economic conditions of farmers, their employees, and local communities, as well as the health and welfare of all forms of life [Sukhdev.S.Malhi; Tarlok.S.Sahota et al.,2013].Organic farming is one such technique that promotes food safety while also increasing soil biodiversity. As a result, the goal of this research is to practice organic

farming in order to create more sustainable agricultural systems and boost soil fertility [Raja N, Biopesticides and Biofertilizers, 2013].

Marine fish excrement is a nutrient-dense source. Anyone that cleans and prepares fish, from large commercial food processors to small sport-fishing companies, faces a waste disposal dilemma. Composting, similar to how home gardeners generate their own soil enhancer, is a possible answer. There hasn't been much work done. Composting fish waste and seaweed to provide a fertilizer for organic agriculture has been completed [Jeyanthi Rebecca et al.,2014].

The goal of this study was to standardize the usage of the marine waste crab shell as a biofertilizer and investigate its impact on plant (Raddish) growth and soil enrichment.

Crab shell is a good source of nitrogen, potassium, phosphorus, calcium, and magnesium in a dry organic form. The mineral content of hard shell crustaceans was higher than that of soft shell crustaceans [Bakiyalakshmi, S.V et al.,2016].The crab used in this experiment was Portunus sanguninolentus, also known as the three-spotted crab, blood-spotted swimming crab, or red-spotted swimming crab. Proteins, lipids, and carbohydrates make up the biochemical of this crab. Seven saturated fatty acids, two monounsaturated fatty acids, and seven polyunsaturated fatty acids were discovered out of a total of 16 fatty acids. There were 10 necessary amino acids found, with arginine being the most abundant, followed by tryptophan, methionine, and threonine. Calcium, magnesium, iron, phosphorus, sodium, potassium, copper, manganese, zinc, chromium, and iodine were among the minerals found [Sheeba Wilson et al.,2017].

Radishes, in general, are high in carbs, sugars, dietary fibres, protein, and even fat and fluoride. It also includes water-soluble vitamins (B1, B2, B3, B5, B6, B9, and C) as well as minerals (calcium, iron, magnesium, manganese, zinc, potassium, and phosphorus). Furthermore, radish was discovered to have unique bioactive chemicals that have recently been recognised as having potential human health advantages. Glucosinolates (e.g., glucoraphanin, glucoraphanin, 4 hydroxyglucobrassicin, glucoerucin, glucoraphasatin, glucobrassicin, 4-methioxyglucobrassicin, and neoglucobrassicin) and isothiocyanates (e.g., sulforaphene, sulforaphane, and indole-3-carbinol) [Baenas, N., Gomez-Jodar et al,2017].

With this background, the present investigation was to enhance the utilization of crab waste and help to minimize the environmental pollution. The minerals, chitin and chitosan from crab exoskeletons may enhance the growth properties for plants. So the crab shell powder is mixed with soil for the analysing the growth of radish (Rhaphanus sativus) and soil fertility.

Hence, the present research work is carried out to study the effect of crab shell powder (which act as an organic fertilizer) on the growth and nutritional status of radish (Rhaphanus sativus).

MATERIAL AND METHODS

In this work, an attempt was made to prepare a biofertilizer from the marine waste crab shell and to investigate its efficacy in terms of plant growth and nutritional status.

Collection of samples :Three spotted crab shells were collected from local fish market that regularly throws about 20kg to 30kg of crab shell per week as waste. It was cleaned by washing continuously with water to remove all the unwanted dirt from the shell. The cleaned crab shell was kept under the sun for 3 days for drying. After 3 days, the dried crab shell was taken and powdered by crushing in a mortar and pestle or blender. The crab shell powder was kept stored for further mineral analysis such as nitrogen, potassium, phosphorus, calcium and magnesium.

Soil sample :The red soil was collected from Chengalpet district. The soil was weighted approximately and was filled in two wide and length pots. In each pot was filled with 10 kg of soil.

Seeds : The seeds of Raphanus sativus were collected from plant nurseries.

Procedure :

About 10kg of soil is taken in each pot. Holes were made in the pot to prevent from water clogging. The powdered crab shell was taken and weighed 250gms and mixed in one pot which was labeled as “Test”. The soil sample without crab shell powder was labeled as “Control”. The pot filled with crab shell powder was left for two days before sowing the seeds.

After two days of soil filled in pots, The seeds were sown 1 inch deep. Radish does not require to be buried deep into soil. The seedlings were allowed to grow for one to two months. The pot was kept in enough sunlight and watered everyday to maintain soil moisture content for healthy growth. After week 8, the tubers and leaves of radish were collected for nutritional analysis.

PLATE 1 – RADISH SEEDS

PLATE 2 – PREPARATION OF CRAB SHELL

PLATE 2A – CLEANED CRAB SHELL

PLATE 2B – CRAB SHELL POWDER

PLATE 3 – SOIL MIXING

PLATE 3A – SOIL WITH CRAB SHELL

PLATE 3B – WITHOUT CRABSHELL

Assesment of Nutritive value:

pH:

Method for determination of pH Value by electrometric method in control and test soil. [Environmental protection Agency- USEPA METHOD 9045 D, SW-846]

The basic principle of pH measurement is determination of the activity of the hydrogen ions by potentiometric measurement using a standard hydrogen electrode and a reference electrode. Take 20g of the sample in to a 50ml beaker, add 20ml of distilled water and stir the suspension for 5 minutes, let the sample suspension stand for 15 minutes to allow most of the suspended to settle from the suspension or filter off the aqueous phase for pH measurement. Lace the electrode and temperature probe in to the beaker and wait

until it shows the constant reading on LCD screen. Note down the pH and reported it as pH@ 25◦C. Rinse the electrode and temperature probe with distilled water and wipe gently with tissue paper after the measurement and keep in distilled water.

Total Nitrogen:

The total nitrogen in soil and crab shell was determined by the method of Vijayarengan P et al. [Indian Standard: 10158-2003 Methods of analysis of soil and Vijayarengan P et al.,2017].

Digestion :

Hundred milligram of dried materials were taken in the Kjeldahl flasks and 5 ml of salicylic – sulphuric acid mixture (5 g salicylic acid in 100 ml concentrated sulphuric acid) was added. The flask was, rotated to mix and allowed to stand for 30 min. Approximately 0.3 g sodium thiosulphate was added and heated gently until fumes appeared. Then 5 ml of concentrated sulphuric acid and approximately 0.1 g of catalyst mixture (copper sulphate, potassium sulphate and selenium dioxide mixed in the ratio of 1:8:1) were added. Digestion was performed at low heat until frothing stopped and fumes of sulphuric acid were freely evolved. After 5-10 min heat was increased, so that the acid is boiled and condensed one third way up the neck of the flask. Digestion was continued for at least 3 h, till the digest has become colourless. On completion of digestion, the flask was cooled and 20ml of water was added. The flask was again cooled and the content was transferred into a 50 ml volumetric flask and made up to the volume.

Distillation :

Distilled water was boiled in the flask and clips wer kept closed and opened respectively when steapassed through the funnel and the funnel was washed with 1 ml of water each time. The ground glass20ml per was replaced and 8 ml of 40 per cent sodium hydroxide was added in funnel. The lower end of the condenser was kept dipped into 5 ml of 2 per cent boric acid and few drops of mixed indicator (6 ml methyl red solution (0.16 per cent in 95 per cent alcohol) and 12 ml bromocresol green (0.04 per cent in water) were mixed and 6 ml of 95 per cent alcohol was adde to the mixture) contained in a 50 ml conical flask. When steam issued freely through the tube, the clip

was closed and the ground glass stopper was lifted to allow sodium hydroxide to run into the digest. The stopper was immediately replaced and distillation was continued until 30 ml distillate had been collected. After a few ml of liquid had distilled over, the end of the condenser was raised above the level of boric acid. Heating was stopped after distillation was completed, so that the liquid in the distillation chamber was sucked into the jacket. A few ml of water was added through the funnel and the stopper was replaced. This liquid in the jacket was allowed to run as wast by opening the clip. Now the apparatus was ready for the next distillation. Then the whole distillate was. titrated against standard 1/28 hydrochloric acids solution until the pink colour just. Blank digestion, distillation and titration, were made using all the reagents without plant sample. The percentageof total nitrogen was calculated by the following formula

Percentage of nitrogen = (T-B) × 5 +× N × 1.4/S

where,

T = Sample titrated (ml)

B = Blank titrated (ml)

N = Normality of hydrochloric avadu (1/28 = 0.0357142)

S = Weight of plant material (g)

Aliquot factor = 5

Potassium:

Determination of potassium in soil, crab shell, radish leaves and tuber by the method of Vijayarengan P et al [IS 10158-1982 and Vijayarengan P et al.,2017].

Dried and ground samples weighing 0.5 g were digested in 100 ml Kjeldahl flasks using 15 ml of concentrated nitric acid, 0.5 ml of 60 per cent perchloric acid and 0.5 ml of concentrated sulphuric acid. Digestion was continued until the nitric and perchloric acids were driven-off. The inorganic residue was cooled and diluted with 15 ml of distilled water and filtered through Whatmann No.42 filter paper. The filtrate was made up to 50 ml with distilled water. The filtrate was used for potassium estimation by flame photometer and standards were prepared with potassium chloride.

Phosphorus:

Determination of phosphorus content in soil and crab shell by the method of Olsen's method and Vijayarengan P et al [FAO Method, Olsen's method and Vijayarengan P et al.,2017].

One gram of dried sample was digested with 10 ml of acid mixture (nitric acid, 750 ml; sulphuric acid, 150 ml; perchloric acid 60 per cent, 300 ml). The digest was cooled and made up to 50 ml and filtered through acid washed Whatmann No.1 filter paper. One ml of digest was mixed with 2 ml of 2 N nitric acid and diluted to 8 ml. One ml of molybdovanadate reagent (25 g of ammonium molybdate in 500 ml water, 1.25g ammonium vanadate in 500 ml of 1 N nitric acid; both were mixed in equal volumes) was added, make up to 10 ml, shacked and the absorbance was measured at 420 nm in a spectrophotometer, after 20 min of standing. Standard graph was prepared using potassium dihydrogen phosphate.

Calcium and Magnesium :

Determination of soluble calcium and magnesium in soil, crab shell, radish leaves and tuber [Food and agricultural organization,2007., EDTA- Titrimetric method].

Two ml of the filtrate was mixed with 2 ml of 5 percent lanthanum chloride solution and diluted with 10 ml of 1N hydrochloric acid. The solution was fed into an atomic absorption spectrophotometer at 211.9 nm for calcium and 285.4 nm for magnesium. Standard curves were prepared by using calcium chloride and magnesium chloride.

Iron :

Determination of iron by atomic absorption spectrophotometer in leaves of *Raphanus sativus [AOAC* 21st EDITION 2019].

To describe the method procedure for the analysis of iron content in Hemocryl gel solution. A specified quantity of the test sample is ashed and digested in the acidic medium and diluted to obtain the required concentration as iron in the final solution. NIST traceable standard iron is diluted to check the linearity. The standard and samples are aspirated in the atomic absorption spectrophotometer as per the sequence, to obtain the iron concentration in the aspirated sample in mg/Kg or mg/L. the final content will be reported by considering the dilution factor, label claims etc.

Take 20 gram of gel sample. Heat the crucible in a muffle furnace maintained at 550◦C for 6- 12 hours, and cool. Add 60 ml of hydrochloric acid, and boil gently on a hot late or steam bath for 30 minutes, intermittently rinsing the inner surface of the crucible with 6 N hydrochloric acid. Cool, and quantitatively transfer the contents of the crucible to a 100 ml volumetric flask. Rinse the crucible with small portions of 6 N hydrochloric acid, and add the rinsings to the flask. Dilute with water to volume, and filter, discarding the first 5 ml of the filtrate. Dilute this solution quantitatively with 0.125 N hydrochloric acid to obtain a nominal concentration of 2 µg/ml of iron to the final volume. Aspirate sample like Blank, standard 1, standard 2, standard 3, standard 4, standard 5, Blank, Sample-1 prep-1, Sample-1 Prep-2, Blank, Check standard, Blank. Run and print the report. Any variation in the run sequence needs to the justified approximately.

Vitamin C :

Estimation of Vitamin C in *Raphanus sativus* tuber. (FSSAI Manual fruits and vegetables)

Preparation of buffer : Dissolve 6.8g of potassium dihydrogen ortho phosphate in 1000 ml of water. Filter the solution through 0.45 µm nylon membrane filter and degas it.

Preparation of mobile Phase : Mix well 300 volumes of buffer and 700 volumes of acetonitrile then degas it.

Diluent : Mix well 300 ml of water and 700 ml of methanol then degas it. Accurately weigh and transfer about 30 mg of vitamin C working standard in to a 100 ml volumetric flask, add about 70 ml of diluents to disperse the content and sonicate for 5 minutes then make up to the volume of diluents. Filter the solution through 0.45 µm nylon membrane filter.

Sample preparation : Accurately weigh and transfer the sample equivalent to about 30 mg of vitamin C in to a 100 ml volumetric flask , add 60 ml of diluents and sonicate for 15 minutes at below 25◦C to disperse the content and then make up to the volume with diluents. Filter the solution through 0.45 µm nylon membrane filter.

Procedure : Separately inject equal volumes of the blank, standard reparation and sample preparation in to the chromotograph, record the chromatograms, and measure the response of major peak.

$$\textbf{Vitamin C} = \frac{AT}{AS} \times \frac{WS}{100} \times \frac{100}{WT} \times \frac{P}{100} \times \frac{Avg.Wt}{LC} \times 100$$

Where,

AT – Average area of vitamin C peak from sample preparation

AS – Average area of vitamin C peak from standard preparation

WS – Weight of vitamin C working standard in mg

P - Percentage purity of vitamin C working standard on as is basis.

LS – Label claim in mg.

RESULTS AND DISCUSSION

Organic farming is one such technique that promotes food safety while also increasing soil biodiversity. As a result, the goal of this research is to practise organic farming in order to create more sustainable agricultural systems and boost soil fertility [Surya Anjani kumar sarva et al.,2014].Plant extracts, animal byproducts, and other natural products are used in organic farming. The current organic fertiliser was chosen from Vyrukshayurveda, versus Ash and Cucumber dies if profusely smoked with bones of crabs [Nalini S, Surapala's Vrikshayurveda, 1996 and 2004].

Reusing trash from the fishing industry is not widespread, and a considerable percentage of waste biomass is thrown straight into the environment without treatment. This form of trash, on the other hand, is a high-value raw material that can be used to make biocompounds [Jeyanthi Rebecca et al.,2015]. In this research, one type of marine trash that is discarded is crab shell, which can be utilised as an organic fertiliser to reduce pollution and improve soil chemical composition and plant quality.The essential thing to consider for greater returns in any crop production programme is to minimise the cost of production without sacrificing crop yield. This can be accomplished by using organic fertilisers instead of inorganic fertilisers and minimising the amount of inorganic fertiliser used. Organic nutrients are more difficult to obtain since the materials must be degraded and organic nutrients mineralized [Sarva SAK, Giri A,2015], resulting in increased nutritional value. Many species of living organisms are activated by organic manures, which release phytohormones and may stimulate plant growth and nutrients .

These organisms require nitrogen for multiplication, which is provided by organic manure. An attempt was undertaken in this approach to compare the performance of radish in soil with and without crab shell powder as an organic fertiliser. The outcomes are addressed further down.Crab shell fog as organic fertilizer to increase plants of Cucurbitaceae growth dramatically [Surya Anjani kumar sarva et al.,2014] and effect of marine waste on seed germination on pea, green gram and tomato in which crab shell provided plants were germinated soon when compare to prawn+ crab and prawn [L.Jeyanthi Rebecca et al.,2014]. In this present study, the observation of the germination time of the seeds in test (with crab shell powder amendment) was faster when compared to the germination time of the seeds in control (without crab shell powder amendment). Figure 1 represents the percentage of germination of seeds. It depicts that 90% of radish seeds were found to be germinated in the pot with crab shell powder amendment (test). Whereas, 65% of seeds were only germinated in the pot without crab shell powder (control).

Table -1 Recorded the height of the plant in the following week 1, 2 and 3 which depicts the amendment of crab shell powder in soil increases the height of the plant (test) when compared to plant without crab shell. **Table -2** Recorded the length of the radish at the day of harvest (week 8). At the time of harvest, radish length, weight and width which was in test pot is increased when compare to radish control. The plant's height is an important growth characteristic that is closely linked to the plant's productive potential. Plant productivity is said to be positively associated with optimum plant height [L.Jeyanthi Rebecca et al.,2015].

The nitrogen concentration of the crab shell powder amendment soil was higher than the soil without crab shell amendment, as evidenced by this study. This could be due to the effects of organic manure, which have been shown to considerably enhance soil pH and nitrogen, accessible phosphorus, exchangeable potassium, calcium, and magnesium concentrations.

Table-3 Recorded the amount of minerals present in 250 grams of crab shell powder in which calcium was higher followed by magnesium, nitrogen, phosphorus and potassium. The nitrogen, potassium, phosphorus, calcium and magnesium in test soil shows higher concentration with the amendment of crab shell powder when compare to control was recorded in **Table-4.** Higher plant development during organic manure fertilisation can be linked to the manure's enhancement of soil physical and chemical qualities.
In this investigation on comparative effect of crab shell powder amendment in soil as organic fertilizer (Test) and without crab shell (Control) on Iron, Potassium and Calcium composition of leaves of Raphanus sativus and potassium, calcium and vitamin C in tuber of Raphanus sativus revealed that plant grown on crab shell amendment soil (Test) produced higher amount when compared to without crab shell amendment (Control) which was recorded in **Table -5 and 6**.

The result of this research are agreement with previous researchers who have reported increases in minerals and vitamins with organic fertilizers [Jeyanthi Rebecca et al.,2014 and 2015 and Funda, Y,et al.,2013].

PLATE 4A–CONTROL (Without Crab shell)

PLATE 4B – TEST (With crab shell)

FIGURE 1 – NUMBER OF SEEDS GERMINATED IN CONTROL AND TEST POT

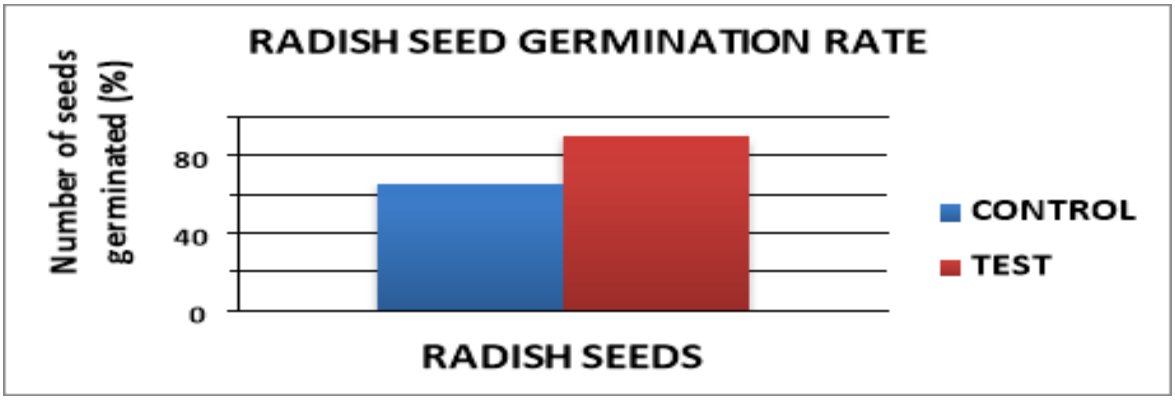

TABLE 1 – HEIGHT OF THE PLANT (cm)

WEEKS MEASURED	HEIGHT OF CONTROL PLANT (cm)	HEIGHT OF TEST PLANT (cm)
DAY 4	4 cm	6 cm
WEEK 1	8 cm	10 cm
WEEK 2	10 cm	12 cm
WEEK 3	11 cm	14 cm

PLATE 5 – HEIGHT OF THE PLANT (WEEK 1)

PLATE 5A - CONTROL SINGLE PLANT

PLATE 5B – TEST SINGLE PLANT

PLATE 6– HEIGHT OF THE PLANT (WEEK 2)

PLATE 6A – CONTROL PLANT

PLATE 6B– TEST PLANT

PLATE 7– HEIGHT OF THE PLANT (WEEK 3)

PLATE 7A – CONTROL PLANT

PLATE 7B – TEST PLANT

PLATE 8– HEIGHT OF THE PLANT (WEEK 6)

PLATE 8A – CONTROL GROWTH

PLATE 8B – TEST GROWTH

PLATE 9 – HEIGHT OF THE PLANT (WEEK 7)

PLATE 9A – CONTROL GROWTH

PLATE 9B – TEST GROWTH

PLATE 10 – LENGTH OF RADISH TUBER (AFTER WEEK 8)

PLATE 10A – LENGTH OF CONTROL RADISH

PLATE 10B – LENGTH OF TEST RADISH

HEIGHT OF THE TUBER	CONTROL			TEST		
	RADISH 1	RADISH 2	RADISH 3	RADISH 1	RADISH 2	RADISH 3
WEIGHT (grams)	32.62	27.27	7.55	86.33	85.58	47.45
LENGTH (cm)	10	8	6	16	14	10
WIDTH (cm)	9	11	5	11	10	9

TABLE 2 – GROWTH PARAMETERS OF THE RADISH TUBER

PLATE 11 – COMPARISON OF CONTROL AND TEST RADISH

ASSESMENT OF NUTRITIVE VALUE

TABLE 3 – MINERALS IN 250 g OF CRAB SHELL POWDER

PARAMETERS	UNIT PRESENT (%)
NITROGEN	1.78
PHOSPHORUS	1.53
POTASSIUM	1.23
CALCIUM	628.5
MAGNESIUM	7.2

TABLE 4 – MINERALS PRESENT IN CONTROL AND TEST SOIL

PARAMETERS	CONTROL (%)	TEST (%)
pH	7.60	7.97
NITROGEN	0.108	0.142
PHOSPHORUS	1.03	7.14
POTASSIUM	0.56	0.67
CALCIUM	45.29	274.97
MAGNESIUM	8.6	24.06

NUTRIENTS PRESENT IN CONTROL AND TEST RADISH LEAVES AND TUBER:

TABLE 5 – NUTRIENTS PRESENT IN CONTROL AND TEST RADISH LEAVES

PARAMETERS	CONTROL (mg/kg)	TEST (mg/kg)
POTASSIUM	8025	8935
CALCIUM	60.88	62.71
IRON	83.5	105.6

TABLE 6 – NUTRIENTS PRESENT IN CONTROL AND TEST RADISH TUBER

PARAMETERS	CONTROL (mg/100 g)	TEST (mg/100 g)
WATER CONTENT	91.13	90.56
POTASSIUM	22.23	38.25
CALCIUM	24.25	35.12
VITAMIN C	10.25	18.27

CONCLUSION

Organic farming is one such technique that promotes food safety while also increasing soil biodiversity. Chemical fertilizers, on the other hand, pollute water bodies and groundwater, and excessive synthetic inputs in soils have rendered them biologically dead.

This research clearly demonstrates that one of the marine waste crab shell is a great organic material. Thus, from the results of the present study, it can be concluded that crab shell acts as an excellent organic fertilizer for better soil quality and enhances plant minerals quality.

Hence, crab shells may be added to the soil which enhances the growth and nutritive value of radish effectively in agricultural practices instead of getting thrown out as waste to reduce the environmental pollution and improve plant growth and nutritive value.

REFERENCE

[1] Baenas, N., Gomez-Jodar, I., Moreno, D. A., García-Viguera, C., & Periago, P. M. (2017). Broccoli and radish sprouts are safe and rich in bioactive phytochemicals. Postharvest Biology and Technology, 127, pp : 60–67.

[2] Bakiyalakshmi.S.V, Valli.V and R.Delinta Linu Swarnila, Isolation and Application of Chitin and Chitosan from Crab shell. (2016), pp. 91- 99

[3] Funda, Y., C. Safak, M. Nilgun and C.E. Bihter, (2013). Effect of organic and in fertilizer on yield and mineral content of onion (Allium cerpa L.). Afr. J. Biotechnol., 10: 11488-11492.

[4] Jeyanthi Rebecca, L., Anbuselvi, S., Sharmila, S., prathiba Medok and Dola sarkar.,(2014), Effect of marine waste on seed germination, pp: 581-584.

[5] Jeyanthi Rebecca, L., Anbuselvi, S., Sharmila, S., prathiba Medok and Dola sarkar.,(2015), Effect of marine waste on plant growth, Pp: 299-301.

[6] Krishna Chandra., Handbook of production and quality control of organic inputs., (2005) Pp :6 - 33

[7] Nalini S (1996), Surapala's Vrikshayurveda (The Science of Plant Life by Surapala). Agri-History Bulletin 1: 94

[8] Nalini S (2004) ,Vishvavallabha (Dear to the World. The Science of Plant Life). Agri-History Bulletin 5: 134

[9] Raja N (2013) Biopesticides and Biofertilizers: Ecofriendly Sources for Sustainable Agriculture. J Biofertil Biopestici 4: e112, ISSN: 2155-6202

[10] Roy.R.N, Finck.A, Blair.G.J, Tandon.H.L.S; Plant nutrition forfood security; FAO fertilizer and plant nutrition Bulletin, Rome (2006); pp: 25-42 and 92-136.

[11]Sarva SAK, Giri A (2015) Effect of Freshwater Crab Shell Fog as Organic Fertilizer to Increase Plants of Cucurbitaceae Growth Dramatically. Agrotechnol 4: 129. Volume 4 • Issue 1 • 1000129

[12] Sheeba Wilson., Immaculate Jeyasanta,K and Jamila Patterson., Nutritional status of swimming crab Portunus sanguinolentus, (2017); pp: 191-202.

[12] Sukhdev.S.Malhi; Tarlok.S.Sahota; et al, Agricultural Sustainability.(2013), pp: 77-101.

[13] Surya Anjani Kumar Sarva and Archana Giri, Effect of Freshwater Crab shell Fog as Organic Fertilizers, ISSN 2249-3050, Volume 5, Number 4 (2014), pp. 307-314.

[14] P.Vijayarengan and M.Christhu Uthayam, Changes in nutrients content of Radish (Raphanus sativus) under copper toxicity. (2017). 4 (4): 88-93.

[15] AOAC 21st EDITION 2019, 9.1.09 999.11

[16] Environmental protection Agency- USEPA METHOD 9045 D,rev 4,(2004)., SW-846

[17] FAO Method, 2007- Olsen's method.

[18] Food and agricultural organization,(2007)., EDTA- Titrimetric method).

[19] Indian Standard: 10158-2003 Methods of analysis of solid wastes.

[20] IS 10158-1982 (RA.2003).