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DIETARY FIBRES AND WATER BINDING CAPACITY OF HIGH VOLTAGE ELECTRICAL DISCHARGE TREATED COCOA SHELL

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Introduction

The chocolate industry, like most other food industries, has a problem with solving the by-product utilisation. The main by-product of the chocolate industry is cocoa shell. It is very rich in fibres and other bioactive components that can be used for other purposes. In the last few years, the process that is increasingly used and tested to treat by-products is high voltage electrical discharge (HVED). HVED is performed between two electrodes submerged in water. Electrical breakdown is spreading from positively to negatively charged electrode, resulting in non-thermal processing of food.

Materials and methods

Preparation of samples

- Cocoa shell was separated from fermented and roasted (135 °C, 55 min) cocoa beans;
- Treated in two concentrations of 1.5 and 3%;
- Control samples were mixed in water for 15, 30 and 45 min;
- HVED treatment was performed in same concentrations for the same time with frequencies of 40 and 80 Hz;
- After the treatment samples were dried (40 °C) and grinded.

Dietary fibers

- Determined according to gravimetric AOAC method 991.43;
- Insoluble dietary fibers were determined gravimetrically after filtration and soluble dietary fibers by precipitation from the obtained filtrate;
- Corrections for undigested proteins and ash were included.

Water binding capacity (WBC)

- Determined by mixing of 2.5 g cocoa shell with 30 mL water;
- Mixing and centrifugation (3000 rpm for 15 min) of solutions;
- Supernatant was decanted and residue weighted.

Particle size

- Determined by sieving 50 g of grinded cocoa shell with analytical sieve shaker (sieve sizes of 50, 71, 100, 125, 200 and 315 µm).

Results

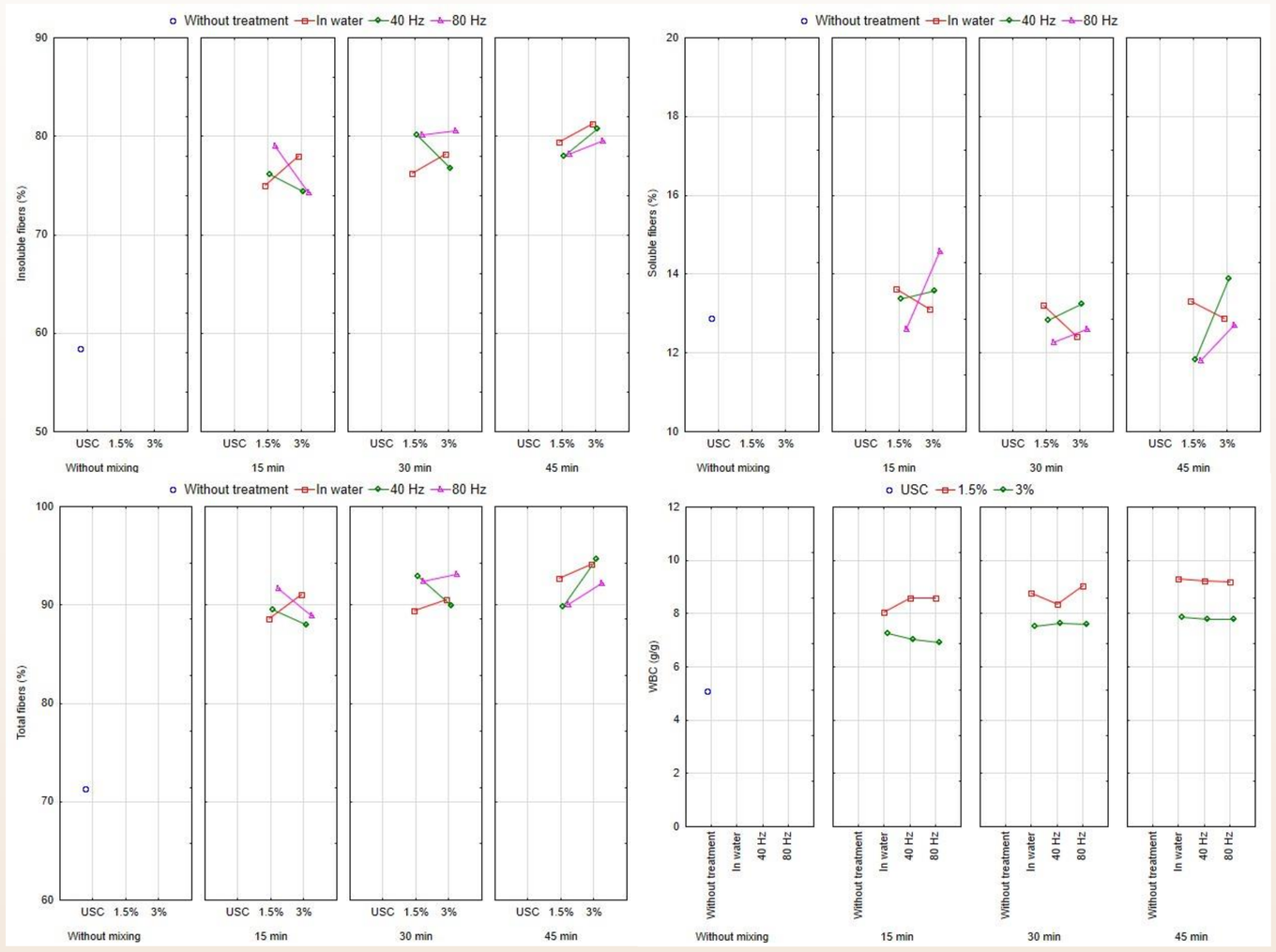

Figure 1 Content of insoluble, soluble and total dietary fibers and water binding capacity of untreated and treated cocoa shell

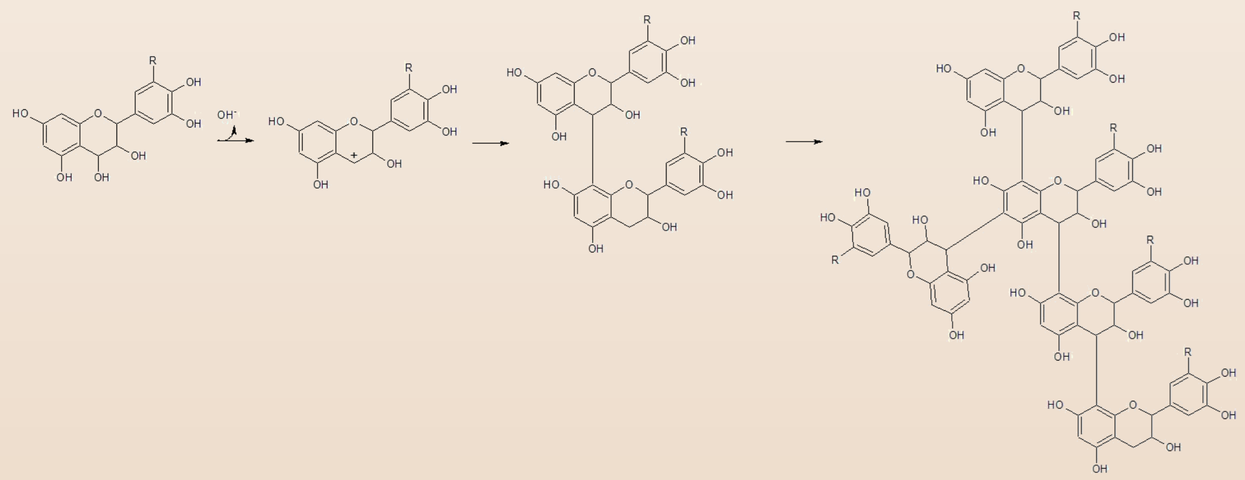

Figure 2 Condensation of polyphenols

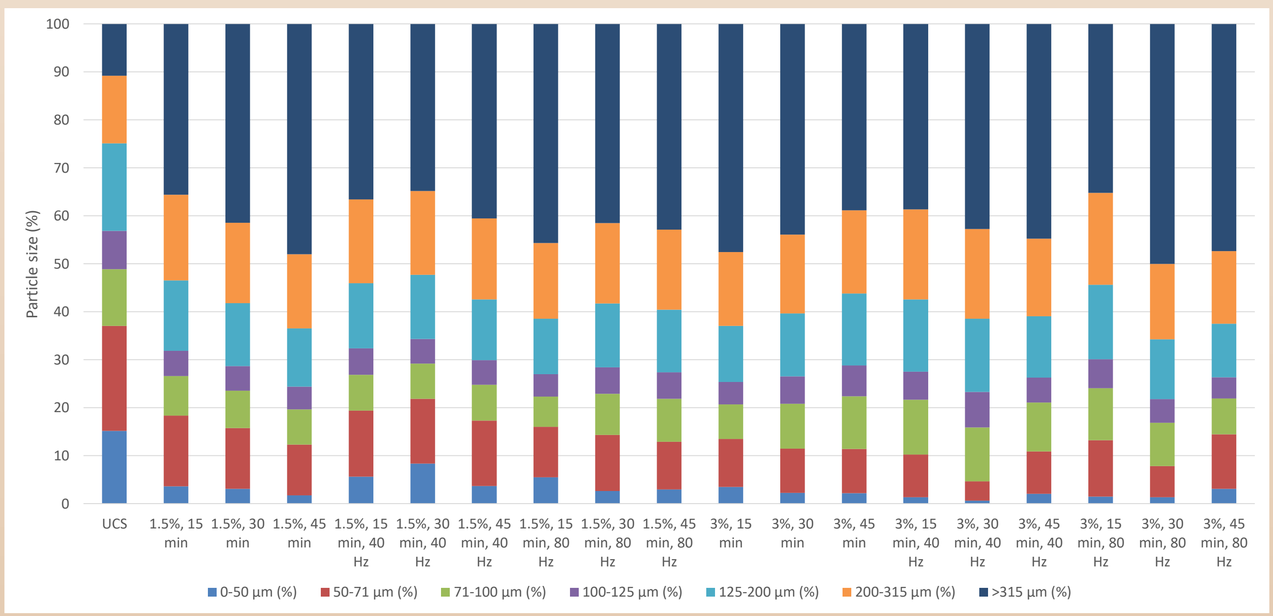

Figure 3 Particle size of grinded samples of untreated and treated cocoa shell

Conclusions

- Insoluble and soluble dietary fibers content increased in treated samples, both in water and HVED treated cocoa shell (**Figure 1**). Insoluble fibers increased more significantly than soluble fibers. HVED generates reactive species which could induce reactions of condensation of catechins to condensed tannins (**Figure 2**) which are insoluble in water.
- Untreated sample had lowest WBC compared to water or HVED treated samples. Samples treated at a concentration of 1.5% had a higher WBC compared to samples treated at a concentration of 3% (**Figure 1**).
- All treatments had a significant effect on particle sizes of samples. Treated samples had higher percentage of particles larger than 315 µm, while untreated cocoa shell had largest percent of particles between 0 and 50 µm (**Figure 3**).

Acknowledgment

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