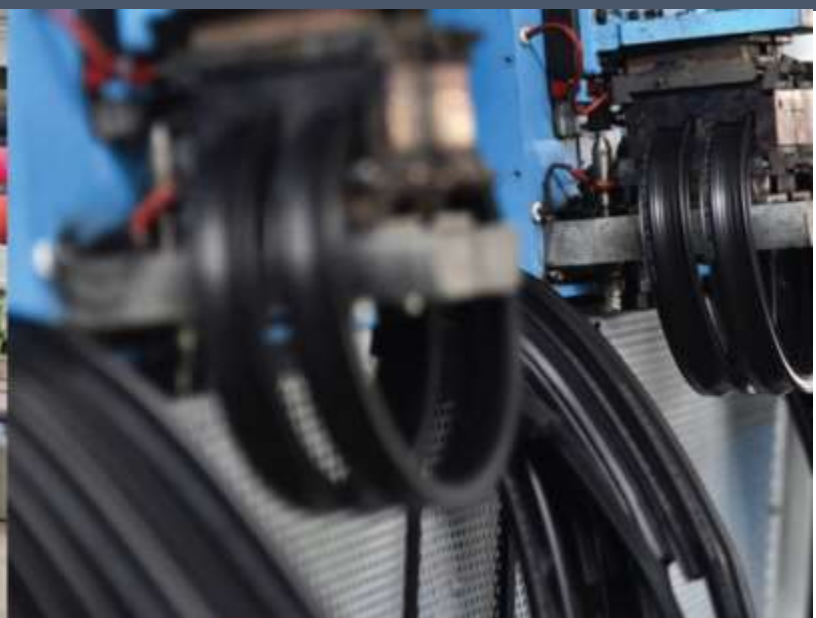


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**Batch Microwave Heat Treatment
for Drying/ Roasting of Semolina**

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| | |
|------------|--|
| Customer : | M/s. Girnar Food & Beverages Pvt. Ltd |
| Process : | Batch Microwave Heat Treatment for Drying/Roasting of Semolina |

Test Report No: 180/KRDC/LAB/17 Mum 23/01/2023

Date Sample reception : 21/01/2023
ID : 180/LAB/23

Sample Description:

Sampling : As Requested
Sample Condition : Acceptable
Sampling date : 21/01/2023
Product : Semolina
Requirement : Roasted Semolina with desired Moisture content 2-3%
Start Date test : 21/01/2023
End Date test : 21/01/2023

Laboratory Experimental System -



Format: F/R&D/01

The value obtained is already corrected for possible recover value stated, if applicable. This document may not be reproduced or disclosed wholly or partly in any part thereof without the written consent of the laboratory management or customer. This document relates only to the specimen samples processed. The processed sample will be kept in this laboratory for 7 days from the date of heat treatment.

System Specifications -

| | |
|---|---|
| Microwave Power | 2 KW (CW) |
| Frequency | 2450 MHz \pm 50 |
| Convective Power | 3.5 KW (airflow 350 I/min at 20°C) |
| Microwave Exposure Zone (Cavity) | 1 Cubic meter |
| Mode Stirrer | One |
| Thermal Monitoring System | Single Channel Fiber Optic: Range - 40 to 250°C |
| Exhaust Power | 1 HP |
| Tray size (width*height*depth) | 450*950*50 mm |

Laboratory's Environmental Conditions -




| | |
|---|---------------------|
| Temperature (degree C) | 29.4°C (\pm 5°C) |
| Humidity (%) | \leq 50% RH |
| Pressure (kN/m² or kPa) | Not recorded |

Note for recommendation: Environmental conditions have a direct impact on test results. Accuracy and consistency of test data are affected by the laboratory conditions

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Equipment Used -

| Name of Equipment | Picture of Equipment | Specifications |
|---------------------------------------|---|--|
| Compact Thermal Imaging Camera |  | Model: FLIR E-30 Resolution: 160x 120IR Thermal sensitivity of 0.10°C |
| Thermo Hygrometer |  | Model No: HTC-2 Temperature accuracy: $\pm^{\circ}\text{C}$ (1.8°F) Temperature resolution: 0.1°C (0.2°F) Humidity range: 10%~99% RH Humidity accuracy: $\pm 5\%$ RH Humidity resolution: 1% RH |
| Moisture Analyzer |  | Make: Axis Balance Description: Moisture range: 1%(sample 0.02/0.05g), 0.1% (Sample 0.5/5g), 0.01%(Sample>5g) |

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Procedure of the Experiment -

- The experiment was performed on Semolina to speed up the heating rate.
- For this experimental run, the given sample was taken in the glass tray and placed in the MW heating system with suitable parameters.
- After the heating treatment, the sample was analyzed.

Analytical Results:

Trials 1 –

Initial Weight- 300g

Initial Moisture- 11.1%

| Cycles | Cycle time (mins.) | Specifications of Microwave | Moisture Content (%) | On product Temperature (°C) | Remark |
|--------|--------------------|--|----------------------|-----------------------------|--------------------|
| 1 | After 5 mins. | Magnetron Power: 1 Kw; Set temp.-70°C | 9.2 | (85-90) | Drying Started |
| 2 | After 10 mins. | Magnetron Power: 1 Kw; Set temp.-70°C | 5.7 | (90-93) | Drying Continuous |
| 3 | After 15 mins. | Magnetron Power: 1 Kw; Set temp.-70°C | 4.6 | (100-103) | Drying Continuous |
| 4 | After 20 mins. | Magnetron Power: 1 Kw; Set temp.-70°C | 3.7 | (100-113) | Drying Continuous |
| 5 | After 25 mins. | Magnetron Power: 1 Kw; Set temp.-70°C | 2.2 | (100-123) | Roasted as desired |

Final Weight- 227g

Final Moisture- 2.2%

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Trials 2 –

Initial Weight- 300g

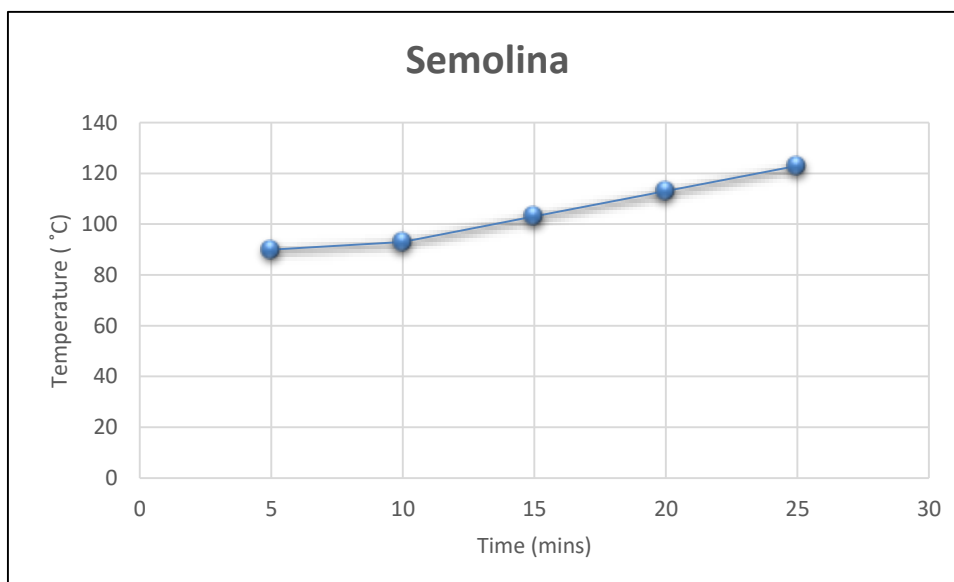
Initial Moisture- 11.1%

| Cycles | Cycle time (mins.) | Specifications of Microwave | Moisture Content (%) | On product Temperature (°C) | Remark |
|--------|--------------------|--|----------------------|-----------------------------|--------------------|
| 1 | After 22 mins. | Magnetron Power: 1 Kw; Set temp.-70°C | 1.7 | (110-146) | Roasted as desired |

Final Weight- 272g

Final Moisture- 1.7%

Time Temperature Profile:



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Moisture Analysis Report:

| Trial 1 | | Trial 2 | |
|--|--|---|--|
| <p>Drying started</p> <p>Date : 21-01-2023 Time : 14:14:31 Model : A05200 Serial number : 138</p> <p>Drying parameters</p> <p>Product : 0</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard Mode : Short mode Calculation : $((w0-w)/w0)*100\%$ Finished : 3 samples</p> <p>Initial weight : 0.673 g Final weight : 0.598 g Drying time : 00:01:40s Sampling interval : 20 sec Moisture : 11.1 %</p> <p>NOTE Initial moisture</p> <p>The analysis performed by:</p> <p>Signature: <i>Angali</i></p> | | <p>Drying started</p> <p>Date : 21-01-2023 Time : 14:14:31 Model : A05200 Serial number : 138</p> <p>Drying parameters</p> <p>Product : 0</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard Mode : Short mode Calculation : $((w0-w)/w0)*100\%$ Finished : 3 samples</p> <p>Initial weight : 0.663 g Final weight : 0.668 g Drying time : 00:02:00s Sampling interval : 20 sec Moisture : 2.2 %</p> <p>NOTE Final moisture</p> <p>The analysis performed by:</p> <p>Signature: <i>Angali</i></p> | |

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Images during trials:



Untreated Sample

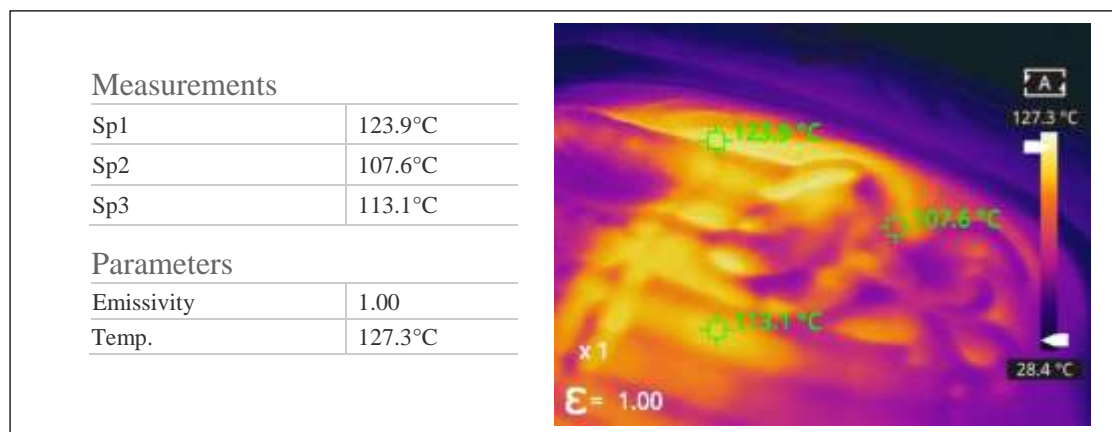
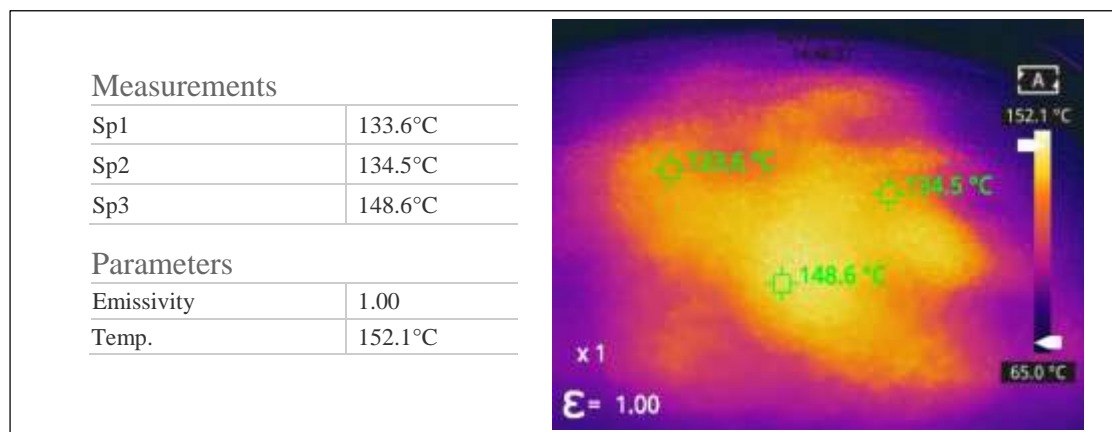


Treated Sample (Trial 1, Trial 2)

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Thermal Images:



Observations:

The heating behavior of Semolina was investigated under the Microwave heating system. The heating rate was found to be increasing with respect to the increase in time. As per the physical investigation, it was observed that the product was not roasted as desired without a charring effect. Also, the taste and aroma were retained after the treatment.

Asali

Ms. Sayali Asole
(Tested By)