

# Study of some engineering and environment parameters to compost production

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The main objective of this work is to compare the quality of produce compost using two different methods. Another objective is to evaluate the need for sieving the compost and its influence on the quality. The experiment was carried out at Training Center for Recycling of Agricultural Residues (TCRAR) at moshtohor. During 2006 season to examine some of the factors affecting the engineering rapid production process and quality of compost and study the effect of sifting process on the quality of final compost product. Two sieves granules (2 and 10 mm) were used throughout turned and static compost experiments. The obtained results can be summarized as follows:

- 1-Comparisons between two types of composting processes turned and static.
- 2-Study the effect of sifting process on the quality of final compost product.

Materials: 1: compost:input compost been working compost using farm waste, which is the remnants of livestock and plant residues was therice straw as an essential and remnants of maize stalks and sewage sludge treatment and analysis were as follows :

| Materials                      | Cattle dung | Maize stalks | Rice Straw | Sewage sludge |
|--------------------------------|-------------|--------------|------------|---------------|
| Total Nitrogen %               | 1.53        | 1.09         | 0.49       | 3.14          |
| Total Organic Carbon%          | 44.95       | 46.58        | 44.94      | 37.68         |
| C/N Ratio                      | 29.37       | 42.73        | 91.71      | 12            |
| Total Phosphorus %             | 7.30        | 0.67         | 0.34       | 1.04          |
| Total Potassium %              | 1.43        | 0.28         | 40.52      | 0.43          |
| Bulk Density kg/m <sup>3</sup> | 128.45      | 4.03         | 72.16      | 420.82        |
| Moisture Content %             | 81.08       | 7.55         | 55.34      | 44.42         |

2: Experimental procedure: Six piles were carried out at Training Center for Recycling of Agricultural Residues (TCRAR) at moshtohor and prepared using rice straw, maize stalks, sewage sludge and Cattle dung. The amounts of each of the previous materials were calculated to give a mixture of C/N ratio about 30:1 by Compost Recipe Calculator (Fig 1). The materials of each pile were thoroughly mixed and stacked in several layers at site area of about 2.25m(W) x 12m (L) x 1.70m (H). The previously mentioned mixture of organic materials was used in preparing compost by two different methods, i.e. static and turned. For sifting evaluate one objective of the works is study the effect of sifting process on the quality of final compost product. Two sieves grades (2 and 10mm) were used throughout turned and static compost experiment .Compost quality parameters used in this investigation were its content of elements and organic matter.

- 3-Results:3-1 Compost Production:3-1-1- The physical and chemical changes:Recorded temperatures showed higher rates during thermophilic phase which began two days after the compost and lasted for about 50 days in static compost, and about 30-35 days in turned compost, which rose temperatures reaching a maximum (60-70 °c) during the first twenty days of the beginning composting of all pile. Mesophilic phases continue more than one day of the experiment and then start back again after the end of the thermophilic phase and lasted for about 40-45day in static compost, while 28 days in turned compost, which had temperatures of less than 45°c higher than 30°c.-Carbon dioxide was more valuable than 15% in static compost, but in the turned went up 19% or more before turning then DROPPed both at the end of the manufacturing process to be close up to 2%.-EC salinity: increased the (salinity of compost) increased with time elapsed of showing 11.34 dS /m in turned compost and 7.04 dS /m in static compost inhabitant at the end of the maturity.-pH arrived in turned compost to 7.94, while that of the static compost to 8.06.- The CEC Increased from 36.11 at the start of the experiment to 88.98 and 68.93 Meq/100g compost for both turned and static compost respectively at the stage of maturity.-Carbon / nitrogen ratio was in low values where declind from 29.88 to 14.51 and 13.44 in both static and turned

compost maturity respect.3-1-2: changes in the concentration of elements:3-1-2-1 - Concentration of ammonia decreased by increasing of time period of compost from 481 to 48 and 31 mg / kg at the end of the manufacturing phase of static, turned compost,respectively.3-1-2-2 Available phosphorus showed a slight decrease in static compost whereas its value exhausted a slight increase for turned compost.3-1-2-3- Potassium available increased moral of 15.24 and 12.85 to 15.53 g / kg during the same period.3-1-2-4- Micro-elements (iron, manganese, zinc, copper) increased moral of 128.50, and 976.12 to 1024.0 ppm of iron-and 68.38 to 311.00 and 327.54 ppm of zinc-and 48.56 to 281.00 and 183.00 ppm for Manganese-and 28.00 to 68.00 and 58.00 ppm of copper for static and turned compost, respectively.3-1-3- Microbial load & compost:All tested beneficial bacteria ( Azotobacter , Azosperillum ,Klebsiell ,Bacillus , Nitrosomonas and Nitrobacture )showed a progressive increase in theirs densely during the time of composting where most & them increased from 102 to 104 - 106 CFU/g compost at the maturity.- Pathogenic bacteria were disappeared at the end of composting.

3-2- Sifting EvaluationSifting process of compost showed a clear effect on the quality and content of components for both types& compost.3-2-1- Change in bulk density:-The bulk density of compost granules for less than 10mm, compost granules for less than 2mm, compost reject for 10mm and compost reject for 2mm decreased from 0.648g/cm<sup>3</sup> to 0.581, 0.514, 0.627, 0.594g/cm<sup>3</sup> respectively for Static compost.On the other hand in 1he corresponding figures for turned compost were 0.569g/cm<sup>3</sup> to 0.434, 0.419, 0.547and 0.512g/crn<sup>3</sup>.3-2-2. Changes in the pH:-The result clearly indicated that the pH values were slightly affected by different size of granules where pH ranged from 7.94 to 8.13 for static compost and from 7.12 to 8.05 for turned compost.3-2-3-Changes in the electrical conductivity:-The EC value was 7.04 for the final static compost and decreased to 6.12, 3.15, 5.13 and 6.81 for granules less than 10 mm, granules less than 2nun compost reject at 10inm and compost reject at 2 mm respectively. On the other hand in turned compost the EC value was 11.34 for the final compost and decreased to 9.14, 7.19, 10.01 and 11.15 for granules less than 10 mm, granules less than 2mm compost reject at 10 mm and compost reject at 2mm respectively during sifting process.3-2-4- Cation Exchange Capacity (CEC):-The CEC values were gradually decreased throughout the sifting process of composting static compost or turned compost methods. The CEC value was 68.93 for the final static compost and decreased to 67.12, 63.15, 68.13 and 67.77 for Granules less than 10mm, Granules less than 2inm compost reject for 10min and compost reject for 2mm respectively. On the other hand in turned compost the CEC value was 88.98 for the final compost and decreased to 85.17, 81.27, 88.16 and 86.04 for Granules less than 1 Orrun, Granules less than 2rnin compost reject for 10min and compost reject for 2rnm respectively during sifting process.

**SUMMARY AND CONCLUSION**

-100-3-2-5. C/N ratio:-Organic carbon content (OC%) during sifting process decrease from 27.72% for the final static compost to 26.67,26.24,26.69% and 26.75% for granules less than 10mm, granules less than 2mm compost reject for 10mm and compost reject for 2mm respectively. On the other hand in turned compost the organic carbon content was 23.09% for the final compost and decreased to 22.56,22.31,22.78% and22.94% for granules less than 10mm, granules less than 2mm compost reject for 10mm and compost reject for 2mm respectively during sifting process.3-2-6. Changes in total nitrogen:-Total nitrogen percent (TN %) during sifting process, indicated that a significant decrease from 1.91% for the final static compost to 1.68,1.01,1.41% and 1.76% at Granules less than 10mm, Granules less than 2mm compost reject for IOmm and compost reject for 2mm respectively. On the other hand in turned compost the total nitrogen content was 1.72% for the final compost and decreased to 1.42,0.82,1.32% and 1.491% for granules less than 10mm, granules less than 2mm compost reject for 10mm and compost reject for 2min respectively during sifting process.It is clear that sift process to remove granules greater than 10mm in this granules mines containing part-Degradable or humus and organic matter and the main reason to reduce the quality and content of the final elements in the final product.