Production of Compost Using Organic wastes

Jang Hoon Lee*, Joon Oh Jung, Hyuk Ku Kwon,
Youn Ku Nam, Jung won Yun

*College of Environment & Safety Engineering, Hoseo University,
Asan 336- 795 Korea*

Abstract

Since 2003, Korean government has restricted landfill application of organic waste, which shares approximately 56% of total waste sludge from municipal and industrial wastewater treatment plants. In addition, enforcement of the ocean disposal prohibition law is effective from 2005. Organic sludge was composted for the purpose of converting to organic fertilizer. After moisture content was regulated with bulking agents aerobic treatment performed. When composting was conducted, commercial and activated microbe materials, identified from soil were seeded in sewage sludge. Carbon dioxide production was increased sharply after 24 hours. Temperature and pH of compost reached to 66.2℃ and 8.
Heavy metals were lower than their regulatory limits, which enable it to utilize as organic fertilizer.

Introduction

Among other such as ocean disposal, incineration, reclamation and recycling technology, simple drying and composting seem to be the most typical methods in either reuse or reduction of the wastes. Simple dried materials have to be treated by incineration or reclamation. Therefore, this investigation describes the study of the effect composting to make organic fertilizer with organic wastes.

Materials and Methods

Dewatered sludges were obtained from sewage treatment, paper mill, confectionery and dairy industries and used for this study. For sewage sludge, composting was conducted by seeding commercial composting microbial solution and activated microbes materials (35mℓ/kg, respectively) to investigate the effect of them. The process of bioreactor was shown in fig 1. A physical and chemical characteristic of material is on Table 1. Moisture content of the materials under composting was adjusted in the range of 61-64%, and weighed 10kg for each reactor. Air feed rate was regulated to 1 ℓ/min by flow controller. This flow rate was found to be the optimum for the composting of organic materials.

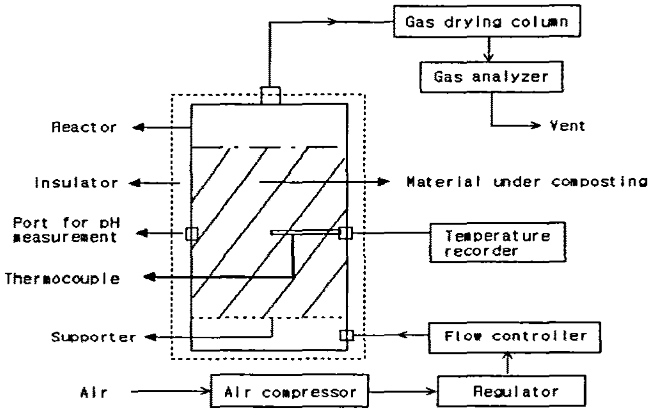

Fig. 1. Schematic diagram of composting reactor.

Results and Discussion

Fig. 2 shows the temperature changes during the composting process. Most of the temperature profiles follow typical composting temperature change pattern except the paper mill sludge. This may be because high cellulose content and/or some additive chemicals in the paper mill sludge were not favorable to the growth of microorganism in the compost. Regarding the thermophilic stage, sewage sludge stated the earliest, reached the highest, and maintained the longest period of the time.

However, seeing microorganism was net effective Fig 3, show the pH change during the composting. The initiated pH of around 5.6 reaches 8.3 at the end or the process regardless of the materials. The increase of pH initiated at around 24~27 hour, which corresponded to the point of temperature rise in Fig 2.

Carbon dioxide emissions in Fig 4, resemble the temperature profiles and the area under each curve indicate the total emission of CO_2 was the composting. Therefore, it seemed that sewage sludge under gone the most decomposting of organics. Again, no practical decomposting was observed for the paper mill sludge.

If the heavy metals amount compares with fertilizer standard, it appeared by norm low excepting Cu in paper compost.

Table 1. Proximate analysis of sludge and C/N ratio

Origin	Moisture (%)	Ash (%)	Combustible (%)	C/N
Sewage	61.1	3.0	35.9	27.0
Paper mill	64.1	13.2	22.7	49.9
Confectionery	63.1	2.4	34.5	29.4
Dairy	62.7	1.6	35.8	29.1

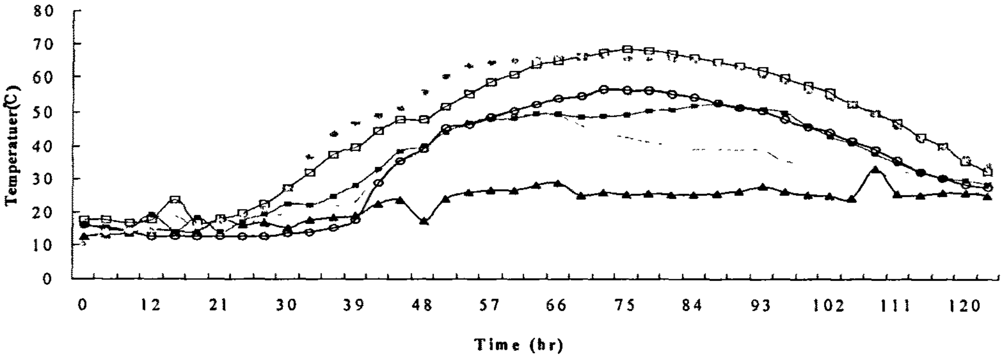

Fig. 2. Variation of Temperature during composting process.

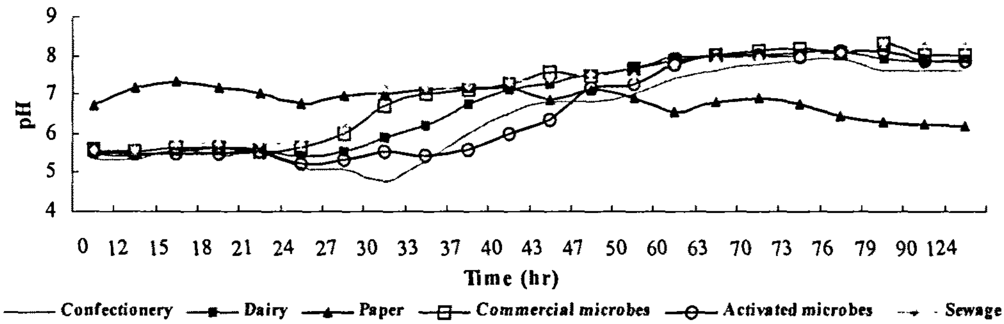

Fig. 3. Variation of pH during composting process.

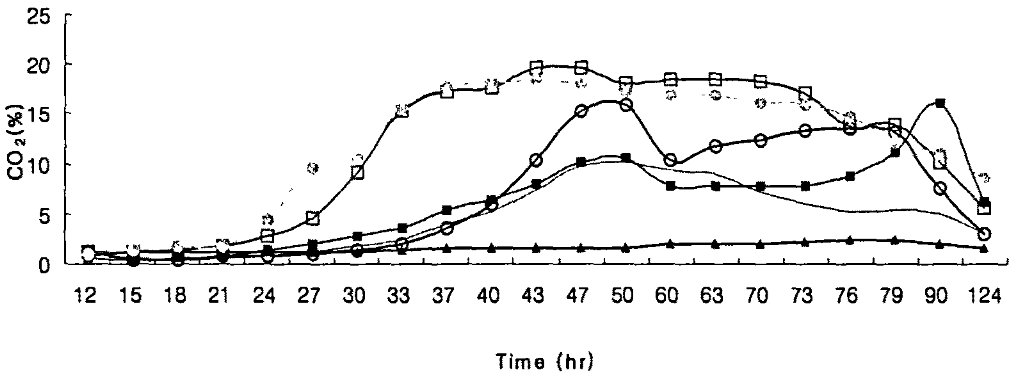

Fig. 4. Variation of CO_2 emission during composting process.

Table 2. Government control concentration of fertilizer

(mg/kg)

Section	Cr	Pb	Cd	Hg	As	Cu	Zn	Ni
Regulation	300	150	5	2	50	300	900	50
Sewage compost	87.05	32.41	3.03	ND	2.34	191.02	231.79	33.80
Paper compost	121.29	ND	3.02	0.34	0.24	426.14	428	ND
Confectionery compost	ND	ND	ND	ND	ND	45.23	521.01	28.23
Dairy compost	ND	ND	ND	ND	ND	124.23	474.11	ND

ND: not detected

Conclusion

In most cases, the utilization of organic wastes from municipal and industrial wastewater treatment plants as fertilizer is limited in Korea. It is partially permitted to use organic wastes from rural wastewater treatment plant as a fertilizer, only after pass the regulatory limit. However to encourage the recycling the useful resource, it maybe considered to re-establish legal system.

References

Joon-Oh Jung, Jeong-Hee An : The Influence of Air Feed Rate on the Composting Process of Food Waste. J. of KSEE Vol. 23, No. 6, pp1013~1021. 2001.

Chae-Gun Phae, Jae-Kyoung Cho, No-Hyuk Kwak, Dong-Wook Kim : A study on the Evaluation of Optimum Treatment by Analysis of Sewage Sludge Properties. J. Korea Solid Wastes Engineering Society Vol. 15, No.3, 252~260, 1998.

N. Morisaki., C-G. Phae , K. Nakasaki., M. Shoda and H. Kubota., : Nitrogen transformation durig thermophilic composting., J. Ferment. Bioeng., No1, P.5,7~61, 1989.

Bagstam, G. : Population change in microorganisms during compositng of sqruce-back. 2. Environ. J. Appl.Environmental Microbial, 50, 4, 899-905, 1985.