

Test report

Sesame seed heating and drying

Client: Tarboosh Restaurant

October 28 2024





Backgrounds

Backgrounds

- In the previous test, Sairem conducted trials using sesame seeds without soaking process. The results showed that microwave heating could quickly raise the temperature of the sesame seeds to the target temperature, reducing their moisture content to about 1%. Additionally, there was no noticeable oozing effect or significant color change during the process.
- For the next test, we followed the conditions suggested by Tarboosh Restaurant (details provided in the following slides).

Objective

- To determine the quality changes in sesame seeds under different processing conditions if there are oozing effect or any negative quality changes.

Backgrounds

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

- 2450 MHz microwave batch processing machine
- Setting power 1.2 kW
- On Rotational mode and air extraction mode
- Temperature regulation function were applied.

Sample and process condition

- Sesame seeds 200g with **thickness 10-15 mm**
- Checked sample every 30 seconds
- Aim to reach target temperature between 112 to 120 °C
Detailed test conditions are described in the next slides

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**



Methods

Trial list suggested from Tarboosh

- A. Run sesame seeds without soaking at 110-118°C for approximately 1 hour and observe any changes in color or oozing.
- B. Soak sesame seeds in hot water until they reach an average moisture content of 30-35%*. Then, process them at 110-118°C, observing any caking, porous texture formation, or changes in color.
- C. Soak the sesame seeds in hot water until they reach an average moisture content of 30-35%. Then, microwave them at 55°C for 10 minutes, followed by 65, 75, 85, 95°C, and finally 110-118°C, each for 10 minutes.
- D. Soak the sesame seeds in hot water until they reach an average moisture content of 30-35%. Then, microwave process at 110-118 °C. At the initial stage, gentle mixing process were applied.



Methods

Soaking process

A. Put sesame seeds in hot water (hot water temperature was about 70 °C) for 10 min



B. After soaking, Drain the excess water from soaked sesame seeds using a strainer.



C. Waited for one and a half hours to ensure that the sesame seeds absorbed enough water.

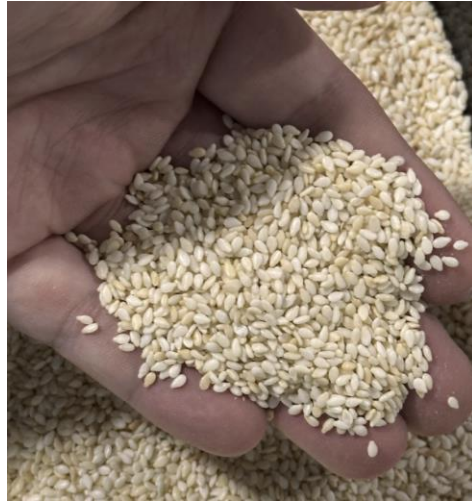




Results: Condition A. No soaking, 1h heating at 110-118 °C



Before test



After test



Observations

A. After processing, color of sesame seeds became a little brown but no burning color or significant changes





Results: Condition A. No soaking, 1h heating at 110-118 °C



Before test



After test
(Video)



Observations

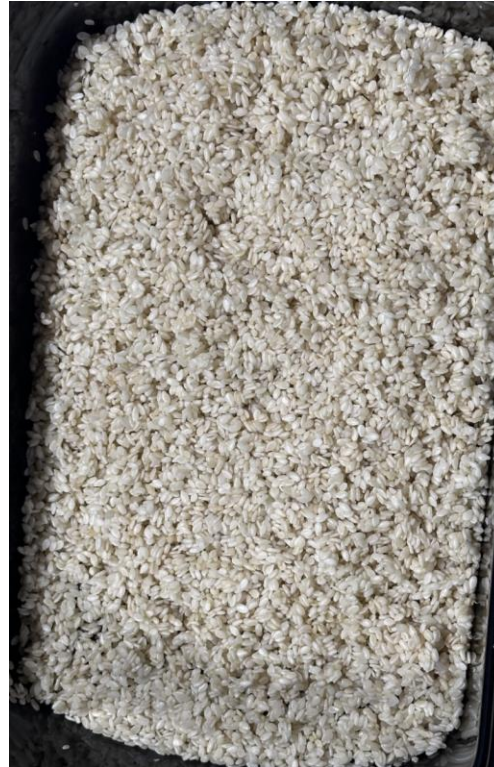
- The color changed slightly to a yellowish or light brown hue, but it did not significantly darken or turn black.
- No oozing effect were observed from the sample (please check the video)
- Final moisture contents: **0.66%**



Results: Condition B. Soaking, 1h heating at 110-118 °C



Before test



After test

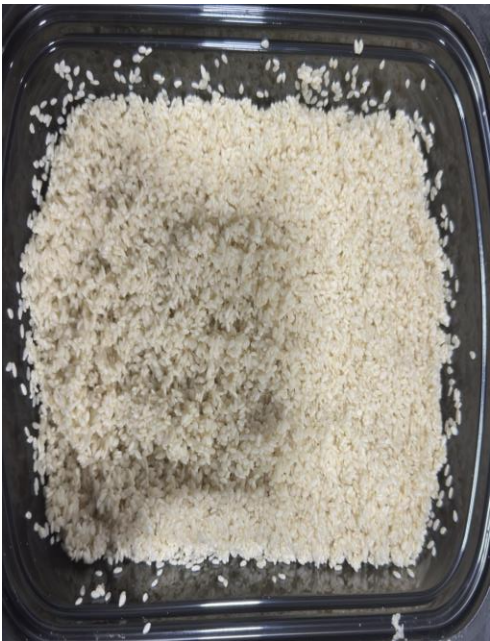


After test (video)

Observations

- After processing and testing, the color did not show significant differences (the photos are close to the actual product color).
- However, caking was observed after processing (check the video for details).
- Final moisture content: **1.84%**.

Results: Condition C. Soaking, Gradually increased temp.



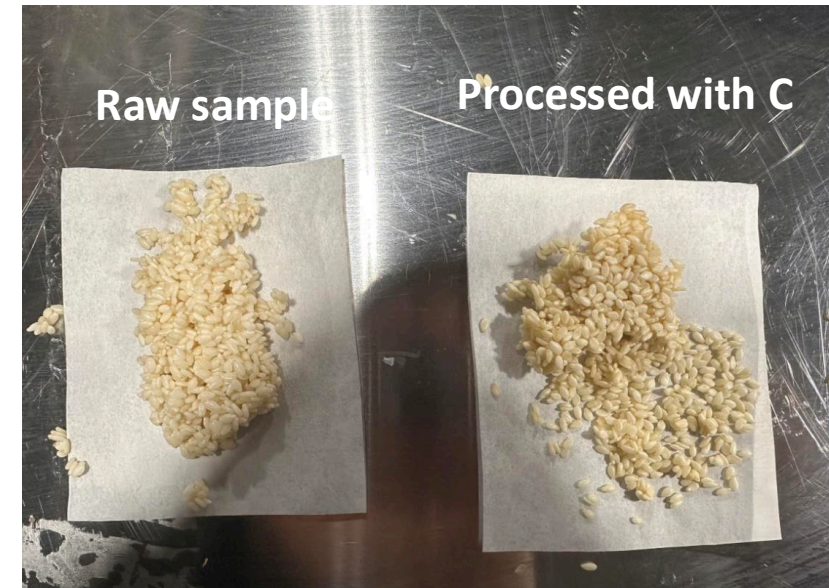
Before test



After the last step
(110-118 °C for 10 min)



After process
(caking effect)



Observations

- The temperature was gradually increased from room temperature (about 20°C) to 55°C and held for 10 minutes. Then, the temperature was held at 65°C, 75°C, 85°C, 95°C, and 110-118°C for 10 minutes at each step.
- The sample showed a caking effect and the highest moisture level. The color was slightly browned. Final moisture content: 4.71%.

Results: Condition D. Soaking, mixing during tests



Before test



Mixing process



Procedures

Time	Reached Temp
2 min	74 °C , then mixing
4 min	100 °C , then mixing
8 min	80-100 °C – on/off cycle
18 min	80-100 °C - on/off cycle
28 min	110 °C
38 min	110 °C

Processing conditions and results

- At the initial stage of drying, we applied gentle mixing using plastic spatula to prevent caking effect.
- Final moisture contents: **1.87%**



Results: Condition D. Soaking, mixing during tests



Before test

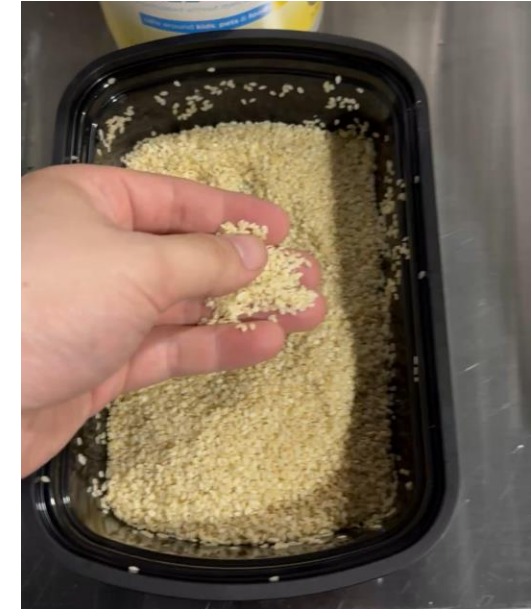


Mixing process



Raw sample

Processed with D



**After process
(video)**

Observations

- The color changed slightly to a yellowish, and it did not significantly darken or turn black like other conditions.
- After processing, there are no caking effect were observed.
- Sesame was very little sticky but not much (please check the video)





Summary

- The moisture content of sesame seeds easily reached between 1-2%. We can also achieve moisture content below 1%, but this would likely require longer processing times or higher power (additional tests are needed).
Alternatively, combined technologies (such as hot air at the end or radio frequency heating) may be necessary.
- There were slight color changes after processing, with the seeds turning a very light yellow or light brown. No burning or defects in appearance were observed.
- Mixing could help prevent the caking effect in the sample.
No significant oozing effect was observed during processing (the seeds were not sticky to the touch after processing).
- All soaked sesame seeds without mixing experienced caking during processing.
At least in the initial stage of drying (or heating), gentle mixing should be applied.



LABOTRON FL12000

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

Key features

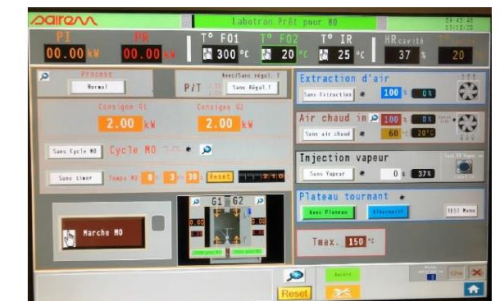
- 2450 MHz Magnetron generator
- Good homogeneity even with thick products: microwave generators installed on the top and at the bottom of the oven cavity.
- Monitoring of the process: integrated product temperature measurement.
- Ventilation, Hot air, Steam and Infrared options are available.

General application

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



Infrared option



Touch screen panel

