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## INTRODUCTION

The cheese industry generates an average of 9 L of cheese whey (CW) for every 1 kg of cheese (Guimaraes et al., 2010). Cheese whey contains mostly sugars (lactose), fat and proteins.

Anaerobic digestion, with the purpose of producing methane, is separate into four steps: hydrolysis, acetogenesis, acidogenesis, and methanogenesis. By suppressing methanogenesis and favoring acidogenesis, other types of products with high added value can be produced, such as volatile fatty acids (VFA).

The aim of this research was to evaluate the influence of temperature and pH to produce VFAs using CW as a substrate.

## MATERIAL AND METHODS

Figure 1. Reactors



The experiments were conducted in 1 liter reactors (Figure 1) with a mixture substrate/inoculum 1:1, (in VS proportions).

The assays were performed in batch under two different conditions of pH, acidic (pH 5.5) and basic (pH 10), and three different conditions of temperature: psychrophilic (10°C), mesophilic (38°C), and room temperature (20°C).

The reactors were below constant mixing and the pH was adjusting every day by using 1M NaOH and 1M HCl.

The temperature was maintained on the reactor glass jacket by circulation water. The reactors were connected to a thermostat water bath by heating immersion circulator.

The anaerobic digestion was carried out for 7 days.

## REFERENCES

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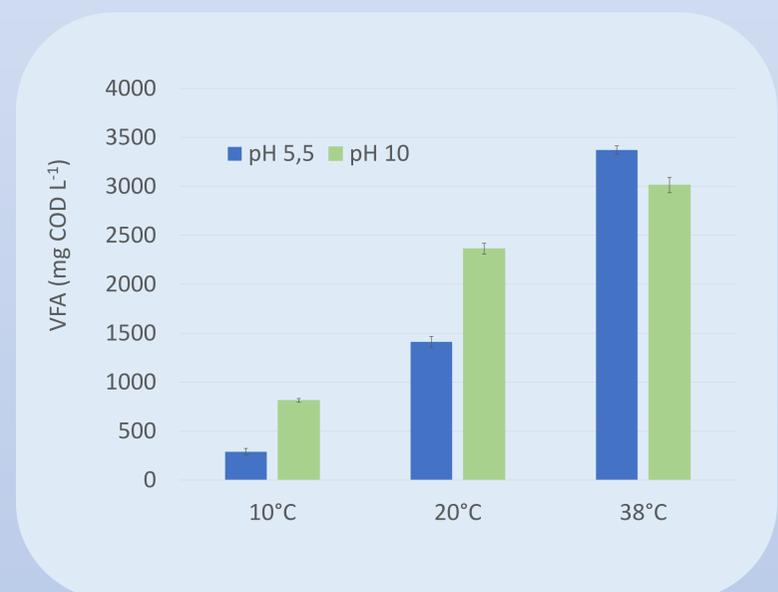
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## RESULTS AND DISCUSSION

The effects of pH and temperature are described in Figure 2. The highest production of VFA was 3372 mg COD L<sup>-1</sup> in acidic conditions (pH 5.5) at 38°C.

Under basic conditions, VFA production is increased, if compared to acidic conditions, when temperatures of 10°C and 20°C are used. At psychrophilic conditions (10°C) the highest production was obtained at pH 10, with 814 mg COD L<sup>-1</sup>. At 20°C, the highest VFA production was 2763 mg COD L<sup>-1</sup> at pH 10. Therefore, at lower temperatures acidogenesis occurs better when the pH is alkaline.

Figure 2. Production of VFA at different temperatures and pH



The VFA composition was affected by pH and temperature, since by altering fermentation conditions, different metabolic routes are promoted (Zheng et al., 2015). At 10°C, for both pH, the only VFA produced was acetic acid. At 20°C under alkaline conditions and mesophilic temperature the predominant fermentation product was acetic acid (Yuan et al., 2011), while in acidic conditions and mesophilic temperature the primary fermentation product was butyric acid, with 1248 mg COD L<sup>-1</sup>.

## CONCLUSIONS

- The highest production of VFA was obtained at a temperature of 38°C, with a concentration of 3372 mg COD L<sup>-1</sup>.
- At lower temperatures (i.e. 10 °C and 20°C) VFA production is higher when the pH is alkaline.
- The highest variety of VFA occurs under acidic conditions.
- Under psychrophilic conditions the only VFA produced is acetic acid.
- At pH 5.5 and mesophilic conditions the main VFA is butyric acid.