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# Bioaugmentation of an acetate-oxidising anaerobic consortium in up-flow sludge blanket reactor subjected to high ammonia loads

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**Abstract**

Ammonia is the major inhibitor of anaerobic digestion (AD) process leading to suboptimal utilisation of the biogas potential of the feedstocks and causing economical losses to the biogas plants. However, ammonia is mainly inhibiting the aceticlastic methanogens, while the hydrogenotrophic methanogens, in syntrophic association with acetate oxidising bacteria, are more resistant to ammonia toxicity effect. The use of syntrophic acetate oxidising methanogenic consortia could provide a new approach to tackle ammonia toxicity effect in AD. The SAO culture (i.e. *Clostridium ultunense* spp. nov. in association with *Methanoculleus* spp. strain MAB1), is an acetate oxidising methanogenic consortium that can produce methane ($CH_4$) at high ammonia levels. In the current study the bioaugmentation of the SAO culture in a mesophilic up-flow anaerobic sludge blanket (UASB) reactor subjected to high ammonia loads was tested. The co-cultivation in fed-batch of a fast-growing hydrogenotrophic methanogen (i.e. *Methanoculleus bourgensis*) with the SAO culture was also investigated. Results obtained clearly demonstrated that bioaugmentation of SAO culture in a UASB reactor was not possible most probably due to the slow growth of the culture. The incubation period (duration of lag+exponential phase) of SAO culture was reduced more than 30% when it was co-cultivated with *Methanoculleus bourgensis*, in fed-batch reactors. Therefore, the bioaugmentation of the SAO culture along with *Methanoculleus bourgensis* in a UASB reactor is a promising approach to overcome ammonia toxicity.