

# FULL-TEXT

## **Influence of laser irradiation on rumen fluid for biogas production from dairy manure**

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### **ABSTRACT**

The irradiation of rumen fluid (RF) with laser source was hypothesized to enhance the anaerobic process and accelerate the manure digestion, which increases the biogas and methane production. The photobiostimulating effects of laser irradiation on biogas and methane production were investigated by irradiating the RF for 0.5, 1 and 2 h with 532 nm laser source compared with 1 h incandescent light, non-irradiated RF and the control. The highest significant values of the biogas and methane production were found to be 583 ml Biogas g<sup>-1</sup> VS and 367.9 ml CH<sub>4</sub> g<sup>-1</sup> VS when RF was irradiated for 0.5 h with 532 nm laser source (p<0.05) compared with the other irradiation times with laser, incandescent light source, non-irradiated RF, and the control which yielded only 357 ml Biogas g<sup>-1</sup> VS and 196 ml CH<sub>4</sub> g<sup>-1</sup> VS, respectively. Moreover, the biogas and methane production rates were found to be inversely proportional with the irradiation time using laser source. The results showed that the lag phase was reduced from 4 days to 1 day. Additionally, the time to achieve the highest biogas production (peak) was reduced from day 28 to day 16 of the Hydraulic Retention Time (HRT) compared with the control.

**Keywords:** biogas, laser irradiation, photobiostimulation, biomass, anaerobic treatment, waste management.

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