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Production and transfer kinetics of three aroma compounds into the coffee beans during simulated wet processing and their fate after the transfer

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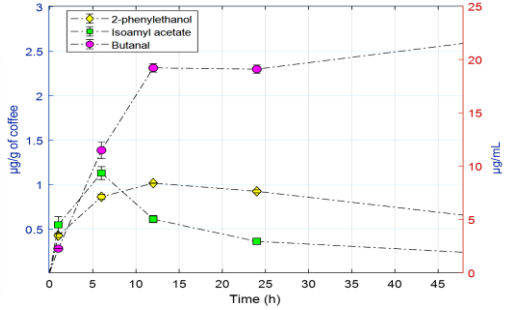
DID YOU KNOW?

The flavor is arguably the most important aspect of coffee. Recent studies have highlighted that the postharvest processing can have a direct impact on the quality and value of the final product. Pereira et al., (2019) assumed that it might exist a diffusion process of microbial metabolites into the coffee beans during the fermentation step, enhancing the final coffee quality, this transfer was proven by Hadj Salem et al,(2020). However, are these volatiles of interest could be produced by yeasts and able to cross the different layers (mucilage and parchment) surrounding the coffee beans?

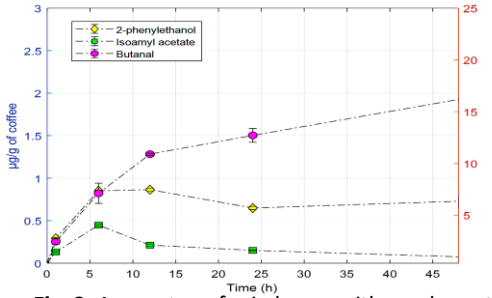
M&M: Progressive experimental approach

3 molecules were chosen to follow their production and transfer into coffee beans during simulated fermentation:

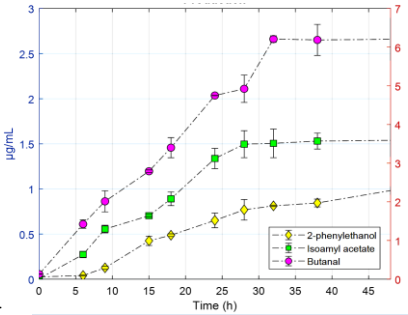
- Transfer: 10g of coffee samples submerged in water concentrated in a mix of marked compounds (with deuterium) using coffee beans with and without parchment.
- Production: 10mL of coffee pulp model media inoculated with LSCC1 (selected coffee yeasts)
- T= 25°C , Agitation= 120rpm, 12h of transfer
- Volatiles were analyzed by SPME-GC-MS



Fig, 1: Aroma transfer in beans without parchment
(axis: left : butanal and isoamyl; right : 2-phenylethanol)



Fig, 2: Aroma transfer in beans with parchment
(axis: left : butanal and isoamyl; right : 2-phenylethanol)



Fig, 3: Aroma production by yeast LSCC1
(axis: left : butanal and isoamyl; right : 2-phenylethanol)

Results/Discussion

The three volatiles were transferred to the coffee beans at different rates.

The transfer of 2-phenylethanol was continuous with an exponential phase at the beginning of the fermentation and a significant resistance of the parchment to its transfer. Isoamyl acetate and butanal are transferred at a lower rate than the higher alcohol and undergo a degradation in the coffee bean which can be linked to the metabolism of the germination, the parchment does not affect the transfer of these two molecules. These compounds were produced by the LSCC1 strain during 30 hours of fermentation with different rates and 2-phenylthanole was the most produced reaching 6 µg/mL of coffee pulp model media.

Conclusion and perspectives: LSCC1 was **able to produce** important aroma compounds during coffee fermentation, those volatile **could be transferred** to the coffee beans by a **diffusion process** crossing the **parchment**, which with its fibrous structure acts as a **molecular filter.** After transfer, some volatiles could undergo **degradation reaction** related to the germination metabolism. the aromatic profile of coffee can be modulated through fermentation based on the yeast strain used and predicted by models simulating this transfer kinetics.

References:
Pereira, G. V. de M., Neto, D. P. de C., Magalhães Júnior, A. I., Vásquez, Z. S., Vandenberghe, L. P. S., & Soccol, C. R. (2019). Exploring the impacts of postharvest processing on the aroma formation of coffee beans – A review. *Food Chemistry*, *272*, 441-452.
Hadj Salem, F., Lebrun, M., Mestres, C., Sieczkowski, N., Boulanger, R., & Collignan, A. (2020). Transfer kinetics of labeled aroma compounds from liquid media into coffee beans during simulated wet processing conditions. Food Chemistry, 322,