

## Proliferation of aerobic complex microorganisms during composting of food garbage and cow manure with biomass charcoal

Satoko Tanaka and Shuji Yoshizawa

(1) Department of Environmental Systems, Meisei University, Hino, Tokyo 191-8506, Japan

### INTRODUCTION

Recently, two technologies have been receiving attention in the field of biomass waste recycling. One is the carbonization of biomass wastes such as woody construction materials waste, waste paper, and wood and bamboo forest thinnings, and another is the composting of garbage generated by homes, restaurants, and food industries and of livestock waste.

Wood and bamboo charcoals have pores that range from several to several tens microns in diameter. Proliferation of composting microorganisms was enhanced on and in charcoal as a medium.

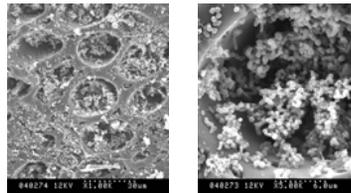


Fig. 1. SEM photographs of microorganism in bamboo charcoal of rice bran composting after 336 hours.

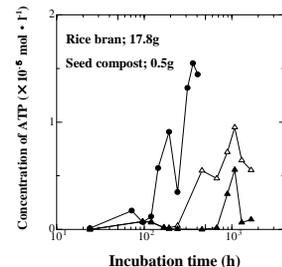


Fig. 2. Incubation time dependent of ATP concentration of rice bran composting. Charcoal amount : ▲; 1.0 g, △; 5.9 g and ●; 15.5 g.

### EXPERIMENTAL

#### Charcoal preparation

- Material: concrete flame wooden waste
- Carbonization temperature: 650°C
- Carbonization time: 2 hrs
- Specific surface area: 500 m<sup>2</sup>/g
- Charcoal diameter: several mm



Fig. 3. 7 m<sup>3</sup> Carbonization apparatus.

Table. Thrown amount of raw materials.

Test name	Test period	Charcoal (kg)	Food garbage (kg)	Cow manure (kg)	Returned compost (kg)
Autumn	9/12-12/5/2006 (15 throws)	1,050	4,050	47,250	450
	Average thrown amount	70	270	3,150	30
Winter	12/15/2006 -3/23/2007 (14 throws)	450	3,780	44,100	980
	Average thrown amount	30	270	3,150	70



Fig. 4. Cow manure about 70 % of moisture spread in the lane.



Fig. 5. Granular charcoal spread to cow manure by the loader.



Fig. 6. House garbage mixed to cow manure and granular charcoal.



Fig. 7. Aeration from the lower part of the compost pile.

### RESULTS and DISCUSSION



Fig. 8. Vertical sectional view of compost pile with charcoal.

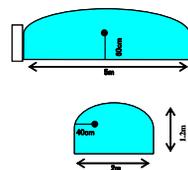


Fig. 9. Measurement point in the pile.

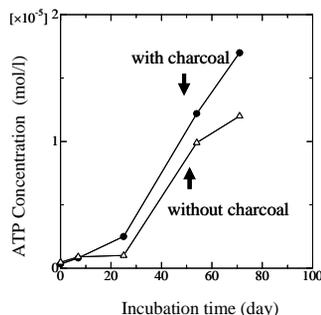


Fig. 12. Incubation time dependent of ATP concentration, with charcoal and without the charcoal.

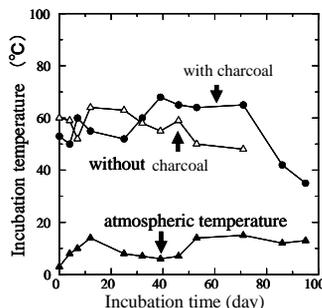


Fig. 10. Incubation time dependent of temperature, with charcoal and without the charcoal.

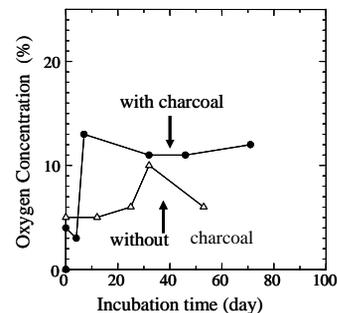


Fig. 11. Incubation time dependent of oxygen concentration, with charcoal and without the charcoal.

### CONCLUSIONS

In composting food garbage and cow manure, addition of biomass charcoal is effective for proliferation of aerobic microorganisms.

In winter time at average outdoor temperature of 10°C, it takes 4 months to finish the fermentation with charcoal. (Without charcoal, it takes 6 months.)