SUPPLEMENTARY MATERIAL

Optimization of the recovery of carotenoids from tomato processing wastes: application on textile dyeing and assessment of its antioxidant activity

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Abstract

The present study has been focused on the extraction of natural pigments from tomato industry waste. At first, different solvents and solvents mixture were compared to determine which one is the best for extracting carotenoids compounds from tomato by-products. A mixture of hexane and acetone gave the highest carotenoids extraction yield among the others examined.

The extraction conditions were optimized using a five-level-five-factor central composite design. Under optimal conditions ; solvent-solid ratio 90, hexane percentage in the solvent mixture 60, extraction duration 50, number of extractions 4, extraction temperature 35°C, the yield of carotenoids was 80.7 µg /g.

The colored extract of tomato by-products was applied on textile fabrics to investigate the dyeing characteristics and antioxidant activities. The results indicate that extract can be applied on textile fabrics (wool, silk, and polyamide) to produce colored clothing with acceptable antioxidant properties.

Keywords: Carotenoids, Tomato wastes, Extraction, Dyeing, Antioxidant activity.

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Figure S2. Visible spectra of Hexane/Acetone extract

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Table S1. Central composite arrangement for independent variables X_1 (solvent/solid ratio), X_2 (hexane percentage), X_3 (time), X_4 (Number of extractions) and X_5 (temperature) and their response (carotenoids yield)

Figure S1. Contour plots analysis for the carotenoids yield

Figure S2. Visible spectra of Hexane/Acetone extract

Figure S3. FTIR spectra of Hexane/Acetone extract

The figure displays two screenshots of the Minitab software interface, showing experimental data for tomato carotenoid yield.

Screenshot 1 (Top): Minitab - article tomato.MPJ - [Worksheet 4 ***]

	C1 StdOrder	C2 RunOrder	C3 PtType	C4 Blocks	C5 X1	C6 X2	C7 X3	C8 X4	C9 X5	C10 Carotenoids Yield
1	1	8	1	1	30	30	20	2	50	47,60
2	2	29	1	1	70	30	20	2	30	47,60
3	3	25	1	1	30	70	20	2	30	46,20
4	4	24	1	1	70	70	20	2	50	53,60
5	5	26	1	1	30	30	40	2	30	42,60
6	6	3	1	1	70	30	40	2	50	42,90
7	7	32	1	1	30	70	40	2	50	67,00
8	8	19	1	1	70	70	40	2	30	45,80
9	9	13	1	1	30	30	20	4	30	37,04
10	10	1	1	1	70	30	20	4	50	58,60
11	11	4	1	1	30	70	20	4	50	56,10
12	12	17	1	1	70	70	20	4	30	38,42
13	13	6	1	1	30	30	40	4	50	48,90
14	14	21	1	1	70	30	40	4	30	55,00
15	15	23	1	1	30	70	40	4	30	80,40
16	16	22	1	1	70	70	40	4	50	59,20
17	17	16	-1	1	10	50	30	3	40	56,00
18	18	12	-1	1	90	50	30	3	40	50,80
19	19	11	-1	1	50	10	30	3	40	42,90
20	20	27	-1	1	50	90	30	3	40	62,60
21	21	7	-1	1	50	50	10	3	40	52,70
22	22	31	-1	1	50	50	50	3	40	62,00
23	23	18	-1	1	50	50	30	1	40	25,26

Screenshot 2 (Bottom): Minitab - article tomato.MPJ - [Worksheet 4 ***]

	C1 StdOrder	C2 RunOrder	C3 PtType	C4 Blocks	C5 X1	C6 X2	C7 X3	C8 X4	C9 X5	C10 Carotenoids Yield
24	24	28	-1	1	50	50	30	5	40	38,20
25	25	5	-1	1	50	50	30	3	20	37,25
26	26	2	-1	1	50	50	30	3	60	47,40
27	27	20	0	1	50	50	30	3	40	36,87
28	28	15	0	1	50	50	30	3	40	36,68
29	29	30	0	1	50	50	30	3	40	35,48
30	30	14	0	1	50	50	30	3	40	35,50
31	31	9	0	1	50	50	30	3	40	34,90
32	32	10	0	1	50	50	30	3	40	34,90