

Phenolic compounds of native Australian fruits, their bioactivities, bioaccessibility, safety evaluation, and impact on the gut microbiome

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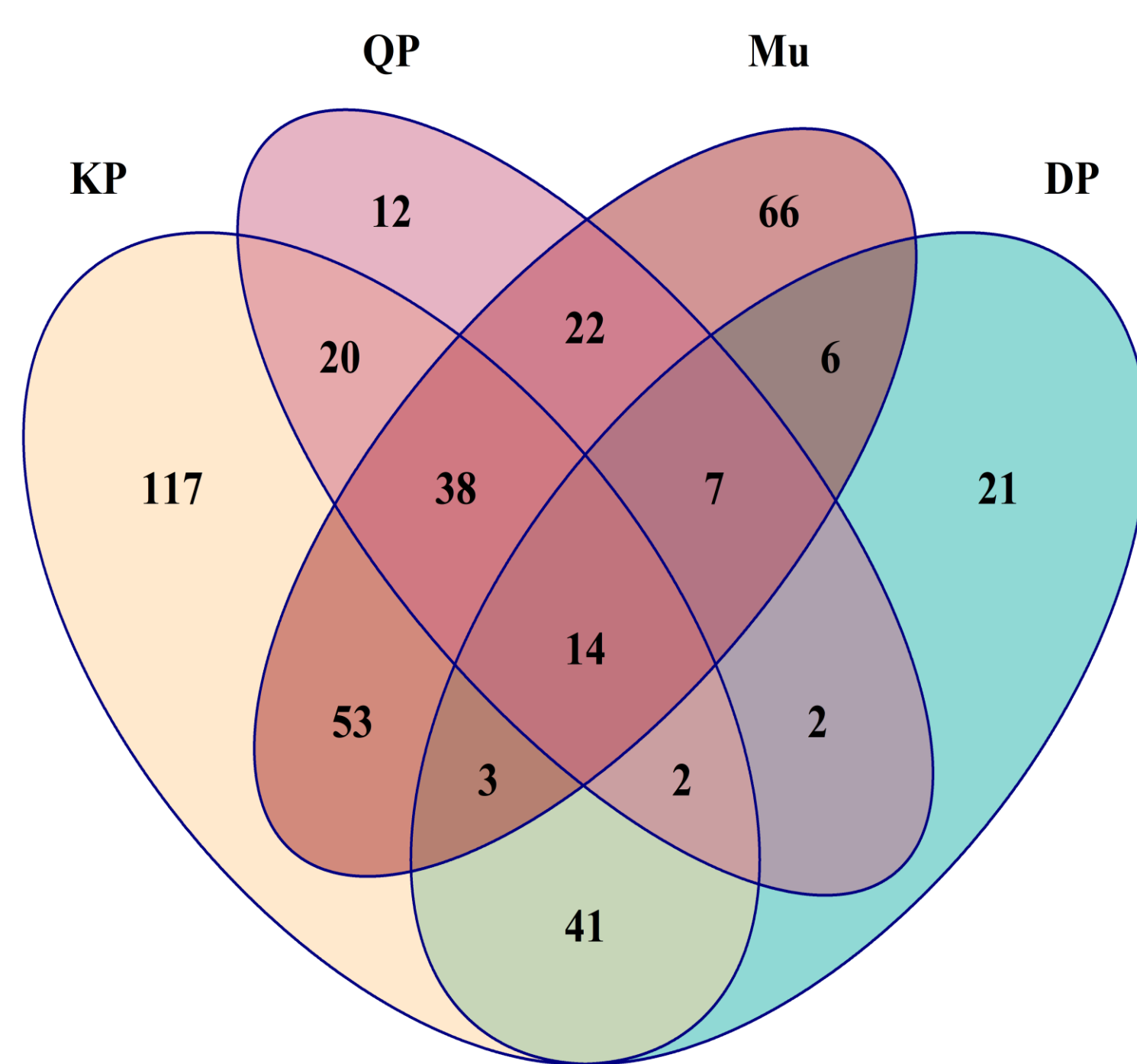
Introduction

Phenolic compounds are vital bioactive constituents that benefit human health. Native Australian flora offers a substantial potential source of new bioactive phenolic compounds for medicinal, nutraceutical, and potential phytopharmaceutical applications. Native Australian fruits are enriched with beneficial phytochemicals, especially phenolic compounds, which are not fully elucidated for their biological potential and impact on the gut microbiome. Therefore, this study investigated Kakadu plums (KP), Davidson plums (DP), Quandong peaches (QP), and Muntries (Mu) for comprehensive metabolomic profile, bioaccessibility, bioavailability, safety evaluation, and the impact of the gut microbiome.

Results

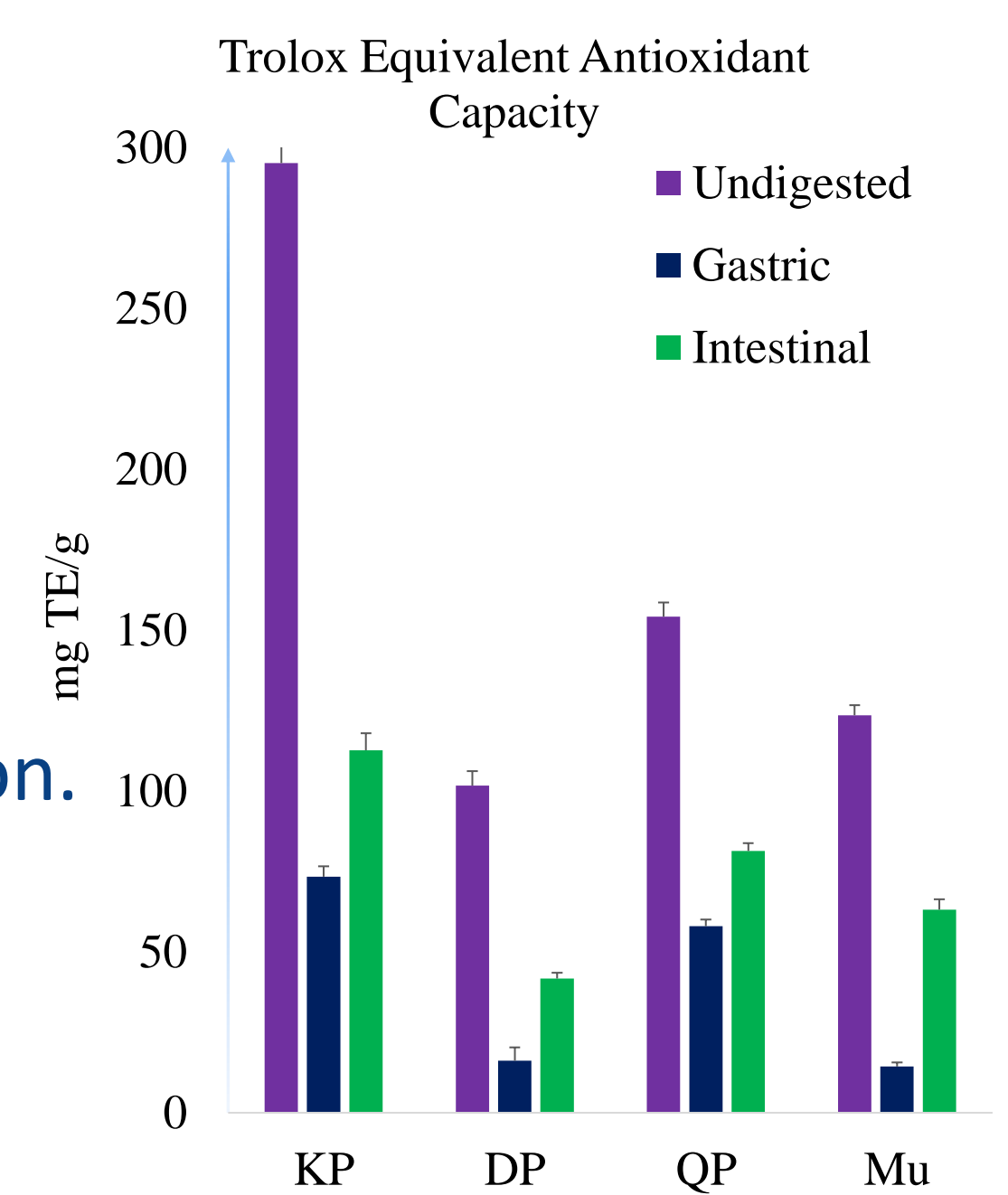
Metabolomic Profile

We tentatively identified a total of 427 phytochemicals. Kakadu plums and Muntries have the highest number of unique phytochemicals. It is important to mention that biological activities depend on specific compounds and their concentrations in a mixture.



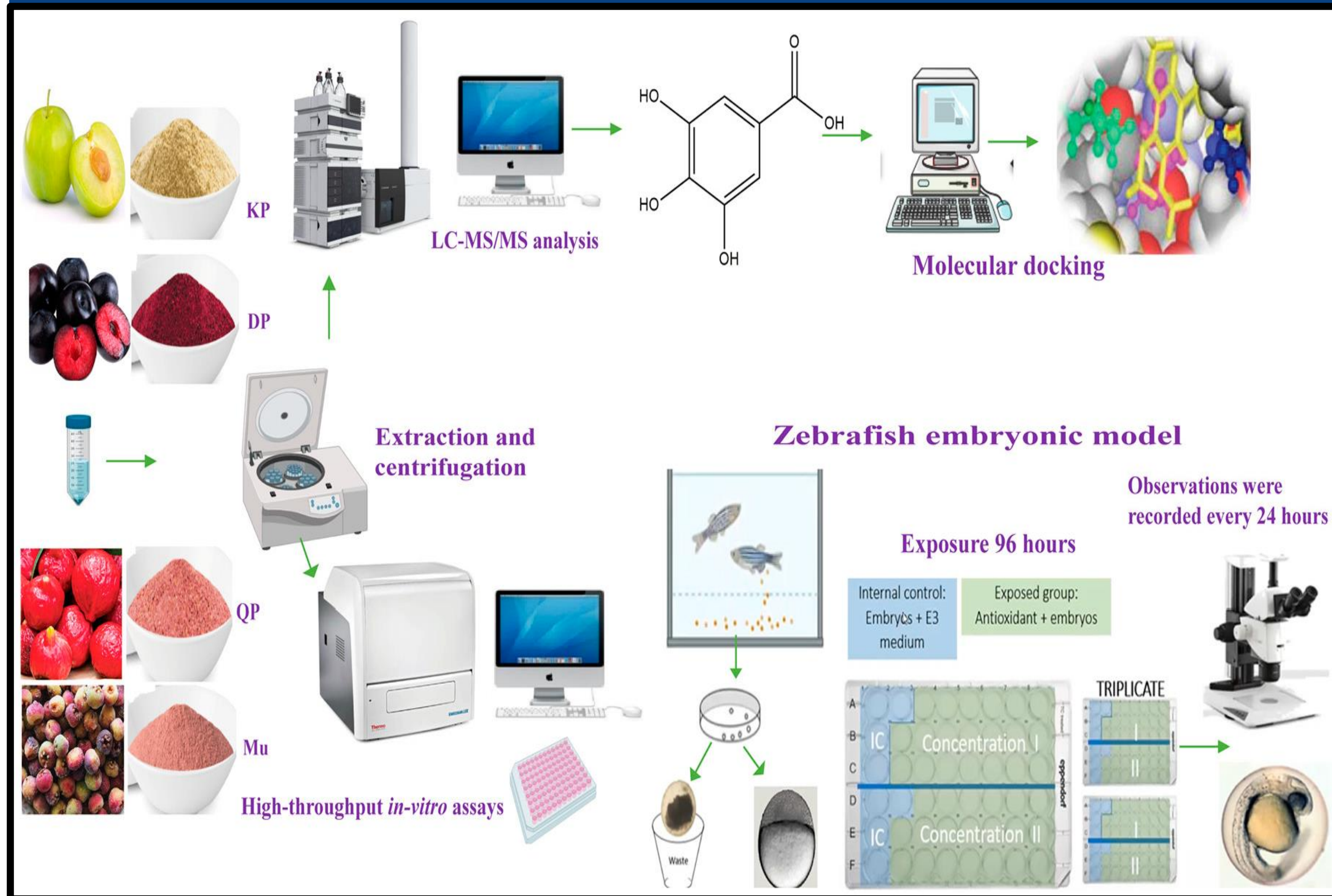
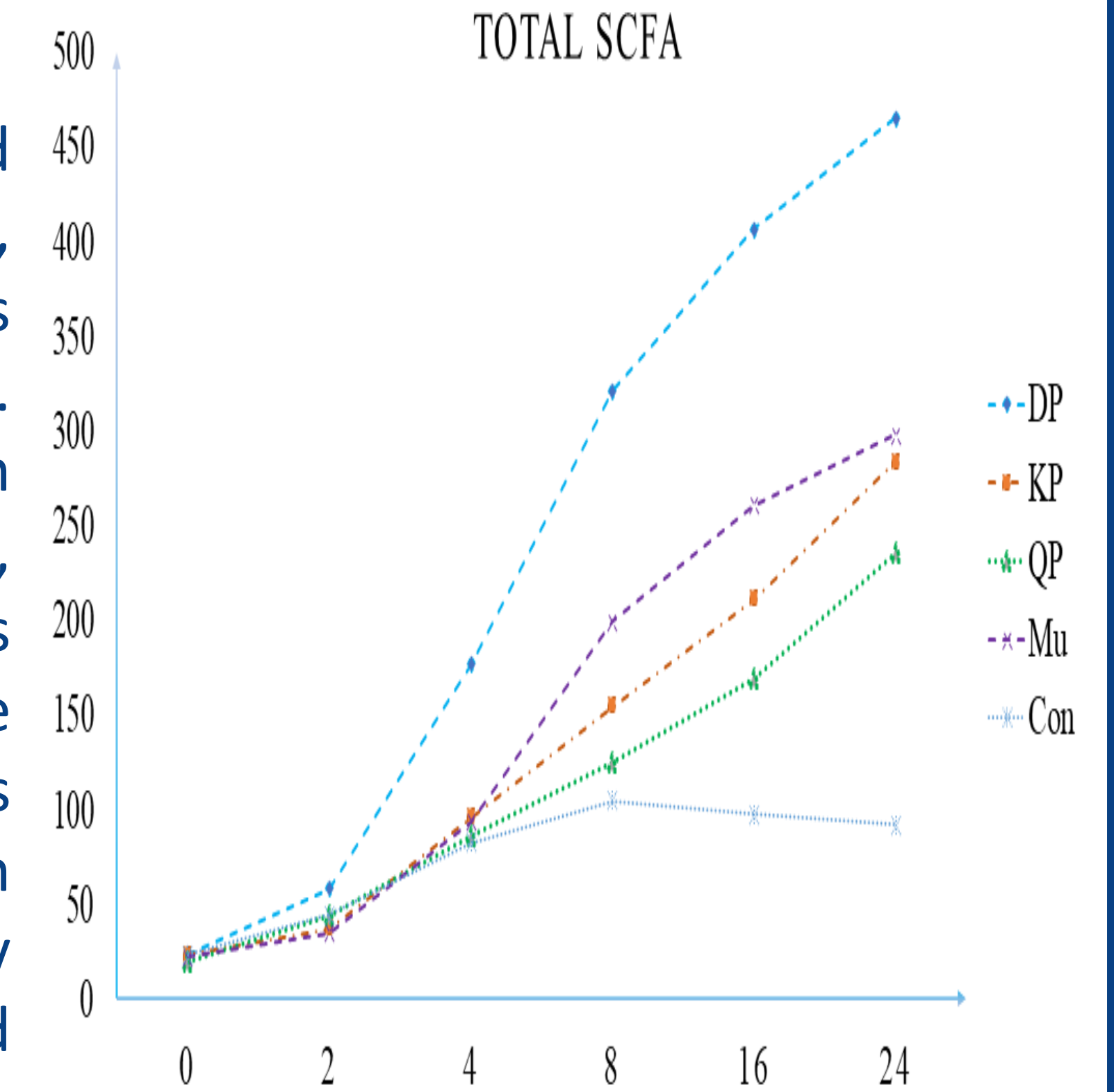
Bioaccessibility and bioactivities

Kakadu plums have the highest Antioxidant Potential due to higher concentration of total phenolic content and vitamin C. We observed Using LC-ESI-QTOF-MS/MS that condensed tannins and anthocyanins with sugar moieties Have bioaccessibility in gastrointestinal digestion. Vitamin C has the highest bioaccessibility and predicted bioavailability from Kakadu plums.



Short-chain fatty acids

We observed an increasing trend after 24 hours of fermentation, indicating that gut microbiota has enough food to produce SCFAs. Native fruits are enriched with condensed tannins, anthocyanins, and dietary fiber, which act as prebiotics. Davidson Plum has the highest production of SCFAs. It is also observed that the production of SCFAs was higher than many other fruits, like blue and blackberries.



Conclusion:

The selected native Australian fruits significantly impact the microbial composition and production of short-chain fatty acids. Native Australian fruits are superior to others due to their higher flavonoid concentration (condensed tannins and anthocyanins), vitamin C, and dietary fiber. Moreover, native Australian fruit extracts are included in the safe category using an embryonic zebrafish model that could lead to drug discovery. These native fruits are highly beneficial for the modulation of the gut microbiome. In-silico molecular docking and simulated pharmacokinetics properties provide a better understanding of their biological function. The effective utilization of native Australian fruits could help to detoxify free radicals in antioxidants-deficient individuals and fulfill the antioxidants and nutritional sufficiency in the population. These fruits could be used as functional foods. The metagenomic analysis could help to understand the unique role of these native fruits in the modulation of the gut microbiome not only in normal conditions but also in dysbiosis.

References:

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