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Kerone Research & Development Centre (KRDC)
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Continuous Rotary IR Heat Treatment for Drying of Fenu Flakes

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Customer :	**M/s. Indus Biotech Limited**
Process :	**Continuous Rotary IR Heat Treatment for Drying of Fenu Flakes**

Test Report No*: *164/KRDC/LAB/17 Mum 20/12/2022

Date Sample reception : 19/12/2022
ID : 164/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 Specification -

IR Power	5 kW
Type of IR Emitters	Quartz Infrared
Rotary Drum Size	Φ324 mm x 800 mm long x 3mm Thick.
Thermal Monitoring System	Single Channel Fiber Optic: Range -40 to 250ºC
Exhaust	Exhaust port with manual damper
Air Circulation Fan	Radial Fan FHP 0.5HP

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 sample was treated in the Continuous Rotary IR Heating System under different parameters.
- After the heating treatment, the sample was analyzed.

Analytical Results:

Trial 1 –

Initial Wt. – 280g

Initial Moisture – 9.7 %

Cycle	Heat Exposure Time	Specifications of Microwave	Moisture Content (%)	Remark
C1	10 mins 40 sec	Set temp: 100ºC; Drum speed:0.52 rpm	5.9%	No Charring No Burning Smell On product temp: (52-65) ˚C

Final Wt. – 210g

Final Moisture – 5.9%

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Trial 2 –

Initial Wt. – 220g

Initial Moisture – 11 %

Cycle	Heat Exposure Time	Specifications of Microwave	Moisture Content (%)	Remark
C1	13 mins 57 sec	Set temp: 150ºC; Drum speed:0.38 rpm	4.3%	No Charring No Burning Smell On product temp: (60-70) ˚C
C2	27 mins 54 sec	Set temp: 150ºC; Drum speed:0.38 rpm	2.4%	No Charring No Burning Smell On product temp: (60-72) ˚C
C3	41 mins 51 sec	Set temp: 150ºC; Drum speed:0.38 rpm	1.3%	No Charring No Burning Smell On product temp: (60-72) ˚C
C4	55 mins 48 sec	Set temp: 150ºC; Drum speed:0.38 rpm	0.8%	No Charring No Burning Smell On product temp: (60-74) ˚C

Final Wt. – 152g

Final Moisture – 0.8%

Images during Trials:

Untreated Sample

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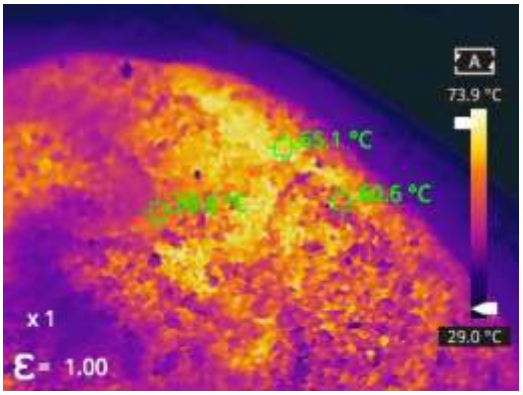
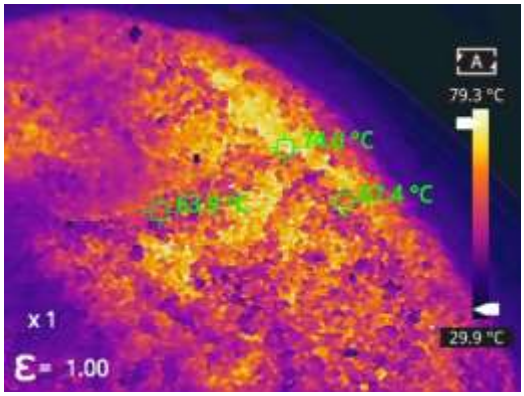
Treated Sample (Trial 1, Trial 2)

Thermal Images:

Measurements	
Sp1	65.1°C
Sp2	60.6°C
Sp3	58.6°C
Parameters	
Emissivity	1.00
Temp.	73.9°C



Measurements	
Sp1	63.9 °C
Sp2	67.4°C
Sp3	74.0°C
Parameters	
Emissivity	1.00
Temp.	79.3°C



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Moisture Report:

Trial 1

Drying started

Drying parameters

Product : 0

Drying temperature : 105.0 °C

Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples

Initial weight : 0.901 g

Final weight : 0.814 g

Drying time : 00:03:20s
Sampling interval : 20 sec

Moisture : 9.7 %

NOTE Initial moisture

The analysis performed by:

Signature.....

Drying started

Drying parameters

Product : 0

Drying temperature : 105.0 °C

Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples

Initial weight : 0.865 g

Final weight : 0.814 g

Drying time : 00:02:20s
Sampling interval : 20 sec

Moisture : 5.9 %

NOTE Final moisture.

The analysis performed by:

Signature.....

Trial 2

Drying started

Drying parameters

Product : 0

Drying temperature : 105.0 °C

Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples

Initial weight : 0.500 g

Final weight : 0.445 g

Drying time : 00:02:20s
Sampling interval : 20 sec

Moisture : 11 %

NOTE Initial moisture

The analysis performed by:

Signature.....

Drying started

Drying parameters

Product : 0

Drying temperature : 105.0 °C

Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples

Initial weight : 0.895 g

Final weight : 0.801 g

Drying time : 00:01:40s
Sampling interval : 20 sec

Moisture : 8.8 %

NOTE Final moisture.

The analysis performed by:

Signature.....

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Observations:

The heating behavior of Fenu Flakes was investigated under the IR heating system. The heating rate was found to be increasing with respect to the increase in time. As per the physical investigation, the Flakes dried without any charring effect, and moisture content was obtained as desired. The crispiness was also obtained as desired.

Ms. Sayali Asole
(Tested By)