



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

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AIMCAL (USA)



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In Association With



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](mailto:info@kerone.com), [www.kerone.com](http://www.kerone.com)



**Continuous Microwave+Convection Heat  
Treatment for Heating of Curry Leaves**

ISO 9001-2008 | ISO 9001-2015 | EMS 14001 | OHSAS 18001

In Association with SVCH-Technologii, Moscow (Russia)



RESEARCH & DEVELOPMENT



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<b>Customer:</b>	<b>M/s. Hindustan Unilever R&amp;D, Bangalore</b>
<b>Process:</b>	<b>Continuous Microwave+Convection Heat Treatment for heating Curry Leaves</b>

### TEST REPORT No: 47/KRDC/LAB/17 Mum 31/03/2021

Date Sample reception : 30/03/2021

ID : 47/LAB/190

### SAMPLE DESCRIPTION:

Sampling : As Requested  
 Sample Condition : Acceptable  
 Quantity : 10 kg  
 Sampling date : 31/03/2021  
 Product : Curry Leaves  
 Requirement : Heat Treatment  
 Start Date test : 31/03/2021  
 End Date test : 31/03/2021

### TRIAL EXPERIMENTAL SET UP:



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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**CONTINUOUS MICROWAVE+CONVECTION HEATING SYSTEM SPECIFICATIONS:**

<b>Microwave Power</b>	8.7kW
<b>Frequency</b>	2450 ± 50 MHz
<b>Convective Power</b>	2.5 kW
<b>Microwave Exposure Zone (Cavity)</b>	3000 mm length wise
<b>Product surface temp. range</b>	Max. 120 deg cells
<b>Conveyor width</b>	500mm
<b>Conveyor Speed</b>	Variable 0.2 to 4MPM
<b>Conveyor Motor Drive</b>	1 HP AC Induction with VFD
<b>Entry Vestibule length</b>	1100mm
<b>Exit Vestibule Length</b>	1100 mm
<b>Exhaust Power</b>	1.5 HP

**ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:**

<b>Temperature (degree C)</b>	35°C (±5°C)
<b>Humidity (%)</b>	≤30% RH
<b>Pressure (kN/m<sup>2</sup> or kPa)</b>	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: 160x 120IR 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: $\pm (1.8^{\circ}\text{F})$ Temperature resolution: 0.1°C (0.2°F) Humidity range: 10%~99% RH Humidity accuracy: $\pm 5\%$ RH Humidity resolution: 1% RH

**SAMPLE PREPARATION AND METHOD/PROCEDURE:**

The experiment has been performed on given sample of curry leaves to speed up the heating rate. For this experimental run sample has been placed on belt conveyor and passed through microwave+convection heating system for different setting parameters to achieve heat treatment. Then, the observations are made for on the basis of temperature on product and any damage to sample during microwave exposure.





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**ANALYTICAL RESULTS:**

	<b>Trial No. 1</b>	<b>Trial No. 2</b>
<b>Microwave Power (kW)</b>	<b>6</b>	<b>6</b>
<b>Setting Temperature (°C)</b>	<b>60</b>	<b>70</b>
<b>Exposure Time (minutes)</b>	<b>3 min exposure + 1 min hold time</b>	<b>4.5 min exposure + 1 min hold time</b>
<b>Temperature on Product (°C)</b>	<b>60-65</b>	<b>70-75</b>
<b>Initial moisture Content (%)</b>	<b>71.9%</b>	<b>73.2%</b>
<b>Final moisture Content (%)</b>	<b>67.57%</b>	<b>64.6%</b>
<b>Remarks, if any</b>	<b>No change in color</b>	<b>No change in color</b>

**BEFORE AND AFTER PICTURES OF TREATED SPECIMEN SAMPLE:****BEFORE****AFTER**



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## SURFACE TEMPERATURE OF THE TREATED SPECIMEN SAMPLE:

### TRIAL 1



### TRIAL 2



## OBSERVATIONS:

The heating behavior of Curry Leaves has been investigated under the microwave irradiation mode dryer for heat treatment. As per physical investigation, it has been observed that there is no color change and no damage in any of the sample with required temperature on product.

Miss. Komal Bhoite  
Tested By