

Abstract

Solid wastes of the straw mushroom crop factories were discharged to be a collection of animal breeding and disease and also have bad smell. Dust and smoke was formed from the burning of wood that used as fuel to make the mushroom. The solid waste from straw mushroom crop factories created environmental problems and affected to the quality of straw mushroom. Therefore the any problems should be studied to find solutions to control solid waste treatment, renewable energy to fuel production facility of the straw mushroom crop factories. The biomasses were produced in the form of the charcoal powder compressed to sticks and the green charcoal sticks from the solid waste of straw mushroom crop factories. The results of this study showed the amount of the energy sticks had directly affects to the heating value and the duration of the fire. The heating value per unit of the green charcoal, the charcoal powder briquette, and the normal wood charcoal were 0.324 ± 0.017 kW/kg, 0.438 ± 0.144 kW/kg, and 0.461 ± 0.212 kW/kg, respectively. The charcoal powder briquette and the normal wood charcoal had the duration of the fire were 83.33 ± 25.17 minutes and 90.00 ± 30.00 minutes, respectively while the green charcoal had the duration of the fire was 66.67 ± 12.58 minutes. This study concluded that the green charcoal and the charcoal powder briquette that made from the solid waste of the straw mushroom cultivation could be used instead of the normal wood charcoal. The results of this study also showed that the solid waste was treated in the anaerobic digestion reactor and renewable energy was produced in the form of the biogas. The anaerobic digestion reactor could be effective in removing COD are highest were 80.00%. The pH was 6.6 - 7.6 at outlet in the 3 days, 5 days, 7 days, and 9 days of hydraulic retention times. The ratio of COD: BOD was high as shown that the anaerobic biological process has the potential to eliminate the organic matter in the solid wastes. Most organic compounds containing carbon was the main component to be easily digested by microorganisms.

There was a significant organic removal efficiency of the high rate anaerobic digestion tested in terms of TS, DO, COD ($p < 0.05$). The maximum biogas production was $0.098 \text{ m}^3 / \text{day}$ in the hydraulic retention time as 5-7 days. While the biogas production, the green charcoal, the charcoal powder briquette production and the solid waste of straw mushroom crop was used as fertilizer were evaluated the value from various economic indicators. They were concluded that the green charcoal production should be most invested. The net present value (NPV) of the green charcoal production was 27,322.54 baht/year. Internal rate of return of investment (IRR) was 48.95 % that it was more than minimum lending rate (MLR) 6.87 % of the Krung Thai Bank Public Company Limited. The B/C ratio was 1.04 that it was more than 1. It showed that the green charcoal production provided a greater return on investment. The payback period of the green charcoal production was also the shortest of 1.73 years. The renewable energy production should be invested in the second order and the third order that were the charcoal powder briquette production and the biogas production, respectively. A summary of this research could to solve problems many aspects of the community. The anaerobic digestion technology reduced to solid wastes and air pollution such as dust, smoke and greenhouse gases from the biogas using as fuel to the mushroom crop factories. Therefore, the factories should reduce emissions from energy consumption such as reduce electricity utilization in factories and reduce the use of firewood for heating in production. Biomass and biogas technology had helped to improve the quality of our environment by eliminating agricultural wastes.