ORGANIC ACID PRODUCTION FROM STARCHY WASTE BY RUMEN DERIVED MICROBIAL COMMUNITIES

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ABSTRACT
Converting organic waste to energy carriers and valuable products such as organic acids (OA) using microbial fermentation is one of the sustainable options of renewable energy. Substrate and inoculum are important factors in optimizing the fermentation. In this study, we investigated organic acid production and microbial composition shift during the fermentation of starchy (potato) waste using two different sources of rumen fluid, obtained from fistulated cows in the Netherlands and Thailand as inoculum. The bacterial community profiles of both reactors were analysed using 16S rRNA amplicon pyrosequencing and the relationship between the communities and the organic acid production profiles were determined. The results showed that *Streptococcus* spp. are important for fast lactate (up to 250 mM) production during the first stage (0 - 1 day) in both reactors. Lactate was then the substrate for secondary fermentation to produce acetate, butyrate, and propionate. OA production profile and bacterial composition of both reactors were different in the second part of the fermentation. At day 8, in the reactor with a Dutch rumen inoculum, butyrate (140 mM) and acetate (100 mM) were the main products that correlated with increases in relative abundances of *Parabacteroides, Sporanaerobacter,* Helicobacteraceae, Peptostreptococcaceae, and Porphyromonadaceae. In the reactor with the Thai rumen inoculum, acetate (190 mM), propionate (120 mM), and butyrate (70 mM) were produced, which correlated with increases in relative abundances of *Bacteroides, Dysgonomonas, Eubacterium,* Enterobacteraceae, and Porphyromonadaceae. In summary, starchy waste is very suitable as alternative source for organic acid production, especially lactate, using rumen fluid as an inoculum. OA production was dependent on the inoculum source and *Streptococcus* spp. (86% average relative abundance) played an important role in lactate production in the first stage of the fermentation process.