Determination of CEC to evaluate the quality and maturity of compost prepared by using municipal solid waste

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Abstract- The CEC is the most important chemical parameter to check the stability and maturity of the compost. The higher value of CEC at the end of composting process give the more mature compost without any phytotoxicity and increased germination index. The composting process can be speed up by the addition of some inoculum in it. The present study was designed to find out the CEC of mature compost produced by municipal solid waste, as CEC must be increased with the time interval in composting process. The value of CEC depends on the nature of waste used for composting. It was concluded that the mature compost was formed by using MSW after 3 months of composting process with the addition of commercially available inoculum BST alone and with addition of molasses. The higher value of CEC was given by the windrows treated with BST inoculum without the addition of molasses.

Index Terms- C: N, CEC, MSW, BST.

I. Introduction

The composting is one of the useful method of recycling the bio-waste. The composting process is naturally occurs but it can be improve by optimizing different physical parameters, such as temperature of windrow, aeration, pH and moisture content. The maturity of the compost is important to use it as a bio fertilizer. The immature compost can be harmful for the plant as it contains pathogenicity and it can cause severe damage to the plant. The main causes of immaturity of compost can be too high C: N. The production of ammonia can lead to the toxic effects to the plants. (Golueke *et al.*, 1977). The mixing of soil to the immature compost can delay or stop the seed germination. The value of C: N should be decreased with the time interval during composting process. The cation exchange capacity of the soil is extracted became greater as the humification progressed (Harada and inoko, 1980). The phenolic and carboxyl groups are very useful in estimating the CEC (Lax *et al.*, 1986). The maturity of the compost in case of determining the CEC value also depend on the nature of organic waste used for composting (Bernai *et al.*, 1998). The increase in cation-exchange capacity and the high percentage of humification index revealed the higher rate of humified organic matter. The value of germination index show the decrease in the phytotoxicity during composting (Paredes *et al.*, 1999).

II. Methodology

The municipal solid waste was sorted. The four windrows were prepared with the weight of 550. The two prepared windrows were inoculated with BST inoculum and two were inoculated with BST commercial inoculum and molasses to enhance the rate of decomposition and the windrows were left for 3 months to get the good quality of mature compost. The C: N was adjusted below 30 by determined the C: N of individual sample of MSW which include screened matter, cow dung, saw dust and green waste. The value of C: N for the windrows of MSW was resolute by using the C: N calculator. The table 1 shows the quantity of individual samples of MSW used to adjust the C: N ratio of the windrow for composting. The four windrows were prepared for composting process with same C: N adjustment as shown in **table 1**.

Table 1

Ingredients	**Quantity used to adjust the C:N of windrows (30:1)**	**Weight of the windrow (Metric Tons)**	**Inoculum**
Screening matter, Green waste, Saw dust, Cow dung	16.5, 352, 17, 165	550	BST
Screening matter, Green waste, Saw dust, Cow dung	16.5, 352, 17, 165	550	BST and molasses
Screening matter, Green waste, Saw dust, Cow dung	16.5, 352, 17, 165	550	BST and molasses
Screening matter, Green waste, Saw dust, Cow dung	16.5, 352, 17, 165	550	BST

III. Determination of CEC to check compost maturity and stability

The compost sample was collected from the windrows and CEC of compost was determined by taking 200mg of compost sample in a flask. The sample was than washed with 0.05 N HCL solution. The sample was washed again with distilled water to remove any residue remained of HCL. The 1 N Ba(OAc)2 solution was prepared and the pH of solution was adjusted at 7. The solution of Ba(OAc)2 was added in the flask contains sample of compost and left for overnight. The sample was filtered and the small amount of Ba(OAc)2 was added in it. The prepared sample was then titrated with 0.05 N NAOH solution using a potentiometer. The amount of protons released gave the CEC of sample (Harada and inoko 1998).

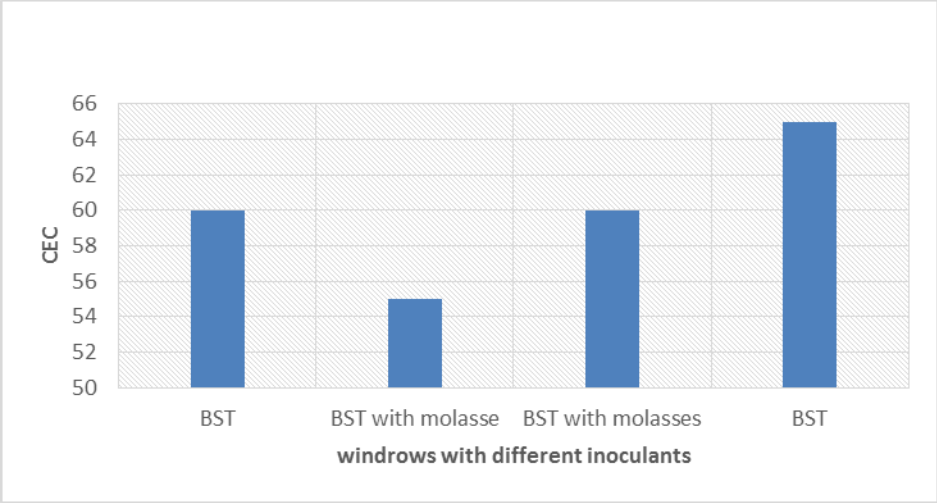
IV. Results and discussion

The Cation exchange capacity was increased with increase in time interval of composting process. It was reported by Saharinen (1998) that the CEC must be high at the end of composting process, the value of CEC must be above 60% to supply the compost in market, as our results show high CEC in mature compost of all windrows. The low value of CEC indicates low quality and less maturity of compost because the uptake of nutrients is not enough in low CEC compost for the efficient growth of plants. The figure 1 shows the comparison of CEC of compost formed by BST inoculum and with addition of molasses. The C: N of the mature compost must be decreased from the adjusted value, it should be below 20:1 at the end of composting process. There is an inverse relationship between CEC and C: N of compost. The value of CEC increased with the time interval and the C: N decreased (Guo *et al.*, 2012).

Table 2

Windrows	CEC	INOCULUM
1	60	BST
2	55	BST with molasses
3	60	BST with molasses
4	65	BST

Figure 1



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