KERONE

A CRISIL-NSIC RATED COMPANY
ISO-9001-2008 COMPANY

Member Of

AIMCAL (USA) (EUROPE)

A.M.P.E.R.E

In Association With

EMitech

Kerone Research & Development Centre (KRDC)
B/47, Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com

Batch Microwave Heat Treatment for Drying of Jaggery Powder

Kerone Research & Development Centre (KRDC)
B/47,Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com

Customer :	**M/s. Girnar Food & Beverages Pvt. Ltd**
Process :	**Batch Microwave Heat Treatment for Drying of Jaggery Powder**

Test Report No*: *181/KRDC/LAB/17 Mum 23/01/2023

Date Sample reception : 21/01/2023
ID : 181/LAB/23

***Sample Description*:**

Sampling : As Requested
Sample Condition : Acceptable
Sampling date : 21/01/2023
Product : Jaggery Powder
Requirement : Dried Jaggery powder with desired Moisture content 1-2%
Start Date test : 21/01/2023
End Date test : 21/01/2023

Laboratory Experimental System -

Kerone Research & Development Centre (KRDC)
B/47,Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com

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

Kerone Research & Development Centre (KRDC)
B/47,Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com

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)**

Kerone Research & Development Centre (KRDC)
B/47,Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com

Procedure of the Experiment -

- The experiment was performed on Jaggery Powder 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- 3.8%

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	0.6	(55-56)	Dried as desired (Some lump formations with a moisture content of 1.6%)

Final Weight- 291g
Final Moisture- 0.6%

Trials 2 –

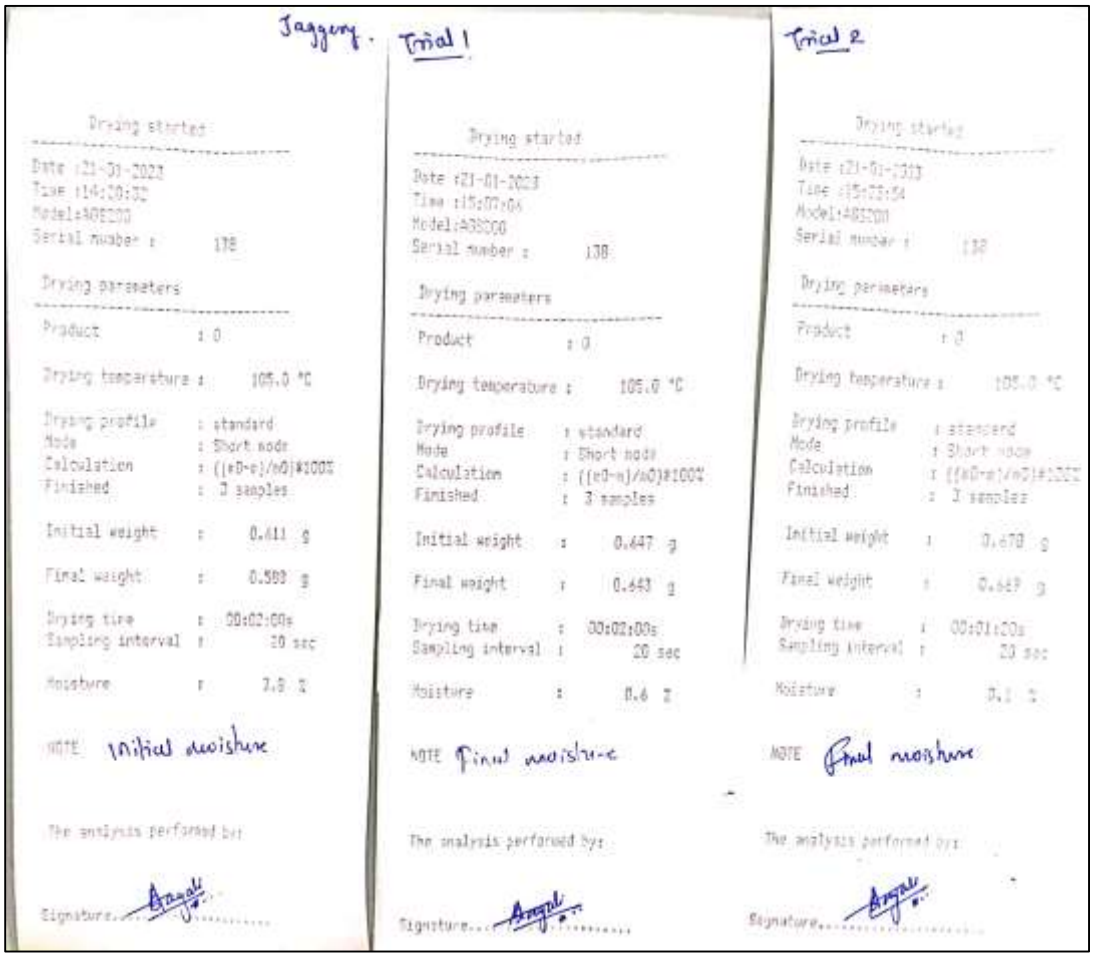
Initial Weight- 300g
Initial Moisture- 3.8%

Cycles	Cycle time (mins.)	Specifications of Microwave	Moisture Content (%)	On product Temperature (˚C)	Remark
1	After 7 mins.	Magnetron Power: 1 Kw; Set temp.-70˚C	0.15	(60-70)	Dried as desired

Final Weight- 298g
Final Moisture- 0.15%

Kerone Research & Development Centre (KRDC)
B/47,Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com

Moisture Analysis Report:



Jaggery.

Trial 1

Drying started
Date :21-01-2023
Time :15:07:06
Model:AD3000
Serial number : 138

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 : 0.647 g
Final weight : 0.643 g
Drying time : 00:02:00s
Sampling interval : 20 sec
Moisture : 0.6 %

NOTE Final moisture

The analysis performed by:

Signature: Angali

Trial 2

Drying started
Date :21-01-2023
Time :15:22:54
Model:AD3000
Serial number : 138

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 : 0.670 g
Final weight : 0.669 g
Drying time : 00:01:00s
Sampling interval : 20 sec
Moisture : 0.1 %

NOTE Final moisture

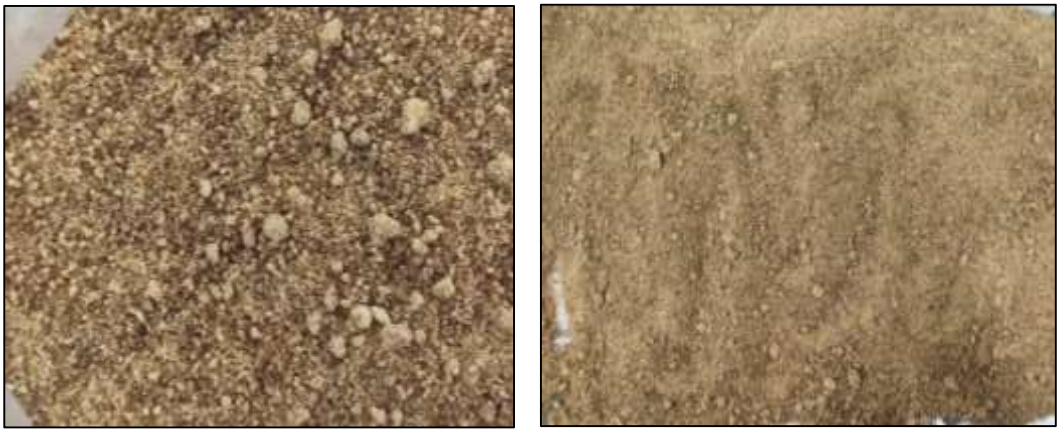
The analysis performed by:

Signature: Angali

Kerone Research & Development Centre (KRDC)
B/47,Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com

Images during trials:

Untreated Sample

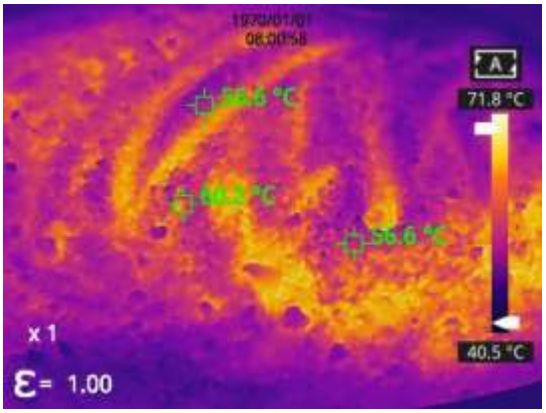


Treated Sample (Trial 1, Trial 2)

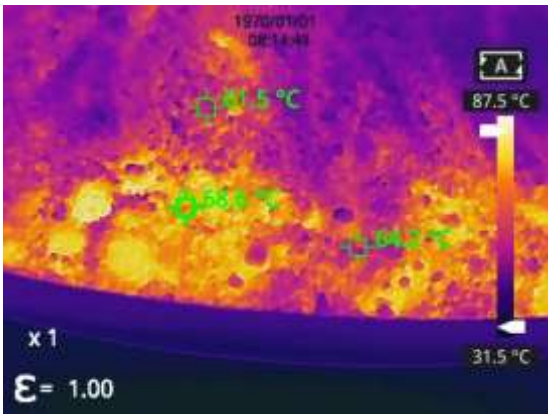
Kerone Research & Development Centre (KRDC)
B/47,Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com

Thermal Images:

Measurements	
Sp1	56.6°C
Sp2	60.2°C
Sp3	56.6°C
Parameters	
Emissivity	1.00
Temp.	71.8°C



Measurements	
Sp1	61.5°C
Sp2	68.6°C
Sp3	64.2°C
Parameters	
Emissivity	1.00
Temp.	87.5°C



Observations:

The heating behavior of Jaggery Powder 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 free-flowing after Microwave heat treatment. Also, the taste and aroma were retained moisture was achieved as desired.

Ms. Sayali Asole
(Tested By)