

**Foods
2020**

The 1st International Electronic Conference on Food Science and Functional Foods

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María del Carmen Razola-Díaz, Eduardo Jesús Guerra-Hernández, Celia Rodríguez-Pérez, Ana María Gómez-Caravaca, Belén García-Villanova and Vito Verardo

Optimization of Ultrasound Assisted Extraction of Phenolic Compounds from Orange By-product

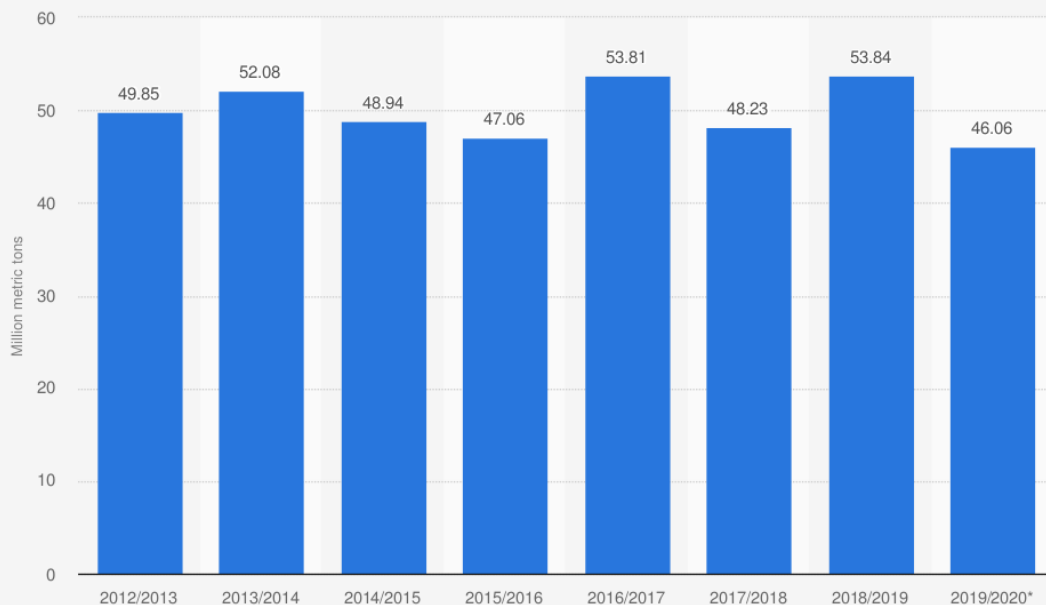


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1. INTRODUCTION

Orange production worldwide from 2012/2013 to 2019/2020 (in million metric tons)

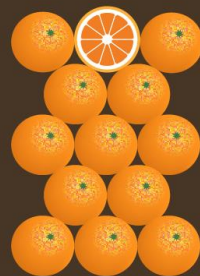


Sources
FAO; USDA Foreign Agricultural Service
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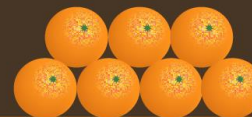
Additional Information:
Worldwide; USDA Foreign Agricultural Service; 2012/2013 to 2019/2020

Production of oranges in the EU (2018)

EU
6.5 million tonnes
274 000 ha



SPAIN
3.6 million tonnes (56%)
140 000 ha



ITALY
1.6 million tonnes (24%)
83 000 ha

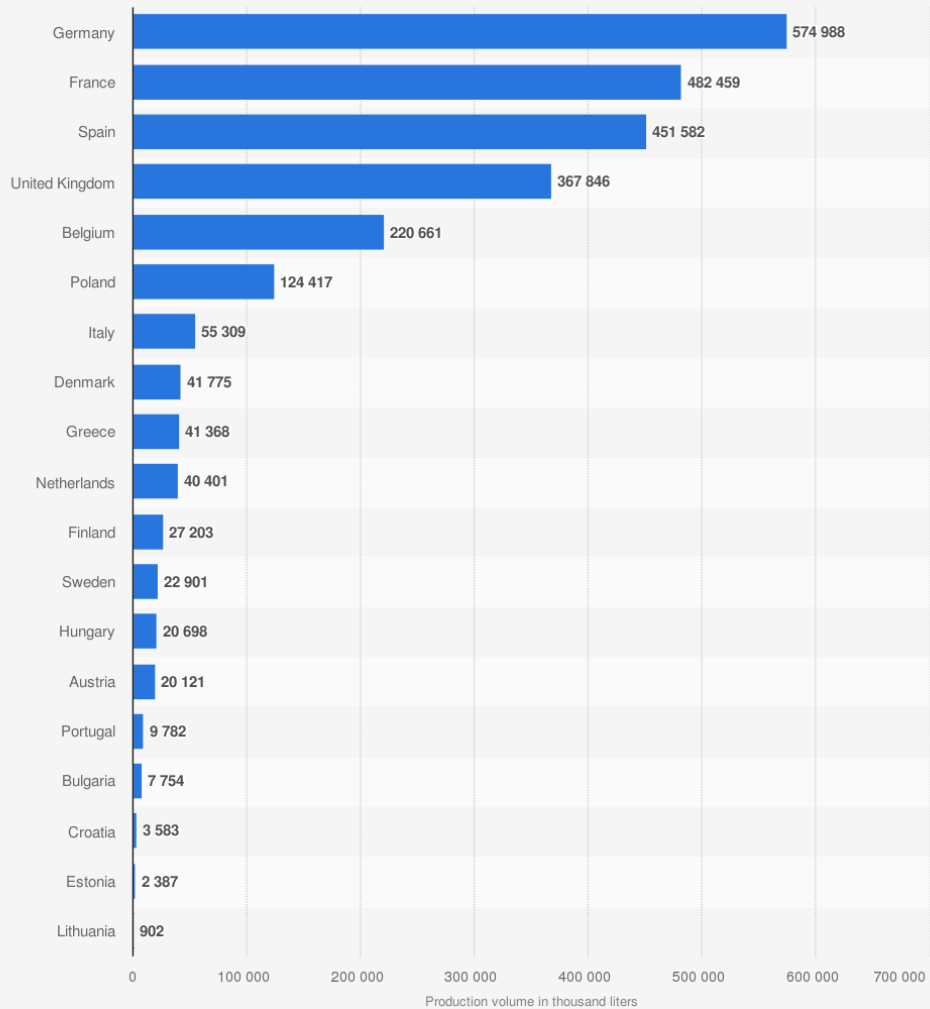


GREECE
0.9 million tonnes (14%)
32 000 hectares



1. INTRODUCTION

Production volume of orange juice in the European Union (EU) in 2017, by country (in 1,000 liters)



Source
Eurostat
© Statista 2020

Additional Information:
EU; 2017; production volume sold; EU 28; excl. frozen juice and orange juice n.e.c.



PROCESSING



BY-PRODUCT

BIOACTIVE COMPOUNDS SOURCE

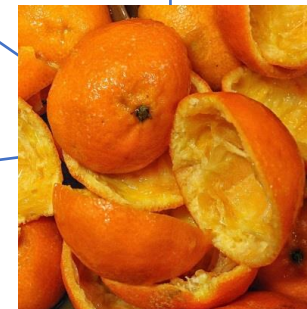
Anti-inflammatory

Antioxidant

Anti-cancer

Cardioprotective

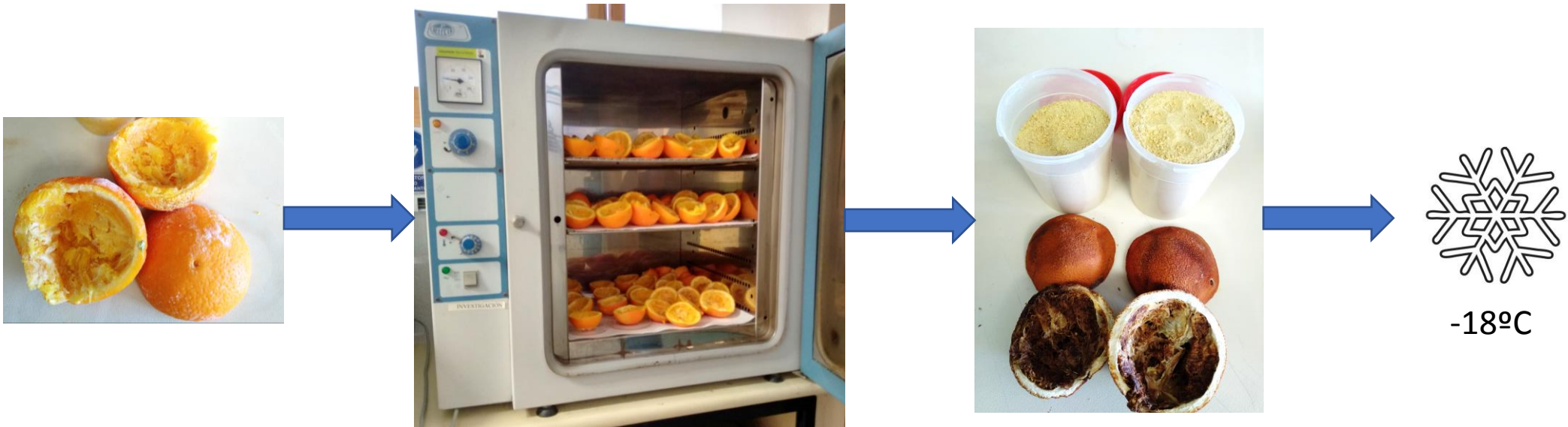
Anti-diabetic



Anti-rheumatic

Others

2. MATERIALS AND METHODS



3. MATERIALS AND METHODS

Table 2. Box Behnken desing with encoded values.

Independent factors				
	Ethanol/water (v/v)	Time (min)	Amplitude (%)	Pulse (%)
1	-1	-1	0	0
2	1	-1	0	0
3	-1	1	0	0
4	1	1	0	0
5	0	0	-1	-1
6	0	0	1	-1
7	0	0	-1	1
8	0	0	1	1
9	0	0	0	0
10	-1	0	0	-1
11	1	0	0	-1
12	-1	0	0	1
13	1	0	0	1
14	0	-1	-1	0
15	0	1	-1	0
16	0	-1	1	0
17	0	1	1	0
18	0	0	0	0
19	-1	0	-1	0
20	1	0	-1	0
21	-1	0	1	0
22	1	0	1	0
23	0	-1	0	-1
24	0	1	0	-1
25	0	-1	0	1
26	0	1	0	1
27	0	0	0	0

- BOX BEHNKEN DESING (Table 2)

$$Y = \beta_0 + \sum_{i=0}^4 \beta_i X_i + \sum_{i=0}^4 \beta_{ii} X_{ii}^2 + \sum_{i=0}^4 \sum_{j=0}^4 \beta_{ij} X_i X_j$$

Ethanol/water: 0, 50, 100 (v/v)

Time: 5, 25, 45 min

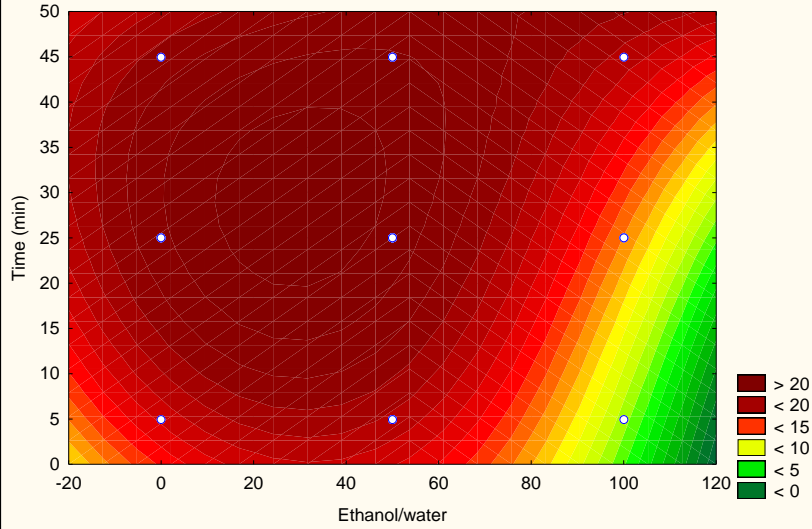
Amplitude: 20, 60, 100%

Pulse: 10, 50, 100%

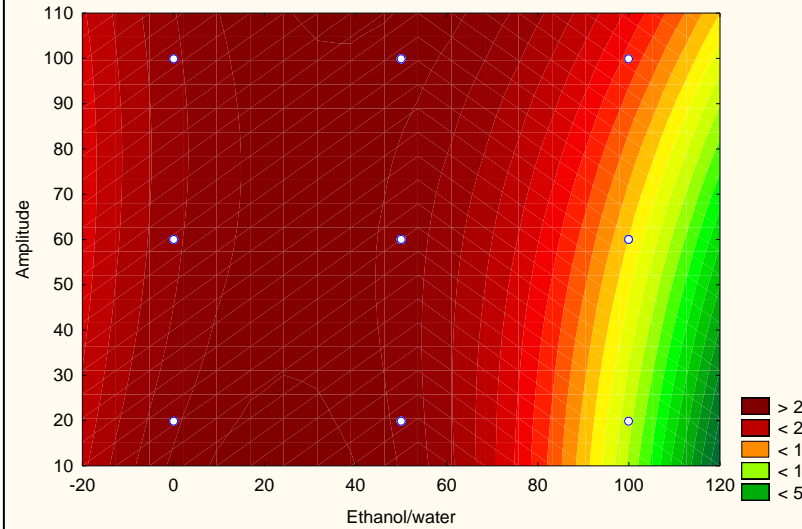
- DATA PROCESSING → STATISTICA 7.0
- OPTIMAL CONDITIONS → SURFACE RESPONSE METHODOLOGY
- TOTAL PHENOLIC COMPOUNDS
 - FOLIN METHOD
 - IONIC HPLC
- ANTIOXIDANT ASSAYS
 - ABTS
 - DPPH

2. RESULTS AND DISCUSSION

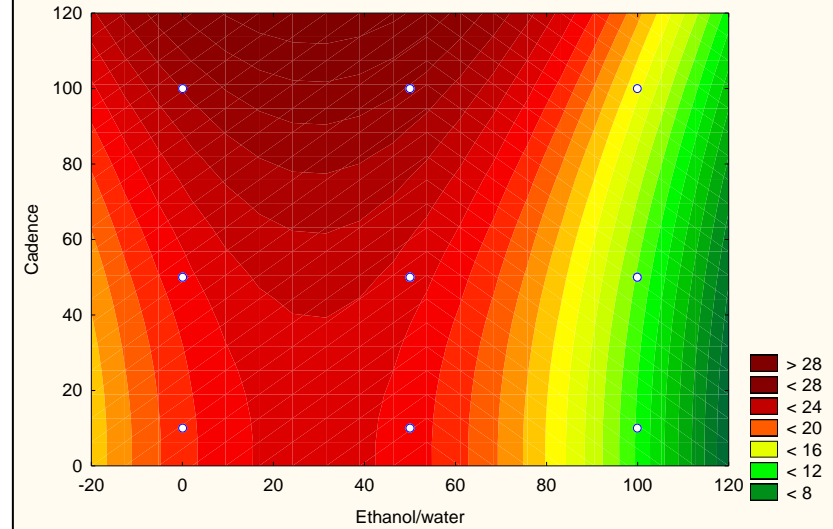
Fitted Surface; Variable: TPC
4 3-level factors, 1 Blocks, 27 Runs; MS Pure Error=.4517254
DV: TPC



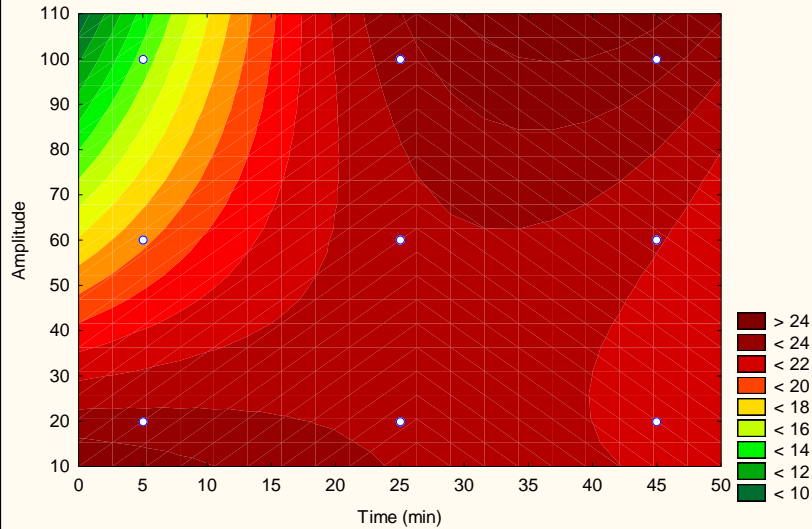
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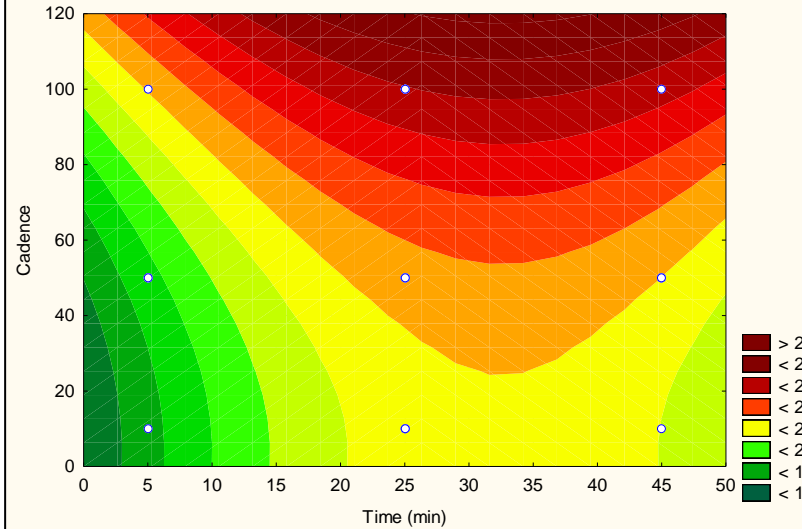
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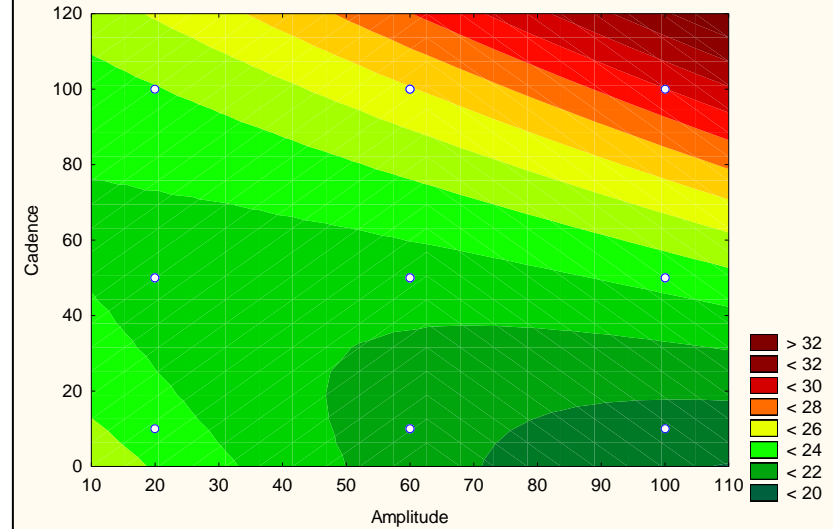
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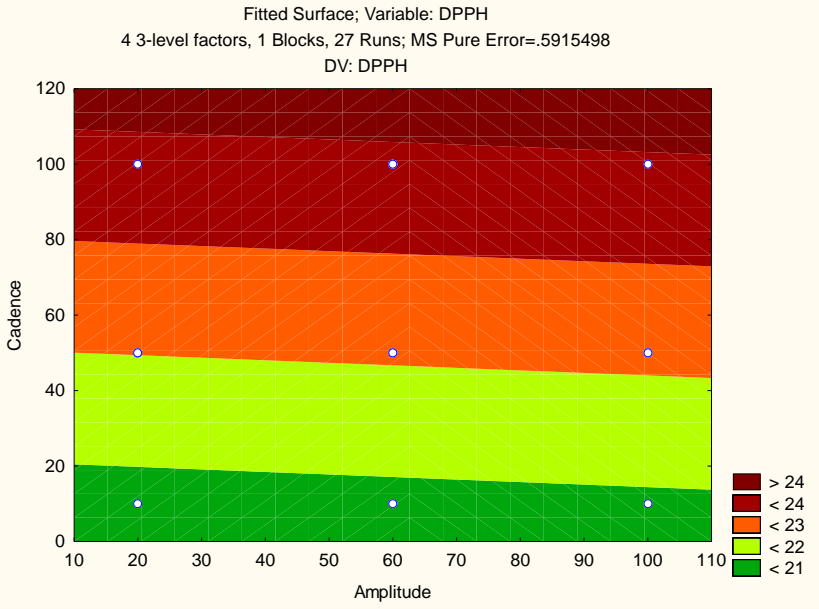
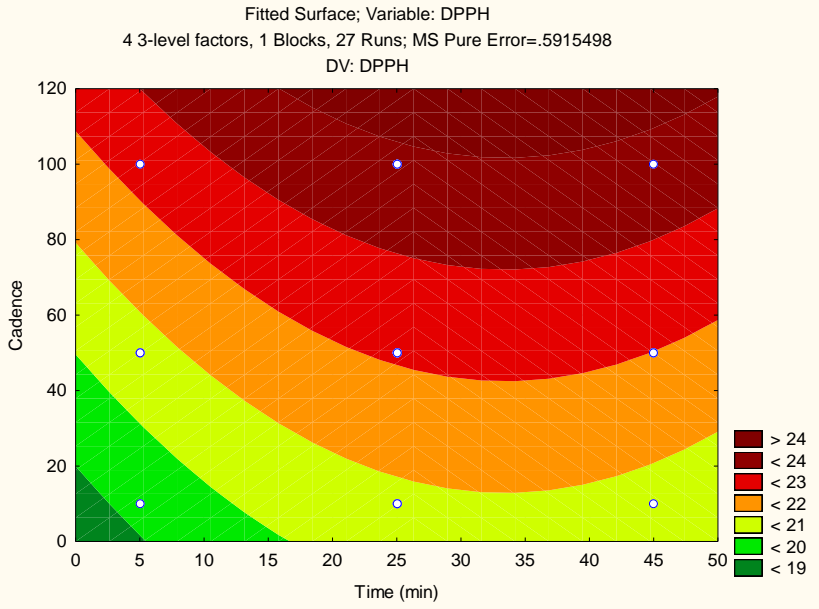
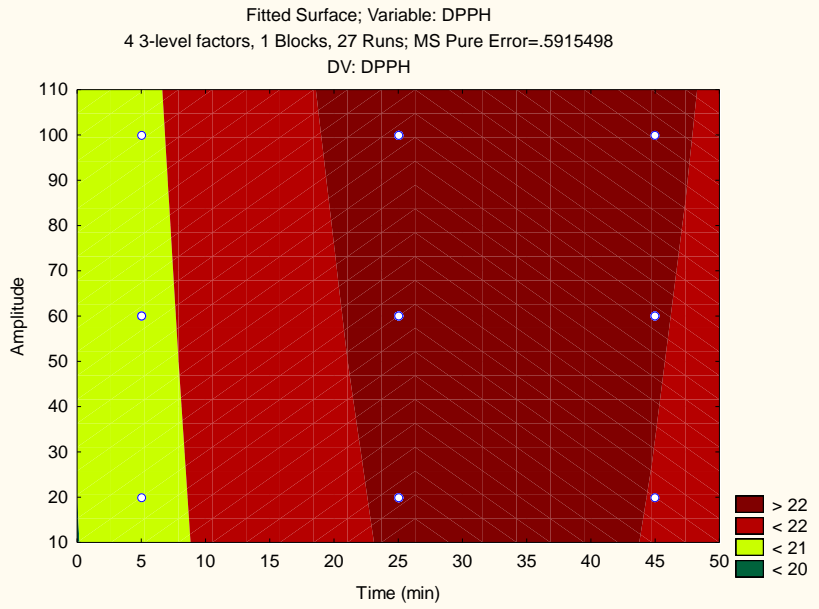
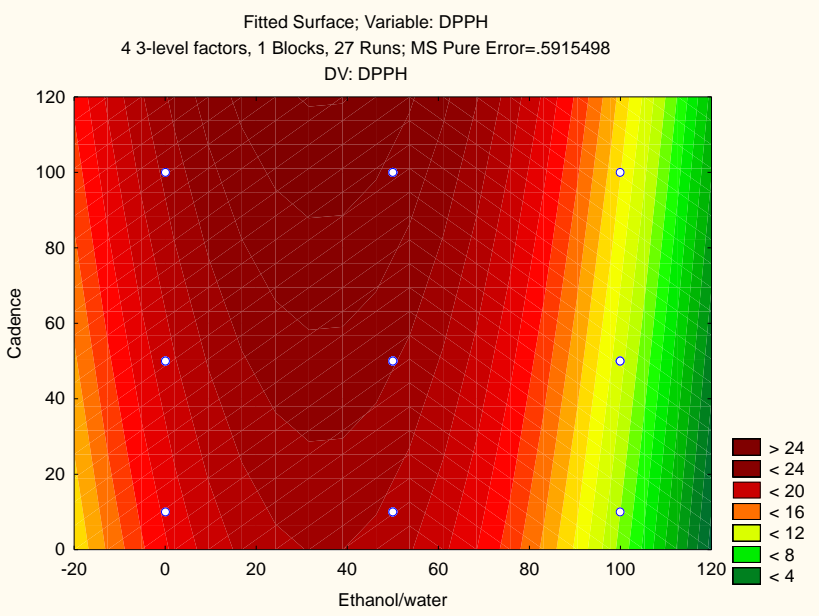
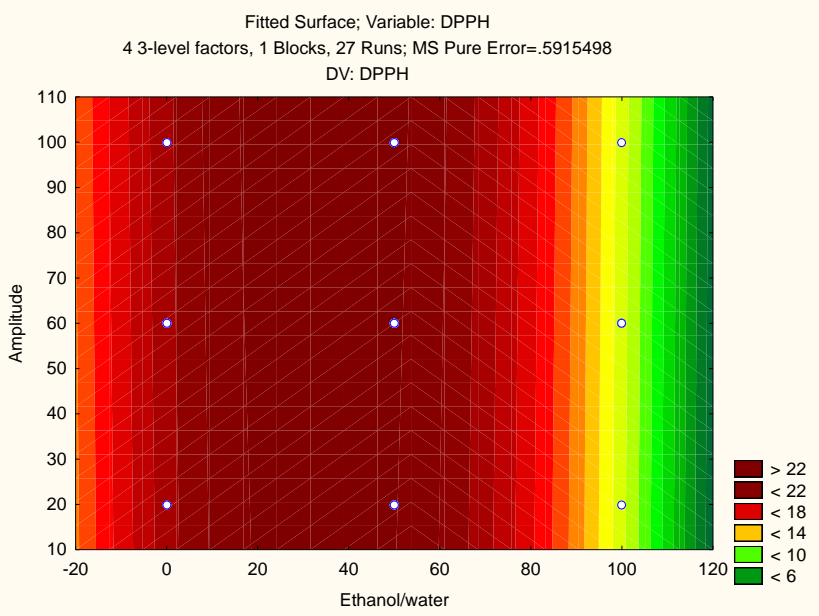
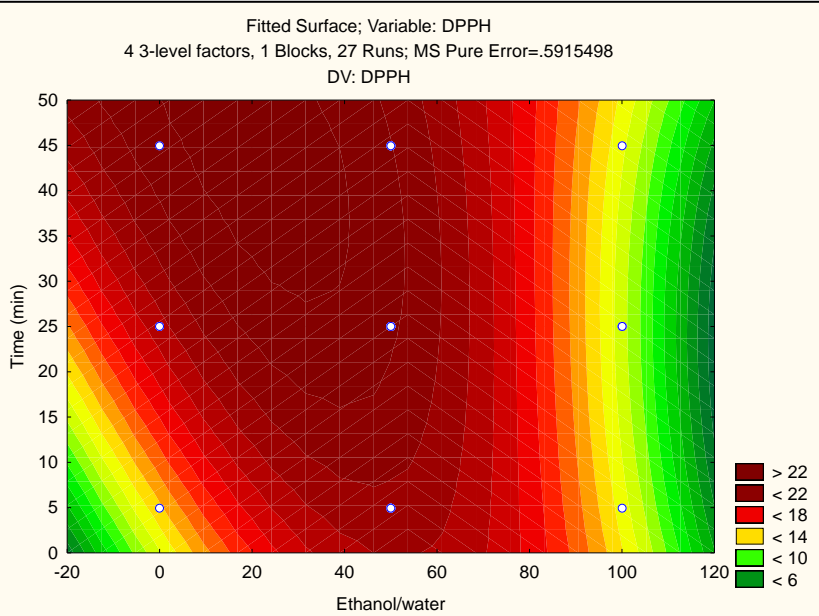
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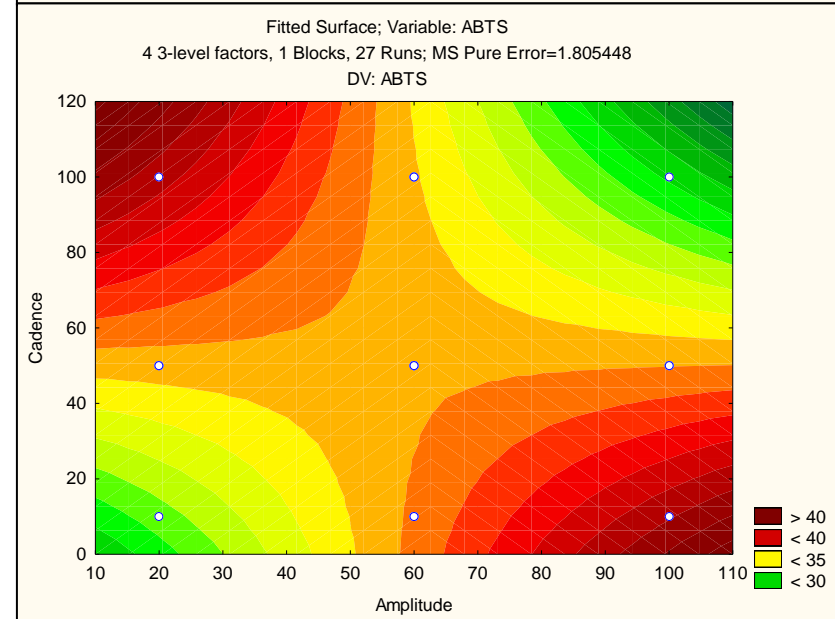
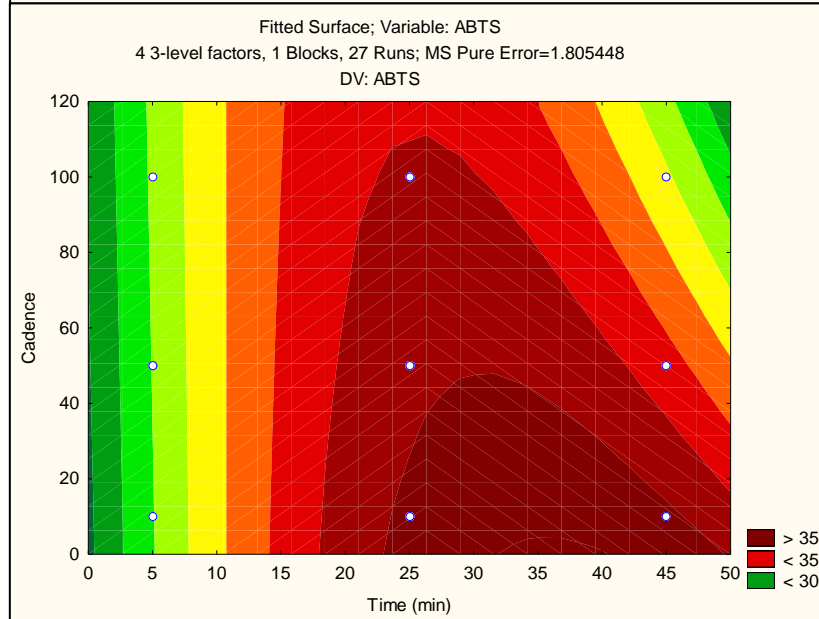
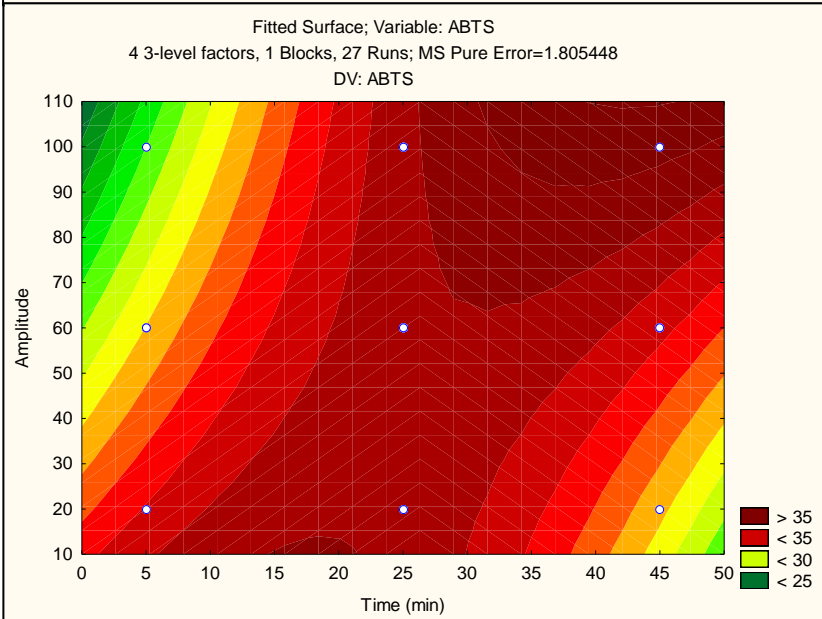
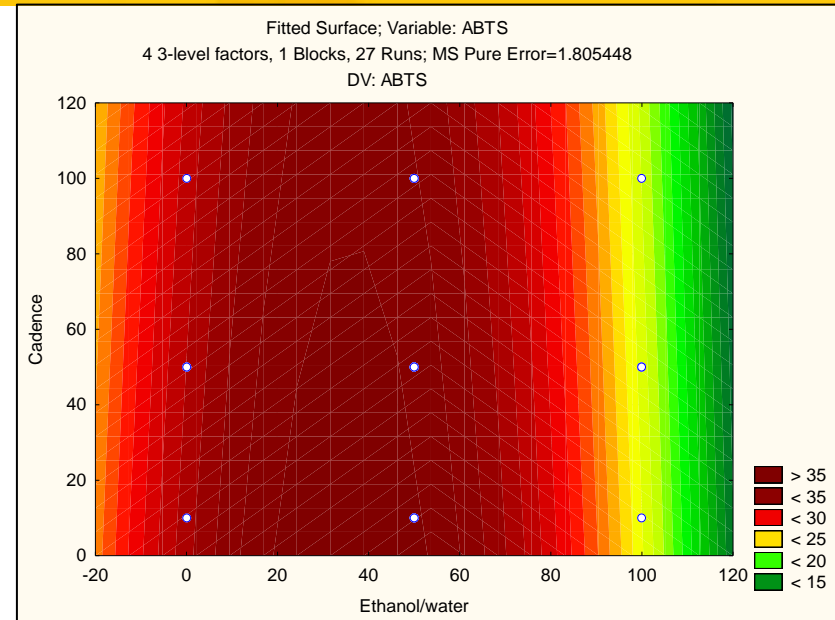
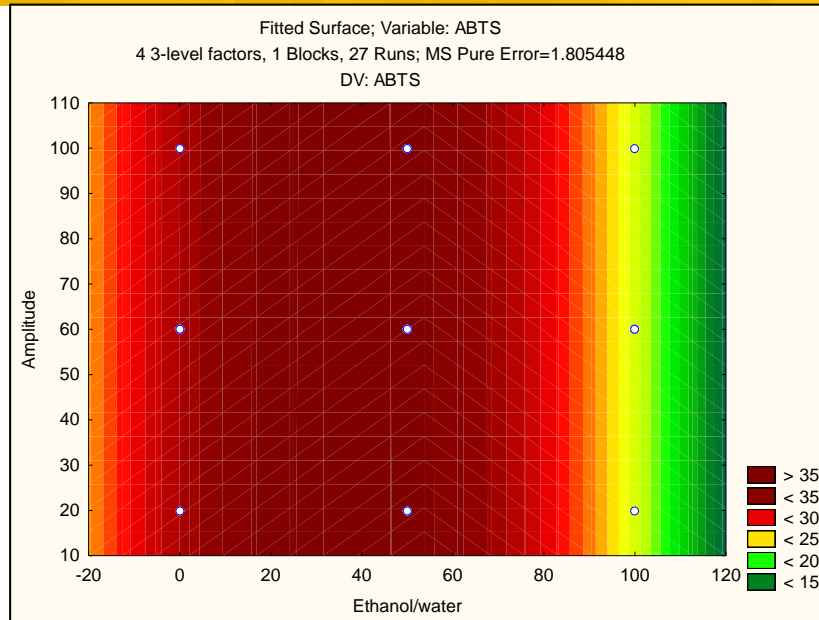
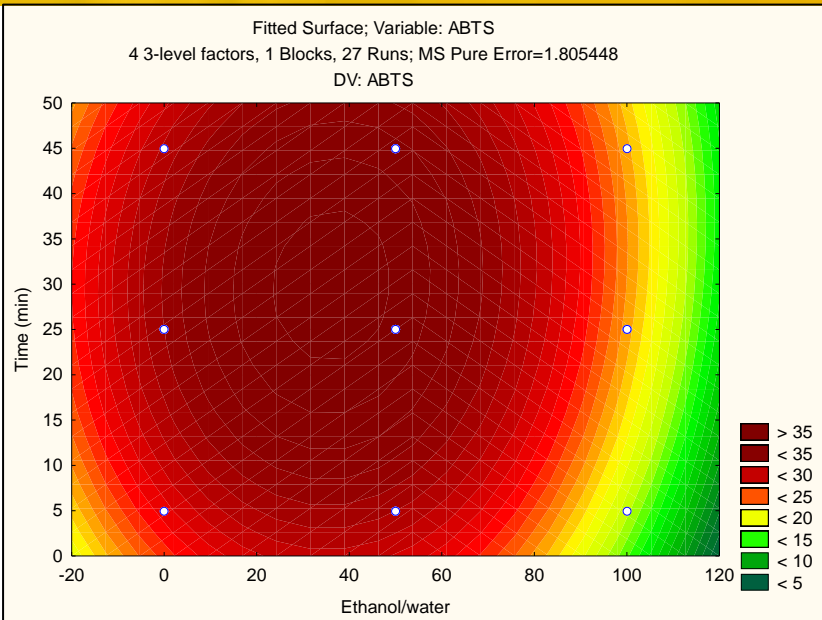
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2. RESULTS AND DISCUSSION



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ANOVA	TPC	ABTS	DPPH
R ²	0.9564	0.9286	0.8694
<i>p</i> Regression model	0.0011	0.0043	0.0001
<i>p</i> Lack of fit	0.1522	0.2624	0.1117

Parameter	Optimal conditions		
Ethanol/water (% (v/v))	45		
Time (min)	35		
Amplitude (%)	90		
Pulse (%)	100		
	TPC	DPPH	ABTS
Predicted value (mg/g d.w.)	29.36 ± 3.5	24.44 ± 3.6	32.02 ± 7.0
Obtained value (mg/g d.w.)	30.42 ± 1.5	26.37 ± 1.6	35.62 ± 2.1

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