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Influence of simulated in vitro gastrointestinal digestion on phytochemical contents and biological activities of date by-product extract (*Phoenix dactylifera* L.)

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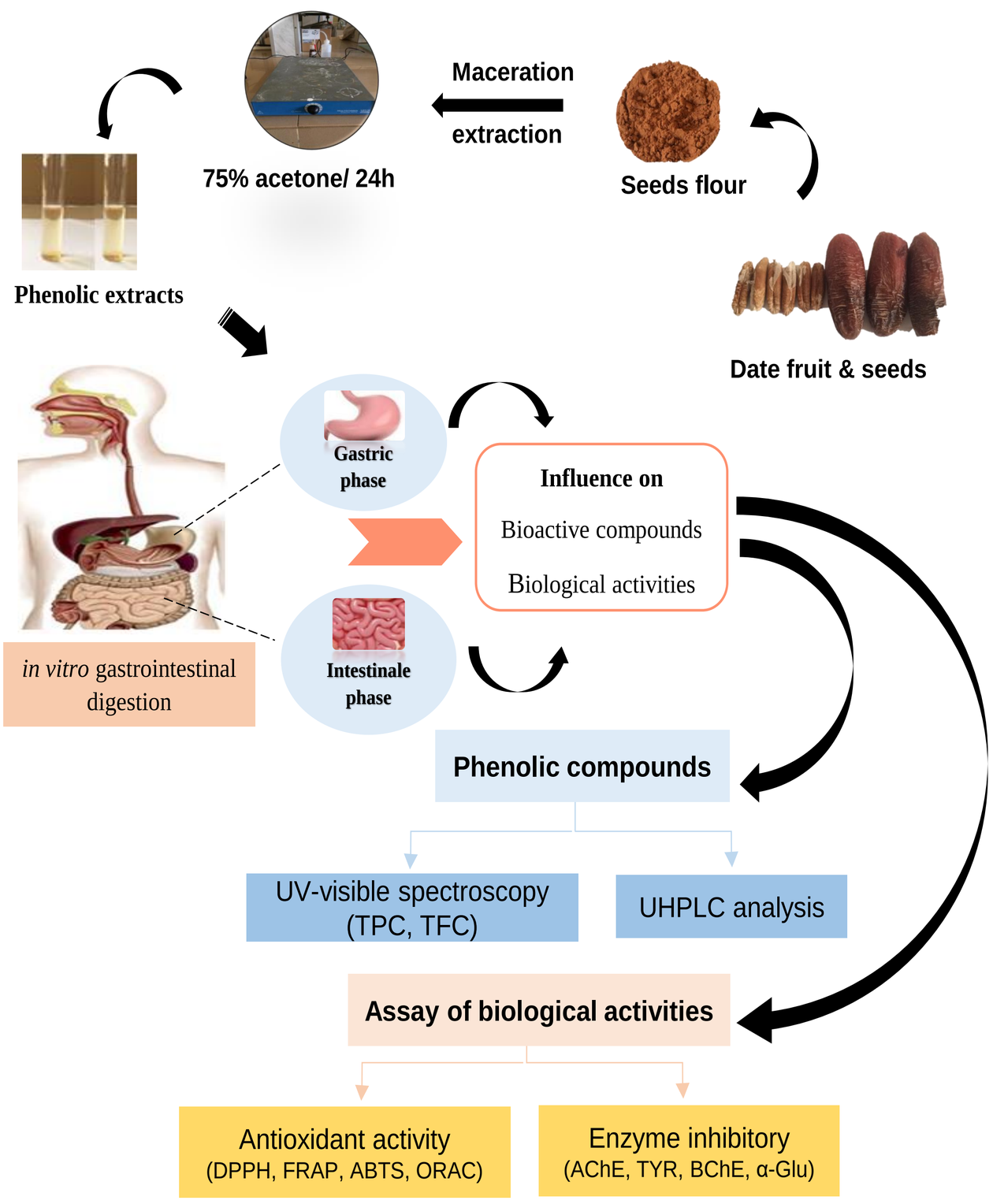
INTRODUCTION & AIM

Date palm (*Phoenix dactylifera* L.) is one of the most ancient cultivated plants well known worldwide, especially in the desert regions of Middle East and North Africa. The socioeconomic importance of date palm is due to its multipurpose uses. Its fruit, known as a staple food, is widely consumed fresh and also transformed or used as ingredients in several processed food products.

Date by-products, particularly the seeds, represent a significant waste stream generated during date fruit processing. However, these by-products are rich reservoirs of phytochemicals with promising biological activities. Understanding how these bioactive compounds behave during gastrointestinal digestion is crucial for elucidating their bioaccessibility and potential health benefits upon consumption. This research aims to shed light on the fate of phytochemicals and their potential bioaccessibility during *in vitro* gastrointestinal digestion as well as the biological activities of date by-product extract sourced from Ourous cultivar. Such insights hold implications for leveraging date by-products as functional ingredients in various applications, from nutraceuticals to cosmeceuticals, with potential health-promoting attributes, thereby contributing to sustainable utilization and valorization of this revered botanical resource.

MATERIALS & METHODS



RESULTS & DISCUSSION

Table 1: Bioactive compounds and Antioxidant capacities from *Phoenix dactylifera* seed extracts before and after gastric and intestinal phases of digestion process

Digestion phases	Phenolic compounds		Antioxidant activity			
	TPC (mg GAE/g)	TFC (mg QE/g)	DPPH (mg TE/g)	FRAP (mg AAE/g)	ABTS (mg TE/g)	ORAC (mg TE/g)
Undigested	298.72 ± 23.57	14.93 ± 1.27	578.08 ± 21.04	978.16 ± 37.79	565.20 ± 17.29	354.57 ± 16.86
Gastric digest	884.74 ± 31.28	160.05 ± 3.69	97.26 ± 2.12	1409.76 ± 54.47	175.67 ± 3.06	3066.36 ± 4.03
Intestinal digest	1042.09 ± 67.86	135.90 ± 3.55	249.09 ± 7.85	1176.41 ± 9.22	625 ± 31.44	4580.96 ± 72.18

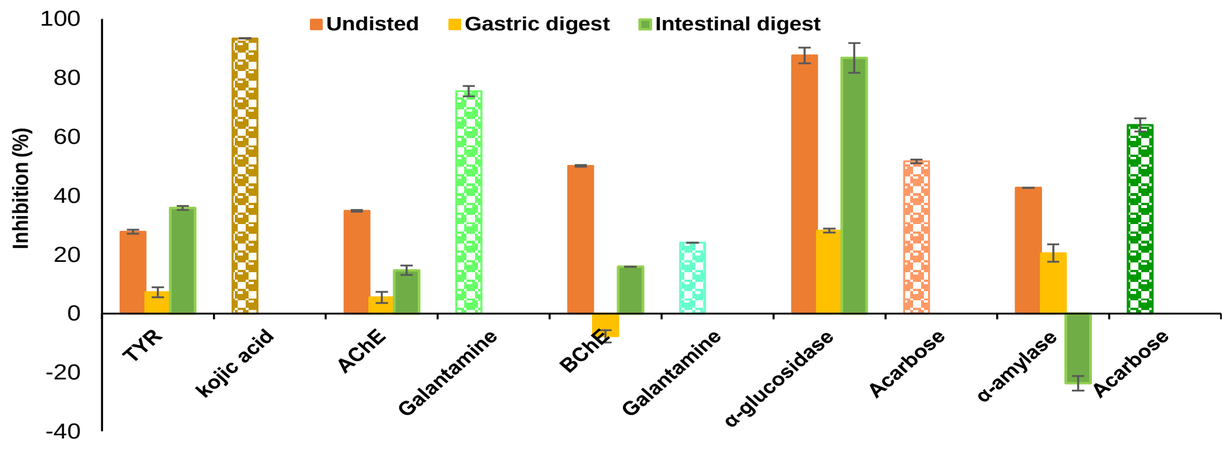


Figure 1: Changes in the enzyme inhibitory potential linked with type 2 diabetes mellitus and neurodegenerative diseases of seed extracts before and after *in vitro* gastrointestinal digestion.

***TYR**: tyrosinase; **AChE**: acetylcholinesterase; **BChE**: butyrylcholinestesrase*

Table 2: UHPLC phenolic profiles of date seed extracts before and after gastric and intestinal phases of the digestion process.

Compounds (mg/100g) Phenolic Acides	Undigested	Gastric digest	Intestinal digest
Protocatechuic acid	44.81 ± 3.81	149.39 ± 0.65	345.20 ± 11.30
Syringic acid	8.43 ± 0.46	79.52 ± 1.61	71.09 ± 4.53
Der. caffeic acid	7.69 ± 0.54	12.99 ± 0.04	19.83 ± 0.25
Der. Sinapinic acid	7.11 ± 0.62	88.05 ± 0.27	99,.3 ± 13.29
Gallic acid	6.19 ± 0.86	297.80 ± 2.17	184.40 ± 24.16
Der. Hydroxycinnamic	5.48 ± 0.34	10.84 ± 0.01	14.38 ± 0.03
Der. ferulic acid	5.33 ± 0.38	9.33 ± 0.51	18.64 ± 0.47
Flavonoïds			
Catechin	171.60 ± 1.70	8662.21 ± 63.47	1612.82 ± 23.27
Procyanidin	58.93 ± 1.92	5100.39 ± 323.6	2157.85 ± 46.84
Procyanidin	77.95 ± 3.14	354.67 ± 3.19	697.80 ± 61.79
Procyanidin	74.25 ± 2.87	645.54 ± 1.83	456.75 ± 13.75
Procyanidin	109.8 ± 6.35	275.64 ± 3.85	322.68 ± 24.11
Quercetin-3-O-glucoside	22.37 ± 2.05	55.06 ± 4.71	91.77 ± 3.47
Der. quercetin	4.68 ± 1.8	-	149.76 ± 16.21
Der. quercetin	5.01 ± 0.27	11.77 ± 0.66	13.77 ± 1.63

CONCLUSION

This work suggest that the date by-product (seeds) could be an interesting source of natural antioxidants for food formulations, development of value-added products and preventing some diseases. Overall, the experimental results displayed the importance of evaluating the bioactivity of date seed extracts after digestion. They also showed that the release or bioaccessibility of the phenolics present in the analyzed extracts occurs gradually during the different digestion phases, which is influenced by the digestion conditions.

FUTURE WORK

Further research based on *in vivo* and clinical studies is needed to confirm this extracts as viable food matrices with distinct biological properties.