

Aqueous two-phase systems for the primary purification of olive pomace extracts obtained by autohydrolysis

Leandro Cabrera, Lucía Xavier, Berta Zecchi

Universidad de la República, Montevideo, Uruguay
lcabrera@fing.edu.uy

Summary

- ✓ Ethanol/salt ATPS were evaluated for the selective purification of phenolic compounds from olive pomace extracts obtained by autohydrolysis.
- ✓ All ATPS tested promoted separation of phenolics from sugars, with phenolics preferentially migrating to the ethanolic phase.
- ✓ Overall, ethanol/ammonium sulfate ATPS proved the most effective system for primary phenolic purification, offering an advantageous solvent composition for further processing.

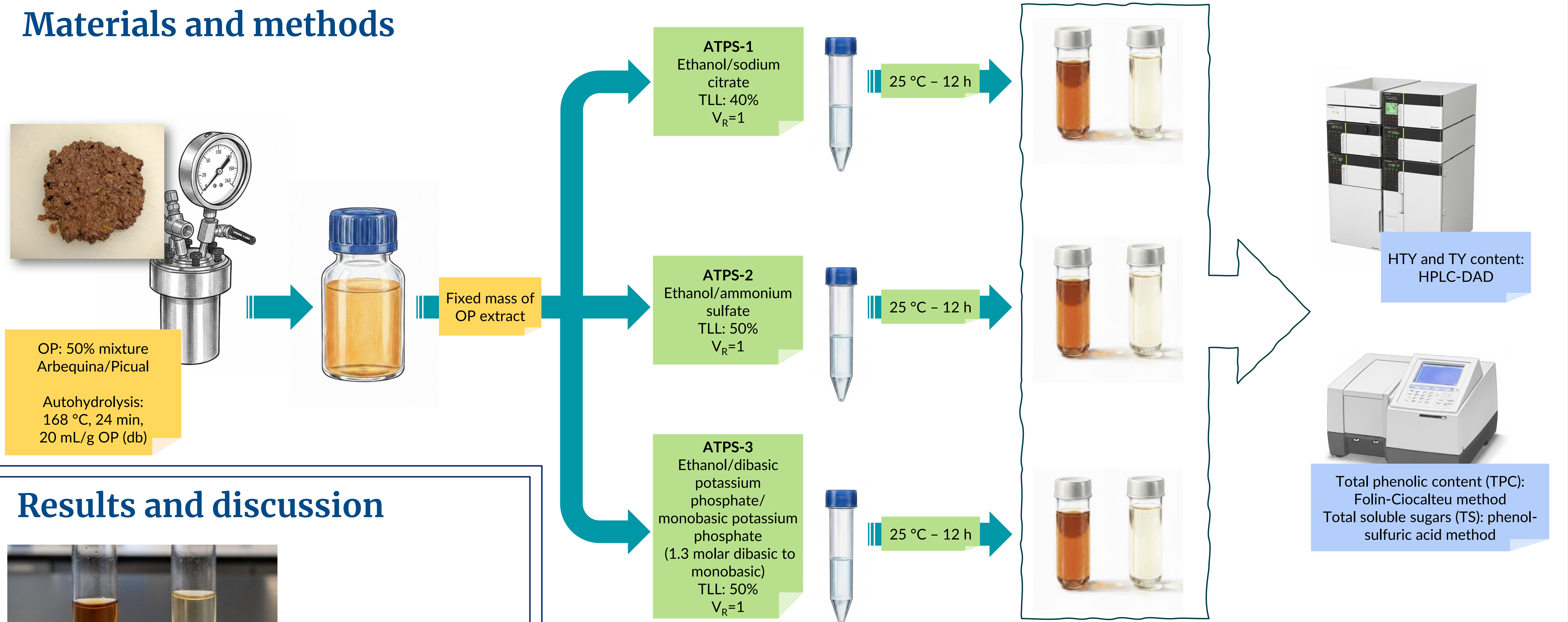
Introduction

Olive pomace (OP), the main by-product of two-phase olive oil extraction, retains up to 99% of the fruit's phenolic compounds, including hydroxytyrosol (HTY) and tyrosol (TY), making it a promising source of natural antioxidants for food and pharmaceutical use.

While autohydrolysis is an effective green method for extracting these compounds, it also co-extracts other substances like sugars, highlighting the need for selective purification. In this context, aqueous two-phase systems (ATPS), particularly those based on ethanol and salt, offer a sustainable, low-cost, and scalable alternative for this purpose.

Objective: This study investigates ethanol/salt-based ATPS for the primary selective purification of phenolic compounds, particularly HTY and TY, from OP extracts obtained via autohydrolysis.

Materials and methods



Results and discussion

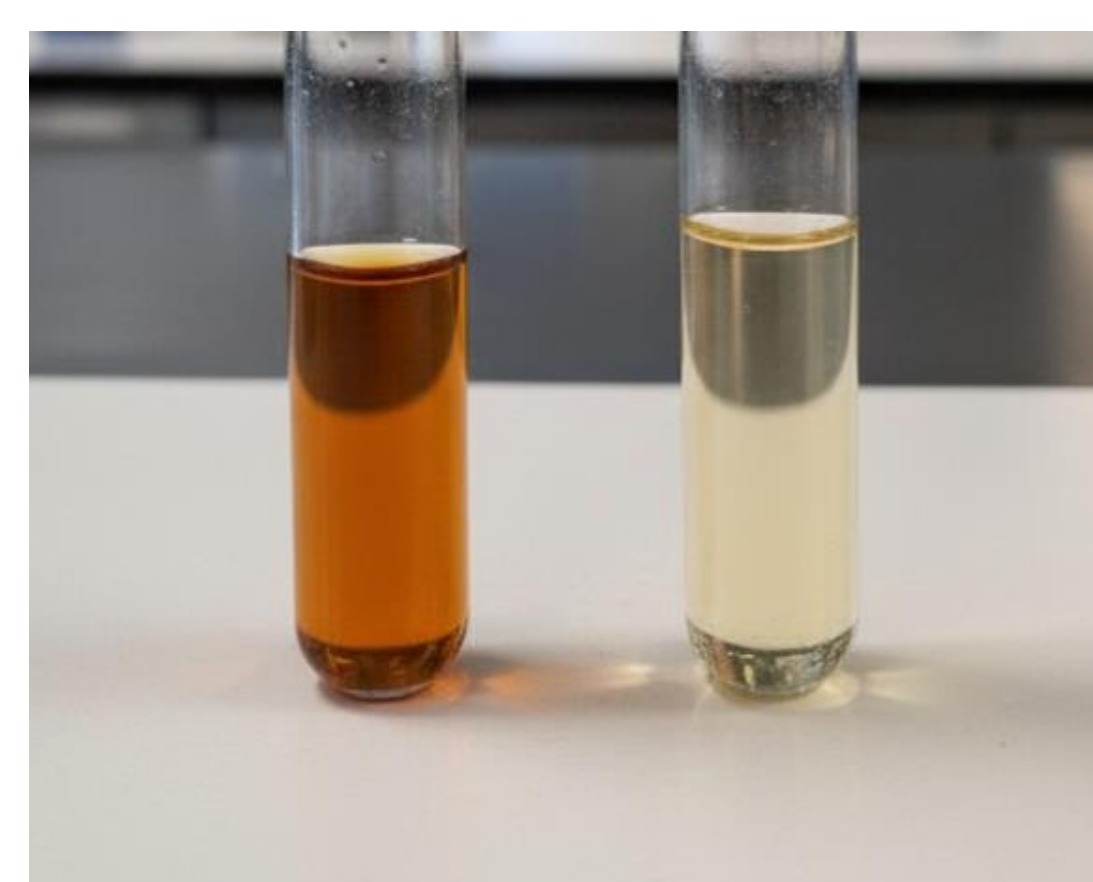


Figure 1: Top phase (left) and bottom phase (right) for the case of ATPS-1

Figure 1 shows the top phase (left) and bottom phase (right) for the case of ATPS-1. Figures 2 and 3 show the recovery results in the top phase, defined as the mass of the target compound (TPC, TS, HTY, or TY) relative to the initial mass of the corresponding compound in the extract, for the three tested ATPS. On the one hand, a differential separation between the compounds of interest (TPC and HTY) and TS is observed in all three ATPS, with a clear preference of the compounds of interest to migrate to the top (ethanolic) phase. In the case of TY, a differential separation with respect to TS was achieved only in the case of ATPS-2. On the other hand, ATPS-2 showed the highest recovery of TPC, HTY, and TY (approximately 90% in all three cases), with similar TS recoveries (approximately 50%) compared to the other two ATPS. The recovery of the compounds of interest in the top phase—which in the case of ATPS-2 contains around 27% (w/w) ethanol—could facilitate subsequent concentration and/or purification steps, given that ethanol is easier to remove than water (the sole solvent in the original extracts).

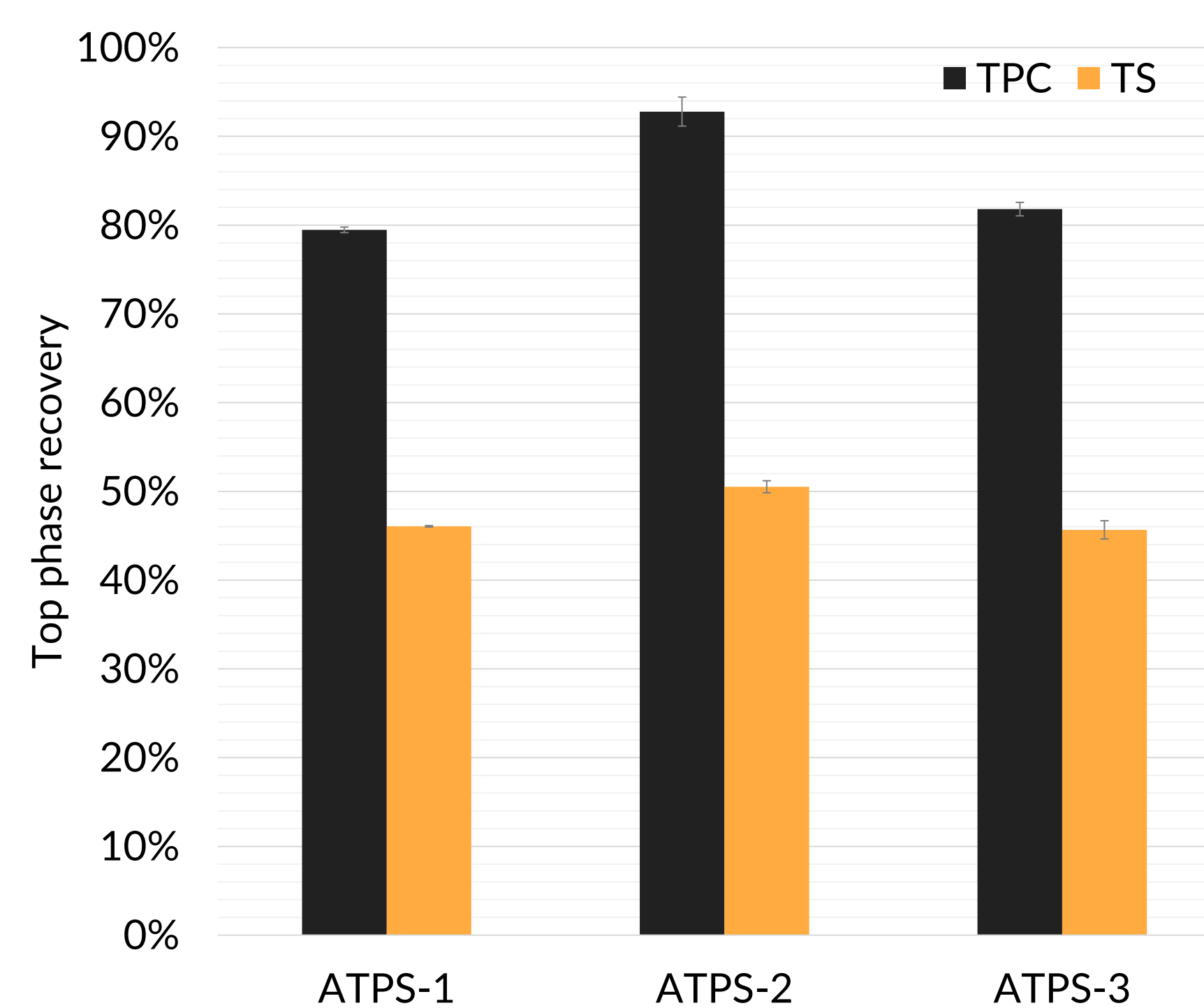


Figure 2: Top phase recovery of total phenols (TPC) and total soluble sugars (TS). Error bars correspond to standard deviation of 3 replicates.

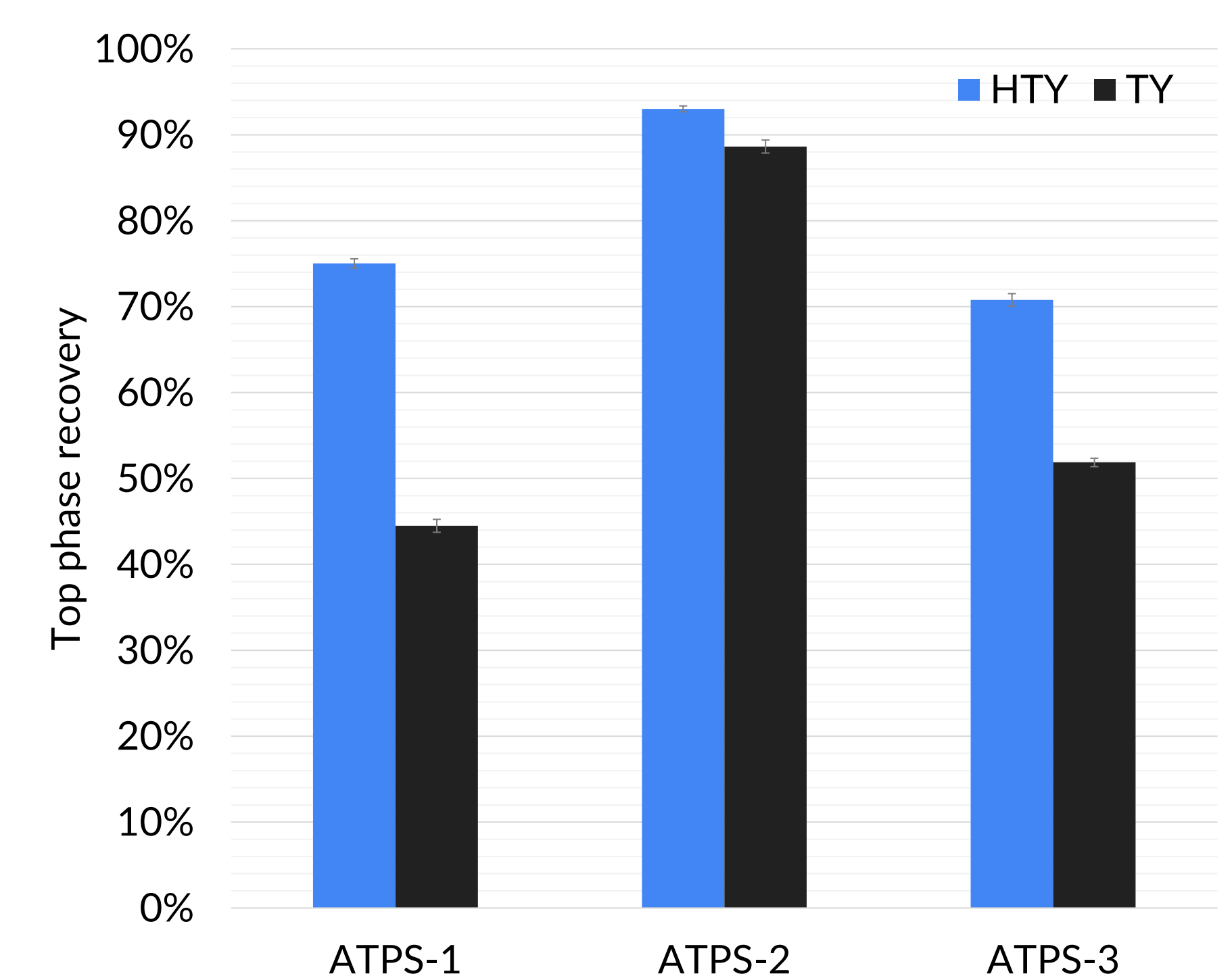


Figure 3: Top phase recovery of hydroxytyrosol (HTY) and tyrosol (TY). Error bars correspond to standard deviation of 3 replicates.

Conclusions

The results demonstrate that all three ATPS evaluated are effective for achieving a primary separation between phenolic compounds and total sugars. Among them, ethanol/ammonium sulfate ATPS stands out due to its superior recovery of the target compounds (TPC, HTY, and TY), while maintaining comparable TS recoveries. Future work should be carried out to thoroughly evaluate different separation conditions using the ethanol/ammonium sulfate ATPS.

Acknowledgments

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