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Effect of high voltage electric discharge on the extraction of phenolic compounds from mandarin (*Citrus unishu* M. var. *okitsu*) peel waste

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Citrus peel

- Industrial citrus processing- large quantities of by-products (mainly citrus peel)
- High amount of bioactive compounds
- Hesperidin-main compound



Experimental work

High Voltage Electric Discharge (HVED) assisted extraction procedure

- Different experimental conditions:
- solvent:solid ratio (200, 300, 400 mL/g),
- frequency (40, 70, 100 Hz)
- treatment time (5, 10, 15 min),

Custom-built equipment constructed by Ingeniare CPTS1



Experimental work

Analysis

- Separation, identification and quantification of phenolic compounds -HPLC with a variable wavelength detector.



RESULTS

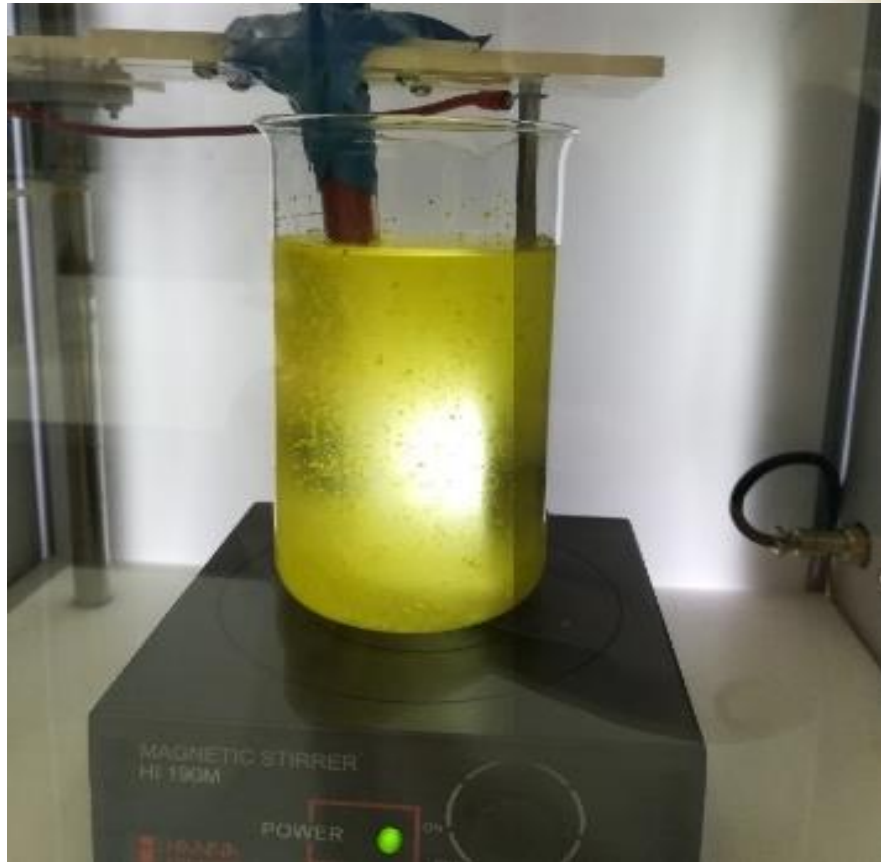


Figure 1. Formation of an electrical discharge between two electrodes in citrus peel extract during HVED treatment

RESULTS

Table 1 Extraction yield, total phenol content and antiradical activity for citrus peel extracts obtained with HVED

	Total phenol content (mg GAE/g)	DPPH (%)	Extraction yield (mg/g)
1	134.44	92.22	416.80
2	166.23	91.97	430.00
3	176.49	94.93	389.00
4	173.15	92.68	453.00
5	179.31	92.30	432.00
6	170.59	92.09	427.20
7	275.46	92.85	391.50
8	274.18	91.80	426.10
9	176.23	92.50	432.31
10	161.36	90.99	424.80
11	96.23	93.91	441.20
12	270.85	91.75	359.50
13	138.28	92.30	418.40
14	115.21	87.06	456.00
15	193.92	91.97	463.20
16	204.95	92.18	422.40
17	232.13	92.90	424.01

RESULTS

Table 2 Phenolic compounds detected in citrus peel extracts obtained with HVED

RUN	Hesperidin (mg/g)	Narirutin (mg/g)	Rutin (mg/g)	Cryptochlorogenic acid (mg/g)	Neochlorogenic acid (mg/g)
1	58.51	12.77	2.49	1.05	0.68
2	59.96	13.55	2.25	0.98	0.68
3	64.74	13.72	4.35	0.75	0.53
4	59.46	13.95	4.33	0.93	0.72
5	67.07	14.20	4.62	0.79	0.64
6	70.62	14.53	2.55	0.81	0.64
7	69.76	14.74	2.66	0.84	0.60
8	55.88	7.47	1.37	0.43	0.33
9	59.16	12.87	4.19	0.39	0.54
10	67.08	14.67	4.78	0.85	0.68
11	59.22	17.39	5.10	1.10	1.10
12	72.91	12.19	5.25	0.86	0.66
13	50.52	13.51	4.00	0.85	0.62
14	62.90	14.40	5.05	0.76	0.72
15	58.71	13.76	4.56	0.69	0.71
16	64.50	14.54	4.92	0.65	0.68
17	68.32	14.58	5.13	0.67	0.61



CONCLUSION



- HVED treatment - enhanced extraction efficiency
- Intensified mass transfer and increased release of intracellular compounds into the solvent
- Citrus-peel material rich in bioactive compounds

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