

学 位 論 文 要 旨	
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題 目	Study on highly efficient methane fermentation using swine feces as substrate (豚糞を基質とした高効率メタン発酵に関する研究)
<p>In this research, methane fermentation was used for treatment of swine feces, which is a social problem in Kagoshima prefecture. Methane fermentation digested liquid (hereinafter referred to as "digested liquid") discharged after the methane fermentation treatment contains fertilizer components, so reduction of agricultural land is expected. Therefore, in the Chapter 2, the safety of the digested liquid was examined. Methane can be obtained as an energy product in methane fermentation process. In the Chapter 3, microbial communities contained in digested liquid with high methane fermentation efficiency were examined. It is necessary to maintain high methane fermentation efficiency utilizing the digested liquid showing high methane fermentation efficiency on-site at methane fermentation facilities. A summary of each chapter is as follows.</p> <ol style="list-style-type: none"><li>1. The digested liquid that is discharged after methane fermentation contains inorganic fertilizer components such as N, P, and K, so it is expected that it will be effectively used as a substitute for chemical fertilizer, which price increases soaring in recent years. However, food poisoning damage due to pathogenic bacteria mixed in digested liquid derived from excreta such as swine feces is also concerned. In this study, we investigated the change in bacterial concentration of pathogenic bacteria (<i>Salmonella enterica</i>) using mesophilic temperature treatment which is easy to maintain methane fermentation facility, and the fact that the methane production amount has a positive correlation with the reduction of the bacterial concentration of <i>Salmonella enterica</i> showed that. The result of this research will be useful for safely maintaining and operating the medium temperature methane fermentation facility before stabilization.</li><li>2. Digested liquid with high methane fermentation efficiency and digested liquid with low methane fermentation efficiency were acquired and named H-DS and L-DS, respectively. H-DS showed higher methane fermentation efficiency than L-DS even when raw swine feces was used as a substrate. Microbial community analysis revealed that the diversity index of H-DS was higher than that of L-DS, and that the high methane fermentation efficiency of H-DS was probably due to the cooperative relationship between acetogenic bacteria and acetic acid-utilizing methanogens. The results of this study suggest that selection of seed sludge is important for managing methane fermentation facility and to operate it efficiently.</li><li>3. In order to utilize the digested liquid with high methane fermentation efficiency obtained in the 2 chapter of this study, it is necessary to study optimal method for preserving of digested liquid. In this study, five kinds of preservation methods (glycerol stock, frozen storage, refrigerated storage, long-term culture, subculturing every 10 days) were conducted. The digested liquid preserved in each preservation method was inoculated into the swine feces supernatant medium at the same time after 90 days, and methane fermentation was carried out.</li></ol>	