Valorization of tomato by-products from agro-industrial processing through an “one pot” simultaneous extraction with a biphasic system

F. Contillo*, M. Marone*, P. Marasco*, M. Monteleone*, M. Albenzio, M. Caroprese**, M. Francavilla***

***STAR*Research Group, Department of Agriculture, Food, Natural Resources and Engineering (DAFNE), University of Foggia, Via Napoli 25, 71122 Foggia, Italy; (francesco.contillo@unifg.it)**
**** Department of Agriculture, Food, Natural Resources and Engineering (DAFNE), University of Foggia, Via Napoli 25, 71122 Foggia, Italy**

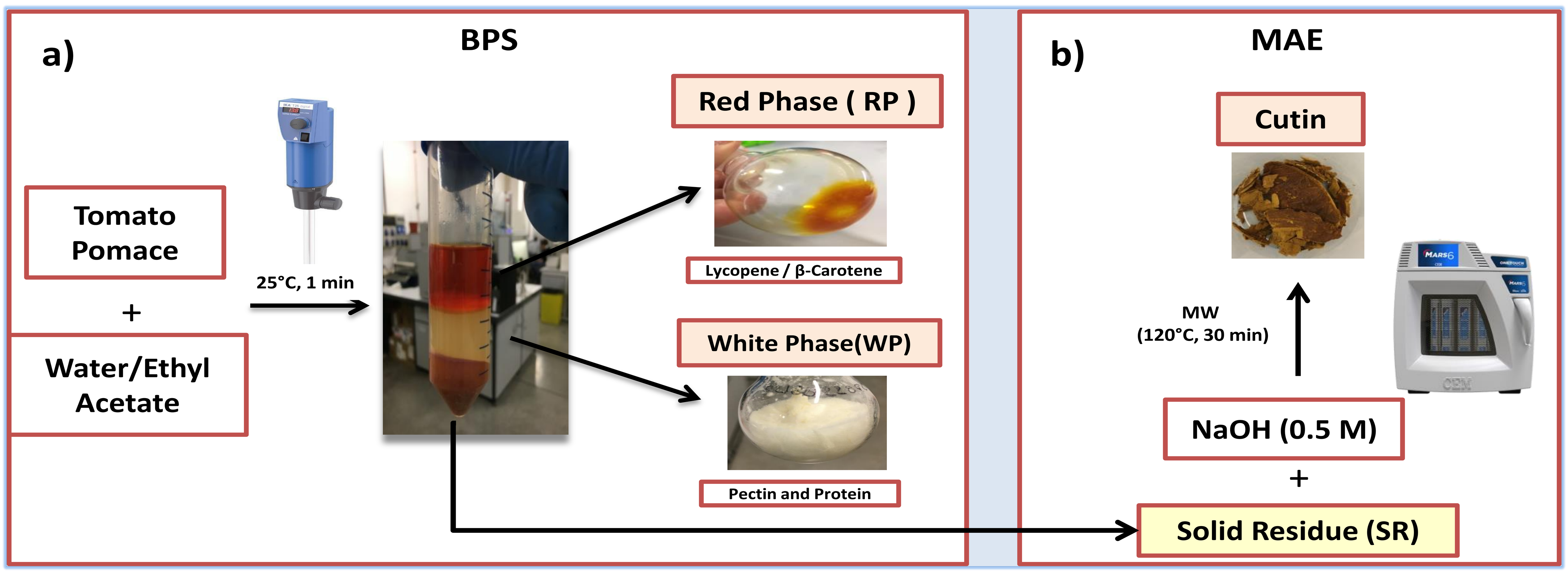
THESSALONIKI2021
8th International Conference on Sustainable Solid Waste Management
23-26 JUNE 2021

Introduction

The tomato industry produces huge quantities of by-products which represent an environmental and economic concern. The biorefinery processes applied on the tomato industry are an opportunity to reduce waste and obtain products with high added value. Indeed, these by-products contain a pletora of bioactive compounds, which could make them a renewable source of antioxidants, polysaccharides, biopolymers and natural dyes (carotenoids). Therefore, the aim of this work was to investigate new routes for the valorization of tomato by-products by means cascade extraction process, inspired to the Green Chemistry principles, for the recovery of high value added compounds. The proposed biorefinery process integrates the extraction of lipid compounds and pectin from tomato pomace (TP), using a one pot simultaneous extraction based on a Biphasic system (BPS), consisting of ethyl acetate and water, followed by cutin extraction from the residue by microwave-assisted alkaline hydrolysis (MAE).

Methods

*Figure 1. The integrated biorefinery process designed for valorization of tomato pomace: **a)**“One-pot” simultaneous extraction of lipids, pigments (lycopene and β-carotene) and pectin with a biphasic system BPS (ethyl acetate and water); **b)** Microwave assisted extraction (MAE) of cutin from solid residue*



Results & Discussion

Table 1: Lipids and Pectin yields achieved from Tomato Pomace at different extraction conditions (Temperature and Emulsion Time) by means the Bi-Phasic-Extraction System.

Experimental Conditions		Lipids			Pectin				
Temperature (°C)	Emulsion. Time (min)	Lipids ± SD (% w/w dw)	All Trans Lyc ± SD (mg/g dw)	β-Carotene ± SD (mg/g dw)	WP ± SD (% w/w dw)	Total Sugar (% w/w dw)	C (% w/w dw)	H (% w/w dw)	N (% w/w dw)
25	1	7.4 ± 0.4	1.28 ± 0.04	0.059 ± 0.001	17.7 ± 0.7	72.30	40.5	6.8	4.2
25	5	6.4 ± 0.7	1.33 ± 0.07	0.069 ± 0.003	18.1 ± 0.8	73.70	39.7	6.9	4.0
25	10	7.4 ± 0.1	1.20 ± 0.05	0.065 ± 0.001	17.8 ± 0.5	77.10	40.2	6.8	4.1
40	1	7.4 ± 0.1	1.21 ± 0.02	0.070± 0.001	20.8 ± 0.2	71.90	41.1	6.8	4.3
40	5	7.7 ± 0.2	1.23 ± 0.03	0.057 ± 0.001	18.5 ± 0.8	75.10	40.2	6.7	3.9
40	10	8.0 ± 0.9	0.99 ± 0.04	0.052 ± 0.001	15.9 ± 0.9	71.90	39.4	6.7	4.1
60	1	8.0 ± 0.3	1.13 ± 0.05	0.050 ± 0.002	17.2 ± 0.3	74.40	39.6	6.7	3.9
60	5	7.7 ± 0.1	0.93 ± 0.06	0.054 ± 0.001	17.4 ± 0.5	74.10	39.9	6.6	4.0
60	10	7.8 ± 0.1	0.97 ± 0.04	0.053 ± 0.001	17.5 ± 0.6	75.80	40.5	6.7	4.1

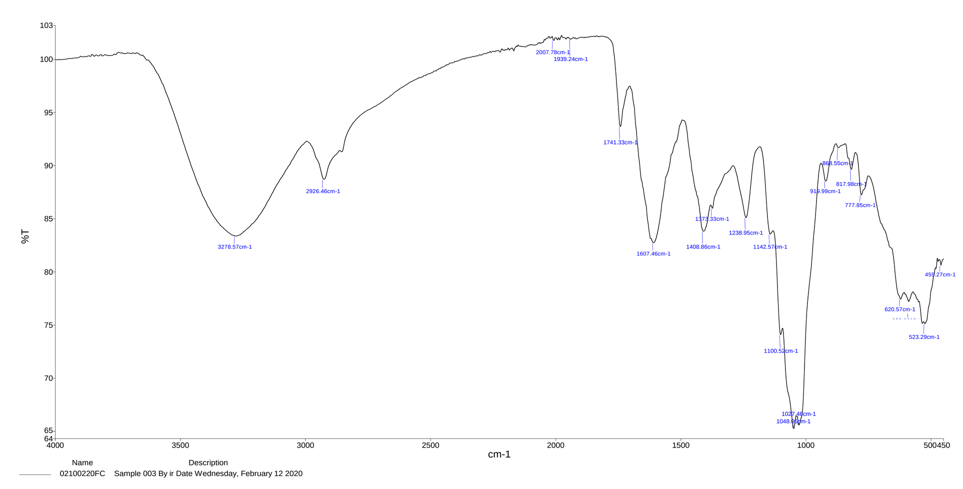


Figure 2: ATR-FTIR spectra of the pectin extracted with BPS

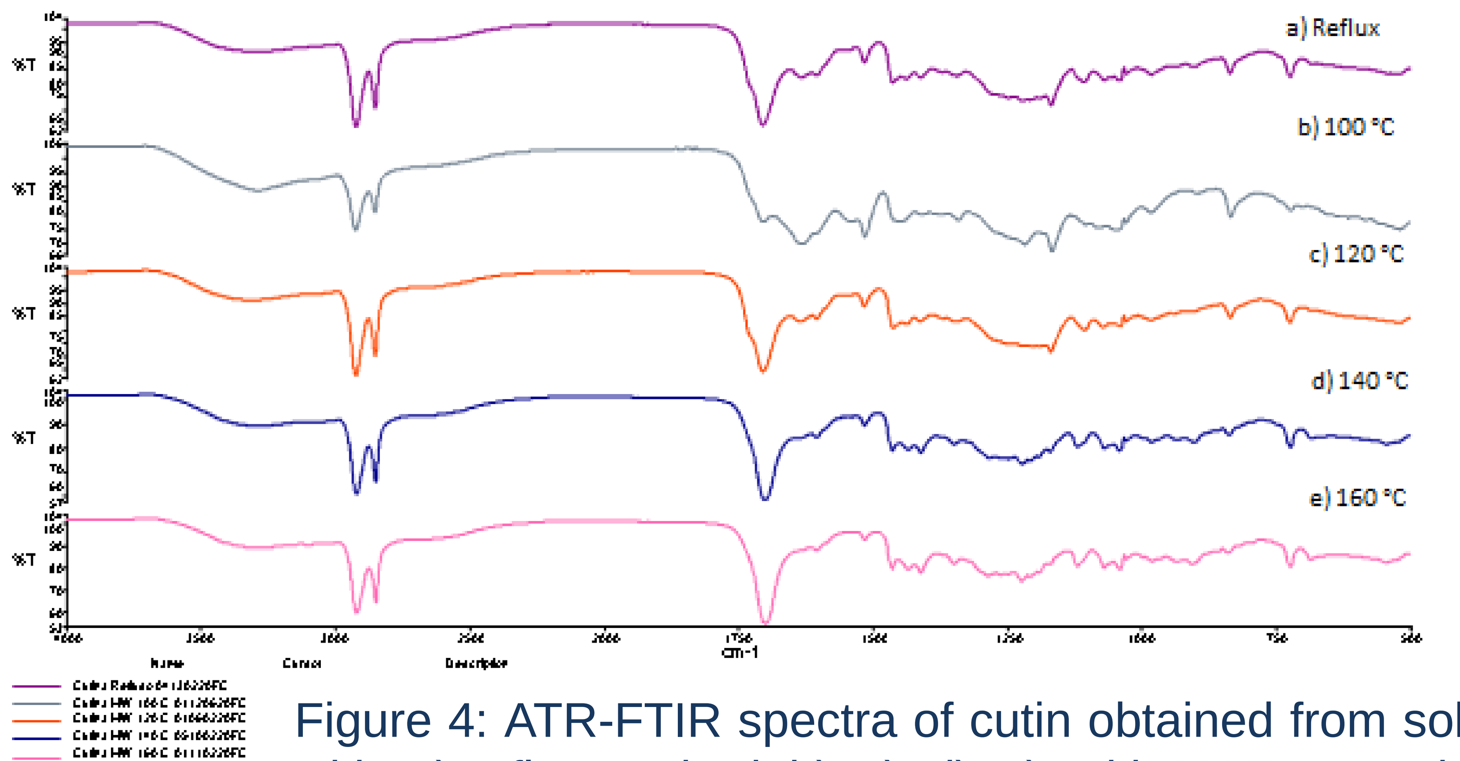


Figure 4: ATR-FTIR spectra of cutin obtained from solid residue with: a) reflux method; b), c), d), e) with MAE extraction method using an extraction time of 30 minutes and different temperatures (100, 120, 140 and 160 °C respectively)

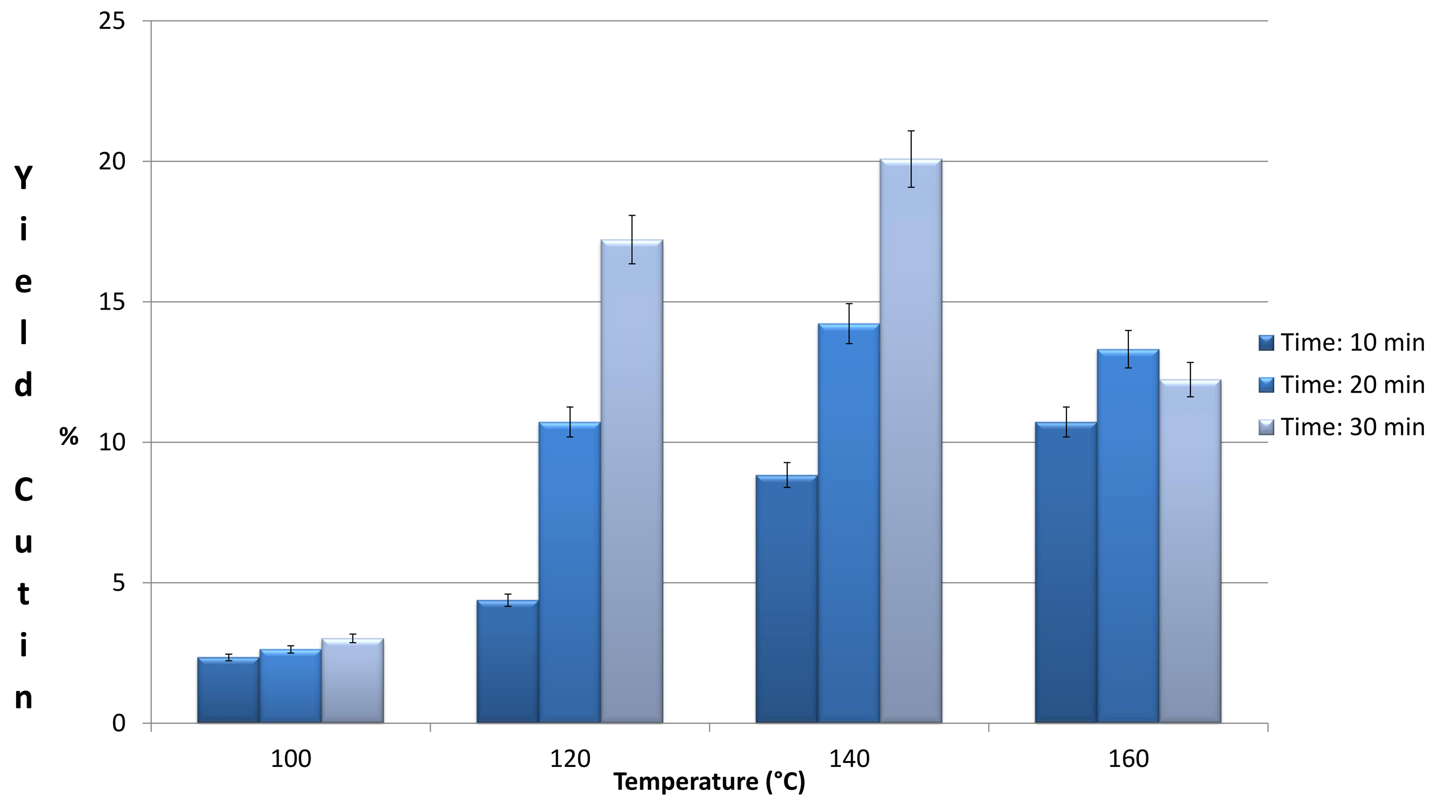


Figure 3: Cutin yields obtained at different experimental conditions: Time (10,20,30 minutes), and Temperature (100,120,140,160 ° C).

Conclusions

In conclusion, the proposed biorefinery process seem to demonstrate the effectiveness of green sequential extractions of high-value compounds from TP, converting this by-product/waste in a multi-products source