



# KERONE

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

Member Of



AIMCAL (USA)



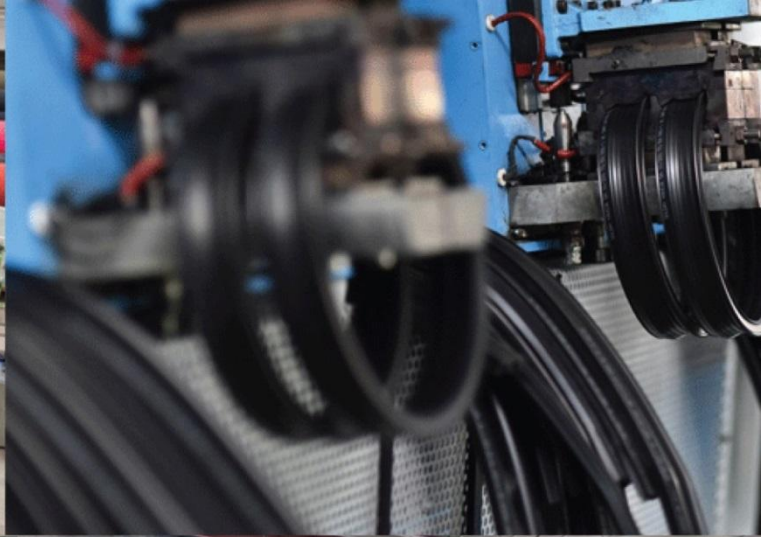
A.M.P.E.R.E (EUROPE)

In Association With



ELECTRO MAGNETIC innovative technologies

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



**Batch Microwave Heat Treatment for  
Sterilization of Lotus Seed Products**

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



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

Customer :	M/s. Mithila Naturals, Faridabad
Process :	Batch Microwave Heat Treatment for Sterilization of Lotus Seed Products

**TEST REPORT No: 47/KRDC/LAB/17 Mum 02/12/2019**

Date Sample reception : 02/12/2019

ID : 47/LAB/144

**SAMPLE DESCRIPTION:**

Sampling : As Requested  
Sample Condition : Acceptable  
Quantity : 5 kg  
Sampling date : 02/12/2019  
Product : Lotus seed and Seed Powder  
Requirement : Sterilization  
Start Date test : 02/12/2019  
End Date test : 02/12/2019

**LABORATORY EXPERIMENTAL SET UP:**



Format: F/R&D/01



Kerone Research & Development Centre (KRDC)

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

#### LAB BATCH MICROWAVE+CONVECTION HEATING SYSTEM SPECIFICATIONS:

<b>Microwave Power</b>	2 kW(CW)
<b>Frequency</b>	2450 MHz $\pm$ 50
<b>Convective Power</b>	3.5 kW (air flow 350 l/min at 20°C)
<b>Microwave Exposure Zone (cavity)</b>	1 cubic meter
<b>Mode Stirrer</b>	One
<b>Thermal Monitoring System</b>	Single Channel Fiber Optic: Range -40 to 250°C
<b>Exhaust Power</b>	1HP
<b>Tray Size</b>	450x950x50 mm

#### ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:



<b>Temperature (degree C)</b>	35°C ( $\pm$ 5°C)
<b>Humidity (%)</b>	$\leq$ 47% RH
<b>Pressure (kN/m2 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





## EQUIPMENTS USED:

Name of Equipment	Picture of Equipment	Specifications
Compact Thermal Imaging Camera		Model: FLIR E-30 Resolution: 160x 120 IR Thermal sensitivity of 0.10°C
Thermo Hygrometer		Model No: HTC-2 Temperature accuracy: $\pm^{\circ}\text{C}$ (1.8°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 Lotus seed, Seed kheer and seed powder to speed up the heating rate for sterilization treatment. For this experimental run, given sample has been sealed packed in microwave transparent bags and placed in microwave heating system for different setting parameters to achieve sterilization treatment. The observations are made on the basis of temperature on product and any damage to sample and bag.

## ANALYTICAL RESULTS:

### 1. Kheer:

Sample Weight taken: 250 grams

Moisture Content: 6.9%

Sr. No.	MW Power (kW)	Time (minutes)	Temp. on product (°C)	Remarks, if any
1.	0.5	5	50-60	No change

Format: F/R&D/01



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

2.	0.8	4	60-70	No change
3.	1	3	60-70	No change
4.	1.2	2.5	65-71	No change
5.	1.4	2	68-75	No change

2. Powder:

Sample Weight taken: 500 grams

Moisture Content: 5.1%

Sr. No.	MW Power (kW)	Time (minutes)	Temp. on product (°C)	Remarks, if any
1.	1	3	60-70	No change
2.	1.4	2	60-70	No change

3. Seeds:

Sample Weight taken: 200 grams

Moisture Content: 11.4%

Sr. No.	MW Power (kW)	Time (minutes)	Temp. on product (°C)	Remarks, if any
1.	0.5	5	70-80	No change
2.	0.7	2	60-70	No change
3.	0.9	1.5	60-70	No change
4.	1.1	1.5	60-70	No change
5.	1.4	1	60-70	No change

Format: F/R&D/01



## Kerone Research & Development Centre (KRDC)

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

### THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

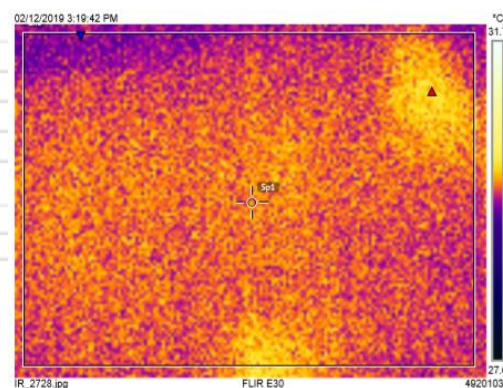
#### 1. Before Heat Treatment:

##### Measurements

Bx1	Max	30.4 °C
	Min	29.3 °C
	Average	29.8 °C
Sp1		30.0 °C

##### Parameters

Emissivity	0.95
Refl. temp.	20 °C



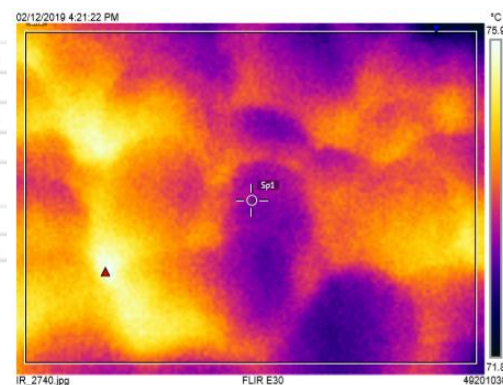
#### 2. After Heat Treatment:

##### Measurements

Bx1	Max	75.8 °C
	Min	72.1 °C
	Average	74.0 °C
Sp1		73.2 °C

##### Parameters

Emissivity	0.95
Refl. temp.	20 °C



### BEFORE AND AFTER PICTURES OF TREATED SPCIMEN SAMPLE:

#### 1. Kheer:



Format: F/R&D/01



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

**2. Powder:**



**3. Seeds:**



**OBSRVATIONS:**

The heating behavior of Lotus seeds and seed powder has been investigated under the microwave irradiation mode for sterilization treatment. As per physical investigation, it has been observed that there is no colour change in sample with required temperature on product and no damage to bag.

*K Komal*

Miss. Komal Bhoite  
Tested By

Format: F/R&D/01