KERONE

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ELECTRO MAGNETIC Innovative Technologies

Kerone Research & Development Centre (KRDC),
B/47, Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/43/44/45/46, Email-info@kerone.com, www.kerone.com

Batch Microwave + Convection Heat Treatment for Drying of Cardamom

ISO 9001-2008 | ISO 9001-2015 | EMS 14001 | OHSAS 18001
In Association with SVCH-Technologii, Moscow (Russia)

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Customer :	**M/s. OOM PLANTATION**
Process :	**Batch Microwave + Convection Heat Treatment for Drying of Cardamom**

TEST REPORT No: 47/KRDC/LAB/30 Mum 02/09/2021

Date Sample reception : 29/08/2021
ID : 47/LAB/31

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : Around 1 Kg.
Samples opening date : 29/08/2021
Product : Green Cardamom
Start Date test : 01/09/2021
End Date test : 01/09/2021

LABORATORY EXPERIMENTAL SET UP:

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LAB BATCH MICROWAVE+CONVECTION HEATING SYSTEM SPECIFICATIONS:

Microwave Power	2 KW (CW)
Frequency	2450 MHz ± 50
Convective Power	3.5 KW (airflow 350 l/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

ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (^oC)	26^oC (±5^oC)
Humidity (%)	≤70% 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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EQUIPMENTS USED:

Name of Equipment	Picture of Equipment	Specifications
Compact Thermal Imaging Camera		Model: FLIR E-30 Resolution: 160 x 120 IR Thermal sensitivity of 0.10°C
Moisture Analyzer		Make: Axis Balance Description: Moisture range: 1%(sample 0.02/0.05g), 0.1% (Sample 0.5/5g), 0.01%(Sample>5g)
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

SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on Cardamom to speed up the drying rate. For this experimental run, given sample has been spread on a PTFE table and kept in MW+ Convection heating chamber with suitable parameters. Observations are made after decided time period on the basis of change in Weight, moisture of the product and appearance.

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ANALYTICAL RESULTS:

Initial Wt. of Cardamom: 150g
Initial moisture of Cardamom: 81.6 %
Magnetron Power: 0.3 KW
Temperature Limit: 40°C
Fan speed: 100; Heater- 100%

Cycles	Cycle Time (min.)	Product Temperature	Product Weight (g)	Product Weight Loss (%)
C1	60 min	(40-45) °C	111 g	26.0%
C2	120 min	(45-50) °C	85 g	23.42%
C3	180 min	(50-55) °C	62 g	27.05%
C4	240 min	(50-60) °C	47 g	24.19%

Total cycle time: 4 Hr
Final Wt. of Cardamom: 45 g
Final moisture of Cardamom: 6.2%

BEFORE AND AFTER PICTURES OF TREATED SPECIMEN SAMPLE:

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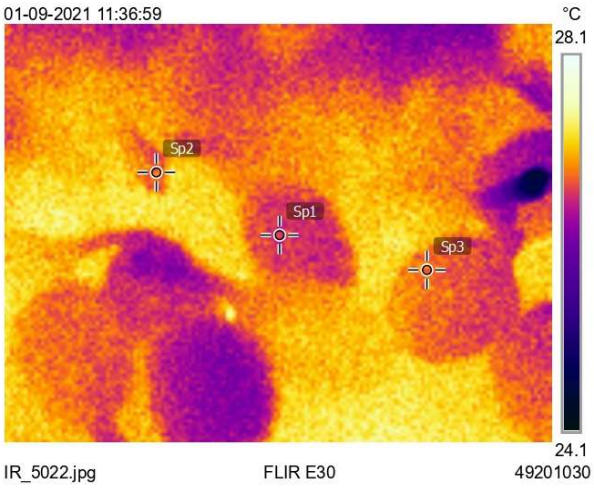
THERMAL ANALYSIS REPORTS:

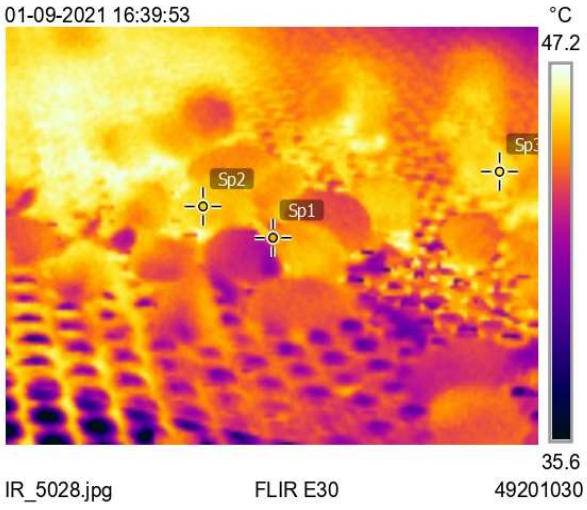
BEFORE TREATMENT-

Measurements	
Sp1	26.8 °C
Sp2	27.0 °C
Sp3	26.7 °C
Parameters	
Emissivity	0.95
Refl. temp.	20 °C



AFTER TREATMENT-

Measurements	
Sp1	45.2 °C
Sp2	45.3 °C
Sp3	46.0 °C
Parameters	
Emissivity	0.95
Refl. temp.	20 °C



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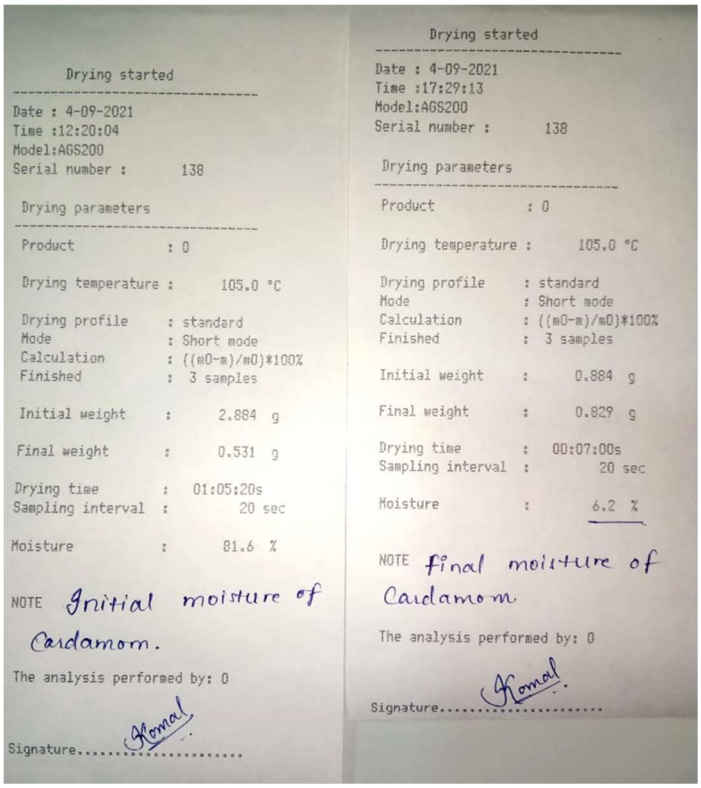
MOISTURE ANALYSIS REPORTS:



Drying started

Date : 4-09-2021
Time :12:20:04
Model:AGS200
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 : 2.884 g
Final weight : 0.531 g
Drying time : 01:05:20s
Sampling interval : 20 sec
Moisture : 81.6 %

NOTE Initial moisture of Cardamom.

The analysis performed by: 0

Signature.....

Drying started

Date : 4-09-2021
Time :17:29:13
Model:AGS200
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 : 0.884 g
Final weight : 0.829 g
Drying time : 00:07:00s
Sampling interval : 20 sec
Moisture : 6.2 %

NOTE final moisture of Cardamom

The analysis performed by: 0

Signature.....

OBSERVATION:

The drying of Cardamom has been investigated under the Microwave + Convection heating system. The drying rate is found to be increasing with respect to increase in time. It has been found that the product's weight decreases with respect to increase in setting temperature. As per physical investigation, it has been observed that product is dried without any burns also green colour of product and aroma is retained.

Ms. Komal Ingle
(Tested By)