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Kerone Research & Development Centre (KRDC)
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Batch Microwave Heat Treatment for Sterilization and Drying of Fenu Flakes

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Customer :	**M/s. Indus Biotech Limited**
Process :	**Batch Microwave Heat Treatment for Sterilization and Drying of Fenu Flakes**

Test Report No*: *163/KRDC/LAB/17 Mum 20/12/2022

Date Sample reception : 12/12/2022
ID : 163/LAB/20

***Sample Description*:**

Sampling : As Requested
Sample Condition : Acceptable
Sampling date : 19/12/2022
Product : Fenu Flakes
Start Date test : 19/12/2022
End Date test : 20/12/2022

Laboratory Experimental System -

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System Specifications -

Microwave Power	2 KW (CW)
Frequency	2450 MHz ± 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)	29.4ºC (±5ºC)
Humidity (%)	≤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: ±°C (1.8°F)** **Temperature resolution: 0.1°C (0.2°F)** **Humidity range: 10%~99% RH** **Humidity accuracy: ±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 Fenu Flakes to speed up the heating rate.
- For this experimental run, the given sample was placed in the MW heating system with suitable parameters.
- After the heating treatment, the sample was analyzed.

Analytical Results:

Trial 1 –

Initial Wt. – 280g

Initial Moisture – 9.7%

Cycle	Cycle Time	Specifications of Microwave	Moisture Content (%)	Remark
C1	5 mins.	Magnetron Power: 0.8 kW; Set temp: 70ºC	6.7%	No Charring No Burning Smell On product temp: (52-60) ˚C
C2	10 mins.	Magnetron Power: 0.8 kW; Set temp: 70ºC	5.9%	No Charring No Burning Smell On product temp: (60-67) ˚C
C3	15 mins.	Magnetron Power: 0.8 kW; Set temp: 70ºC	5.3%	No Charring No Burning Smell On product temp: (65-70) ˚C

Final Wt. – 265g

Final Moisture – 5.3%

Total time taken – 15 mins.

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Trial 2 –

Initial Wt. – 220g

Initial Moisture – 11%

Cycle	Cycle Time	Specifications of Microwave	Moisture Content(%)	Remark
C1	5 mins.	Magnetron Power: 1.8 kW; Set temp: 70ºC	5.2%	No Charring No Burning Smell On product temp: (65-70) ˚C
C2	10 mins.	Magnetron Power: 1.8 kW; Set temp: 70ºC	5.1%	No Charring No Burning Smell On product temp: (65-70) ˚C
C3	15 mins.	Magnetron Power: 1.8 kW; Set temp: 70ºC	4.4%	No Charring No Burning Smell On product temp: (65-70) ˚C
C4	20 mins.	Magnetron Power: 1.8 kW; Set temp: 70ºC	4.1%	No Charring No Burning Smell On product temp: (65-70) ˚C
C5	25 mins.	Magnetron Power: 1.8 kW; Set temp: 70ºC	3.8%	No Charring No Burning Smell On product temp: (65-70) ˚C
C6	30 mins.	Magnetron Power: 1.8 kW; Set temp: 70ºC	3.4%	No Charring No Burning Smell On product temp: (65-70) ˚C
C7	35 mins.	Magnetron Power: 1.8 kW; Set temp: 70ºC	2.4%	No Charring No Burning Smell On product temp: (65-70) ˚C
C8	40 mins.	Magnetron Power: 1.8 kW; Set temp: 70ºC	1.6%	No Charring No Burning Smell On product temp: (65-70) ˚C

Final Wt. – 196g

Final Moisture – 1.6%

Total time taken – 40 mins.

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Images during trials:

Untreated

Treated (Trial 1, Trial 2)

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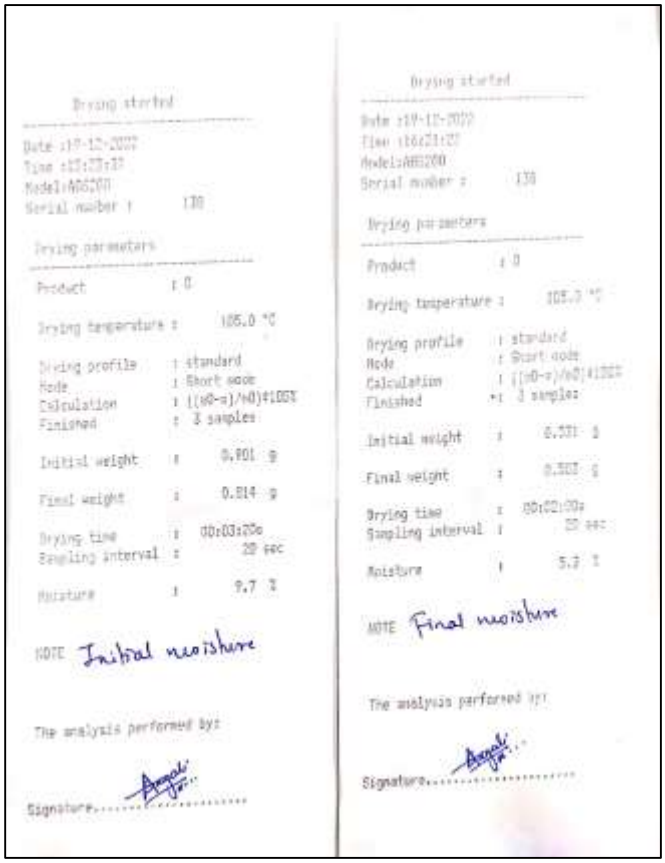
Moisture Report:

Trial 1



Trial 2

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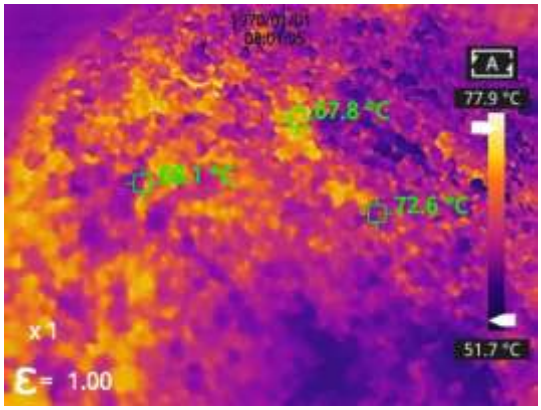
Thermal Images:

Measurements	
Sp1	67.8°C
Sp2	68.1°C
Sp3	72.6°C

Parameters	
Emissivity	1.00
Temp.	77.9°C



Observations:

The heating behavior of Fenu Flakes was investigated under the Microwave heating system. The heating rate was found to be increasing with respect to increasing in time. As per the physical investigation, it was observed that the sterilization of the product was achieved without any charring effect. The crispiness was obtained as desired.

Ms. Sayali Asole
(Tested By)