

**Enhancement of biogas production from rape straw using different co-pretreatment techniques and anaerobic co-digestion with cattle manure**

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## **Abstract**

The present study investigated the possibility of valorizing rape straw through anaerobic digestion and the possibility of improving biomethane yield by pretreatment with H<sub>2</sub>SO<sub>4</sub>, combined H<sub>2</sub>SO<sub>4</sub> with steam explosion (SE) and SE combined with superfine grinding (SFG). To evaluate the pretreatment method efficiency, several analytical techniques were applied. Additionally, the performance of co-digesting of cattle manure (CM) with pretreated rape straw (PRS) at different ratios was evaluated. The results showed that combined pretreatment could dissolve the lignocellulosic fiber structure, which positively stimulated methane yield. The highest cumulative CH<sub>4</sub> yield (CMY) of 305.7 mLg<sup>-1</sup>VS was achieved by combined SE at 180 °C for 5 min with SFG, which was 77.84% higher than the untreated. The CMY was further improved by 11.4-59% higher than the control (CM) using co-digestion. This study confirmed that, under optimal parameters of AD, pretreatment with SEG180 could significantly boost the CMY from co-digestion of CM and PRS.

**Keywords:** Rape straw, Steam explosion, Sulfuric acid, Combined pretreatments, Co-digestion, Methane production.