A Mighty Mushroom and the Power of Poop: Testing Biogas Production Using Spent Mushroom Substrate V2

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Biogas is a renewable energy source generated by the anaerobic digestion (AD) of organic matter. Of all the gases produced by animal waste, 55-65% is methane, affecting global warming 21 times higher than carbon dioxide. Globally, around 570 million tons of methane are released and wasted annually; however, this energy source can be harnessed to produce renewable and sustainable energy. The experiment proposed by this research was designed to optimize anaerobic digestion by (i) varying the type of animal manure, ruminant (R) vs monogastric (M), to determine which produced the most biogas and whether (ii) the addition of an agricultural waste product, spent mushroom substrate (SMS), could increase biogas production. Eleven different combinations of manures were tested: cow dung (CD), sheep manure (SM), horse manure (HM), pig manure (PM), SMS, CD+SMS, SM+SMS, HM+SMS, PM+SMS, CD+SM+SMS, HM+PM+SMS. The water displacement method was used to determine the biogas yield from each slurry. Results showed that ruminants produced more biogas than monogastric animals when treated with SMS and that SMS consistently increased biogas yield when added to the slurry. The net biogas yields significantly increased by approximately 27.92% compared to the controls ($p < 0.05$). The co-digestion of SMS and animal manures is an innovative solution to the global climate crisis, water, ground and air pollution, surface water contamination, along with adding value to agricultural wastes. Using SMS to convert manure into valuable biofuel could improve its adoption as an energy source and help mitigate our climate crisis.

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Third Award of $1,000