

陈琳,谷洁,高华,秦清军,王小娟,陈智学.Cu对厌氧发酵中水解酶活性及沼气产量的影响[J].农业工程学报,2012,28(9):202-207

### Cu对厌氧发酵中水解酶活性及沼气产量的影响

#### Effects of Cu on hydrolytic enzyme activities and biogas production during anaerobic fermentation

投稿时间: 2011-07-29 最后修改时间: 2012-04-13

中文关键词: [沼气](#),[发酵](#),[Cu](#),[水解酶活性](#)

英文关键词: [biogas](#) [fermentation](#) [copper](#) [hydrolytic enzyme activity](#)

基金项目:国家自然科学基金(40771109, 40871119); 农业部“948”项目(2010-Z20)

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中文摘要:

为了探讨重金属Cu对厌氧发酵产沼气的影响机制,在中温条件下(37℃),研究了猪粪中Cu含量(以干猪粪的质量分数计)对厌氧发酵过程中水解酶活性及产气进程的影响。结果表明:整个发酵过程中CK处理(Cu质量分数49.70 mg/kg)的纤维素酶活性及蔗糖酶活性显著高于H处理(Cu质量分数949.70 mg/kg),CK、L(Cu质量分数349.70 mg/kg)处理的脲酶活性显著高于M(Cu质量分数649.70 mg/kg)、H处理(p<0.05)。H处理对原料的产沼气进程有明显的抑制作用,日产气量在消化的前34 d一直低于CK、L、M处理,CK处理总产气量比H处理高9%。相关性分析表明,CK处理的3种水解酶活性、L处理的脲酶活性、M处理的蔗糖酶活性均与产气速率呈显著正相关(p<0.05),而H处理这种关系不明显,表明外源Cu可能通过影响微生物活性等多方面因素对产气速率造成综合影响,导致水解酶活性与产气速率相关性不显著。该文研究结果可为提高厌氧发酵产气效率,实现畜禽粪便资源高效利用提供参考。

英文摘要:

In order to find out the potential influencing mechanism of heavy metal Cu on the biogas production during anaerobic fermentation, experiments were designed to study the effects of Cu content in the pig manure (as mass fraction of dry pig manure) on hydrolytic enzyme activities and gas production at mesophilic condition (37℃) in the anaerobic fermentation process. The results indicated that the average cellulase activities and sucrose activities by CK treatment (the mass fraction of Cu was 49.70 mg/kg) were significantly higher than that by H treatment (the mass fraction of Cu was 949.70 mg/kg) during the whole fermentation process, and the average urease activities of CK treatment and L treatment (the mass fraction of Cu was 349.70 mg/kg) were significantly higher than that of M treatment (the mass fraction of Cu was 649.70 mg/kg) and H treatment (p<0.05). Apparently, the copper of H treatment inhibited the gas production. Daily biogas yield of H treatment was below those of CK, L and M treatments within 34 days early in the process, and total biogas production of CK treatment was 9% higher than that of H treatment. Correlation analyses demonstrated that the activities of cellulase, sucrose and urease of the CK treatment, the urease activities of the L treatment and the sucrose activities of the M treatment were significantly positive related to the biogas production rate (p<0.05), while these relativity of H treatment were not obvious. The results showed that copper might lead to the comprehensive effects of gas production rate through many factors, such as microbial activity, which made no significant correlation between hydrolytic enzyme activities and gas production rate. The results can provide a reference for improving the gas production efficiency of anaerobic fermentation and utilization efficiency of livestock and poultry manure resources.

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