

APPLE POMACE AS A RESOURCE FOR VOLATILE FATTY ACIDS PRODUCTION: EFFECT OF pH UNDER SEMI-CONTINUOUS OPERATION

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INTRODUCTION

- ❖ More than 3.5 million tons of apple pomace (AP) (Fig. 1) are generated in the world during apple processing.
- ❖ New alternatives for AP valorisation could solve an environmental issue and be an economic chance to exploit zero-cost organic waste.
- ❖ The use of biological fermentation of AP for the production of volatile fatty acids (VFA), which are traditionally obtained via petrochemical routes, is evaluated under semi-continuous operation in this study.

Fig. 1. Apple pomace used in this study



MATERIALS AND METHODS

- ❖ Two reactors at pH values of 5.5 (R1) and 10.0 (R2) were compared in terms of VFA production and composition during 83 days (Fig. 2).
- ❖ The volume of the reactors was 1 L.
- ❖ The operation was carried out at a temperature of 37 °C, with an hydraulic retention time of 8 days and an organic loading rate of 3 g VS L⁻¹ d⁻¹.

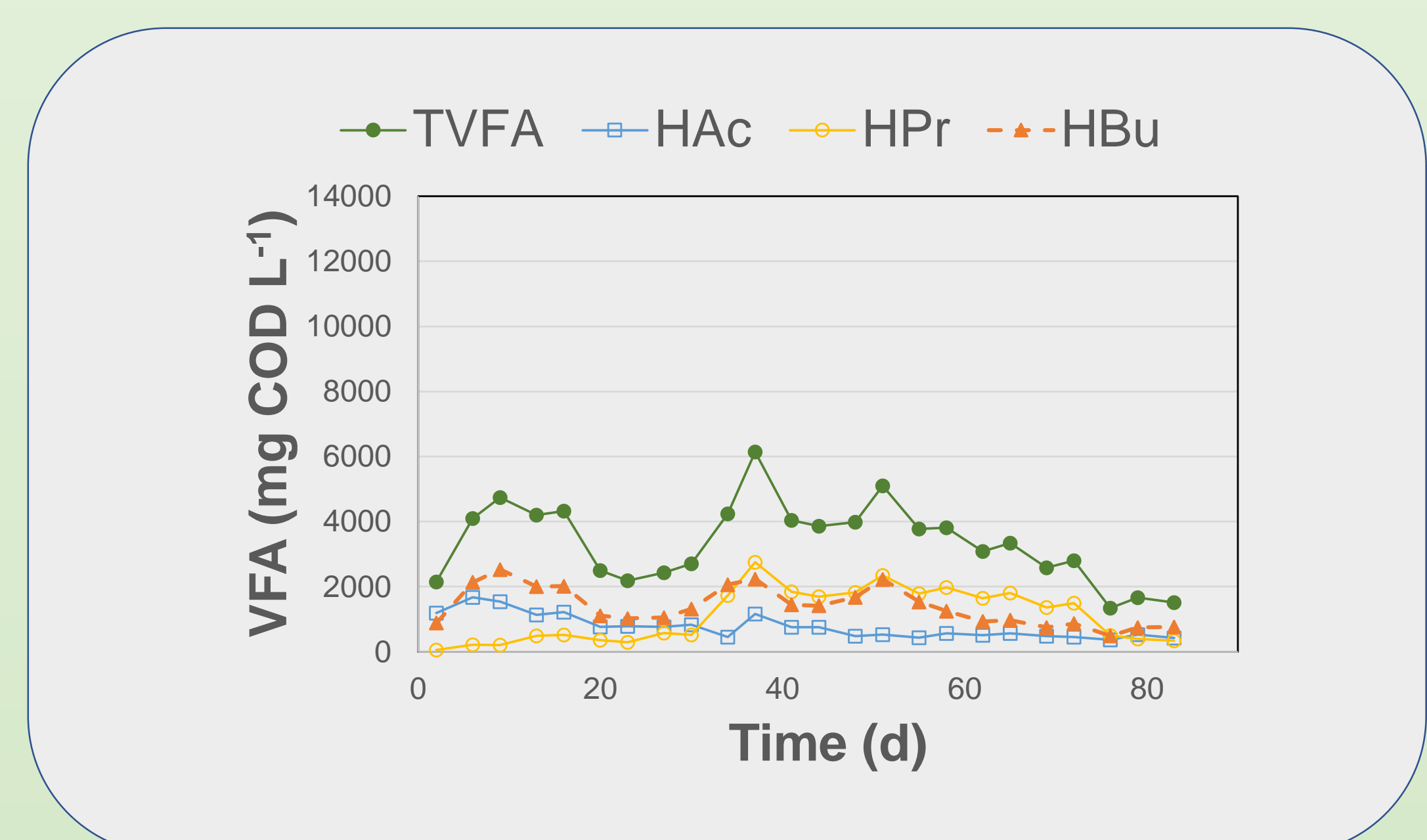
Fig. 2. Lab reactors



RESULTS

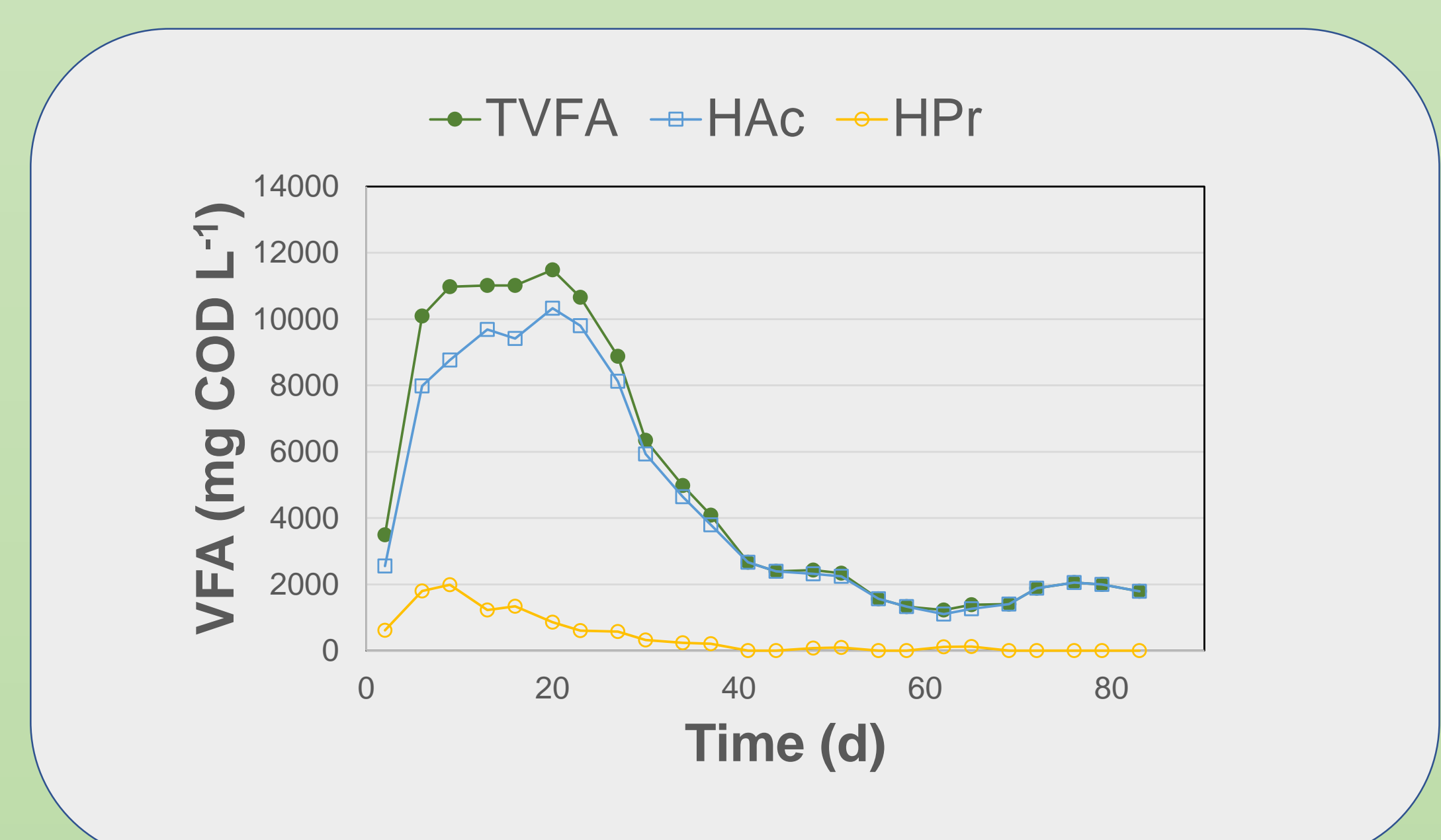
- ❖ At pH 5.5 (Fig. 3), the VFA concentration ranged between 1.3 and 6.1 g COD L⁻¹, with an average value of 3.4 g COD L⁻¹. The VFA profile was dominated by butyric (38%) and propionic (33%) acids. The VFA yield attained was 1.1 ± 0.4 g COD g VS_{fed}⁻¹.

Fig. 3. VFA production at pH 5.5



- ❖ At pH 10 (Fig. 4), two stages can be distinguished. During the first stage (until day 23), the VFA concentration reached 10.9 g COD L⁻¹, with acetic and propionic acids representing 86% and 14% of total individual VFA. In the second stage (after day 23), the concentration of VFA decreased to 1.6 g COD L⁻¹, being acetic acid 98% of total VFA. In this second stage, the VFA yield from day 41 was 0.62 ± 0.12 g COD g VS_{fed}⁻¹.

Fig. 4. VFA production at pH 10.0



CONCLUSIONS

Results showed a great potential of apple pomace for the VFA production under acidic conditions, presenting a more stable process and slightly higher VFA yields compared with alkaline conditions.

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