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Effect of Garbage Enzyme on the Chlorophyll A & B and Carotene Content of fifteen Days Old Cowpea Seedlings

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ABSTRACT

The effect of garbage enzyme on the chlorophyll and carotene content of 15 days old cowpea seedlings was investigated. A varied quantity of garbage enzyme (control (0ml), 20ml, 40 ml, 60 ml and 80 ml) was introduced into different containers with 1600g of soil. Cowpea seeds were planted in each container and monitored for fifteen days. After 15 days, the concentration of beta carotene and total chlorophyll was determined with the aid of spectrophotometer at different wavelengths (666, 653, and 470)nm respectively and at the end point the mean and standard deviation was compared. The result shows that garbage enzymes have directly increased the photosynthetic pigments compared to control. Conclusively, garbage enzymes may serve as a source of organic fertilizer when applied at a specific concentration.

Keywords: Garbage, enzyme, chorophyll, carotene.

INTRODUCTION

Organic fertilizers compose of only plant and animal based material while inorganicfertilizers are produced artificially (Miller, 2014). Inorganic fertilizers are comes in powder, granular and pellets inboxes or bags and liquid formulation in bottles. Inorganic fertilizers can provide nutritionrapidly to plants and designed for plants to absorb directly macronutrients andmicronutrients (Miller, 2014) but organic fertilizer releases nutrient at a slower pace and in a long run more valuable. A method of turning organic waste into something valuable is by converting organic waste into fermented waste juice, also known as garbage enzyme. Garbage enzyme was developed by DrRosukon, who hails from Thailand. Garbage enzyme is a multipurpose solution for households, the environment and agriculture. For agriculture, garbage enzyme is used as organic fertilizer and organic pesticide. For households, garbage enzyme is used as a cleaning liquid to remove oil and grease in the kitchen and remove dirt and odour in the toilet. It is also used as an organic pesticide and cleanses the air.

The functions of Garbage/citrus Enzyme is toresolve (decompose), transform (change), and catalyse the reactions (Fu et al., 2011).Garbage/citrus enzyme is different from fruit enzyme and is not for human consumption. It is a nutritious drinkprepared through proper fermentation of fruits. Garbage/citrus enzyme is used as a natural household cleaner; airpurifier; deodorizer; insecticide; detergent; body care; car care; organic fertilizer, etc. It removes odour and dissolvetoxic air released from smoking, car exhaust, chemical resides from household products, etc. Enzyme that flowunderground will eventually purify the river and the sea. It reduces mosquitoes, flies, rats, cockroaches etc. It is naturalantiseptic for your home. It prevents drainpipe blockages (Fu et al., 2011).

The process of garbage enzyme production is a natural fermentation/anaerobic oxidation whose products are alcohol(incomplete/partial fermentation) and acetic acid (complete fermentation). These are enzymatically performed bynatural and mixed microbial cultures in the starting preparation (fruit dregs and vegetable trimmings). The acidiccondition and the fermentation process may allow enzymes to be extracted from the waste materials into the solution.Likewise extreme environments would destroy most microbes so acetic acid like any other corrosive acid would killsome bugs on contact and if used carefully might be usable as a pesticide/insecticide.

The high acetic acid concentration and low pH could be the main reasons for the many purposes of garbage enzyme cleaning, odour removal, preventing drain blockages, etc. Garbage/citrus enzyme also contains traces of ethanoland propionic acid. Ethanol is known to have antiseptic properties, while propionic acid is used in food preservation.

These substances allow garbage enzyme to act as an anti-microbial agent, insecticide and pesticide. When diluted, itcould provide nutrients to plants due to the “growth hormones”, minerals, enzymes and/or other organic compoundsextracted directly or converted from the waste materials. Rather than

to be disposed and incinerated, these wastematerials can further serve additional purposes through garbage enzyme, and subsequently be composted into organicfertilizer. This will surely help in preventing or reducing all forms of pollutions from the improper solid wastemanagement and incineration, as well as to "close the waste loop" and promote recycling of waste back into the earth (Eriksson et al., 2002).

Fruit and vegetable wastes are generated in huge amounts from both households and commercial/industrial sectors, andlarge-scale garbage enzyme production would help to put these wastes into better uses (Whiteley and Lee, 2006). The highlight of garbage/citrusenzyme is that it is organic and can be homemade at low costs, as compared to other products that contain syntheticchemicals (may be toxic to human health or environment) and consume high energy in their production(Fu et al., 2011).

The garbage enzyme has been touted in the Malaysian media recently as a multipurposesolution for a range of uses, including fertilizer and insect repellent in the garden, household cleaning and even aspersonal shampoo and detergent.

Materials and method

Materials used:

Orange (spoilt), pineapple (spoilt), mango (spoilt), pear (spoilt), cucumber (spoilt), 200g of sugar, filtered soil and Distilled H_2O.

Equipment Used

Mortar and pestle, centrifuge, meter rule, test tube rack, weigh balance, test tube, funnel, curette, sieve and Spectrophotometer(72 G model).

Procedure

3kg of wasted fruit (orange, pineapple, mango, pear, cucumber) were washed, rinsed and placed inside an air tight container. 200g of sugar was added to the fruit inside the air tight container.1500ml of distilled H_2O was added to the container and then sealed. 2 weeks later, 500ml of distilled H_2O was added to the solution.The solution was left to ferment for 2 months. It was filtered and then 500ml of the solution was measured and poured in a conical flask and then it was diluted with 1500ml of distilled H_2O.

1600g of sand was measured into 5 different containers labeled as control, 20 ml, 40ml, 60 ml, 80ml, 100ml.In the container labeled control, 1600g of sand was mixed thoroughly with 100ml of H_2O. Simultaneously, 4 seeds of cowpea were planted.In the container labeled 20ml of the already diluted garbage enzyme solution was added to the 1600g of sand and 80ml of distilled H_2O was added and mixed thoroughly with the sand four seeds of being were sown into the sand. For 15 days the samples were been monitored.

Determination of Photosynthetic Pigments (Chlorophyll a, b and Beta Carotene)

- 0.2g of leaves were weighed in a weigh balance
- The 0.2g of leave was placed in a mortar and homogenised with pestle
- 10ml of methanol was added to the homogenised leave
- Then the leave solution was filtered into a test tube
- The leave extract was transferred from the test tube into a bucket centrifuge
- It was centrifuged for 2500rpm for 15 minutes
- It was transferred into curette which was then placed inside a spectrophotometer at different wavelength (666, 653 and470).
- Readings were taken at different wavelength respectively
- The same procedures were carried out for the other leaves (20ml, 40ml, 60ml, 80ml,).
- The concentration of chlorophyll a and b and beta carotene of each of the leaves were calculated and the means compared.

Calculation

The amounts of these pigments were calculated according to the formulas of Lichtentaler and Welburn, (1985).

$Ca = 15.65\ A_{666} - 7.340 A_{653}$

$Cb = 27.05\ A_{653} - 11.21 A_{666}$

C_{x+c}= $1000A_{470}$ -2.270Ca – 81.4Cb/227, where Ca= chlorophyll a, Cb = chlorophyll b, C_{x+c}= total carotene

RESULT AND DISCUSSION

RESULT

Table 1: Effect of garbage enzymeamended soil on photosynthetic pigment of 15 days old cowpea seedlings.

Concentration of garbage enzymes ml/g	Chlorophyll a	Chlorophyll b	carotene
Control (0ml)	2.3±0.1	6.9914±0.1	0.2947±0.03
20ml	19.1±3.6	40.129±1.5	6.1272±3.6
40ml	12.4 ±0.04	23.9348±0.1	2.0368±0.02
60ml	15.8 ±0.4	36.7018±0.2	2.6839±0.7
80ml	15.8 ±0.01	31.1317±0.2	2.2730±0.2

DISCUSSION

From the results obtained above, it is evident that the various concentrations of garbage enzymes amended soil has a positive effect on the chlorophyll a, b and carotene concentration of the 15 days old cowpea seedlings in relation to that of the control.

At the 20ml concentration of garbage enzyme amended soil, a significant increase in the level of chlorophyll a, b and carotene of the cowpea seedlings was observed as compared to the control and other concentration of garbage enzymes.

At the 40ml concentration of garbage enzyme amended soil, a significantdecrease in the level of chlorophyll a, b and carotene of the cowpea seedlings was observed as compared to that of 20ml garbage enzyme amended soil but still greater than control values.

At the 60ml concentration of garbage enzyme amended soil, a significant increase in the level of chlorophyll a, b and carotene of the cowpea seedlings was observed as compared to the control and 40ml garbage enzyme amended soil but the concentration of photosynthetic pigment was lower as compared to 20ml garbage enzyme amended soil.

At the 80ml concentration of garbage enzyme amended soil, no significant difference in the level of chlorophyll a of the cowpea seedlings as compared to 60ml garbage enzyme amended soil but the level of chlorophyll b and carotene the concentration decreased compared to 60ml garbage enzyme amended soil. Generally, the level of photosynthetic pigment decreased in relation to 20ml garbage enzyme amended soil and is significantly higher in relation to the control values.

The garbage enzyme amended soil increased the photosynthetic activities of the cowpea seedlings and also hence improving the growth of the plant due to the production of more carbohydrates for other metabolic activities which is in line with Masse et al (2001), and Doctor Rosukon , that it is an effective organic fertilizer.

CONCLUSION

Garbage enzymes have been observedto be efficient and effective as an organic fertilizer. The solution is a multipurpose, natural, organic, non-toxic, without synthetic chemicals and best of all; it can be prepared at home from kitchen garbage. From this study, it has been observed that garbage enzyme is an effective fertilizer that increases the level of chlorophyll a, b and carotene in cowpea seedlings.

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