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Polyphenols in kombucha: Metabolomic analysis of biotransformations during fermentation

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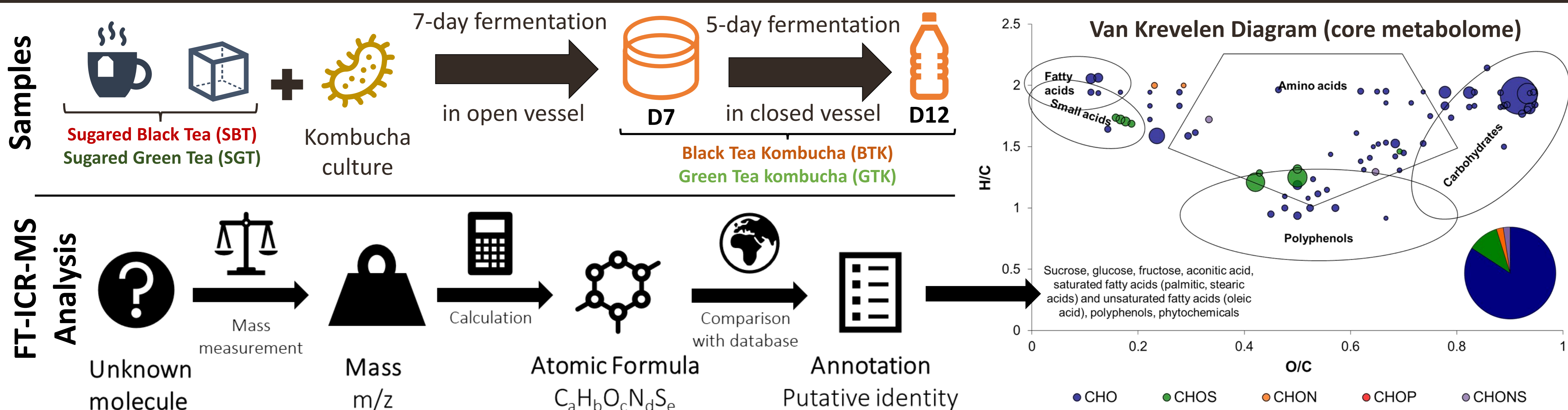
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Kombucha is a non-alcoholic beverage made of sugared tea that is transformed by a **symbiotic consortium of yeasts and bacteria**. This beverage is increasingly produced at industrial scale, but its quality standards remain to be defined. **Metabolomics analysis was carried out using FT-ICR-MS (Fourier Transform-Ion Cyclotron Resonance–Mass Spectrometry)** to understand the chemical transformations induced by the **production phases** and the **type of tea** on the **non-volatile compounds** of kombucha.

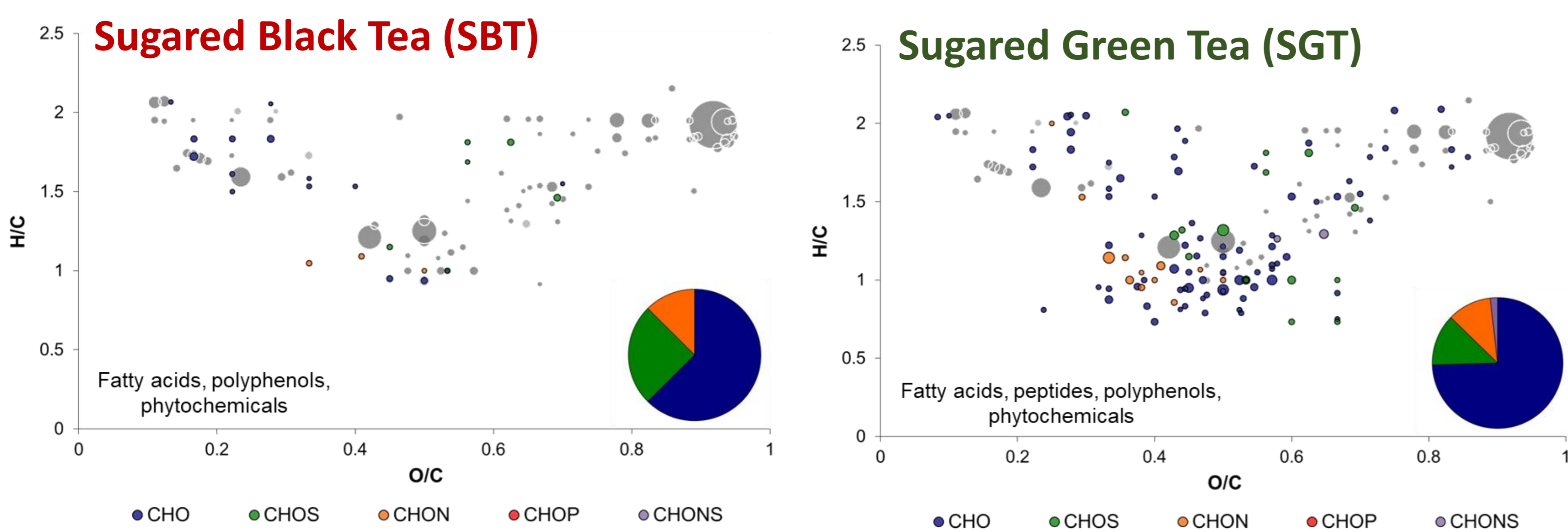
Material and methods



Results

Impact of tea type on kombucha metabolome

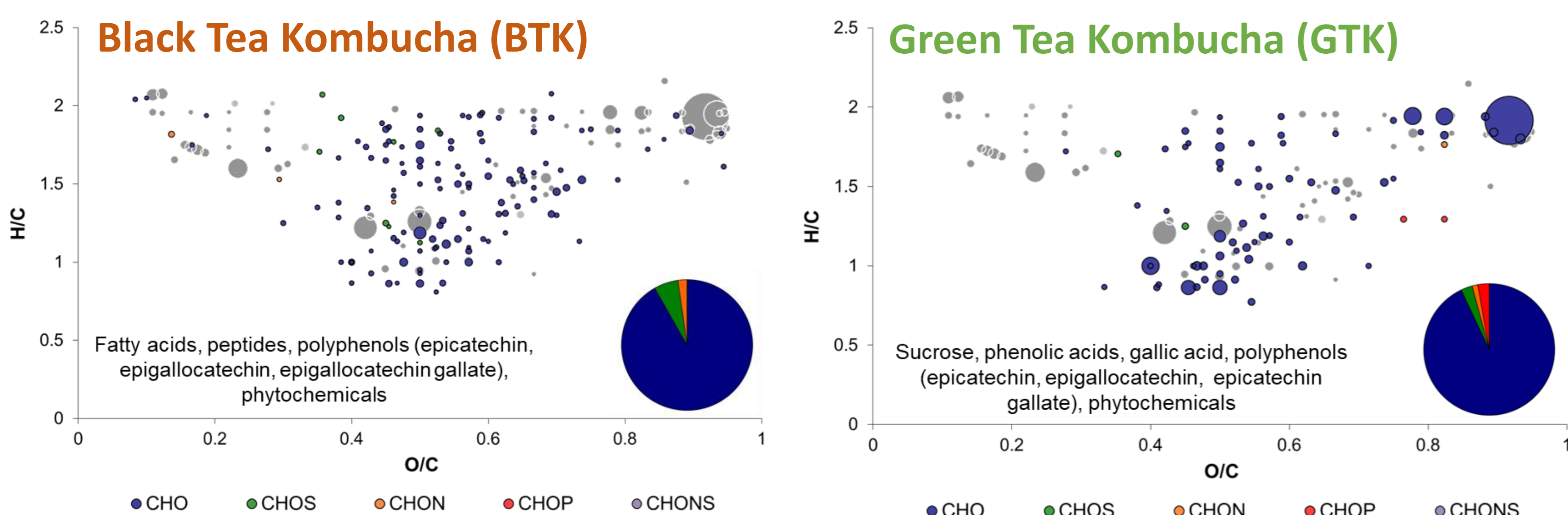
- Lower molecular diversity in **Sugared Black Tea (SBT)** than Sugared Green Tea (SGT).
- After fermentation, higher molecular diversity of **Black Tea Kombucha (BTK)** than **Green Tea Kombucha (GTK)**. Black tea polyphenols underwent a stronger biotransformation.



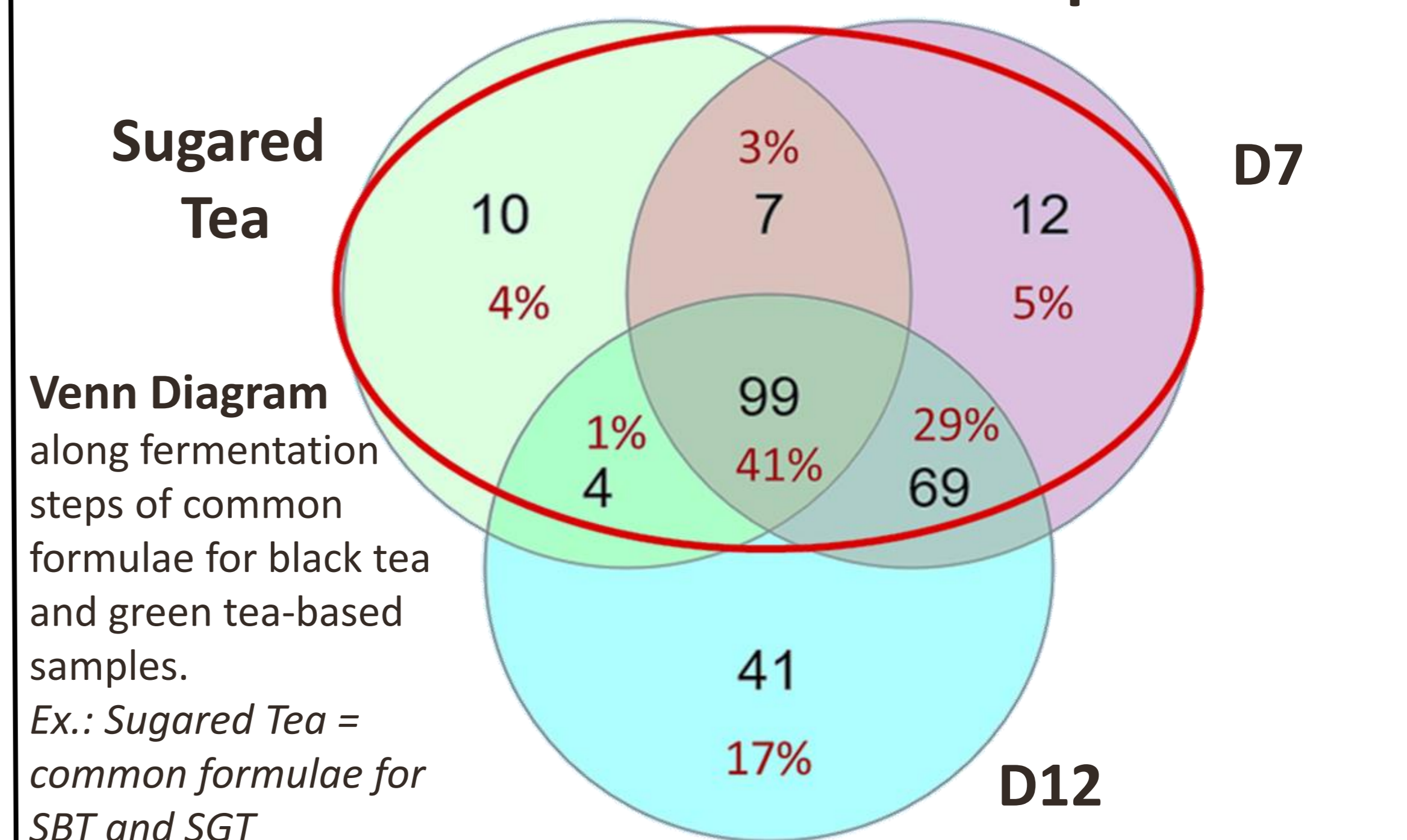
25 formulae for SBT < 137 formulae for SGT with significantly higher intensity by comparison

122 formulae for BTK > 79 formulae for GTK with significantly higher intensity by comparison

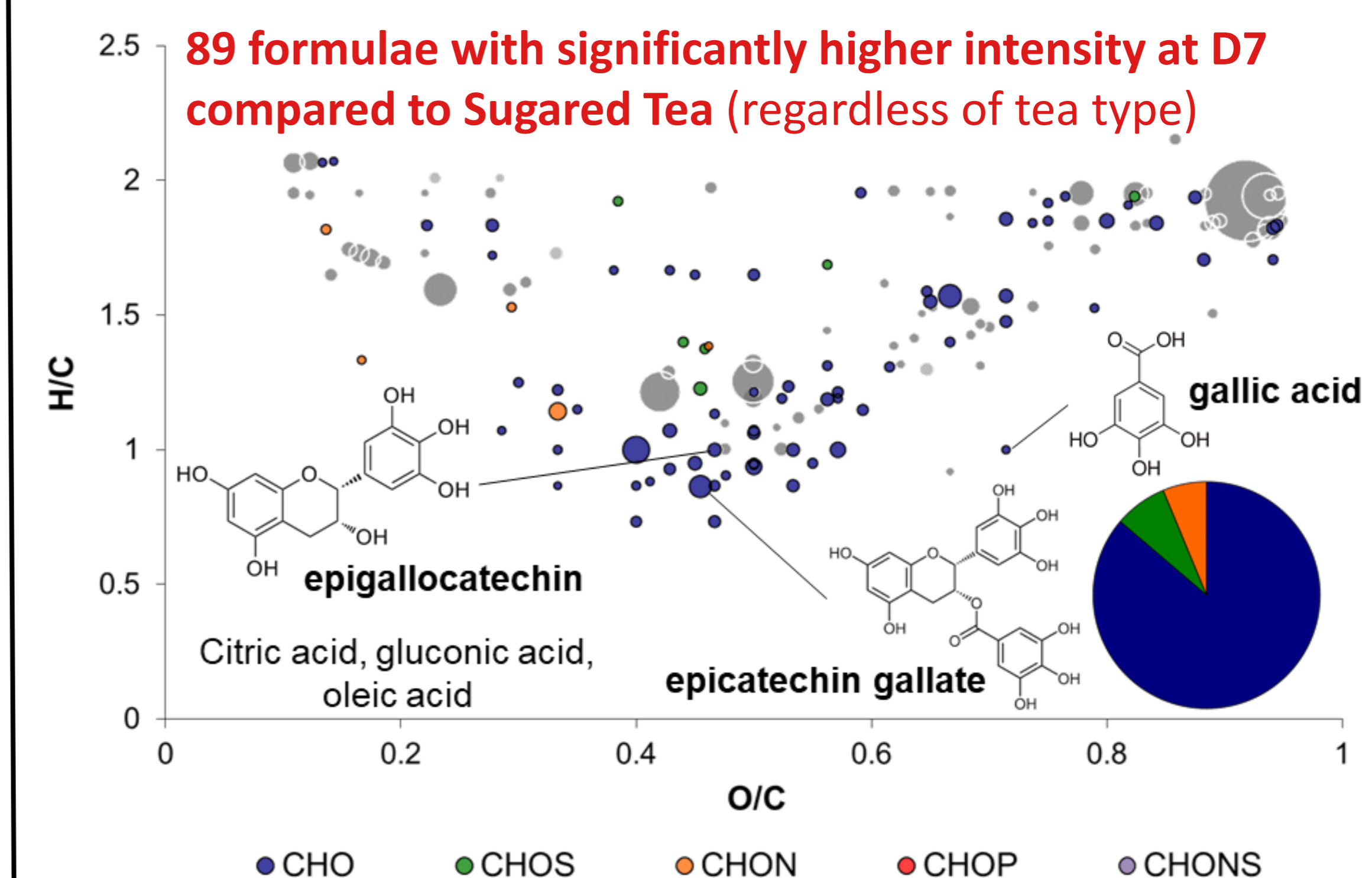
BTK/GTK = common formulae for D7 and D12



Evolution of metabolome after each fermentation phase



- Most biotransformations induced by kombucha fermentation occurred during the first phase and involve polyphenols (regardless from tea type).



- Increase in gallic acid, non-gallated and monogallated flavan-3-ols points towards **degallation reactions** of polygallated species.

Conclusions

- **Black tea polyphenols were more impacted** by microbial activity compared to green tea polyphenols.
- Of the two production phases, the **first phase of acidification in open vessel was the most impactful on molecular diversity**.
- The first phase was characterized by the **release of gallic acid** independently from the tea type. It probably originated from the **hydrolysis of ester bounds** located in polymeric flavan-3-ols. The biotransformation of antioxidant polyphenols could positively impact their **bioavailability** for the consumer.