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Effect of *in vitro* gastrointestinal and colonic digestion on the bioactive properties of yogurt enriched with microencapsuled red grape pomace extracts

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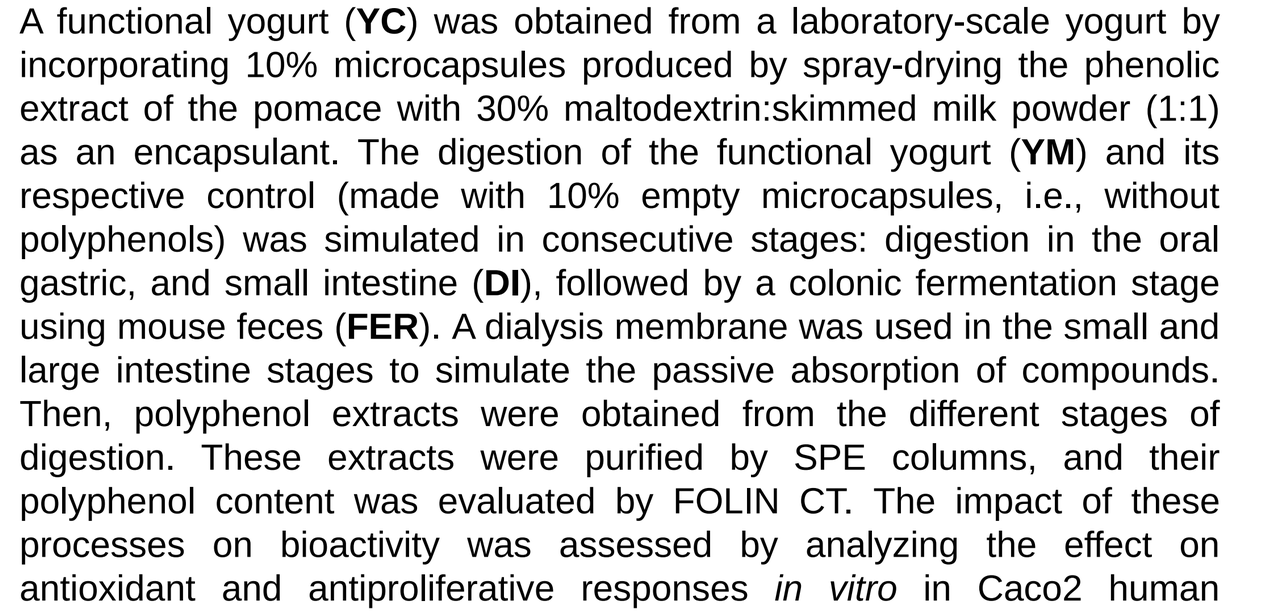
INTRODUCTION & AIM

Red grape pomace, a by-product generated during red wine manufactureingand rich in phenolic compounds, particularly anthocyanins, can be used to obtain natural food additives with antioxidant properties, thus improving their functional characteristics. As polyphenols, and anthocyanins specifically, tend to oxidize, which results in a loss of bioactivity, the microencapsulation of these compounds is proposed to prolong their stability during processing and storage. From a mixture of red grape pomace obtained as residues from *Vitis vinifera L*. wine production, microencapsules rich in pomace polyphenols were developed by means of spray drying. These microcapsules were then added to yogurt, a dairy matrix for mass consumption, with low cost and variable storage periods. The resulting yogurts (YM) were subjected to in vitro gastrointestinal and colonic digestion.

AIM: *To evaluate the impact on the bioactivity of microcapsules containing pomace polyphenols in yogurt by analyzing the in vitro effect on the antioxidant and antiproliferative response in human intestinal cells.*

METHOD

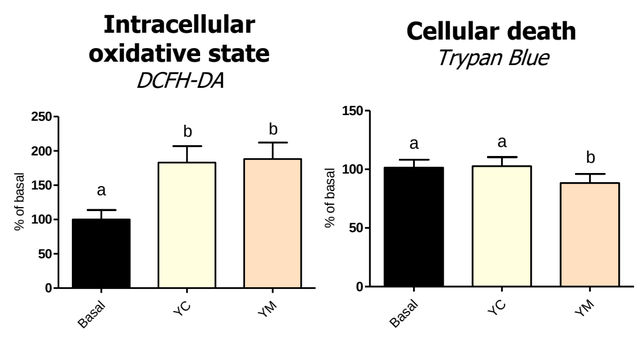
A functional yogurt (**YC**) was obtained from a laboratory-scale yogurt by incorporating 10% microcapsules produced by spray-drying the phenolic extract of the pomace with 30% maltodextrin:skimmed milk powder (1:1) as an encapsulant. The digestion of the functional yogurt (**YM**) and its respective control (made with 10% empty microcapsules, i.e., without polyphenols) was simulated in consecutive stages: digestion in the oral gastric, and small intestine (**DI**), followed by a colonic fermentation stage using mouse feces (**FER**). A dialysis membrane was used in the small and large intestine stages to simulate the passive absorption of compounds. Then, polyphenol extracts were obtained from the different stages of digestion. These extracts were purified by SPE columns, and their polyphenol content was evaluated by FOLIN CT. The impact of these processes on bioactivity was assessed by analyzing the effect on antioxidant and antiproliferative responses *in vitro* in Caco2 human intestinal cells exposed to an H_2O_2 injury and analyzed by flow cytometry. Stats: Generalized Linear Mixed-Effects Models (n=3). DCG post-test ($p<0.05$). Different letters means statistically significant differences.



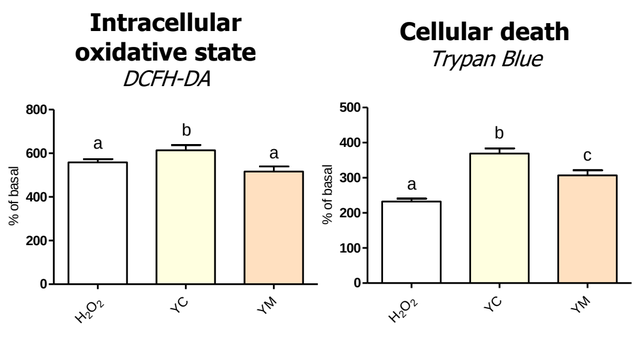
RESULTS

Functional Yogurt enriched with red grape microcapsules (YM)

Basal model

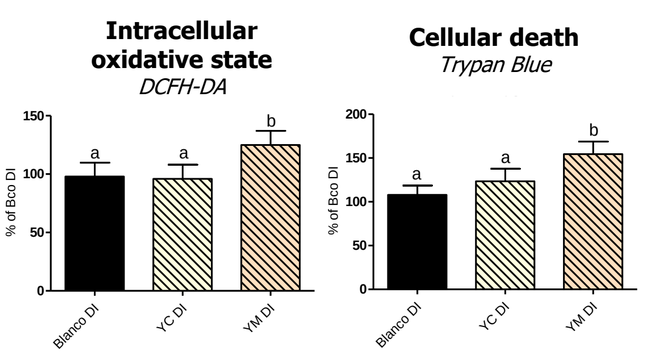


Oxidative stress model

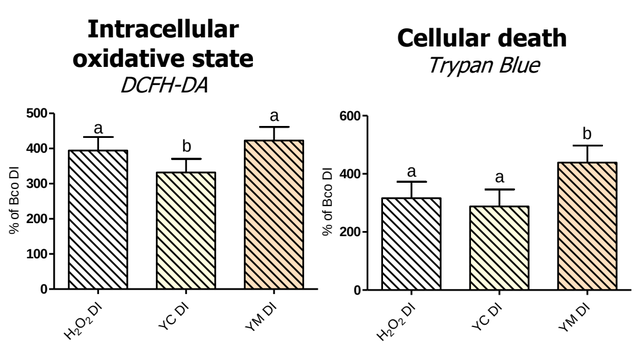


Small-intestine digestive fraction of Functional Yogurt (DI)

Basal model

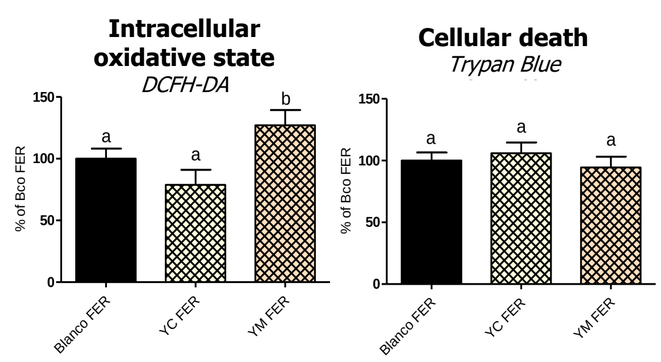


Oxidative stress model

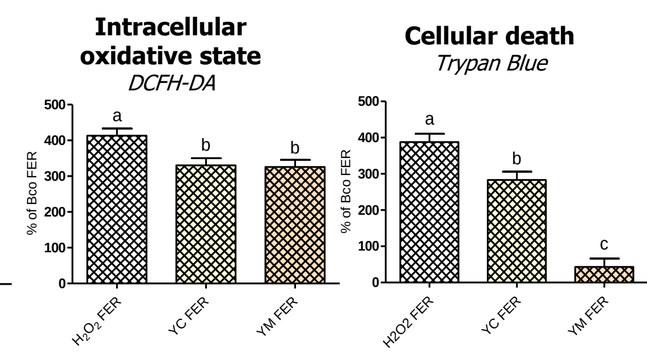


Large-intestine digestive fraction of Functional Yogurt (FER)

Basal model



Oxidative stress model



CONCLUSION

- The results obtained reinforce the relevance of determining the final biological response induced by digested food extracts as the data reveal that exists significant impact on the cell outcomes.
- The enrichment of functional yogurt with red pomace microcapsules may contribute to attenuate H_2O_2–induced oxidative damage and favor cell viability.
- Small-intestine digestion process on enriched yogurt resulted in an pro-oxidant and antiproliferative bioactivities of these fractions.
- Fermented functional yogurt extracts promoted a pro-oxidant intracellular state and showed to improve survival response in oxidative-injured cells.

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