

Determination of piperine in pepper

SpeedExtractor E-914/E-916: Extraction of piperine from pepper

1. Introduction

Pepper is one of the most widely used spice and seasoning. Piperine – the bioactive compound of white, black or long pepper – imparts the spice with its pungency and biting taste [1]. The determination of its content in pepper is of great importance, also for quality control reasons. In the presented application, the sample is extracted with the SpeedExtractor E-916. The total piperine content is determined using UV/Vis spectrophotometry.

2. Experimental

Equipment: SpeedExtractor E-916

Samples:

- Organic long pepper, expected piperine content: 4-5% [1]
- Black pepper, expected piperine content: up to 9% [1]
- Organic black pepper, expected piperine content: up to 9% [1]

Extraction: 0.5 g homogeneous sample was weighed into a 20 mL amber vial, approx. 9 g quartz sand was added and mixed it well with a spatula. The mixture was transferred to an extraction cell using the funnel. The samples were extracted using the SpeedExtractor E-916, applying the parameters specified in Table 1.

Table 1: Parameters for Pressurized Solvent Extraction using the SpeedExtractor E-916

Parameter	Value
Temperature	100 °C
Pressure	100 bar
Solvent	Ethanol 100%
Cells	10 mL
Vials	20 mL, amber
Cycles	2
Heat-up	1 / 1 min
Hold	10 / 2 min
Discharge	2 / 2 min
Flush with solvent	1 min
Flush with gas	2 min



The absorbance of the sample solution is determined and compared to the pure ethanol at 425 nm. The piperine content was calculated based on the absorbance and based on the calibration curve.

3. Results

The determined piperine content is presented in Table 2. The results are in good correlation with the expected values. The low relative standard deviation indicates a complete extraction.

Table 2: Determined piperine content of pepper (rsd: relative standard deviation), n=3

Sample	Piperine content	Mean value	rsd
Long pepper	4.43%, 4.39%, 4.32%	4.38%	1.24%
Black pepper	3.59%, 3.53%, 3.53%	3.55%	1.03%
Organic black pepper	4.33%, 4.39%, 4.38%	4.37%	0.72%



SpeedExtractor E-916

4. Conclusion

Determination of piperine content in pepper by use of the SpeedExtractor E-916 provides reliable and reproducible results. As compared to the method described in AOAC 987.07 [2], the laborious filtration steps after the extraction are omitted using the Pressurized Solvent Extraction.

5. References

- [1] Gorgani, L. et al, Piperine – The Bioactive Compound of Black Pepper: From Isolation to Medicinal Formulations, *Comprehensive Reviews in Food Science and Food Safety*, 16, 124-140, 2017.
- [2] AOAC 987.07 Piperine in Pepper Preparations

For more information, please refer to Application Note 770/2021.