T2R2 東京工業大学リサーチリポジトリ
Tokyo Tech Research Repository

論文 / 著書情報
Article / Book Information

題目(和文)	
Title(English)	Effects of inoculum on accelerating the simulated food waste composting
著者(和文)	Tran Ngoc Minh Quyen
Author(English)	Ngoc Minh Quyen Tran
出典(和文)	学位:博士(学術), 学位授与機関:東京工業大学, 報告番号:甲第10250号, 授与年月日:2016年3月26日, 学位の種別:課程博士, 審査員:中崎 清彦,日野出 洋文,高橋 邦夫,丹治 保典,江頭 竜一
Citation(English)	Degree:Doctor (Academic), Conferring organization: Tokyo Institute of Technology, Report number:甲第10250号, Conferred date:2016/3/26, Degree Type:Course doctor, Examiner:,,,,
学位種別(和文)	博士論文
Category(English)	Doctoral Thesis
種別(和文)	要約
Type(English)	Outline

Powered by T2R2 (Tokyo Institute Research Repository)

TITLE OF DISSERTATION

EFFECTS OF INOCULUM ON ACCELERATING THE SIMULATED FOOD WASTE COMPOSTING

THE OUTLINE OF DISSERTATION

CHAPTER 1: INTRODUCTION

This chapter presented the recent status of municipal solid waste where the accumulation of food waste was raised as an urgent issue. Composting was introduced as the alternative recycling method for food waste. The problem of low pH levels causing by accumulation of organic acids in the composting was revealed with the possible strategies proposed. The notion about using organic acids-degrading microorganisms to solve the low pH problem was suggested. Moreover, the clarification on the interaction of coexisted microorganisms is required for better understanding about the successful composting. Raising those demands together with the goal and objectives of this study was stated.

CHAPTER 2: LITERATURE REVIEW

This chapter reviews literature on the physicochemical conditions for the successful composting. The possible succession of microbial community during the composting was studied. Moreover, the previous studies where the low pH problem was solved for successful composting was reviewed. Literature about characteristic of useful microorganisms in this study was reported.

CHAPTER 3: INOCULATION OF LACTIC ACID BACTERIUM ACCELERATES ORGANIC MATTER DEGRADATION DURING COMPOSTING

In this chapter, the role of lactic acid bacterium *Pediococcus acidilactici* TM14 (PE) was elucidated by inoculation of PE into the compost raw material. The compost raw material was composed of rabbit food with the addition of organic acids that simulate food waste. As the result, PE produced lactic acid at high concentration, and inhibited the production of acetic acid, which is a highly toxic compound, and thus enhanced the activity of fungi with the ability to degrade organic acids, such as *Paecilomyces* sp. QH1. QH1 could grow and degrade organic acids, then increase the pH level. Thus the proliferation of thermophilic bacteria was promoted and organic matter degradation was enhanced. In consequence, composting was accelerated.

CHAPTER 4: INTERACTION OF LACTIC ACID BACTERIA APPEARED IN THE EARLY STAGES OF FOOD WASTE COMPOSTING

This chapter elucidated the role of *Weissella paramesenteroides* TA15 (WE) by inoculating WE into the raw material and the interaction of PE and WE since it was possible that PE and WE coexisted in the food waste. WE was found to produce acetic acid, which is harmful to composting microorganisms, resulting in the inhibition of vigorous organic matter degradation. Whereas, PE enhanced high-rate composting by producing lactic acid, inhibited the accumulation of acetic acid and enhanced the organic matter degradation (Chapter 3). The PE/WE ratio was important in order to facilitate the proliferation of indigenous microorganisms and thus accelerating the composting, when PE and WE coexisted. In other words, PE/WE ratio of $10^{1.5}$ effectively enhanced organic matter degradation during composting, while that of 1 and 10^{-1} did not achieve this result. By adjusting the PE/WE ratio to $10^{1.5}$, the production of organic acids was suppressed probably owing to loss-loss interaction between the 2 lactic acid bacteria and stimulated the activities of indigenous microorganisms, which resulted in high-rate composting.

CHAPTER 5: ACCELERATION OF THE THERMOPHILIC COMPOSTING BY INOCULATING *B. COAGULANS* IP1

In this chapter, it was affirmed that the *Paecilomyces* QH1 was effective in the degradation of organic acids only in the mesophilic condition. A newly isolated *Bacillus coagulans* IP1 (BA) was found to be able to degrade the organic acids at the high temperature of 50^{o}C. The

effectiveness of BA was proved by the inoculation of BA into the raw material of the thermophilic composting which was carried out at 50^{o}C. As the result, BA was able to elevate the low pH levels in the raw composting material and also prevent the disruption of pH during the composting, so the degradation of organic matter was occurred vigorously.

CHAPTER 6: GENERAL CONCLUSIONS

With the results obtained from chapter 3, 4 and 5, the general conclusions were able to be drawn in this chapter. Moreover, the recommendation was proposed for the usage of the new microorganisms that was found to be useful in this dissertation.