

Supplementary materials

Research on spent coffee grounds: from oil extraction to its potential application in cosmetics.

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Ad. 3.3 Optimization of antioxidant extraction from SCG oil

The precise extraction of antioxidants from SCG oil began by selecting the conditions most frequently appearing in the literature. Our focus was on using methanol as a solvent. It was decided to use the Taguchi method to limit the number of performed experiments. A 3x3 matrix was created consisting of three parameters: extraction time (10, 30 and 60 min), MeOH concentration (40%, 60% and 80%) and oil-to-solvent ratio (1:1, 1:2 and 1:4); based on which 9 extraction variants were prepared presented in Table S1. Next, for each solution obtained after the extraction, the chemical tests of FRAP, DPPH and TPC were conducted.

Table S1. Parameters selected for the antioxidant extraction from SCG oil according to the Taguchi optimization method

No	Oil-to-solvent ratio (v:v)	MeOH concentration [%]	Time [min]
1	1:4	40	10
2	1:4	60	30
3	1:4	80	60
4	1:2	40	30
5	1:2	60	60
6	1:2	80	10
7	1:1	40	60
8	1:1	60	10
9	1:1	80	30

Figure S1 was prepared based on the average values received from the individual variants. According to the presented results, the concentration of antioxidants grew with increasing time and the amount of solvent. The results for the methanol concentration are ambiguous, depending on the performed test, the best concentration may be either 80% (FRAP) or 60% (TPC and DPPH).

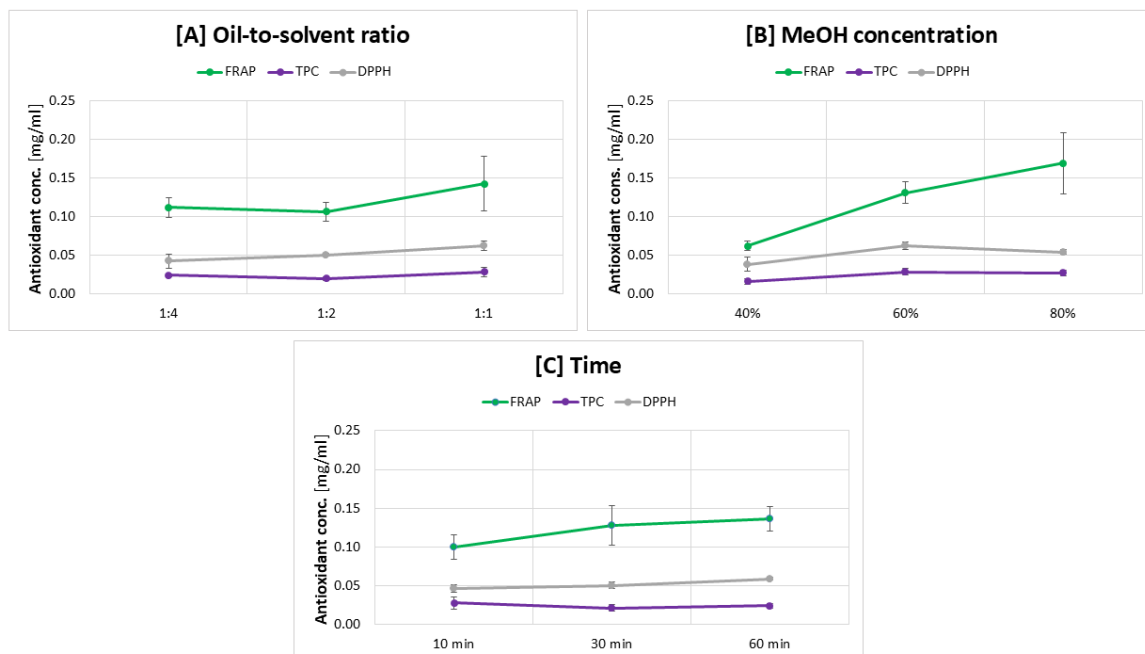


Figure S1. The concentration of antioxidants depending on the oil-to-methanol ratio [A], methanol concentration [B] and extraction time [C], the results are presented in relation to the control ($\text{FeSO}_4 \times 7 \text{H}_2\text{O}$ for FRAP, gallic acid for TPC and trolox for DPPH assay).

Due to the received results, it was decided to perform the extraction several times on the same portion of SCG in order to check the effectiveness of the performed extraction (Figure S2). Unfortunately, the results were not satisfactory. It was often the case that the second extraction gave better results than the first one. Whereas, in most cases, subsequent extractions did not provide a significant decrease in antioxidant concentration, but rather a gradual and moderate decline in concentration. The performed extraction variants were not very effective, however, they were a good introduction to further research.

It was decided to significantly increase the ratio (1:10 and 1:20) and duration of the extraction (4 h and 24 h). These studies are presented in the main part of our article.

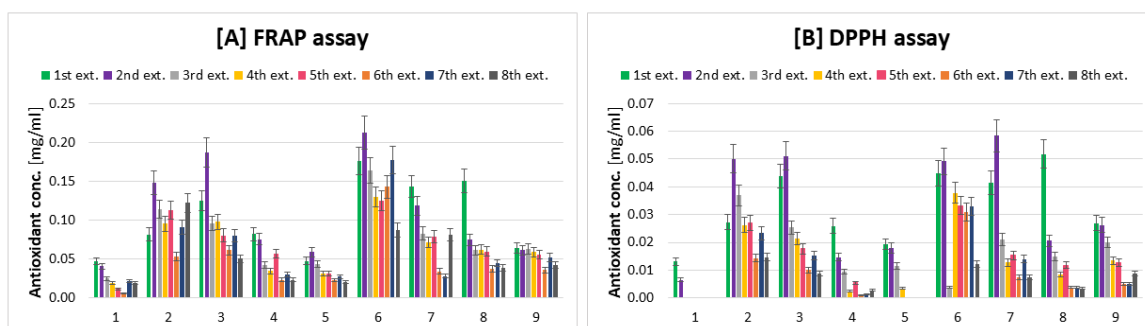


Figure S2. Antioxidant concentration in the subsequent extracts (from the 1st to the 8th extraction for all 9 variants of the Taguchi optimization method) determined by using the FRAP [A] and DPPH [B] assays.