





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





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Customer:	M/s. E.I.D Parry Ltd.
Process:	Batch Microwave + Convection Heat Treatment for Brown Sugar

Test Report No: 120/KRDC/LAB/17 Mum 05/08/2022

Date Sample reception : 01/08/2022 ID : 120/LAB/05

Sample Description:

Sampling : As Requested Sample Condition : Acceptable

Quantity : approx. (20-21) kg - used 1kg each

Sampling date : 04/08/2022 Product : Brown Sugar

Requirement : Moisture reduction below 1%

Start Date test : 04/08/2022 End Date test : 05/08/2022

Objective – To Reduce the Moisture Content from Brown Sugar to avoid Sugar Caking.





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<u>Laboratory Experimental System – </u>



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	Single Channel Fiber Optic: Range -
System	40 to 250°C
Exhaust Power	1 HP
Tray size	450*950*50 mm
(width*height*depth)	





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Laboratory's Environmental Conditions –

Temperature (degree C)	29.4°C (±5°C)
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

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	THE RESERVE TO SERVE THE RESERVE THE RESER	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)

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.





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<u>Procedure of the Experiment</u> -

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

Analytical Results:

Product 1

TRIAL-1:

Initial Wt.: 500g Initial Moisture: 2.4%

Cycles	Specifications of Microwave	Cycle Time	On product	Remarks.
		(min.)	temp	
C1	Magnetron Power: 0.8 kW;	After 10 min	35 °C	Reduction in moisture started
	Set temp. of MW:45°C;			
	Set temp. of Heater:50°C;			
	Fan speed: 100%			
C2	Magnetron Power: 0.8 kW;	After 20 min	40 °C	Process Continues
	Set temp. of MW:45°C;			
	Set temp. of Heater:50°C;			
	Fan speed: 100%			
C3	Magnetron Power: 0.8 kW;	After 30 min	45 °C	Process Continues
	Set temp. of MW:45°C;			
	Set temp. of Heater:50°C;			
	Fan speed: 100%			
C4	Magnetron Power: 0.8 kW;	After 40 min	52 °C	Moisture achieved as desired
	Set temp. of MW:45°C;			
	Set temp. of Heater:50°C;			
	Fan speed: 100%			

Total time: 40 min Final Wt.: 486 g Final Moisture: 0.3%





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TRIAL-2:

Initial Wt.: 500g Initial Moisture: 2.4%

Cycles	Specifications of Microwave	Cycle Time (min.)	On product temp	Remarks.
C1	Magnetron Power: 0.8 kW; Set temp. of MW:45°C;	After 30 min	(40-55)°C	Moisture achieved as desired
	Set temp. of Heater:50°C; Fan speed: 100%			

Total time: 30 min Final Wt.: 490 g Final Moisture:0.0%

Time Temperature Profile :-







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Product 2

TRIAL-1:

Initial Wt.: 500g Initial Moisture: 1.7%

Cycles	Specifications of Microwave	Cycle Time	On product	Remarks.
		(min.)	temp	
C1	Magnetron Power: 0.8 kW;	After 10 min	35 ℃	Reduction in moisture started
	Set temp. of MW:45°C;			
	Set temp. of Heater:50°C;			
	Fan speed: 100%			
C2	Magnetron Power: 0.8 kW;	After 20 min	45 °C	Process Continues
	Set temp. of MW:45°C;			
	Set temp. of Heater:50°C;			
	Fan speed: 100%			
C3	Magnetron Power: 0.8 kW;	After 30 min	53 °C	Process Continues
	Set temp. of MW:45°C;			
	Set temp. of Heater:50°C;			
	Fan speed: 100%			
C4	Magnetron Power: 0.8 kW;	After 40 min	60 °C	Moisture achieved as desired
	Set temp. of MW:45°C;			
	Set temp. of Heater:50°C;			
	Fan speed: 100%			

Total time: 30 min Final Wt.: 477 g Final Moisture: 0.9%



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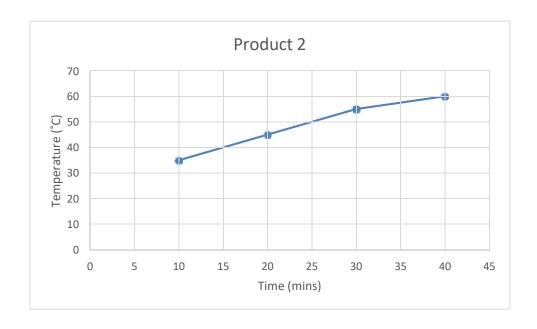
TRIAL-2:

Initial Wt.: 500g Initial Moisture: 1.7%

Cycles	Specifications of Microwave	Cycle Time (min.)	On product temp	Remarks.
C1	Magnetron Power: 0.8 kW; Set temp. of MW:45°C; Set temp. of Heater:50°C; Fan speed: 100%	After 30 min	(60-63)°C	Moisture achieved as desired

Total time: 30 min Final Wt.: 498 g Final Moisture: 0.5%

Time Temperature Profile:-







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Before and After the Sample:







Untreated Sample porduct 2



Treated Sample (Product 1-Trial 1 & 2; Product 2-Trial 1&2)

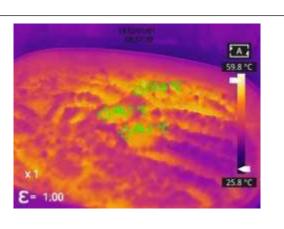




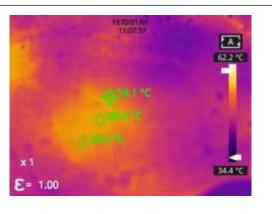
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Thermal Images:

Measurements	<u> </u>
Sp1	52.6 °C
Sp2	46.1°C
Sp3	45.1°C
Parameters	
Emissivity	1.00
Temp.	59.8°C



Sp1	59.1°C
Sp2	60.6°C
Sp3	59.9 °C
D	
Parameters	
Parameters Emissivity	1.00







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Moisture Analysis Report:

PRODUCT 1

			Thial	1		[mid2]	
Drying started		Brying started			Orying started		
Date : 4-08-0022 Time :15:45:32 Model:408200 Serial number : 138 Drying parameters	1	Date: 4-08-2022 Time: 116:31:30 Model:AGS280 Serial number: Drying parameters	139		Date : 4-08-2022 Time :17:37:14 Model:AGS200 Serial number : Brying parameters	138	
Product : 0		Product	: 0	- 1	Product	t 0	
Drying temperature :	105.0 °C	Drying temperature	: 105.0	*C	Drying temperature	: 105.0 °C	
Drying profile : st Mode : Sh Calculation : ((Mode Calculation	: standard : Short mode : ((mD-p)/eO) : 3 samples	*100%	Calculation	: standard : Short mode : ((10-e)/=0)#1992 : 3 sauples	
Initial weight :	0.508 g	Initial weight	: 0.759	9	Initial weight	t 0.571 g	
Final weight :	0.496 g	Final weight	: 0.757	9	Final weight	: 0.590 3	
	00:01:40s 20 sec	Drying time Sampling interval	: 00:01:20s	sec	Drying time Sampling interval	: 00:01:40s : 20 sec	
	2.4 %	Moisture	1 0,3	X	Hoistur∈	: 0.0 %	
HOTE Initial NO	ishne	HOTE FINED N	coishire		HOTE Final nu	vishme	
The analysis performed	by:	The analysis perfo	rned by:		• The analysis perfo	raed by:	
Signature	22770300	Signature	the second		Signature	<u>di</u>	

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PRODUCT 2

Drying started		Drying started		Brying started		
Date : 5-08-2022 Time :14:25:54 Model:485200 Sarial number : Drying parameters	138	Date : 5-08-2022 Time :13:46:29 Model:AGS200 Serial number : Drying parameters	138	Date : 5-08-2822 Time :15:54:55 Hodel:ABS200 Serial number : Drying parameters		
Product	*****	Product	: 0	Product	: 0	
Drying temperature		Drying temperature	1 105.0 °C	Drying temperature	105.0	3.5
Drying profile Mode Celculation	: standard : Short mode : ([n0-x]/a0]%100%		: Short mode : ((mD-p)/vD)#100%	Calculation	: standard : Short mode : ((±0-a)/±0): : 3 samples	100
Finished Initial weight		Initial weight	: 0.550 g	Initial weight		
Final weight		Final weight	0,545 g	Final weight		
towies ties	: 00:01:40:	Drying time Sampling interval	: 00:01:40s : 20 sec	Drying time Sampling interval	1 29 1	THE.
Sampling interval Moisture	1 1.7 %	Hoisture		Moisture	1 0,5	7
HOTE Initial		NOTE Final	moisture	HOTE FINAL	nwishire	-
The analysis perfo		The analysis perfo	rned by:	The analysis perfo	reed by:	
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Observations:

The heating behavior of Brown Sugar was investigated under the Microwave + Convection heating system. The heating rate was found to be increasing with respect to increase in time. As per physical investigation, it was observed that there was Moisture reduction after the treatment.

Concluding Remarks –

The Desired moisture was obtained successfully.

Ms. Sayali Asole (Tested By)