Effect of pH and moisture content on composting of Municipal solid waste

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Abstract- pH and moisture content are important parameters to evaluate maturity of compost prepared by using different type of organic waste. This study was designed to check the effect of pH and moisture content at start and end of composting process. It was concluded from this study that the pH of the compost remained alkaline throughout composting process. The moisture percentage was decreased from 50% with the increase in interval of time. The results showed that the compost is mature enough to be used as bio fertilizer.

Index Terms- MSW, pH, Moisture %, BST

I. Introduction

Composting is increasingly used method to treat any type of organic waste. The pH of municipal solid waste is alkaline and its range from 7- 8 (Lorena *et al.,* 2013). This type of waste is without any glass and inert material. The alkalinity in the pH of MSW is because of the presence of very less amount of short chain organic acids mainly lactic acid and acetic acid. The high concentration of these short chain organic acids increase the acidity of pH. The absence of these organic acids in alkaline conditions and presence in acidic conditions shows that they are important factors in the regulation of compost pH. The change of mesophilic to thermophilic conditions of a compost pile results in the more alkalinity of pH. (Sundberg *et al.,* 2004). The microbes show maximum degradation in the pH range of 7 to 8 (Nakasaki *et al.,* 2011). The rate of organic waste decomposition is slow at low pH conditions (Sundberg *et al.,* 2013).

The moisture content at the initial stage of composting process is optimized and its value should not increase from 50-60%. Moisture is important for the activity of microbes because it increases the rate of metabolism. The activity of microbes is minimum when low moisture is provided (Tiquia *et al.,* 1996). The reduction in the value of moisture content at the end of composting is a positive sign of decomposition and it gives mature compost (Epstein *et al.,* 1995).

II. Material and methods

The experiment was conducted in Lahore compost Pvt Ltd. The three windrows of 650 tons were prepared. The composition of organic waste in control windrow included cow dung, municipal solid waste and green waste. The composition of one experimental windrow with 650 ton weight included cow dung, green waste, municipal waste and press mud. The composition of second experimental windrow included cow dung, green waste, municipal solid waste and humic acid. The commercial BST inoculum was added in all three windrows to speed up the process. Table 1 shows the composition of each windrow.

Table 1

Sr.No.	Windrows	Composition	Total Weight (MT)	Inoculum
1	Control	C.D+G.W+MSW	650tons	BST
2	Press Mud	C.D+G.W+MSW+P.M	650tons	BST
3	Humic Acid	C.D+G.W+MSW+H.A	650tons	BST

III. Determination of pH

The pH was determined at the start and end of composting process. The sample was taken from control and experimental windrows. Each sample was mixed with water in 1:10 to make solution. The prepared solutions were left for 2 hours so that the maximum salts can be dissolved. The pH electrode was dipped in each sample prepared solution and readings were recorded when it was stabilized (Monedero *et al*., 2001)**.**

IV. Determination of moisture content

The 50% moisture content was provided to each windrow at the start of composting process. The moisture content of each windrow was obtained by taking 10g of sample in china dish from control and experimental windrow and placed it in an oven at 60 C for 8 hours. The sample was weight again and moisture content was calculated by dividing the readings of reduction in weight from initial weight (Richard *et al*., 2002)

V. Results and Discussions

The results of control and experimental windrows in term of pH value were almost same. All windrows showed alkaline pH throughout the composting process, in the range of 8.3-8.5 (figure 1). The alkaline pH is important parameter to evaluate compost maturity and stability. The acidic pH affects the rate of respiration of microbes and decreases the rate of degradation. The pH of the compost should be alkaline throughout and end of the composting process. The high activity of microbes at thermophilic stage is because of the alkaline pH (Sundberg *et al*., 2004).

The reduction in moisture content was observed in all windrows. The moisture percentage was decrease with increase in time interval. The value of moisture percentage of control windrow was recorded 30. The moisture percentage of experimental windrow with press mud and humic acid was reduced from 50% to 31% and 32%. Moisture content is a dominant factor in aerobic composting (Liang *et al.,* 2003). It provides better degradation of organic matter and maintain temperature for longer time period. The moisture is inversely proportional to the temperature and the microbe activity (Makan *et al.,* 2012). The moisture % readings in all compost windrows were in the range of 30-32 % (figure 1). There is no significance difference was observed. The decrease in the moisture percentage is positive sign to evaluate the stability of compost. The reduction in moisture percentage gives more stable and mature compost. The results of Moisture % and pH are shown in table 2.

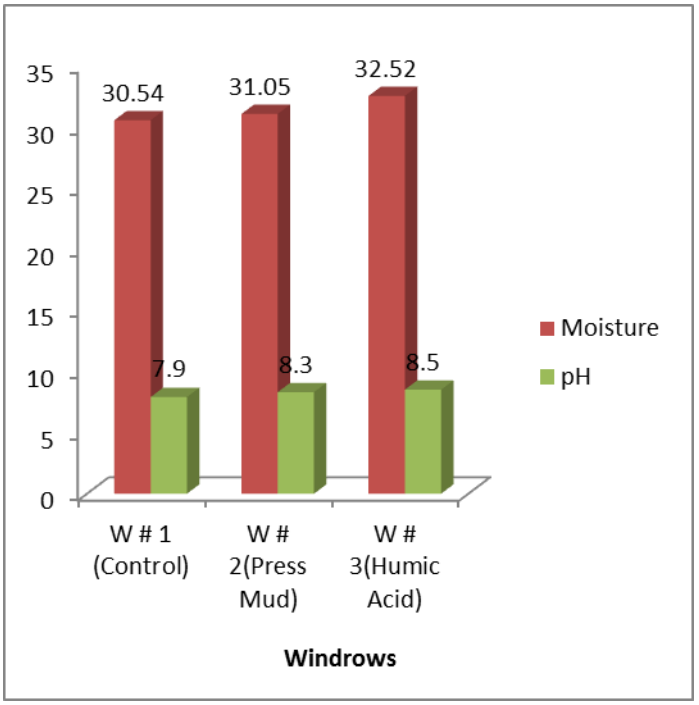
VI. Conclusion

It was concluded that the pH of municipal solid waste was alkaline and it remained alkaline throughout the process of composting in control and experimental windrows. There was no variation observed in pH profile. The moisture % was reduced from 50% to 30% of control windrow and 31%-32% of experimental windrow which had press mud and humic acid. The reduction in moisture profile throughout composting process showed that the degradation rate was high. The microbes were active and decomposed waste.

Table 2

Parameters	**W # 1**	**W # 2**	**W # 3**
Moisture	30.54	31.05	32.52
pH	8.5	8.3	8.5

Figure 1



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