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Effect of tea compost on the growth of *Vigna radiate* (L.) R. Wilczek

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Abstract
Compost tea extracts used as an organic fertilizer have beneficial effects on plant growth and considered as a valuable soil amendment. Compost tea is water based compost extract containing high population of beneficial microbes, is attracting the attention of growers and researches for its apparent disease – suppressive activity and improvement of soil fertility. By analyzing microbes in the compost tea (CTC – crush tear curl) the bacteria identified as the *Bacillus* sp. and the fungi the *Aspergillus Niger*. In green grams, out of 20 grains 15 were sprouted in compost tea extract and 12 sprouted grains in water. The compost tea extract showed the highest germination percentage (100%) compared with control (58.33%). The seedling growth of green grams in compost tea the maximum highest shoot length (15.6 cm), root length (15 cm) and number of leaves (10). The seedling growth of green grams in control the maximum shoot length (12.5 cm), root length (8 cm) and number of leaves (7). The comparative performance of the treatment revealed the superiority of compost tea in enhancing Green gram germination and its growth.

Keywords: compost tea, green gram, root length, shoot length

1. Introduction
Compost tea is water based compost extract containing high population of beneficial microbes, is attracting the attention of growers and researches for its apparent disease – suppressive activity and improvement of soil fertility. Recently compost tea has been defined simply as a liquid extract from tea that may contain organic and inorganic soluble nutrients and a large number of organisms including bacteria, fungi, protozoa and nematodes. The compost tea brewing technique (aerobic or anaerobic) extracts and grows populations of beneficial microorganisms (Ingham 2005; Scheuerell 2003; Scheuerell 2002) [5, 10]. Compost tea extracts used as an organic fertilizer have beneficial effects on plant growth and considered as a valuable soil amendment (Gharib *et al*., 2008) [4]. The use of compost tea extracts to control leaf diseases is an alternative that enables the use of chemicals in agriculture to be reduced. Compost tea drench applied to the substrate also reduced soil diseases. Compost tea is emerging as a crop protection tool for organic agriculture for a number of reasons.

Firstly it contains microorganisms which can reduce incidence of foliar or soil borne diseases, and nutrients contained in compost tea support the survival and proliferation of these microorganisms. Secondly it contains nutrients (extracted from compost) in a readily available form, which rapidly benefit plant growth through direct contribution to plant nutrition. Thirdly compost tea is easily integrated into existing plant fertility and disease control programs due to its ease of application via existing irrigation or spray equipment, or as a soil drench. The tea leaves are added to the compost to promote faster decomposition. The tea leaves would be too acidic for most plants, but the fact is that boiling the tea leaves removes most of the acids, leaving behind highly fertile bit of plant matter. The compost helps to concentrate nutrients and beneficial bacteria in liquid form, for the plant's root to absorb them more easily. They also help to prevent soil borne disease and provide the leaves of the plant with a protective coating. There is considerable evidence that compost extracts can improve plant production by decreasing disease incidence, improving plant nutrient status and generally promoting plant growth (Arancon *et al*., 2007) [2]. The present study is to

find out the microbes in compost tea and compare the Green Gram germination and growth parameters from compost tea extract and normal water.

Materials and Methods

Microbial analysis in compost tea extract

200gm of tea powder (CTC – Crush Tear Curl) is mixed with 100 ml distilled water. The pH is 4.9. The tea extract was shaken for 10 minutes at 100 rpm. Serial dilution of 10^{-2} and 10^{-3} were prepared by sequently transferring 1 ml samples into test tubes containing 9 ml of sterile distilled water. The media used were IS medium. To analysis bacteria in the compost tea extract using Indian Standard Medium (IS Medium).

Tryptone	–	1.25gm
Yeast extract	–	0.625gm
Dextrose	-	0.25gm
$NaCl_2$	-	1.625gm
Agar	-	4gm
Distilled water	-	250 ml
pH	-	7

To analysis fungi in the compost tea extract using Indian Standard Medium (IS Medium).

Yeast extract	-	1.25gm
Dextrose	-	5gm
Chloramphenicol	-	0.25gm
Agar	-	4gm
Distilled water	-	250ml
pH	-	6.6

A 2ml of selected dilution (10^{-2} and 10^{-3}) were pipetted on to petri dishes and selective media poured onto it. For bacteria the plates were incubated at 37 °C for 48 hours and for fungi the plates were incubated at 25 °C for 7 days.

Germination and seedling growth of green grams in the compost tea extract

40 Green grams were selected. Out of which 20 were soaked in compost tea extract while other 20 in water. After 24 hours the green grams were kept at one night for the sprouts growth. The green grams were then transferred to the soil. The experiment was conducted in the month of February and March. Regular monitoring the germination. Then to compare the seed germination and seedling growth of green gram in compost tea extract and water.

Result

Sprouted grains

In compost tea extract, out of 20 green grams 15 were sprouted and in the normal water out of 20 green grams 12 were sprouted (Table 1; plate: II)

Table 1: Number of Sprouted Grains in Compost Tea Extract and Control

Sprouted Time	Control (C)	Compost (C_1)
48° Hr	12/20	15/20

Green grams germination in compost tea and control

Sprouted green grams were transferred into the pot. The C_1 grains treated with compost tea and another one kept as C (control). In the 5th day, 3 grains were germinated in control (C) 12 were germinated in the compost tea (C_1). After 7 days, next 4 grains were germinated in C and 3 were germinated in C_1 (plate III and IV). In control 58.33 % of seed germination and in compost tea 100% of seed germination observed .The compost extract showed the highest germination percentage (100 %) compared with control (58.33%) (Table 2). The seedling growth of green grams as affected by compost tea in root length, shoot length and number of leaves (Table 3). The maximum highest shoot length (15.6 cm) and the minimum (6.5 cm). The root length maximum (15 cm) and minimum (4 cm). The maximum number of leaves (10) and minimum (6). In table 4 showed that the seedling growth of green grams in control. The maximum highest shoot length (12.5 cm) and the minimum (5 cm). The root length maximum (8 cm) and minimum (3.5 cm). The maximum number of leaves (7) and minimum (5).

Table 2: Number of the Green Gram Germination in Compost Tea Extract and Control

Days	C	C_1
5	3/12	12/15
7	4/12	3/15
Germination %	58.33%	100%

C – Control
C_1 – Compost tea

$$\text{Germination \% of compost tea} = \frac{\text{Number of seed germination} \times 100}{\text{Total number of seed}}$$

$$= \frac{15}{15} \times 100$$

$$= 100\%$$

$$\text{Germination \% of control} = \frac{\text{Number of seed germination} \times 100}{\text{Total number of seed}}$$

$$= \frac{7 \times 100}{12}$$

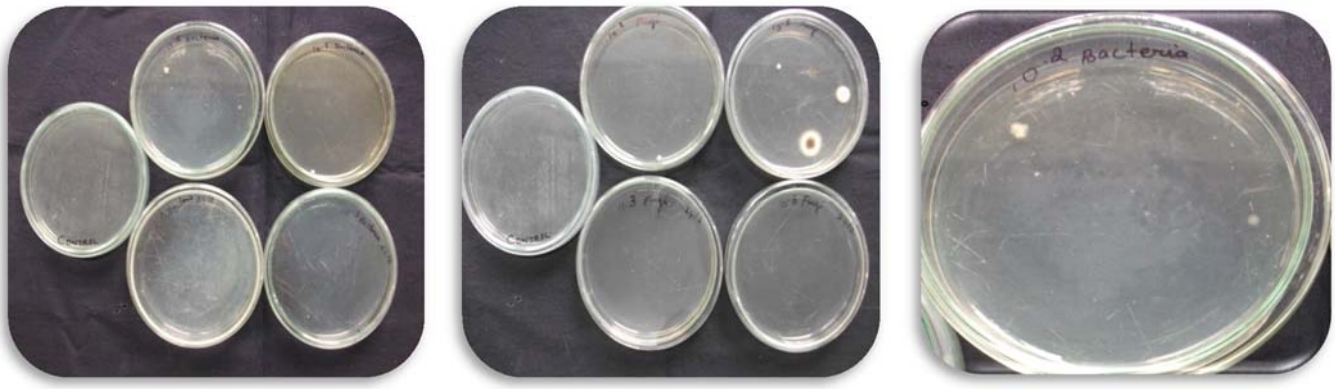
$$= 58.33\%$$

Table 3: Seedling Growth of Green Grams As Affected By Compost Tea.

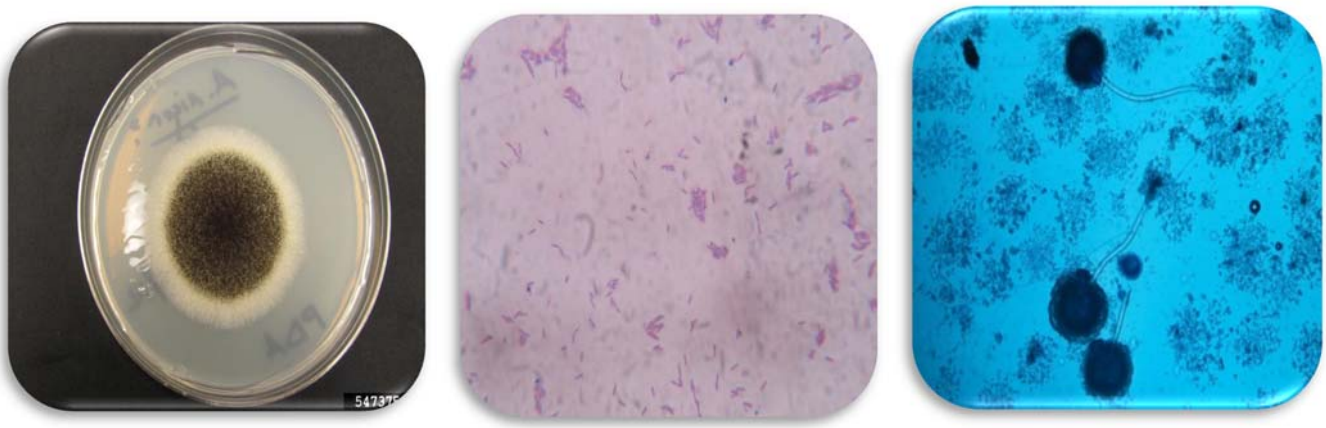
Number Of Plants	Treatment		
	Number Of Leaves	Root Length	Shoot Length
1	6	6.5	6.5
2	7	4	8
3	8	8	8.5
4	10	7	10
5	8	9	7
6	10	6	9
7	8	8	10.4
8	10	13	10
9	7	15	12
10	8	8.9	13
11	10	12	15
12	8	9.6	13
13	10	12	15.6
14	10	10.5	12
15	10	13	14.2

Table 4: Seedling Growth of Green Grams in Control.

Number Of Plants	Control		
	Number Of Leaves	Root Length	Shoot Length
1	7	4	8
2	5	8	12.5
3	7	3.5	8.5
4	5	6.3	8
5	5	4.5	7
6	5	5.5	8
7	5	3.5	5



Bacteria **Fungi** **Bacteria**



Fungi ***Bacillus* sp.** ***Aspergillus niger***

Plate I: Microbial Analysis in Compost Tea

Control **Compost Tea**

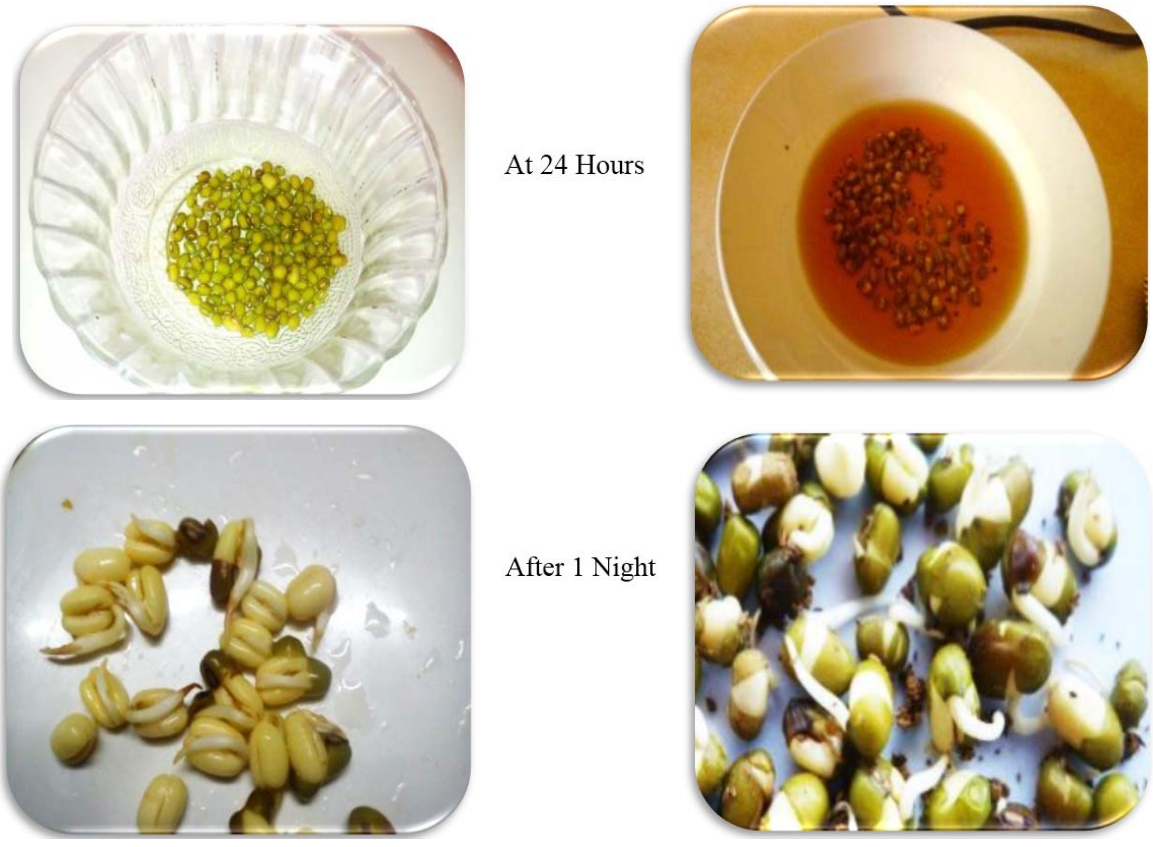


Plate II: Sprouted Growth of Green Grams in Water and Compost Tea

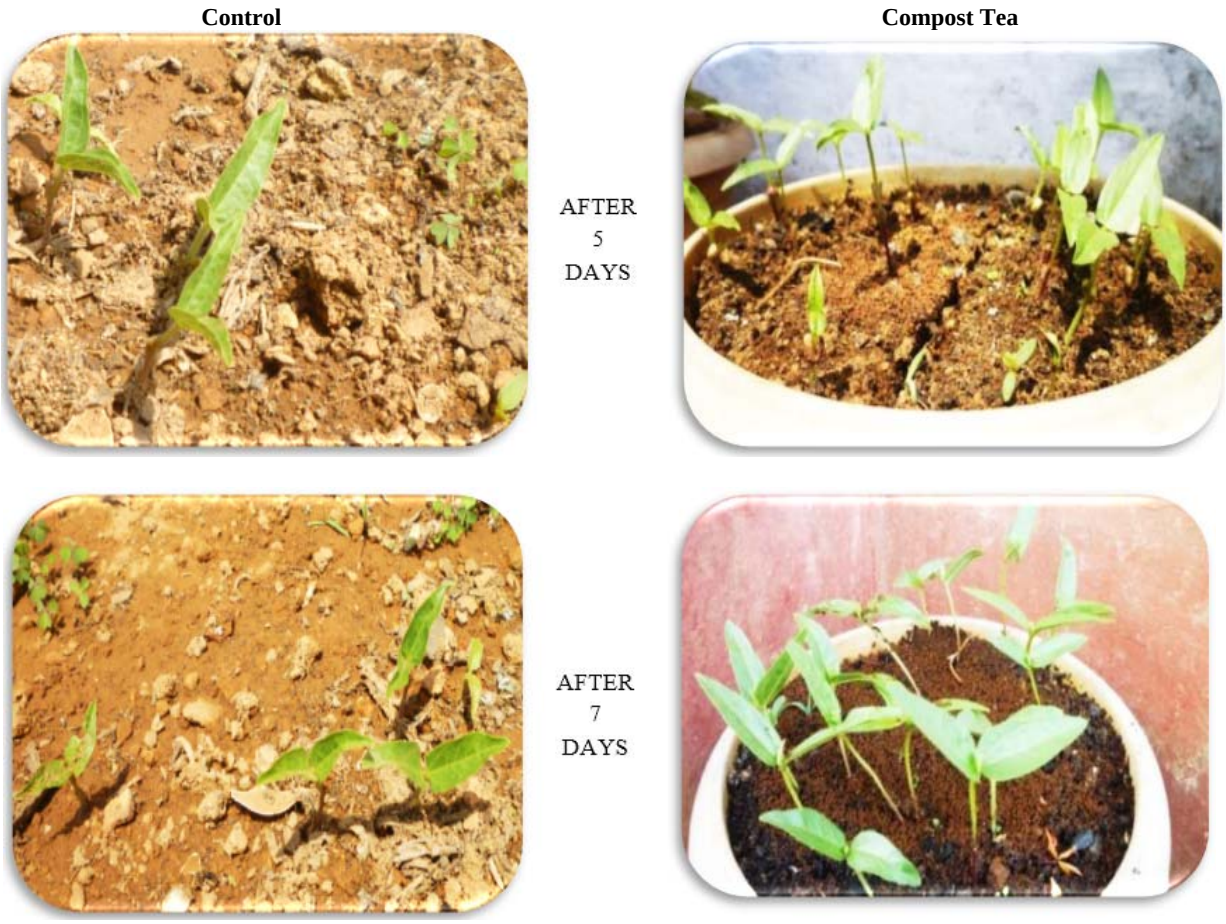


Plate III: Seedling Growth of Green Grams in Water and Compost Tea

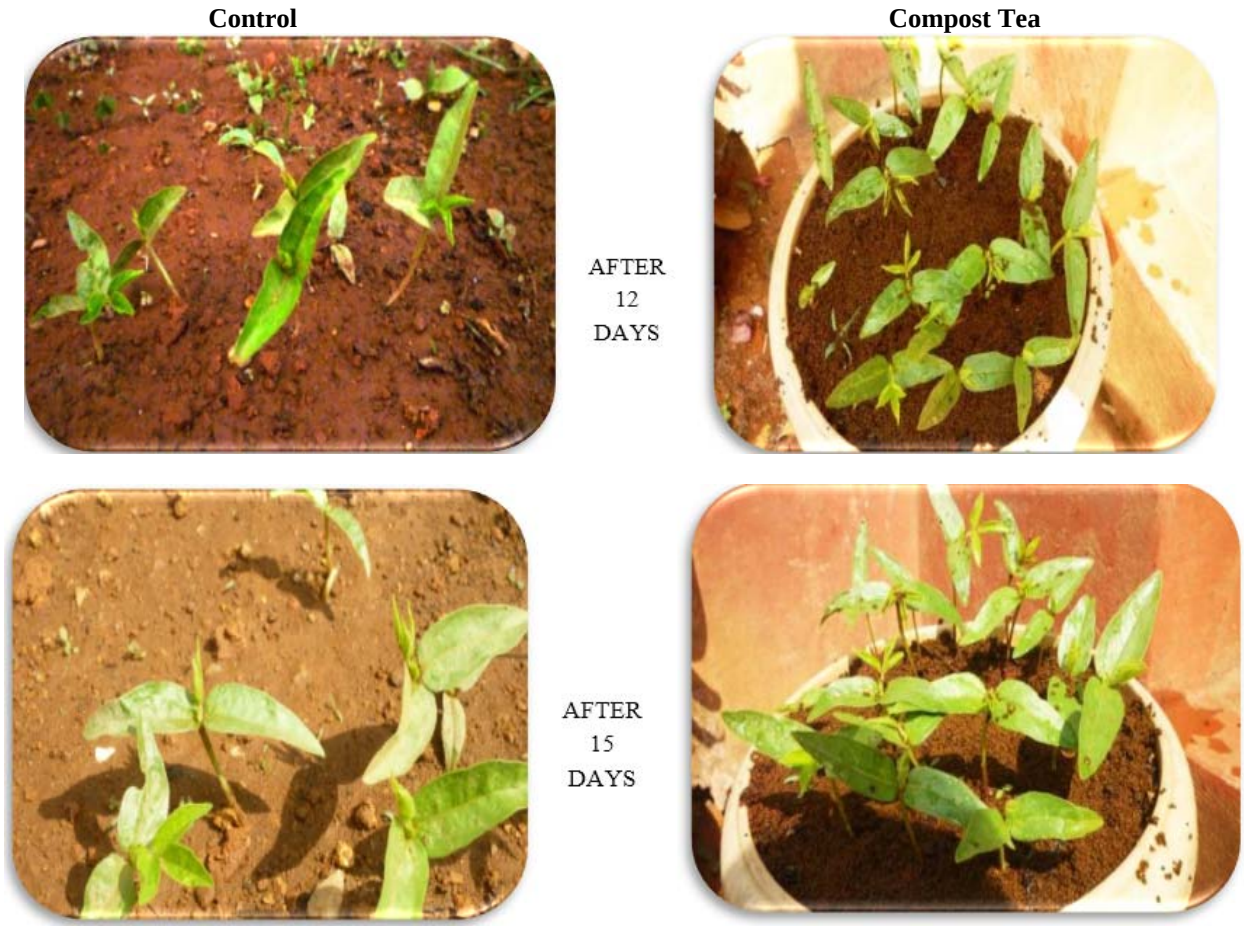


Plate IV: Seedling Growth of Green Grams in Water and Compost Tea

Discussion

The microbial analysis were done in the compost tea extract total microbes found in the compost tea extract (CTC – Crush Tear Curl) were bacteria (*Bacillus* sp.) and fungi (*Aspergillus niger)*. Kishore *et al*., (2005) reported that *Bacillus* species promoted seedling emergence, root length, shoot length, dry weight and pod yield. *Aspergillus niger* is a biocontrol agent that increased the germination and improved crop vigour (Mondal *et al*., 2000) [8]. Several species and strains of *Bacillus* have been reported to induce plant growth promotion (seed germination, seedling emergence, increase in shoot and root biomass etc.) and disease resistance in crops plants. These include *Bacillus Pumilus* on cucumber, tomato (Wie *et al*., 1996, Jettiyanon 1997) [14, 6], tea (Chakraborty *et al*., 2004) [3] and *Bacillus sphericus* on cucumber (Jettiyanon 1997) [6]. In *Aspergillus niger* Compound 1 was more effective for increase in germination and shoot length, whereas compound 2 had relatively greater role in increasing the root length and biomass of cauliflower seedlings (Mondal *et al*., 2000) [8].

The use of solid organic materials and compost tea in some cases enhanced the yield and quality and reduced the input costs. Application of organic materials reduced soil acidity and improved the organic matter and available nutrients of the soil (Sanwal *et al*., 2006) [9]. The comparative performance of the treatment revealed the superiority of compost tea in enhancing tomato seed germination, seedling length and biomass (Ajinath *et al*., 2011) [1].

Conclusion

Use of compost tea to improve plant health, yield and nutritional quality by enhancing beneficial microbial communities and their effects on agricultural soils and plants improving mineral nutrient status of plants; and inducing the production of plant defense compounds that may have beneficial bioactivities in humans

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