Facultad de Química

Defatted rice bran as a source of functional compounds: enzymatic release of bioaccessible peptides and phenolics

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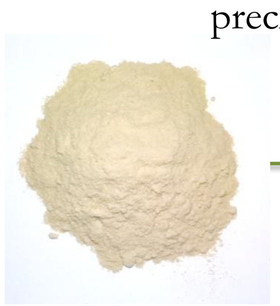
INTRODUCTION & AIM

In recent years, interest in the circular economy has grown as a paradigm for promoting sustainable food production and minimizing waste along the production chain. In this context, rice bran—a by-product of rice processing (*Oryza sativa*)—stands out due to its high nutritional value, low cost, and wide availability. **This study aimed to evaluate the bioactive properties and *in vitro* bioaccessibility of protein hydrolysates derived from a concentrate (DRBC), enriched in protein and total dietary fiber (TDF), obtained from defatted rice bran (DRB) powder.**

METHOD



DRB treated with thermostable α-amylase and amyloglucosidase[1]

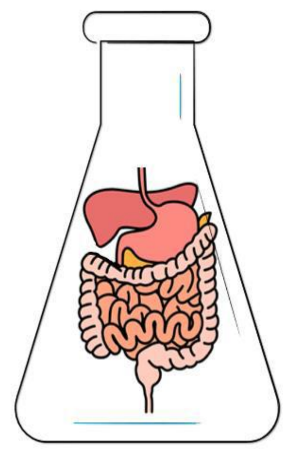
Ethanol 71% (v/v) for 24 h, centrifuged; the precipitate was washed and dried

Defatted rice bran concentrate (**DRBC**)

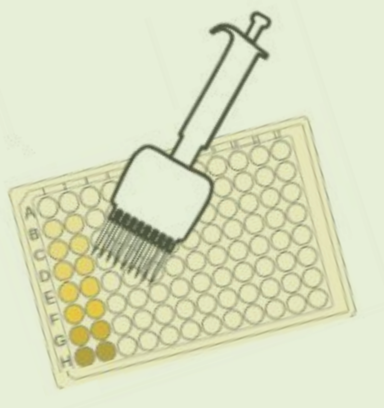
DRBC (100 g L^{-1}, pH 8.0) was hydrolyzed with Alcalase (1.0 mL L^{-1}) at 50 °C for 120 minutes, followed by freeze-drying

Hydrolyzed defatted rice bran concentrate (**H120-DRBC**)

DRBC and H120-DRBC



Bioaccessibility assessed using the standardized INFOGEST 2.0 *in vitro* digestion model[2].



Degree of hydrolysis (DH): trinitrobenzenesulfonic acid method[3].
Antioxidant capacity: ABTS radical scavenging[4] and **ORAC-FL**[5].
Antihypertensive activity: ACE-inhibitory assay[6].
Phenolic compounds: determined and identified by **HPLC-DAD**[7,8].

RESULTS & DISCUSSION

- DH of H120-DRBC hydrolysate: 7.5 ± 1.0% after 120 min.
- Enzymatic hydrolysis emerged as an effective strategy to enhance the bioactive potential of DRBC by releasing functional peptides, without significantly altering the total polyphenol content.
- Bioaccessibility studies revealed a significant increase in the antioxidant and antihypertensive capacities of DRBC and H120-DRBC (Table 1).

RESULTS & DISCUSSION

Table 1. Antioxidant capacity determined by the ORAC-FL and ABTS methods, and ACE inhibition expressed as IC_{50}, for DRBC and the 120-min hydrolysate (H120-DRBC), before and after gastrointestinal simulation.

	ORAC-FL IC_{50} (mg/mL)		ABTS IC_{50} (mg/mL)		ACE IC_{50} (mg/mL)	
	Before	After	Before	After	Before	After
DRBC	$1.25\pm0.03^{b,2}$	$0.24\pm0.02^{b,1}$	$108.0\pm5.5^{b,2}$	$8.3\pm0.2^{b,1}$	$20.37\pm0.03^{b,2}$	$5.06\pm0.07^{b,1}$
H120-DRBC	$0.16\pm0.01^{a,2}$	$0.04\pm0.01^{a,1}$	$10.37\pm0.03^{a,2}$	$5.1\pm0.1^{a,1}$	$1.10\pm0.04^{a,2}$	$0.97\pm0.03^{a,1}$

Mean ± SD (n = 3). Different letters in columns and numbers within rows (for each determination) indicate significant differences ($P < 0.05$, Tukey's test).

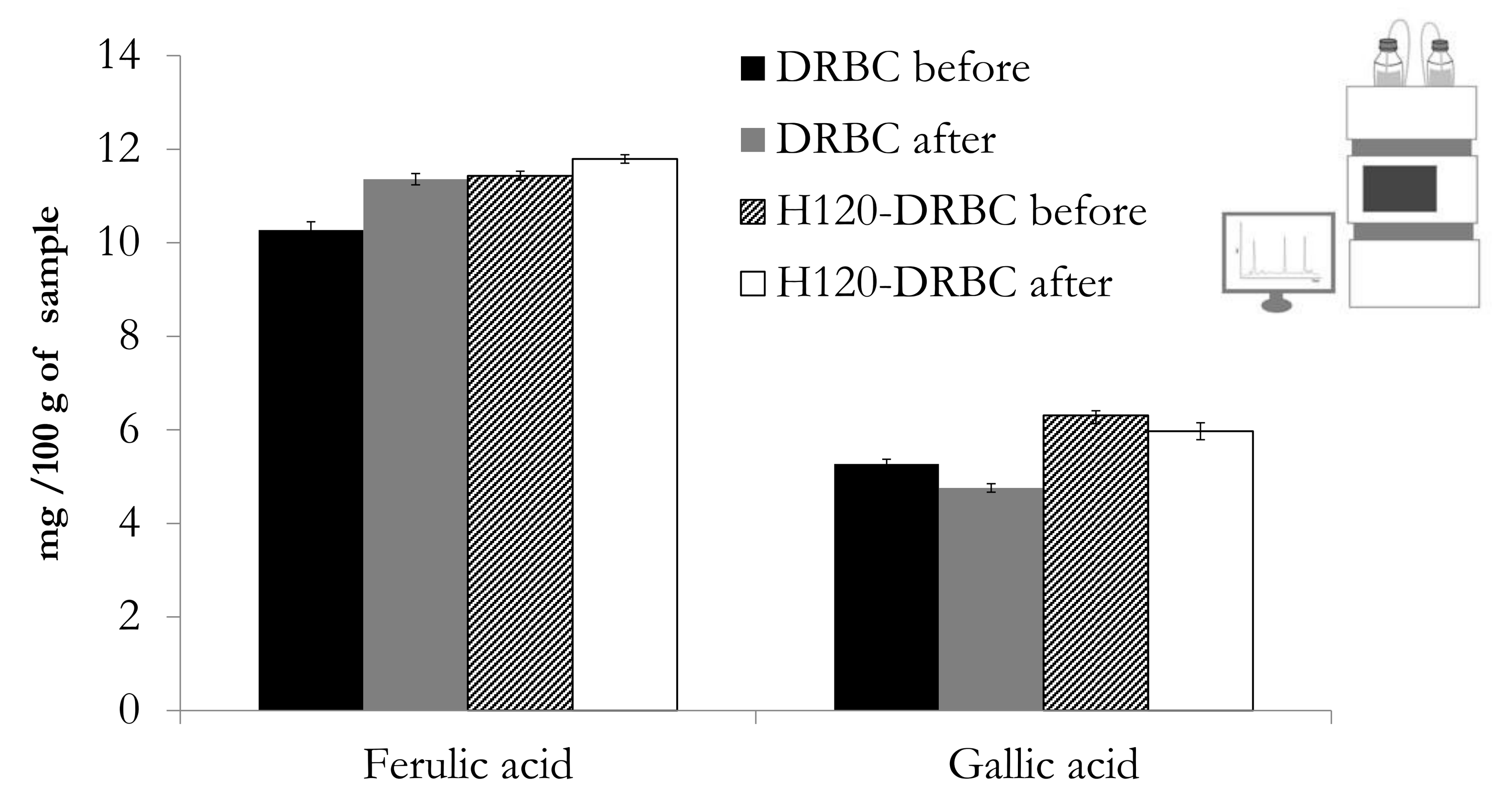


Figure 1. Ferulic acid and gallic acid content (mg/100 g of sample) in DRBC and its hydrolysate H120-DRBC before and after *in vitro* gastrointestinal digestion, measured at 290 nm.

- Ferulic and gallic acids were identified and quantified in the bioaccessible fraction (Fig. 1).
- In the bioaccessible fraction, ferulic acid content increased, while gallic acid decreased.
- The stability of ferulic acid during *in vitro* digestion may be due to a protective effect of bound TDF.
- These findings suggest that both acids have the potential to be absorbed and metabolized after digestion, allowing them to exert their effects throughout the body.

CONCLUSION

These findings support the potential of the hydrolysates as ingredients for functional foods, representing a promising strategy for the sustainable valorization of defatted rice bran.

REFERENCES/ ACKNOWLEDGEMENTS:

PEDECIBA
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