

RESEARCH ARTICLE

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PREPARATION AND APPLICATION OF LIQUID COMPOST TEA

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Manuscript Info Abstract

Manuscript History	Organic fertilizers are the blessings for the agricultural sector.
Received: 01 January 2017 Final Accepted: 02 February 2017 Published: March 2017	Chemical fertilizers damage the soil health whereas organic fertilizers improve the soil health. One such organic fertilizer is the liquid compost tea. As it is composed of huge numbers of aerobes, its application to the soil makes the soil microbially active. This liquid fertilizer also converts the proteins and carbohydrates leaked as root exudates , to plant available nutrients. It also produces humus to increase cation exchange capacity and nutrient retention. Liquid compost tea also helps in disease suppression. Hence, liquid compost tea are an cost-effective way to enhance the agriculturally important microbes in soil, thereby establishing a healthy soil food-web.
<i>Key words:-</i> Liquid Gold Fertilizer,Compost tea, Molasses , Cowdung	
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Introduction:-

As 'Clean and green' is the logo of the century, all countries of the world are trying to find an alternative to the usage of synthetic materials such as chemical fertilizers, which are indeed toxic for the environment. The chemicals in turn enter our food chain, causing Biomagnification.

So, in the agricultural sector, Bioinoculants or Biofertilizers are in high demand. Natural sources of living organisms such as cowdung manure and liquid compost tea, have indeed a remarkable effect on the crops.

Cowdung preparation is known to be a very good natural source of 'Food for plants' known to man. Hence, their addition to the soil, answers a lot for the crops such as wheat production.

Cowdung manure contains methanobacterium which breakdown the complex nutrients in soil and provide the crops with Nitrogen and Phosphorus. Even the water retentivity of soil increases on addition of cowdung manure. It is the cheapest and best source of natural fertilizer.

Another part of the study includes the preparation and application of liquid gold fertilizer. The liquid gold fertilizer is a very good source of antioxidant. Its addition to the soil nourishes the soil with important elements such as Nitrogen, Phosphorus, Potassium, Zinc, Iron and also adds the helpful aerobes to soil. These help to increase the crop production.

Hence, this paper includes a comparative study between crops treated with liquid compost tea and that with cowdung manure and control.

Material and Methods:-

Preparation of Tea Compost:-

Leftover tea leaves are collected, after the preparation of tea from various sources like tea shops, household kitchen, etc. They are kept in a bucket and allowed to get converted into Compost. About 5kgs of leftover tea leaves are kept for Composting.

The bucket is covered to allow the decomposition process to take place faster. Every day observation is done. After about 2weeks the compost is ready.

Characteristics of a Good Compost:-

After 2 weeks it is seen that the tea leaves have turned into fine particles and seen as a compact mass. It smells sweet due to Actinomycetes and its appearance is like a mass of soil.

Preparation of Liquid Tea Compost:-

2kgs of Compost is taken at the bottom of a 5 gallon bucket. Water is then added upto the rim of bucket. Then, to carry on the process of brewing, molasses is added in the bucket.

Preparation of Molasses:-

Molasses is a very good carbohydrate source for bacteria. As it is the food for bacteria, its addition in Liquid Compost Tea encourages luxurious growth of bacteria. As for the preparation of molasses, 150gms of sugarcane jaggery is dissolved in water. The process of dissolving is done in a clean vessel to avoid contamination. The dark liquid is then filled in a 500ml pet bottle and shaken to dissolve the remaining fine particles of jaggery. This dark liquid called molasses is then added to liquid compost tea.





Aeration:-

Aerating liquid compost tea is a must during the brewing process. Aeration is done by bubbling the liquid with the help of an aeration pump. Preferably, 3 bubblers are needed for the process. Bubbling is carried out for 24 hrs. Occasional stirring is also done to dissolve higher quantity of oxygen in the liquid.

This aeration is very important as it allows luxurious growth of aerobes.

Fig2: Aerating Liquid Compost Tea by bubbling



Sieving

After bubbling the dark liquid for about 48 hrs, the liquid is sieved by passing through a piece of cloth. This is done to filter off the clear liquid as the compost particles remain behind on the cloth.

By this process, a clear golden yellow coloured liquid is obtained, which is again subjected to aeration by bubbling for 24hrs.

Fig3: Sieving- Filtering off is Aerated. **Fig4 :** Golden yellow liquid obtained after filtration,liquid from compost



Application to Wheat Crop:-

This liquid compost tea, which is a golden coloured liquid is applied as soil drench, after diluting with water in the ratio of 1:3, just after sowing the seeds of wheat. Then, helpful fungus is observed on the soil and above the seeds of wheat. Then, sprouts of wheat are seen.

This liquid is again added as a soil drench, when the sprouts are 4 weeks old. Also, from time to time, the liquid is added as a foliar spray. Again, soil drench with the liquid is done, just before the growth of the crop ceases.

In order to draw a comparison, Control wheat plants are grown where no liquid compost tea is added. Also, in order to compare the growth of wheat with cowdung preparation and that with liquid tea compost, the wheat crop is grown separately in 3 different big tumblers, each with 2 holes at the bottom.



Mixing of Cowdung Manure with soil:-

Cowdung is dried for several weeks. Then, this dried manure is mixed with garden soil in the ratio of 1:2, i.e 1 part of cowdung is mixed with 2 parts of garden soil.

Then, the seeds of wheat are sown and the soil is watered daily.

Microbiological analysis of Liquid Compost Tea:-

1ml sample of liquid compost tea is added to 9ml of sterile distilled water in the laminar air flow. This tube is marked as 10-1 .From here dilutions are made upto 10^{-6} by adding 1ml inoculum form the previous tube. After, incubating the plates , 84 colonies are observed in the 10^{-6} dilution plate. Hence, cfu/ml = 84,000,000 or 8.4 X 10^7 , calculated by the formula –

CFU/ML = (No.of colonies x Dilution factor)/ Vol. Of culture plate.

Microscopic studies done after Gram's staining shows the presence of Gram positive cocci, Gram positive rods and Gram negative rods.

Fig7& 8: Gram positive rods, Gram negative rods and Gram positive cocci, Microscopic view.





Result and Discussion:-

Wheat is grown under two kinds of treatment -1. Application of liquid compost tea and 2. Soil conditioning with cowdung manure. The third one is a control where no fertilizer is used. Various parameters for measuring the growth of wheat crops is used such as- Length of shoot, stem diameter, leaf diameter, grains / spike, and spike / m^2 . (Ram Ratan Singh et.al)

Out of the three, it is seen that wheat crops with liquid compost tea scores the highest. The wheat crops in this case is healthier and taller compared to the other two. During the growing season it is seen, that sprouts came out within 3 days in the case of tea as compared to cowdung@4days and control @ 5days. Also, rapid increase in height is observed in the case of wheat with tea inoculum. Grains appeared in this case within 40DAS. In the case of cowdung @ 65DAS and Control @ 72DAS.

Fig.8: Wheat after 20 DAS.

- A. Liquid Compost Tea Treatment
- B. Cowdung manure Treatment
- C. Control



The parameters for measuring the growth of wheat are discussed as follows :

Dry weight:-

In case of Tea, the dry weight of crop plant is 5.746g whereas cowdung @ 3.114g and control@2g. Hence, this result depicts that crops with liquid compost tea is healthier than other the other two. Useful aerobes have helped in the growth of crops. Crops with cowdung manure treatment are found to be slender as compared to tea. Control crop as usual is without any treatment and scores the least.

Fig 9&10: Measuring shoot weight Measuring the weight of grains in spike

Stem diameter:-

In case of tea, the stem diameter has been found to be 1mm@ 4 DAS which increased to 6mm @ 41 DAS and remained constant. In case of cowdung ,stem diameter increased upto 4mm and control upto 3.7mm.Hence, the stems are thickest in case of tea.





Series 1 - Tea, Series 2- Control, Series 3 - Cowdung

The graph shows that the rate of growth in case of tea(blue) is the highest due to high nutrient supply via liquid compost tea. But the growth stops after 77cms. Manure treated plant growth(green) seems to be higher than control(red) due to the addition of organic fertilizer.





The graph shows that crop plants with liquid gold fertilizer(blue) have yielded the maximum number of grains/spike as compared to cowdung treatment (green), followed by control(red), as after 90 DAS.



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CONTROL
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This graph shows that maximum number of spike/m2 is with liquid compost tea treatment(blue) as compared to cowdung manure treated crops(green), followed by control(red).

Conclusion:-

This study shows that liquid compost tea is very good for wheat crops as compared to cowdung manure. There is enormous scope to do research with liquid compost tea. Studies can be carried out to isolate organisms from liquid compost tea and the mechanism of crop growth can be studied in detail.

Hence, liquid compost tea is a very good bio-inoculant which can be used to grow crops on a large scale as well. As this bio-inoculant is prepared from leftover tea leaves , the preparation can be made without any revenue. Hence, it is really good for our Indian farmers.

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