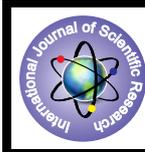


Biochemical Analysis of Groundnut VRI-2 (*Arachis Hypogaea*) Cultivated Under the Influence of Different Coir Compost Mixture



Microbiology

KEYWORDS: coir pith compost, groundnut, biochemical parameters.

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ABSTRACT

Coir pith is an agro industrial by product, which is considered as a waste in the coir factory of India. Naturally coir pith is rich in potash but low in nitrogen and phosphorus. But it was proven that coir pith can be used in field application as biocompost due to rich source of nutrients when composted properly. In the present study, various combination of coir pith compost were applied to the groundnut crop and examined particularly its biochemical parameters. Among the treatments, T₆ showed promising results of superior values obtained from various biochemical parameters viz., chlorophyll, carbohydrate, starch, amino acid and protein content than other treatments and over the control. Hence, organic manure like coir pith compost proved as effective biofertilizer in groundnut crop VRI-2

Introduction

Stabilization of organic wastes prior to land application is highly desirable to eliminate odor, to make nutrients in the wastes, particularly N, readily available for plant use and to prevent the compost incorporated into the soil from being phytotoxic to plant growth. The viability of composting depends on the availability of markets for composts. One of the most effective means of recycling any organic wastes for agricultural use is by means of composting, an accepted practice in India and elsewhere. In many cases in India, it is valuable to add nutrients to compost to increase its fertilizer value. Composting is a biotechnological process by which different microbial communities convert organic wastes into a stabilized form. The treatment by composting leads to the development of microbial populations, which causes numerous physico-chemical changes within mixture. Compost contains many essential nutrients and improves soil physical and chemical properties. Compost improves soil organic matter content, nutrient availability soil aeration, water holding capacity and reduces soil bulk density. Compost, if properly prepared, is beneficial to the productivity of agricultural crops.

It is estimated that 5.74 million metric tonnes of coconut are produced in the world (FAO, 2001). India is reported to produce 0.77 million metric tonnes of coconut (*Cocos nucifera*) equivalent to the availability of ~0.35 million metric tonnes of fibrous husk. About 50% of the husk accounts for the waste of coir industries as coir pith. Because of its high lignin content (~48%) and amorphous, powdery nature, coir pith is one of the toughest biological materials, highly resistant to biological degradation. Coir pith is very poor in nitrogen content, C:N ratio mounting to 112:1 (Nagarajan *et al.*, 1985). Such a high C:N ratio is undesirable for any organic waste for application as organic manure in agricultural farms because it causes deleterious effect to the crops. No economically viable process is available to dispose of coir pith. Coir compost for land application has been proven to be a cost effective.

Scarcity of large quantities of organic manure and high cost are the some of the problems faced in organic cultivation. Of the various organic agricultural wastes, composted coir pith is one, which has immense potential of supplementing the nutritional requirement of crops (Ramaswamy and Kothandaraman, 1991). Composted coir pith act as an important soil ameliorant to improve the physical condition and moisture status, thus it can be used as an effective mulch (Savithri and Khan, 1994). The composted coir pith improved productivity in number of crops, (Savithri and Khan, 1994; Srinivasan *et al.*, 2000).

Groundnut (*Arachis hypogaea*), the world's third largest oilseed crop is highly acclaimed as "King of oilseeds" in Indian agriculture. It is the most important oil seed crop in our country occupying two-third of area under oilseeds cultivation. India ranks first in the world's groundnut production accounting 40% of the world area and 31.7% of the total production in world. In India, among total production of edible oil, 67% comes from

groundnut. The demand for edible oil in the country is rising at about 6% a year. By 2020 AD, India's population is projected to be 1300 million and oil seed requirement is estimated to be 60 metric tonnes as against the present production of 25.6 metric tonnes. Groundnut is soil eco-friendly crop, it can be grown as rain fed crop as well as it responds well to the residual moisture and manures. In this present study, the various biochemical constituents such as chlorophyll, carbohydrate, starch, amino acid and protein contents were analyzed in groundnut that is cultivated under the influence of coir compost containing various organic amendments.

Materials and Methods

Treatment details

T1 – Control (Absence of Nutrients)

T2 – Compost Mixture – 2 (Coir pith (200 kg) + *Pleurotus sajor caju* (2.5 kg) + poultry manure (10 kg))

T3 – Compost Mixture – 3 (Coir pith (200 kg) + *Pleurotus sajor caju* (2.5 kg) + panchagavya (10 L))

T4 – Compost Mixture – 4 (Coir pith (200 kg) + *Phanerochaete chrysosporium* (1 L) + cow dung (10 kg) + panchagavya (10 L))

T5 – Compost Mixture - 5 (Vermicomposting of coir pith (200 kg) + cow dung (40 kg) + panchagavya (10 L))

T6 – 75% NPK + Compost Mixture – 2

T7 – 75% NPK + Compost Mixture – 3

T8 – 75% NPK + Compost Mixture – 4

T9 – 75% NPK + Compost Mixture – 5

T10 – 100% NPK

Biochemical analysis

The total chlorophyll content of groundnut was estimated according to the method given by Talling and Driver (1961). Total carbohydrates were determined according to the method of Hedge and Hofreiter (1962). Starch content was estimated according to the method of McCredy *et al.* (1950). The free amino acid was measured by the method of Moore and Stein (1948). Protein content was estimated according to the Lowry *et al.* (1951) method.

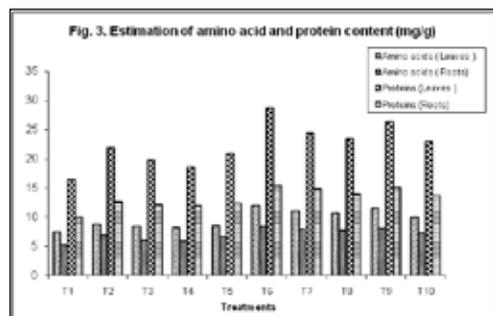
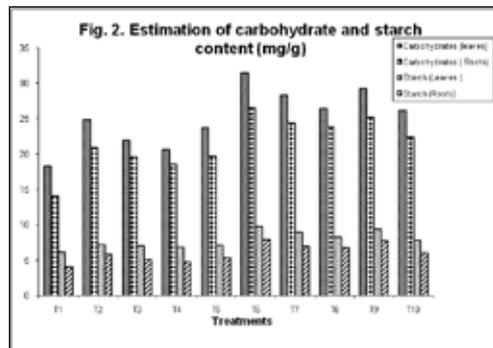
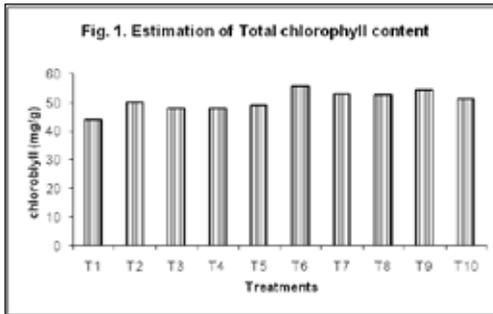
Statistical analysis

The results were subjected to the analysis of variance (ANOVA) as per the method suggested by Gomez *et al.*, (1976). The experimental data processed statistically by applying the SPSS software technique for analysis of variance in RBD (Panse and Sukhatne, 1978). The critical difference was worked out at five per cent probability level for significant results ($p=0.05$).

Results and Discussion

Biochemical analysis of groundnut VRI – 2 (*Arachis hypogaea* L.) showed increase in the amount of total chlorophyll, carbohydrate, starch, amino acid and protein content in the various plants treated with different combination of coir pith compost. Among the treatments, T₆ (75% NPK + Compost Mixture - 2) showed the highest value of total chlorophyll, carbohydrate, starch, amino acid and protein content which is closely followed

by T₉ treatment which was on par with treatments T₇ & T₈ over the control (T₁). The results of various biochemical parameters were given in the Fig. 1, 2 & 3.



Chlorophyll estimation is one of the important plant parameters which are used as an index of production capacity of the plant. The chlorophyll content is an ecological index as well as growth parameters (Billore and Mall, 2004). The chlorophyll content is positively correlated with net photosynthetic rate and it plays a major role in controlling growth and grain filling process. The coir pith compost showed the significant increase in chlorophyll pigment when compared with the untreated coir pith control,

this might be due to the nutrients enriched in the compost and which has been utilized by the plants and also coir pith compost has a rich source of carbon which helps during photosynthesis. Manoharan *et al.* (2011) reported that increased chlorophyll content in *Amaranthus dubius* when combined application of cyanopith biofertilizer. The reduction in chlorophyll content on treatment with untreated coir pith control indicates that its application had a negative impact on the growth of groundnut.

Carbon is a major structural element of carbohydrates which is essential for the various physiological activities of plant. The present study showed that the increased amount carbohydrate in plants treated with coir pith compost particularly treatment like T6. It might be the presence of enormous amount of organic carbon present in the composted coir pith where as untreated coir pith has wider C:N ratio and results in deleterious effect to the plants. Manoharan *et al.* (2011) also reported that increased carbohydrate content in *Amaranthus dubius* when combined application of cyanopith biofertilizers. The above finding was par on with present work.

Starch is one of the most important reserve food materials of the higher plants. Since shoot is the active site of photosynthesis more amount of starch was found in shoot than that of the root. Amino acid is the monomer of protein, which is the common reserve food material manufactured by plants. Shoot contained more amino acid content than that of the root. Sundaram (2010) reported that the amino acid content was increased in the tissues when more nitrogen was supplied to the plants. In present study also coir pith compost having rich in various macro and micro nutrient contents played an important role in plant growth and nutrient uptake, this might be due to the reason of increased amino acid, protein and starch content in groundnut when treated with coir pith compost. Similar result was obtained by Manoharan *et al.* (2011).

Conclusion

The reuse of agro-industrial waste coir pith as a nutrient rich source when composted and applied to groundnut as biofertilizer. Generally, chlorophyll, carbohydrate, starch, amino acid and protein content were enhanced in all the treatments with coir pith compost over the control. Of course, treatment T₆ showed superior results of biochemical parameters which is closely followed by treatment T₉ which is par on with T₇ & T₈. It shows that the coir pith compost has enough nutrients uptake by the plants and resulted significant in chlorophyll, carbohydrate, starch, amino acid and protein content. Hence, conclude that the coir pith compost is ideal for the growth and development of groundnut.

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