International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 04 Issue: 09 | Sep -2017 www.irjet.net p-ISSN: 2395-0072

Evaluating the Perfect Carbon: Nitrogen (C:N) Ratio for Decomposing Compost

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Abstract - *This research work aims at the analysis of the effect of carbon to nitrogen ratio on the performance of increasing the soil strength and plant growth when the decomposing compost are added to it. Carbon to nitrogen ratio is a ratio of the mass of carbon to the mass of nitrogen in a substance.An aerobic and anaerobic composting experiment was conducted to get the optimum C:N ratio of the quickest decomposing compost was found at 2:1.This perfect C:N ratio helps to make the perfect compost pile for growing plants or food minimizes fossil fuels usage and reduce the landfill waste and pollution.*

***Key Words*: Temperature, decomposing compost, C:N ratio.**

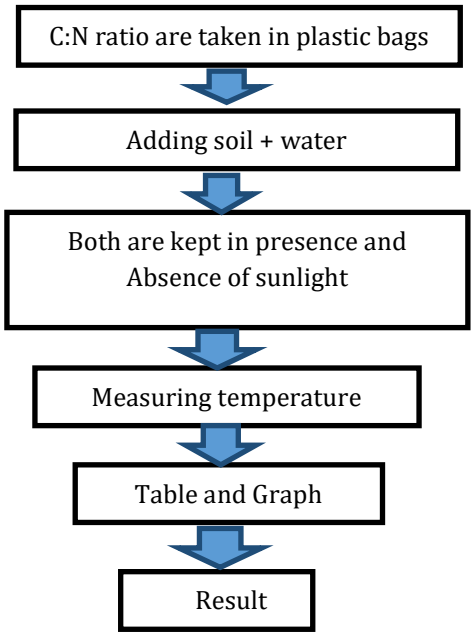
1.INTRODUCTION

Compost is organic matter that has been decomposed and recycled as a fertilizer and soil amendment.The decomposition process is aided by shredding the plant matter,adding water and ensuring proper aeration by regularly turning the mixture. Under aerobic and anerobic conditions, decomposing the organic matter is considered as a cost-effective biological treatment and stabilization method for solid waste. More organic carbon , total and mineral nitrogen accumulated in the soil of conventional and organic farming system than in uncultivated lands. More organic carbon, total and mineral nitrogen accumulated in the soils covered with fabaceae than poaceae in the abandoned lands while in the cultivated lands in both systems conventional and organic this difference was insignificant due to crop rotation. C:N ratio in soils decreased in organic farming system (13), conventional farming system(12), abandoned land (10.5), C:N ratio close to 10 or lower in soils of abandoned lands show possible soil organic matter degradation[1](Sabiene et al.,2010). The C:N ratio of soil is a sensitive indicator of soil quality and for assessing the carbon and nitrogen nutrition balance of soil. Soil organic carbon and nitrogen are used for soil quality assessment and sustainable land use management. Soil organic carbon not only effects the soil fertility, but also has influence on releasing or holding CO2 from the atmosphere through various channels thereby possibly affecting the atmosphere –soil carbon balance. Average of soil organic carbon, total nitrogen content and C\N ratio was 9.25g.kg^-1, 0.93g.kg^-1 and 10.33 respectively. Therefore more effort should be given to increase soil C\N ratio by increasing the application of organic manure to improve the level of soil organic carbon[2] (Jiang et al.,2013). Carbon and nitrogen ratio is important factor for both soil capacity and carbon storage. The total carbon and nitrogen were significantly correlated with bulk density in crop fields and with PH for horticulture and mangrove soils. Whereas the ratio of organic carbon and nitrogen contents showed statistical significance with clay separate content and moisture for horticulture soils. The values of C:N ratio in each cropping system is important for practical farming by adding organic material to decrease or an increase soil nitrogen. Soil management itself also affects carbon and nitrogen distribution in soil and further soil resource sustainability[3](Swangjang,.2015). The test on carbon nitrogen ratio, where the laccase production get increased in the soil substrate cultivation results shows that the highest activites were obtained with a C:N ratio of 5 and the C:N ratio lower than 30:1 induced the laccase synthesis and inhibited the mycelia growth[4](valle et al.,2011). The temperature increase the C:N ratio which results in the reduction of rick of ammonia inhibition[5](yang., 2014). In general the increasing C:N ratio through co-digestion resulted in a more stable PH and better methenogenic activity due to enhanced buffering effect of the digestion medium. A maximum treatment efficiency of 85% was obtained at C:N ratio is 30:1[6](Tanimu et al,.014). The greatest methane production for unit loading rate occurred when the C:N ratio of the feed was 25 [7](Hills DJ et al., 1979).Maximum methane potential was achieved based on C:N ratio in dairy manure and chicken manure 25:1 and 30:1[8](Yang et al., 2012).

Carbon to nitrogen ratio (C\N) means the ratio of carbon element amount in organic matter to its content of nitrogen element amount.It is seen that,the best C\N ratio is 20-30 atoms of carbon for each atom of nitrogen (20-30 carbon atoms: 1 nitrogen atom).High or low C\N ratio will effect negatively on the digestion of the substrate.Here the initial organic materialsviz.,Newspaper, lettuce were taken with soil and water at different proportions.These materials were maintained both at Aerobic and Anerobic conditions by covering the containers with perforated plastic materials. Temperature is checked each and every day using the digital thermometer.w ith the obtained temperature , a graph is plotted against the temperature at both presence and absence of sunlight. With the help of graph,it is seen that the optimum C:N ratio was found at 2:1.

2. MATERIALS AND METHODS

In general carbon content is high in plant material such as straw, cornstalks, sawdust and newspaper. Among these materials it is seen that the carbon content is high in newspaper (175.1).Similarly ,there are more materials available that are rich in nitrogen content which includes lettuce, grass, clipping, alfalfa meal, blood meal and poultry manure. Among these materials,it is seen that the nitrogen is high in lettuce (30%). Hence the newspaper is taken as carbon material and lettuce as nitrogen material in plastic bags. So that the decomposition take place easily which helps in the fertilization of soil faster and filter water is mixed with carbon and nitrogen. With the help of straw, thermometer is fixed in the bags and hence the reading are taken.



3.PROCEDURE:

Carbon and nitrogen are taken at different ratio in 6 plastic bags. 3 bags are kept in the presence of sunlight and other 3 bags are kept in the absence of sunlight. Adding 360 ml of soil and 180 ml of water at different ratios of carbon and nitrogen in each bags. Measuring the temperature by using digital thermometer in each bags. Comparing the decomposing compost rate with respect to temperature (at both presence and absence of sunlight). Finally determine the carbon and nitrogen ratio of the decomposing compost.

Fig 4.1

4. RESULT AND DISCUSSION

TABLE 1:

Bags	C:N ratio
Bag 1	1:1
Bag 2	1:2
Bag 3	2:1

DATA:

1. Temperature Average of decomposing Rate of Compost (Sun)

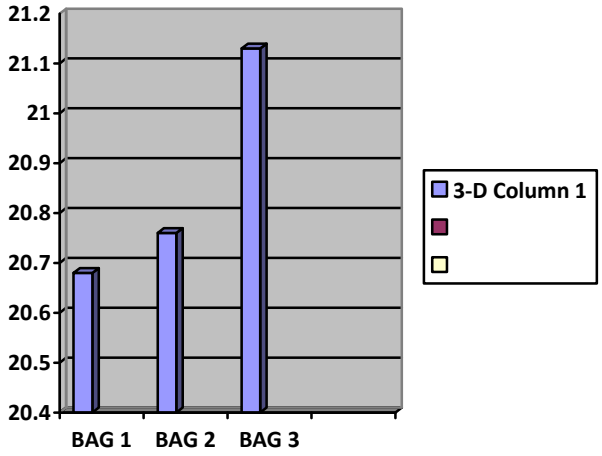


Fig 4.2

In fig 4.2 the average temperature of decomposing rate of compost in the presence of sunlight is found at 20.68, 20.74 and 21.13.

2. Temperature Average of decomposing Rate of Compost (Without Sun)

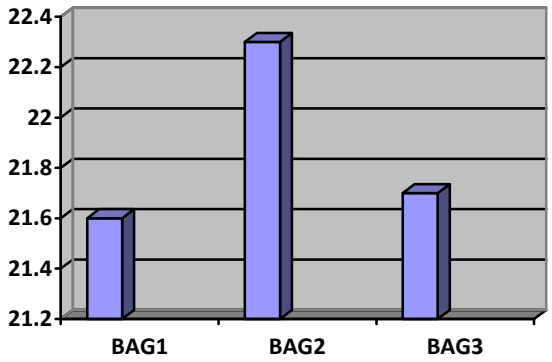


Fig 4.3

In fig. 4.3 represent the average temperature of decomposing rate of the compost. The maximum temperature 22.3 was found in bag 2.

Average comparison for decomposing rate of Compost

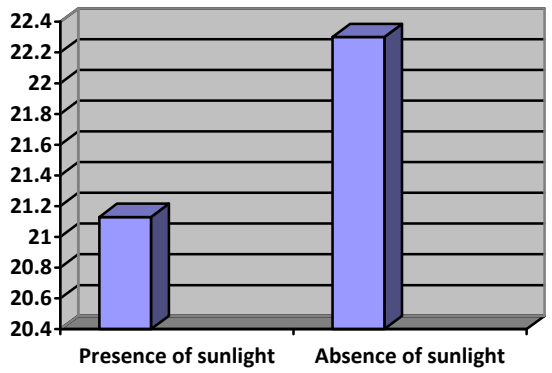


Fig 4.4

In fig 4.4 represent the average comparison for decomposing rate of compost. The maximum temperature with the absence and presence of sunlight was found at 21.13and 22.3 respectively.

DISCUSSION

In general use know that when the soil is at 60 to 65 Fahrenheit it can be adapted to better growth of plants and act as fertilizer similarly it can be seen that in fig 4.2 ,thebag1,bag2,bag3 started degrading and the average temperature of decomposing rate of compost in the presence of sunlight is seen as 28.68°C,20.74°C and 21.13°C respectively. Similarly in fig 4.3 the bag1,bag2,bag3 should degrading and the average of temperature of decomposing rate of compost in the absence of sunlight is seen as 21.6°C,22.3°C and 21.7°C respectively.

Fig 4.4 represents the average comparison for the decomposing rate of compost in both the absence and presence of sunlight. The average was found to be 21.13°C and 22.3°C in the absence and presence of sunlight respectively.

5. APPLICATION:

- Helps make the perfect compost pile for growing plants/food
- Minimizes fossil fuels
- Reduces landfill waste and pollution
- Reduces food scrap waste
- Avoids buying soil amendments
- Environmental Help
- Much more….

6. CONCLUSION:

The conclusion corresponds to the following hypothesis such as bag1 decomposed the quickest and hence the optimum C:N ratio was found at bag1 in the ratio of 2:1and bag2 had a more wanted texture where C:N ratio is 1:1 and bag3 grew mold and it's C:N ratio is 1:2.

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