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. OOM PLANTATION**
Process :	**Batch Vacuum Microwave Dehydrator Treatment for Drying of Cardamom-2**

TEST REPORT No: 47/KRDC/LAB/17 Mum 21/08/2021

Date Sample reception : 21/08/2021
ID : 47/LAB/24

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : 200g
Sampling date : 21/08/2021
Product : Fresh Cardemom
Requirement : Must be dried to 6%-8%
Start Date test : 21/08/2021
End Date test : 21/08/2021

LABORATORY EXPERIMENTAL SET UP:

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LAB BATCH MICROWAVE HEATING SYSTEM SPECIFICATIONS:

Magnetron Power Generator Rating	Air Cooled 1.45KW/2450+50 MHZ x 1 No.
Convection Power	1.5 KW
Total Heater Power	3KW (MW 1.45KW + Convection 1.5KW)
Supply Voltage required	230V- 2Ph supply
MW Overall (LxWxH) in mm	620X670X640
Cavity Chamber (INNER) in mm	L-300 & Φ220
Vacuum Pump Rating	560W, 220V/50Hz, 2880rpm
Free Air Displacement	10.7 CFM
Vacuum Pump (LxWxH)	430x200x300

ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (degree C)	$26^{o}C$ ($\pm 5^{o}C$)
Humidity (%)	≤ 74% 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 fresh Cardamom to speed up the drying rate. For this experimental run, given sample has been placed on a plastic perforated tray and then placed in dehydrating chamber with selection of suitable parameters. Observations are made on the final moisture content of sample, weight and appearance of the product.

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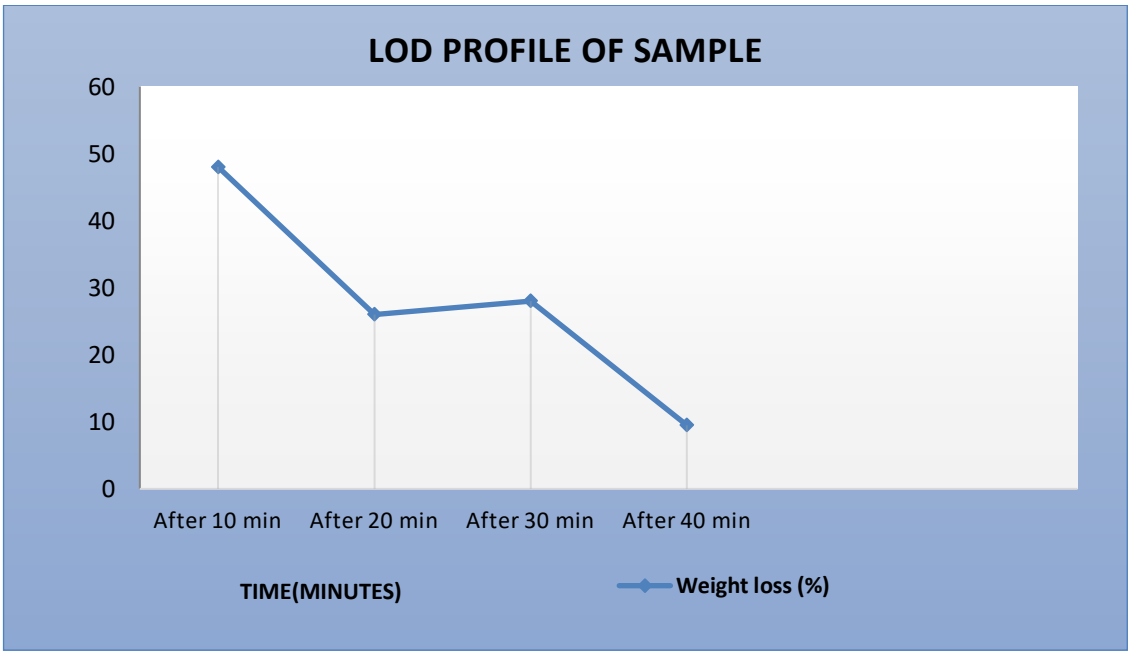
ANALYTICAL RESULTS:

Initial Wt. - 75g
Initial moisture – 81.8%
Microwave Power: 0.45 kW (30% Capacity)
Heater: 40°C (switch 1)
Cycle Time- 10 mins

Cycle Time	Weight noted (grams)	Total weight loss(in %)	Remarks, if any
After 10 min	39	48%	Drying started
After 20 min	29	25.64%	Drying continues but product is little oily
After 30 min	21	27.58	Variant of drying
After 40 min	19	9.52%	Drying completes

Final Wt. - 19g
Final moisture – 7%

GRAPHICAL REPRESENTATION OF DRYING PARAMETERS:



Format: F/R&D/01

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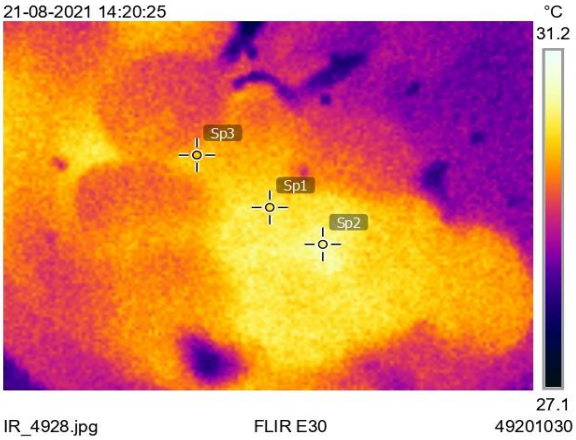
THERMAL ANALYSIS REPORTS:

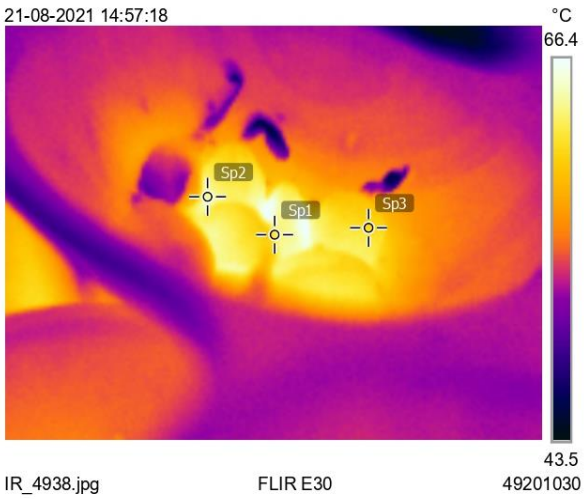
BEFORE TREATMENT:

Measurements	
Sp1	30.2 °C
Sp2	30.3 °C
Sp3	30.1 °C
Parameters	
Emissivity	0.95
Refl. temp.	20 °C



AFTER TREATMENT:

Measurements	
Sp1	62.2 °C
Sp2	64.3 °C
Sp3	61.5 °C
Parameters	
Emissivity	0.95
Refl. temp.	20 °C



Format: F/R&D/01

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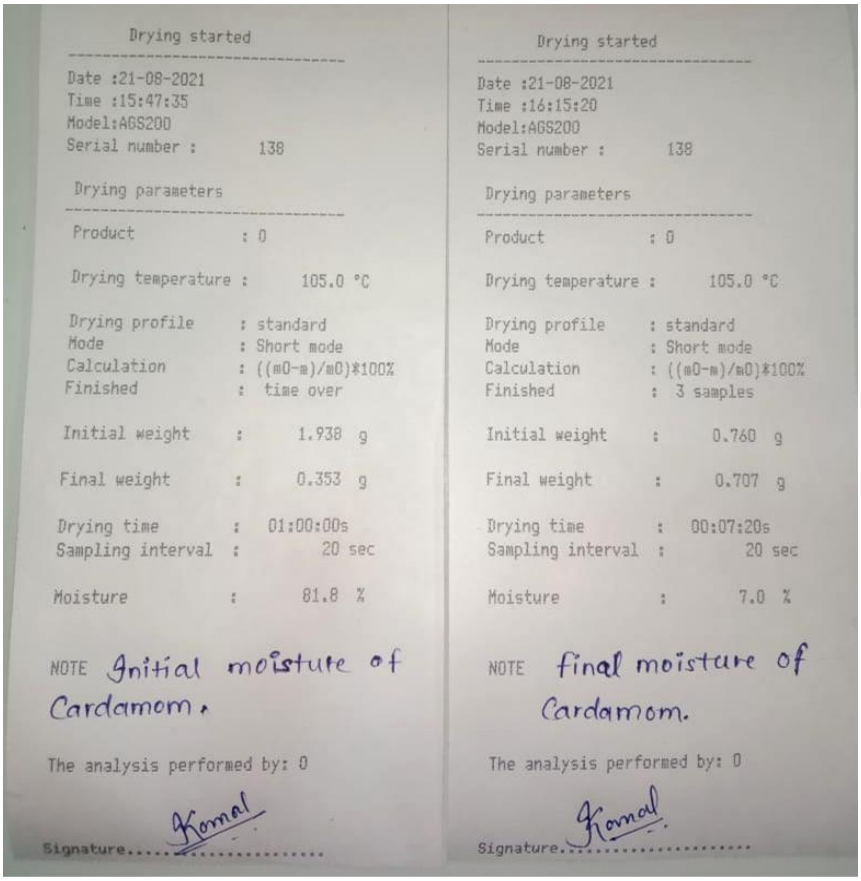
MOISTURE ANALYSIS REPORTS:



Drying started

Date :21-08-2021
Time :15:47:35
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 : time over
Initial weight : 1.938 g
Final weight : 0.353 g
Drying time : 01:00:00s
Sampling interval : 20 sec
Moisture : 81.8 %

NOTE Initial moisture of Cardamom.

The analysis performed by: 0

Signature.....Komal

Drying started

Date :21-08-2021
Time :16:15:20
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 : 0.760 g
Final weight : 0.707 g
Drying time : 00:07:20s
Sampling interval : 20 sec
Moisture : 7.0 %

NOTE final moisture of Cardamom.

The analysis performed by: 0

Signature.....Komal

AFTER PICTURES OF TREATED SPECIMEN SAMPLE:

Untreated

Treated

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OBSERVATIONS:

The drying behavior of cardamom has been investigated under the Vacuum MW + Convection Dehydrator system. The drying rate is found to be increasing with respect to increasing drying time. It has been found that the moisture content on the dry basis (%) decreases with respect to increase drying time. As per physical investigation, it has been observed that the product is dried as desired but complete colour retention is not achieved.

Ms. Komal Ingle

(Tested By)