

Pre-test report

Sesame seed heating and drying

Client: Tarboosh Restaurant

August 15 2024



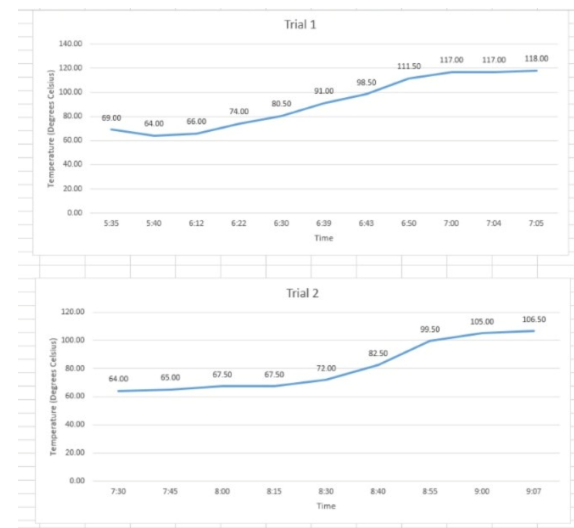
Backgrounds

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- Tarboosh Restaurant is making tahini using sesame seeds. Wet hulling, drying, and roasting processes are currently applied in the tahini production. After the hulling process, Tarboosh Restaurant removes excess moisture to prevent the oozing effect during roasting and drying. Therefore, Tarboosh Restaurant wants to try the microwave heating method to improve their product's quality..
- As first step, Sairem conducted how sesame seed from Tarboosh Restaurant behave in microwave.

Objective

- Determine microwave heating effect on Sesame seeds by checking moisture contents after microwave and oozing effect
- Check the temperature increasement during heating



Temperature trends during roasting process by Bassam



Grinding video from Tarboosh Restaurant

Backgrounds

Test Equipment: FL12000 *(Check details on the last slide)*

- 2450 MHz microwave batch processing machine
- Maximum power 12 kW
- Rotational mode and air extraction mode
- On/Off cycle can be applied.

Sample and process condition

- Sesame seeds
- Checked sample every 30 seconds
- Aim to reach target temperature between 106 to 114 °C

Analysis

- Temperature: Thermal camera and fiber optic sensor
- Moisture content: Moisture analyzer (120 °C until equilibrated)
- Appearance: check via unaided vision



FL12000
(2450 MHz)



**Sesame seed from
Tarboosh Restaurant**

Test results - Overview

Moisture contents

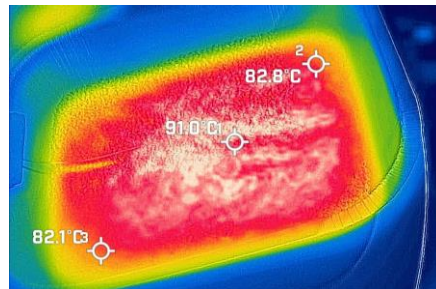
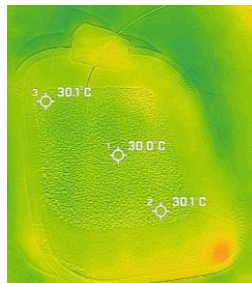
- Initial moisture content ($M.C._{int}$): **$4.31 \pm 0.38\%$** (No changes in moisture during three days of storage)
- Final moisture contents ($M.C._{final}$): **$1.55 \pm 0.35\%$**

Appearance of product

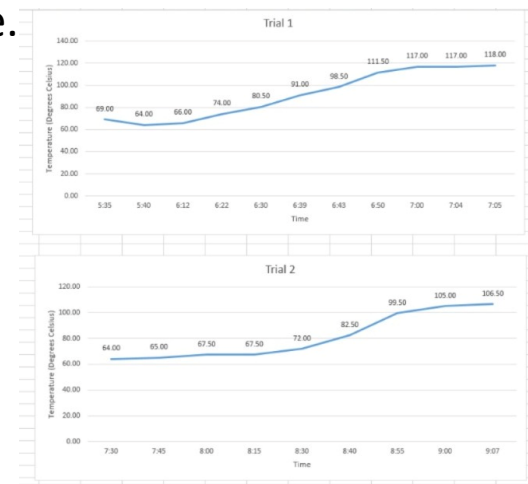
- There is no changes in the color of sesame after processing
- No oozing (leakage of oil) was not observed, not sticky or oil feeling at any conditions

Heating

- The temperature can reach the target level in a short time.
- Heating rate could be controlled by on/off cycle
- Max temp. could reach at $>130^\circ\text{C}$



The sample temperature increased uniformly overall and it has a potential to improve it more in continuous system.

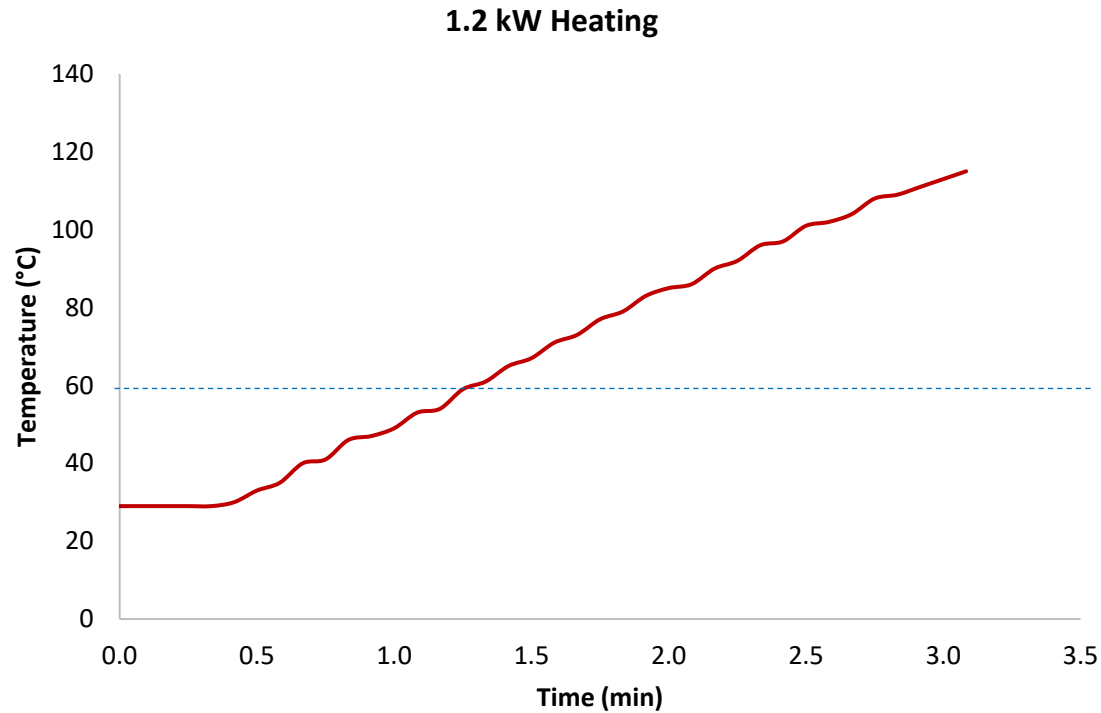


Temperature trends during roasting process by Bassam



Sesame seed after microwave processing

Test results – Temperature trends



Trends of moisture contents

Test	Processing time/step (min)	M.C. (%)
0.6 kW	6	3.60
	18	1.70
	24	1.55
1.2kW	9.5	2.20
	14.5	1.34

*Initial moisture contents: average 4.31%

Fastest condition

- Temperature can reach from 60 to 110 °C within 2-3 min for 100g of sample by 1.2 kW
- To reach the target moisture it takes 15-25 min at 0.6 and 1.2kW conditions in FL12000





Summary for pre-test

Sesame seeds could reach the target process goal using microwave heating

- Microwave was applied to sesame seeds using FL12000 (2450MHz batch system).
- Despite the low moisture content of sesame seeds, the sample was heated rapidly, and we confirmed that the desired moisture content and temperature could be closely achieved.
- Heating rate and heating curve could be adjusted by on/off function and power of microwave in the future.
- The result demonstrates the potential to replace the current roasting process (based on the discussion with Bassam, microwave processing is expected to alternate roasting process).

Next step

- In the pre-test, we used already dried seeds which is different with current process. Thus, we need to receive the samples from Tarboosh Restaurant again.
- Actual sesame seed (after hulling) should be tested to reach target quality of product and mimic current roasting process.

LABOTRON FL12000

FL12000 is designed for industrial laboratory use for the development of new processes requiring heating, drying, or sanitizing capabilities.

Key features

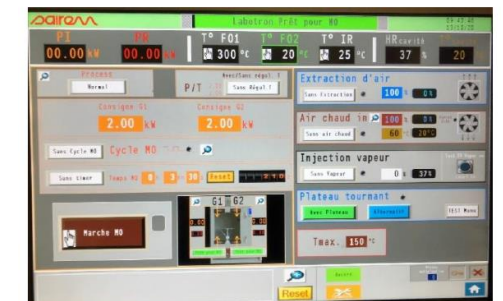
- 2450 MHz Magnetron generator
- Good homogeneity even with thick products: microwave generators installed on the top and at the bottom of the oven cavity.
- Monitoring of the process: integrated product temperature measurement.
- Ventilation, Hot air, Steam and Infrared options are available.

General application

- General heating, Drying, Disinfection, Debacterization, and Pasteurization



Infrared option



Touch screen panel

