ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 9, Issue, 9(C), pp. 28829-28832, September, 2018

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

EFFECT OF BIOCOMPOSTED CORNCOB AND COIRPITH ON PROTEIN AND CARBOHYDRATE CONTENT OF SOYBEAN GLYCINE MAX L. (MERILL) VAR. CO. 7 SOY 3

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DOI: http://dx.doi.org/10.24327/ijrsr.2018.0909.2512

ARTICLE INFO

Article History:

Received 13th June, 2018
Received in revised form 11th July, 2018
Accepted 8th August, 2018
Published online 28th September, 2018

Key Words:

Corncob, Coirpith, *Pleurotus sajor-caju* and *Eudrilus eugeniae.*

ABSTRACT

An experiment was conducted at Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu (India) for assessing the effect of biocomposted corncob and coirpith on biochemical constituents in leaves and seeds of soybean. The treatment T_6 - compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t/ha) showed increased protein and carbohydrate content followed by other treatments. A significant increase in protein and carbohydrate content was noted in T_6 treatment (97.45 mg/g tissue and 76.56 mg/g tissue) on 50 DAS in leaves. Maximum protein and carbohydrate content was achieved in seeds (64.08 and 97.55 mg/g tissue) on 90 DAS. Among the treatments, T_6 showed promising results for protein and carbohydrate content in leaves and seeds as compared to the other treatments and control. Hence, organic manure like biocomposted corncob and coirpith can be recommended as effective organic fertilizer for enhancement of protein and carbohydrate in *Glycine max* L. (Merill) Var. Co. 7 Soy 3.

INTRODUCTION

Agroindustrial wastes and byproducts are renewable forms of resources generated all over the world. Corncob and coirpith contains large amounts of chemical constituents like lignin and cellulose which do not degrade quickly but can be decomposed by using microorganisms, bio fertilizer and earthworm (*Eudrilus eugeniae*) into more available forms. Legume seeds are important sources of nutrients and can serve as high quality dietary protein sources to meet nutrient requirements (Duranti, 2006). Soybean is an herbaceous plant belonging to the family Fabaceae. It is a leguminous oil seed crop having world-wide adaptation. It is commonly known as "golden bean" or "miracle crop" of 20th century as it contains the richest source of protein, oils, amino acids and unsaturated fatty acids. It is also one of the nature's most versatile and fascinating crop in the present farming systems of Indian agriculture. The need of the hour is to improve soil health by providing the much needed organic matter. In the present investigation, the biochemical constituents like protein and carbohydrate contents were analyzed in soybean leaves and seeds which was cultivated under the influence of biocomposted corncob and coirpith.

MATERIALS AND METHODS

Collection of Agro-Industrial Waste

The agro-industrial wastes corncob and coirpith was collected in large amount from in and around Coimbatore and Pollachi. Coirpith was mostly abundant in Eastern slopes of Western Ghats area which includes Pollachi and Coimbatore (Tamil Nadu). The corncob wastes were collected in large amounts from the corn fields of South East Coimbatore. The collected wastes were chopped into small pieces. It was sun dried and stored in gunny bags.

Collection of earthworm

The earthworm *Eudrilus eugeniae* Kinberg were obtained from Tamil Nadu Agricultural University, Coimbatore.

Composting Procedure

Compost pit preparation

Six pits each measuring 1.5 feet length and 4 square feet width were used for composting. They were named as compost 1 (Raw corncob composted by using *Pleurotus sajor-caju* (5t/ ha), compost 2 (Predigested raw corncob + *Eudrilus eugeniae*

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(5t/ ha), compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t/ ha), compost 4 (Raw coirpith composted by using *Pleurotus sajor-caju* (5t/ ha), compost 5 (Predigested raw coirpith + *Eudrilus eugeniae* (5t/ ha) and compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t/ ha).

Compost preparation

The corncob and coirpith wastes were subjected to decomposition by various ways and means to achieve the good quality biocompost.

Compost 1

The sundried 1 kg of corncob waste was transferred to C_1 pit, spread with 20 g of *Pleurotus sajor-caju* spawn spread uniformly and sandwiched above with a layer of one kg of corncob waste. This process was repeated till the heap reaches a height of above 1m. The moisture content in the heap was maintained at about 60-70% by sprinkling water. To accelerate the decomposition process turning was manually done every week during composting.

Compost 2

C_2 pit was filled with 1 kg of corncob waste along with cow dung in the ratio of 1:1. It was allowed for decomposition for 20 days. Vermicomposting process adopted. The moisture content in the heap was maintained at about 60-70% by sprinkling water. To accelerate the decomposition process turning was manually done every week during composting.

Compost 3

C_3 pit was filled by sundried corncob waste. To this 20g of *Pleurotus sajor-caju* spawn was uniformly spread. Above this layer 1kg of corncob waste was spread. This process was repeated until the heap reaches a height of above 1m. The moisture content in the heap was maintained at about 60-70% by sprinkling water. To accelerate the decomposition process turning was manually done every week during composting it was predigested by using *Pleurotus sajor-caju* spawn and then vermicomposting process adopted.

Coirpith compost preparation

Above same procedure was repeated instead of corncob (C_1, C_2 and C_3) coirpith was used in the following composting pits compost 4 (C_4), compost 5 (C_5) and Compost 6 (C_6) respectively.

Treatment application

T_1 – compost 1 (Raw corncob composted by using *Pleurotus sajor-caju* (5t/ha)
T_2 – compost 2 (Predigested raw corncob + *Eudrilus eugeniae* (5t/ha)
T_3 – compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t/ha)
T_4 – compost 4 (Raw coirpith composted by using *Pleurotus sajor-caju* (5t/ha)
T_5– compost 5 (Predigested raw coirpith + *Eudrilus eugeniae* (5t/ha)
T_6 – compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t/ha)

Pot culture experiments

Stones and pebbles were removed from the soil and all the pots were filled with 7 kg of sandy clay loam soil. The biocompost was applied to the respective pots and mixed thoroughly. About 10 viable seeds of soybean was sown in each pot with three replications each for 25, 50 and 75 DAS. After germination five healthy plants were maintained per pot. Plant protection measures and other cultural practices were followed as per recommendation by Tamil Nadu Agricultural University, Coimbatore.

Biochemical Analysis

Protein

Estimated on 25 DAS, 50 DAS, 75 DAS in leaves and 90 DAS in seeds (Lowry *et al*., 1951).

Carbohydrate

Estimated on 25 DAS, 50 DAS, 75 DAS in leaves and 90 DAS in seeds (Hedge and Hofriter, 1962).

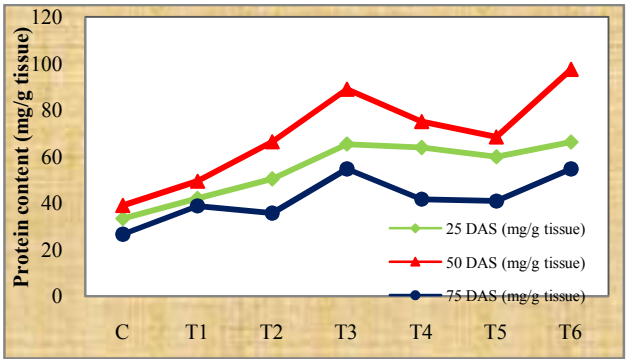
RESULTS AND DISCUSSION

Soybean (Glycine max L. (Merill) Var. Co. 7 Soy 3)
Protein

An increasing trend in protein content was observed in the leaves of all the treatments from 25 to 50 DAS and after that there was decrease in its content on 75 DAS. The results were depicted in the figure-1

Among the treatments, T_6 – compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5 t/ha) registered maximum protein content of 66.23 mg/g tissue (25 DAS) and 97.45 mg/g tissue (50 DAS) followed by T_3 –compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5 t/ha) of 65.33 and 88.90 mg/g tissue on 25 and 50 DAS and after that the protein content in the leaves declined gradually on 54.75 mg/g tissue and 54.72 mg/g tissue on 75 DAS over the Control treatment (33.41, 39.05, 26.63 mg/g tissue).

The present findings coincide with the results of Reghuvaran and Ravindranath (2014). They found that the application of composted coirpith increased the protein content of ornamental plants *Bauhinia purpurea* (8.81 mg/g tissue) and *Hydechium coronarium* (6.90 mg/g tissue). The increase in total protein content up to 50 DAS might be due to the increase in the percentage of nitrogen and phosphorus present in the plants due to the application of biocompost.



** –Significant at 1% (P<0.01); DAS – Days After Sowing

Figure 1 Effect of biocomposted corncob and coirpith on protein content in leaves of soybean (*Glycine max* L. (Merill) Var. Co. 7 Soy 3)

C – Control

T_1 – compost 1 (Raw corncob composted by using *Pleurotus sajor-caju* (5t/ha)
T_2 – compost 2 (Predigested raw corncob + *Eudrilus eugeniae* (5t/ha)
T_3 – compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t/ha)
T_4 – compost 4 (Raw coirpith composted by using *Pleurotus sajor-caju* (5t/ha)
T_5– compost 5 (Predigested raw coirpith + *Eudrilus eugeniae* (5t/ha)
T_6 – compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t/ha)

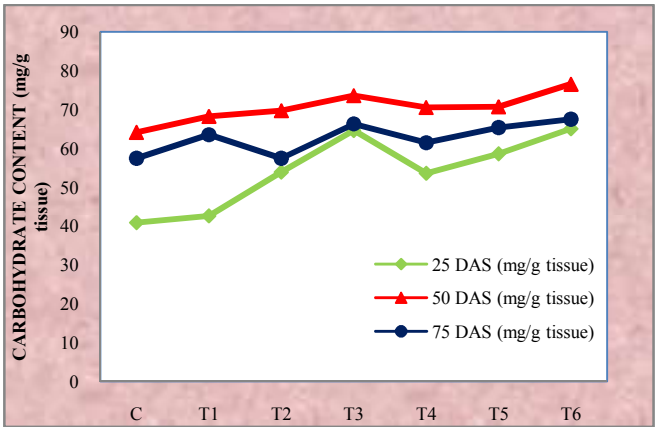
Effect of biocomposted corncob and coirpith on carbohydrate content in leaves of soybean
Soybean (Glycine max L. (Merill) Var. Co. 7 Soy 3)

An increasing trend in carbohydrate content was noticed in all the treatments from 25 to 50 DAS and after that there was a decrease in its content. (Figure-2)

Among the treatments, carbohydrate content in leaf was increased significantly in T_6 – compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5 t/ha) which ranged from 65.07 to 76.56 mg/g tissue followed by T_3 – compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5 t/ha) which ranged from 64.67 to 73.60 mg/g tissue on 25 and 50 DAS and declined to 67.55 and 66.33 mg/g tissue on 75 DAS against the Control (the increase was from 40.90 to 64.14 mg/g tissue on 25 and 50 DAS and declined to 57.43 mg/g tissue).

This result is in accordance with a result of Gangwar and Dubey (2013) who reported a maximum increase in the carbohydrate content 78.45% and 77.62% in basmati rice due to the combined application of blue green algae (15 kg/ha)+ farmyard manure (5 t/ha)+ vermicompost (5 t/ha)+ neem cake (2.5 t/ha). A similar result revealed by Reghuvaran and Ravindranath (2014) that application of composted coirpith significantly increased the carbohydrate content of vegetable plants like *Lycopersicon esculentum, Abelmoscus esculentus*, *Momordica charantia* as compared to the control.

The maximum carbohydrate content was observed in all the biocompost treatments from 25 to 50 DAS. This might be due to the addition of organic substances to soil resulted in substantial increase in carbohydrates content. After 50 DAS the total carbohydrate content of the leaf was significantly reduced. The reduction in the leaf total carbohydrate content in plants could be due to utilization of synthesized carbohydrates for biological purposes in the plant.



** –Significant at 1% (P<0.01); DAS – Days After Sowing

Figure 2 Effect of biocomposted corncob and coirpith on carbohydrate content in leaves of soybean (*Glycine max* L. (Merill) Var. Co. 7 Soy 3)

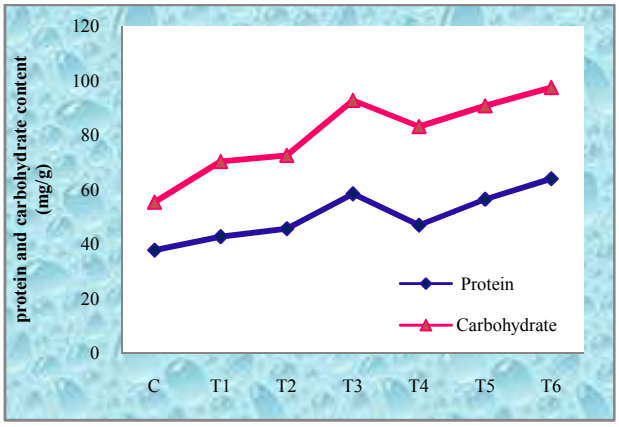
C – Control
T_1 – compost 1 (Raw corncob composted by using *Pleurotus sajor-caju* (5t/ha)
T_2 – compost 2 (Predigested raw corncob + *Eudrilus eugeniae* (5t/ha)
T_3 – compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t/ha)
T_4 – compost 4 (Raw coirpith composted by using *Pleurotus sajor-caju* (5t/ha)
T_5– compost 5 (Predigested raw coirpith + *Eudrilus eugeniae* (5t/ha)
T_6 – compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t/ha)

Effect of biocomposted corncob and coirpith on protein and carbohydrate content in seeds of soybean (90 DAS)
Soybean (Glycine max L. (Merill) Var. Co. 7 Soy 3) (Figure-3)

The protein content was found to be maximum in T_6 – compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5 t/ha) of 64.08 mg/g tissue followed by T_3 – compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5 t/ha) of 58.56 mg/g tissue as compared to Control (37.87 mg/g tissue)

The carbohydrate content was found to be more in T_6 – compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5 t/ha) of 97.55 mg/g tissue followed by T_3 – compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5 t/ha) of 92.84 mg/g tissue as compared to the Control (55.45 mg/g tissue)

A similar result was observed by Zodape *et al.* (2010) who reported that the application of 15% seaweed (*Kappaphycus alvarezii*) extract increased the protein (19.43 mg/g tissue) and carbohydrate (61.99 mg/g tissue) of green gram than control. The present finding was positively correlated with the findings of Ravimycin (2016) who recorded highest protein content in coriander (23.32 mg fresh weight) compared to control (16.48 mg fresh weight) on 90 DAS. The highest protein and carbohydrate content due to the application of earthworm and *Pleurotus sajor-caju* enhanced the increased availability of phosphorus which might have favorably influenced the nitrogen uptake by plants and ultimately accumulated in seed as protein and carbohydrate.



** –Significant at 1% (P<0.01); DAS – Days After Sowing

Figure 3 Effect of biocomposted corncob and coirpith on protein and carbohydrate content in seeds of soybean (*Glycine max* L. (Merill) Var. Co. 7 Soy 3)

C – Control
T_1 – compost 1 (Raw corncob composted by using *Pleurotus sajor-caju* (5t/ha)
T_2 – compost 2 (Predigested raw corncob + *Eudrilus eugeniae* (5t/ha)
T_3 – compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t/ha)
T_4 – compost 4 (Raw coirpith composted by using *Pleurotus sajor-caju* (5t/ha)
T_5– compost 5 (Predigested raw coirpith + *Eudrilus eugeniae* (5t/ha)
T_6 – compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t/ha)

CONCLUSION

Agro industrial wastes can be recycled and used as a cheaper source of organic nutrients. Integrated nutrient management alleviates the effect of inorganic elements responsible for toxicity hazards and prevents the physicochemical degradation of soil thereby contributes to the restoration of soil health. From the present investigation, it has become evident that the biocomposted corncob and coirpith treatment increases the protein and carbohydrate content of soybean in leaves and seeds. Hence it was concluded that the biocomposted coirpith can be effectively used as an organic manures.

Acknowledgement

We thank Avinashilingam Institute for Home Science and Higher Education for Women, for providing all the necessary facilities to carry out the present study.

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How to cite this article:

Sakthivigneswari G and Vijayalakshmi A.2018, Effect of Biocomposted Corncob and Coirpith on Protein and Carbohydrate Content of Soybean Glycine max l. (Merill) var. Co. 7 soy 3. *Int J Recent Sci Res.* 9(9), pp. 28829-28832.
DOI: http://dx.doi.org/10.24327/ijrsr.2018.0909.2740

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