Ultra-Fine Friction Grinding of Sunflower Kernels – Thereof Tahini and Halva Production and Rheological Characterization

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Abstract. Tahini is a paste obtained by milling the roasted sunflower kernel. Usually, a time and energy consuming two-steps process is involved, a three-roll refiner and a beating machine. The aim of this work was to identify and test a milling process for roasted sunflower kernels with lower time and energy consumption. Different particle size sunflower tahini and halva samples were produced by Ultra-Fine Friction Grinding machine Masuko Sangyo "Supermasscolloider" MKCA6-2 and compared to standard technology. The rheological properties of tahini and textural parameters of halva were assessed. Rheological analysis revealed that all tahini samples produced by "Supermasscolloider" showed a different viscosity profile, as compared to control, the sample milled with the gap set at 100μm being the most viscous and the one at 200μm being the most fluid. When testing the halva samples texture, the sample obtained from the tahini milled at 200μm was clearly highlighted as having the lowest hardness values, while the other samples showed similar texture profiles. The feasibility of using an Ultra-Fine Friction Grinding machine for obtaining sunflower tahini and thereof halva with improved textural properties, was assessed successfully.

Keywords: *halva, milling, sunflower seeds, tahini.*

Introduction. Tahini is a food product which can be used as a condiment, dressing, spread, sauce or as a mixture with different sugar, honey or fruit syrups. The tahini term is usually assigned to sesame paste, but in Central Eastern Europe the sesame seeds have been fully replaced by sunflower kernels, resulting thus sunflower tahini (Mureşan *et al.*, 2015). Sunflower tahini is not very popular as a single food but is intensively used as the major ingredient of sunflower halva - a specific confection containing nougat (sugar and glucose syrup beat in the presence of soapwort extract). Currently, the roasted sunflower kernels are milled industrially into tahini by a time and energy consuming two-steps process, a three-roll refiner and a beating machine. For research purposes, Mureşan *et al.* (2014) reported the use of a colloidal mill for obtaining different particle size tahini.

Aims and objectives. The aim of this work was to identify and test a milling process for roasted sunflower kernels with lower time and energy consumption as compared to the one used currently by industry.

Materials and methods. Ultra-Fine Friction Grinding machine "Supermasscolloider" MKCA6-2 (Masuko Sangyo, Kawaguchi, Japan) was used to obtain tahini samples at pilot plant scale. The mill characteristics were: motor 1.5Kw, 3P; grinder diameter φ 150mm; standard capacity 35 – 120 kg/h.

By increasing the gap between the mills stones from 100 to 200μm, different sunflower tahini samples were obtained (T100μm, T150μm and T200μm). A reference tahini sample (TC) was produced industrially by classical technology, three-roll refiner and a beating machine (Mureşan *et al.*,

Tab. 1. The viscosities of tahini samples, measured at 25°C

Tahini samples	Viscosity interval [mPa•s]			
	60 rpm		15 rpm	
Control	36133	32666	63466	52800
T100µm	47733	59466	120533	102400
T150µm	41333	49600	101333	73600
T200µm	35600	50133	97066	87466

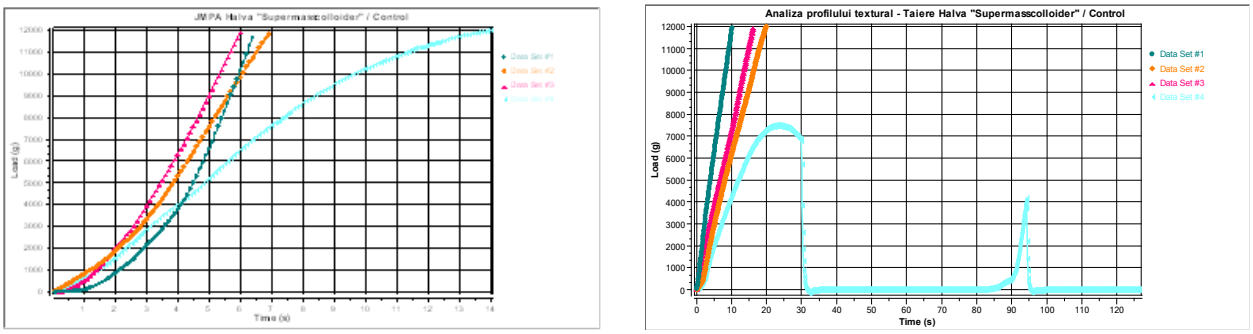

Fig. 1. Halva compression test performed by using junior multiple puncture assembly (A) and Texture profile analysis by using TA7 Blade geometry (B)
Note: #1 – control; #2 – HT100µm; #3 – HT150µm; #4 – HT200µm

2013). Nougat was obtained industrially by beating a concentrated sugar and glucose syrup with soapwort extract. From each tahini sample, correspondent sunflower halva (HC, H100µm, H150µm and H200µm) were produced by kneading the obtained tahini samples with nougat.

The rheological properties of tahini samples were assessed at 25°C, during 120s, using a Brookfield DV-III Rheometer equipped with HB06 geometry. For each sample two measurements were done (high and low rotation speed), at 60 rpm and 15 rpm, respectively. The textural properties of halva samples were assessed by a compression simple test (junior multiple puncture assembly) and texture profile analysis (TA7 Blade geometry) by using Brookfield CT3 Texture Analyzer, test and return speeds being set to 0.5mm/s, while the target value was the samples deformation at 15mm.

Results and Discussion. Rheological analysis revealed that sample TC had a different viscosity profile as compared to T100µm, T150µm and T200µm which were grouped in the same range. However, among the new samples obtained, a ranking can be achieved considering T100µm the most viscous and T200µm the most fluid (Table 1).

When testing the halva samples texture, sample H200µm was clearly highlighted as having the lowest hardness values, while the other samples showed similar texture profiles, according to their hardness being ranked Control>HT150µm>HT100µm (Figure 1).

Conclusion. The present work demonstrated the feasibility of using Ultra-Fine Friction Grinding machine for obtaining sunflower tahini and thereof halva with improved textural properties.

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