Impact of brewery wastewater inhibitors in pure and mixed cultures of the yeast *Rhodosporidium toruloides* NCYC 921 and the microalga *Tetradesmus obliquus* ACOI 204/07

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**ARTICLE INFO**

**Keywords:**

*Rhodosporidium toruloides*

*Tetradesmus obliquus*

Brewery wastewater

Organic acids

Inhibitors

Flow cytometry

**ABSTRACT**

Brewery wastewater (BWW) is an appealing low-cost substrate for the production of single cell oils by oleaginous microorganisms. However, it may contain inhibitor compounds that may affect the microbial metabolism. This work investigated, for the first time, the presence of potential inhibitor compounds in primary brewery wastewater (PBWW) and secondary brewery wastewater (SBWW) for the pure and mixed cultivation of the yeast *Rhodosporidium toruloides* NCYC 921 and the microalga *Tetradesmus obliquus* ACOI 204/07. Three organic acids (OrgAc) were identified in the brewery effluents (acetic, propionic and butyric acids). Yeast and microalga pure and mixed cultivations were performed in PBWW and SBWW in order to understand the behaviour of the microorganisms, individually and together. Flow cytometry (FC) was used to monitor each microbial population during the mixed cultivations, and to study the yeast and microalga cell viability throughout all cultivations. The yeast cells in pure cultures grown in both effluents were severely affected by the OrgAc presence confirmed by the cell stress results obtained by FC. However, in the mixed cultures, the yeast cells were able to develop, and the levels of stress conditions were considerably lower. Only in microalga pure and mixed cultures efficient OrgAc removal was observed.

1. Introduction

Brewery wastewater (BWW) has been proposed as an attractive low-cost substrate for the production of single cell oils by oleaginous microorganisms. However, it may contain inhibitor compounds that may affect the microbial metabolism. This work investigated, for the first time, the presence of potential inhibitor compounds in primary brewery wastewater (PBWW) and secondary brewery wastewater (SBWW) for the pure and mixed cultivation of the yeast *Rhodosporidium toruloides* NCYC 921 and the microalga *Tetradesmus obliquus* ACOI 204/07. Three organic acids (OrgAc) were identified in the brewery effluents (acetic, propionic and butyric acids). Yeast and microalga pure and mixed cultivations were performed in PBWW and SBWW in order to understand the behaviour of the microorganisms, individually and together. Flow cytometry (FC) was used to monitor each microbial population during the mixed cultivations, and to study the yeast and microalga cell viability throughout all cultivations. The yeast cells in pure cultures grown in both effluents were severely affected by the OrgAc presence confirmed by the cell stress results obtained by FC. However, in the mixed cultures, the yeast cells were able to develop, and the levels of stress conditions were considerably lower. Only in microalga pure and mixed cultures efficient OrgAc removal was observed.