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## Two-Stage Dilute Acid Hydrolysis of Dairy Manure for Nutrient Release, Solids Reduction and Reducing Sugar Production

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### ABSTRACT

The microwave enhanced advanced oxidation process (MW/H<sub>2</sub>O<sub>2</sub>-AOP) aided with dilute sulfuric acid was applied in a two-stage treatment of dairy manure for nutrient release, solids reduction, and reducing sugar production. A much higher hydrogen peroxide dosage (1.2 g H<sub>2</sub>O<sub>2</sub>/g TS) was used in Stage 2 than that in Stage 1 (0.38 g H<sub>2</sub>O<sub>2</sub>/g TS). Most of the reducing sugar was produced in Stage 1, and only a small amount produced in Stage 2. The highest reducing sugar yield of 15.5% was obtained at 160°C, 0 mL H<sub>2</sub>O<sub>2</sub>/, and 20 min of heating time. With a high hydrogen peroxide dosage and a higher operating temperature of 160°C in Stage 2, the nutrient release conversion rate was much higher in Stage 2 than Stage 1. All of total phosphorus was converted to orthophosphate, and a very high ammonia concentration was obtained in the treated solution. The results indicated that the MW/H<sub>2</sub>O<sub>2</sub>-AOP operated under the reducing process (without hydrogen peroxide) provided the best yield of reducing sugar; however, when operated under an oxidative process (with hydrogen peroxide), it favoured nutrient release and solids disintegration. The concentration of total chemical oxidation demand (TCOD) in the treated solution decreased with an increase of temperature, hydrogen peroxide dosage and heating time. Soluble chemical oxidation demand (SCOD) concentration decreased with a very high hydrogen peroxide dosage. Volatile fatty acids (VFA) concentration decreased with an increase of hydrogen peroxide dosage. Ammonia and orthophosphate concentrations increased with an increase of temperature and hydrogen peroxide dosage.

### KEYWORDS

Microwave, Advanced Oxidation, Solids Destruction, Reducing Sugar Generation, Nutrient Solubilization

### Cite this paper

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