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Assessment of bio-chemical parameters on *Cyamopsis tetragonalaba* (L.) by treating vermicompost

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Abstract

Vermicompost is the remnants of the earthworms which feed voraciously on organic matter. Earthworms are beneficial organic creatures which man has not exploited. They eat voraciously and feed day and night all garbage if it is shredded to fine pieces. The earthworms are called intestines of the earth and are Bio-refineries purifying all waste into useful compost. Every house can adapt this simple process of converting garbage waste into wealth (Sultan Ismail 1997). The present study was carried out to investigate influence of Vermicompost on *Cyamopsis tetragonalaba* (L.) by assessing Bio chemical parameters such as Chlorophyll content, Protein content, Starch content, Glucose content and Nitrate Reductase activity.

Keywords: Bio chemical character, *Cyamopsis tetragonalaba*, vermicompost

Introduction

The earthworms burrow into the soil, land eat dead animal and vegetable matter and release pellets of bulk compost extremely rich in micro and macro nutrients. The compost contains approximately 0.5 percent Nitrogen, 0.2 percent phosphorus and potash in soluble form. It also contains sufficient quantities of micronutrients. The earthworms also release enzymes that lead to growth of microbes and bacteria. The poor little earthworms not only do all this tirelessly but also multiply in an exponential manner. A thousand earthworms become one lakh in a few months and multiply and continue to help us in more ways than we can. One tablespoon or 5gm of soil contains 25 millions living micro organisms which are dying every second due to the indiscriminate use of chemical fertilizers.

Study Plant: *Cyamopsis tetragonalaba* (L.) Cluster bean,

Cluster bean is robust bushy annual up to 3m tall, bearing stiff erect branches that are covered grooved. The leaves are alternate and trifoliate, the leaflets being ovate and somewhat serrated. The pinkish white flowers are borne in dense axillary racemes. The pods are compressed, ridged, linear, erect and clustered giving the plant its name 'Cluster bean'. Each pod is 4-10cm long, beaked and slightly constricted between the seeds. The seeds are oval varying in colour from white to grey or black.

It is a hardy and drought resistant plant, adapted to arid and semi-arid regions and can grow in areas receiving an average rainfall of 30 to 40 cm. It is grown on a large scale as a pure crop or as a mixed crop with sorghum. The crop grows well on deep alluvial soils and sandy loams.

Experimental method

The seeds of cluster bean were obtained from the Agriculture University, Madurai. The seeds were sown in the field which divided into control and Vermicompost. Vermicompost was applied to the soil before sowing the seeds.

The Bio chemical parameters such as Chlorophyll content, Starch content, Glucose content, Soluble protein content, Nitrate reductase activity of the plants were calculated.

Estimation of Chlorophyll content

Leaf material (200mg) was ground in a pre-chilled pestle and mortar in diffuse light with 80 per cent cold acetone and the homogenate was centrifuged at 3000 × g for 2 minutes. Aliquots of 10 ml of 80 percent cold acetone were added to the pellet and centrifuged till it was non-green.

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The supernatants were pooled and protected from light prior to the estimation of chlorophyll content.

The concentration of chlorophyll was calculated using the formula of Arnon (1949) [3].

Chlorophyll a: $0.0127 \times A_{663} - 0.00269 \times A_{665}$ (mg/ml)

Chlorophyll b: $0.0229 \times A_{645} - 0.00488 \times A_{663}$ (mg/ml)

Total Chlorophyll: $0.0202 \times A_{645} + 0.00802 \times A_{663}$ (mg/ml).

Estimation of Soluble Starch:

The leaves were homogenized in 80 per cent acetone and centrifuged at $3000 \times g$ for 10 minutes. The residue was used for the estimation of soluble starch. Known volume of distilled water was added to the residue and it was boiled for a few minutes. Then it was centrifuged and the supernatant was collected and used to estimate the total starch. 0.1 ml of iodine reagent (3 gm of iodine and 1.5 gm of potassium iodide in 100 ml of distilled water) was added to 0.4 ml of the sample and the volume was made up to 5ml with distilled water. It was mixed thoroughly and absorbance was measured at 600 nm (Mc Cready *et al* 1950). Potato starch was used as standard.

Estimation of Glucose:

200mg of leaf material was ground in 80 percent methanol. It was filtered through muslin cloth and centrifuged. The supernatant was saved and the pellet was collected and washed again with 80 percent methanol and centrifuged. The pooled supernatant was taken for study. To 1 ml of 0.5 percent phenol and 5ml of Conc. Sulphuric acid were added. Then the whole solution was made up to 12 ml with distilled water. The absorbance was read at 490 nm (Dubois *et al.* 1956) [13]. The total glucose was estimated with glucose standard graph.

Estimation of Soluble Protein:

The leaves were homogenized in 80 percent acetone and centrifuged at $10,000 \times g$ for 10 minutes. To the pellet 2ml of 0. N NaOH solutions was added and centrifuged again. Soluble protein content of the centrifuged homogenate was determined by the method of Bradford (1976) [10]. The absorbance was calculated from calibration graph plotted using known amount of bovine serum albumen as protein standard.

Estimation of Nitrate Reductase activity:

200mg of leaf material was cut in to small bits and incubated in glass vials containing 5 ml of incubation medium with the following reagents (Jaworski 1971).

100Mm KH_2PO_4 KOH buffer pH 7.5

100Mm KNO_3 1% N-Propanol

1% triton $\times 100$

Incubation was carried out in the dark for 1h at room temperature giving occasional shaking. Aliquots of 0.5 ml of the incubation mixtures were analyzed for nitrite after 1 hr of incubation. To 0.5 ml of incubation medium 1.5ml of distilled water was added, to which 1ml of 3 percent Sulphanilamide in 3N HCl and 1 ml of 0.02 percent N-Naphthyl ethylene diamine dihydrochloride (N-1-N) were added in quick succession. 15 minutes was allowed for color development and absorbance was read at 540nm (Muthuchelian 1989) [20].

Result and Discussion

From the experiments it is concluded that the crop cluster bean showed considerable increase in the yield besides Bio chemical parameters in Vermicompost.

Chlorophyll content in leaves ranged from 0.14 mg/g.f. wt-0.21

mg/g.f. wt. Protein content in leaves ranged from 0.05 mg/g.f. wt- 0.06 mg/g.f. wt. Starch content in leaves ranged from 0.06mg/g.f. wt – 0.16 mg/g.f. wt. Glucose content in leaves ranged from 0.06 mg/g.f. wt -0.10 mg/g.f. wt. Nitrate Reductase activity in leaves ranged from 0.10 mg/g.f. wt -0.20 mg/g.f. wt.

Table 1: Cluster bean by using Vermicompost

Cluster bean	Control	Vermicompost
Chlorophyll content	0.14±0.019	0.21±0.012
Protein content	0.05±0.002	0.06±0.007
Starch content	0.06±0.006	0.16±0.006
Glucose content	0.06±0.005	0.10±0.007
Nitrate Reductase activity	0.10±0.006	0.20±0.029

Maximum Chlorophyll, Starch, Protein, Glucose and Nitrate reductase content was observed in Cluster bean by using Vermicompost. (Table 1).

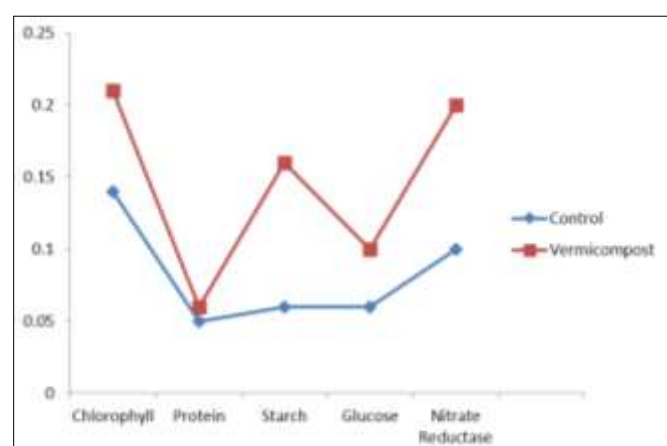


Fig 1: *Mean±SEM

Discussion

Chemical fertilizers are synthetic product which affect soil microorganism and degraded the soil quality in a gradual manner. Application of Bio fertilizers is recommended by the agronomists to save the expenditures incurred by the farmers. Cultivation of Cheap and effective fertilizers are undertaken by the farmers under the guidance of agriculturists. For example in several rural areas vermicompost is being manufactured and sold in Markets. These fertilizer products fetch a considerable income to the farmers.

In the present study confirms that the application of vermicompost has influence on bio chemical parameters of Cluster bean. The impact of vermicompost upon maize (patil 1993) [21], rye grass (Springett and Syers 1979) [23], Sugar cane and Soy bean (Shuxin *et al.* 1991), Vinca rosea (Reddy 1988), Tomato, Brinjal, Carrot, Radish, Coriander, Bhindi and Cow pea (kale 1998) [15] has been well documented.

Vermicompost contains a good amount of macro and micronutrients. It also serves as a very good base for establishing and multiplication of beneficial symbiotic microbes which helps in fixing nitrogen in the soil, besides enhancing the availability of phosphate and nitrogen uptake of phosphate by plants (Kale 1995) [16].

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