KERONE

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

Member Of

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

In Association With

EMitech

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

# Continuous Microwave+IR Heat Treatment for Drying of Sprouted Mung Bean

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. Heena Enterprise** |
| **Process :** | **Continuous Microwave+IR Heat Treatment for Drying of Sprouted Mung Beans** |

## TEST REPORT No: 47/KRDC/LAB/17 Mum 06/07/2020

Date Sample reception : 04/07/2020
ID : 47/LAB/165

## SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : 2 kg
Sampling date : 04/07/2020
Product : Sprouted Mung Beans
Requirement : Drying
Start Date test : 04/07/2020
End Date test : 04/07/2020

## LABORATORY EXPERIMENTAL SET UP:

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

## LAB BATCH MICROWAVE+CONVECTION HEATING SYSTEM SPECIFICATIONS:

| | |
|---|---|
| **Microwave Power** | 1.45 kW(CW) |
| **Frequency** | 2450 MHz ± 50 |
| **Infra-red Power** | 4 kW |
| **Microwave Exposure Zone (Cavity)** | 1000 mm length wise |
| **Web width** | 380mm |
| **Entry Vestibule length** | 1200mm |
| **Exit Vestibule Length** | 1200 mm |
| **Exhaust Power** | 0.5 HP |

## ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

| | |
|---|---|
| **Temperature (degree C)** | 29°C (±5°C) |
| **Humidity (%)** | ≤82% 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.

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

## EQUIPMENTS USED:

| Name of Equipment | Picture of Equipment | Specifications |
|---|---|---|
| Compact Thermal Imaging Camera |  | Model: FLIR E-30<br>Resolution: 160x 120IR<br>Thermal sensitivity of 0.10°C |
| Thermo Hygrometer |  | Model No: HTC-2<br>Temperature accuracy: ±°C (1.8°F)<br>Temperature resolution: 0.1°C (0.2°F)<br>Humidity range: 10%~99% RH<br>Humidity accuracy: ±5% RH<br>Humidity resolution: 1% RH |
| Moisture Analyzer |  | Make: Axis Balance<br>Description:<br>Moisture range: 1%(sample 0.02/0.05g), 0.1% (Sample 0.5/5g), 0.01%(Sample>5g) |

## SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on given sample of Sprouted Mung Beans to speed up the heating rate for drying treatment. For this experimental run, given product has been placed in Continuous Microwave Hybrid Heating System and microwave+IR exposure has been given with suitable parameters. The observations are made on the basis of temperature on product, total weight loss, final moisture content and any damage to product samples.

Also, the observations are made after every 1 pass of 10.5 minutes on the basis of LOD method by checking weight loss. Also, initial weight before drying and final weight after drying was taken.

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

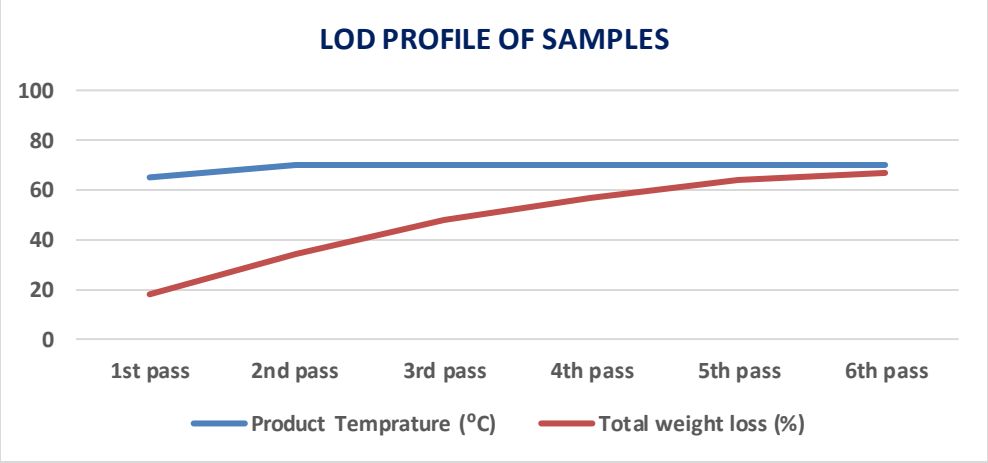
## ANALYTICAL RESULTS:

**Microwave Power: 1.3 kW**
**Infrared Heater Temperature: 70°C**
**Initial Moisture Content: 67.7%**
**Initial Weight: 2 kg**

| Sr. No. | Time (minutes) | Final Wt. (kg) | Total Wt. Loss (gm) | Surface Temp. (°C) | Remarks |
|---|---|---|---|---|---|
| 1. | After 1st pass | 1.639 | 361 | 65 | Drying rate started |
| 2. | After 2nd pass | 1.319 | 320 | 70 | Drying phase continues |
| 3. | After 3rd pass | 1.041 | 279 | 70 | Variant of Drying rate |
| 4. | After 4th pass | 0.842 | 198 | 70 | Variant of Drying rate |
| 5. | After 5th pass | 0.714 | 128 | 70 | Variant of Drying rate |
| 6. | After 6th pass | 0.663 | 51 | 70 | Dried |

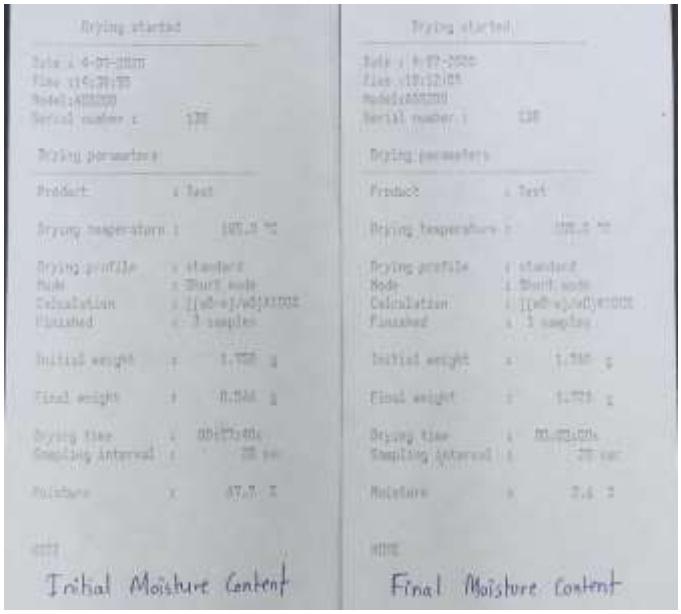
**Total Time: 63 mins**
**Final Weight: 663 gm**
**Total Weight Loss: 1.337 kg**
**Final Moisture Content: 2.6%**

## GRAPHICAL REPRESENTATION OF DRYING PARAMETERS:



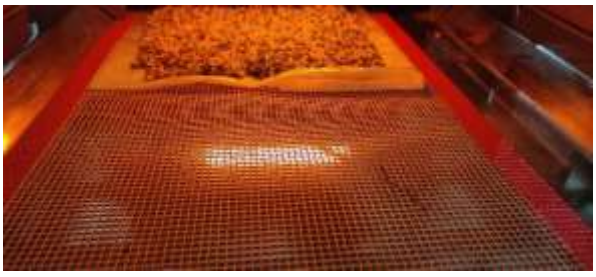
Kerone Research & Development Centre (KRDC)
B/47,Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/43/44/45/46, Email-info@kerone.com, www.kerone.com

## MOISTURE ANALYSIS REPORTS:




## BEFORE AND AFTER PICTURES OF TREATED SPCIMEN SAMPLE:

1. **Before Heat Treatment:**



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. After Heat Treatment:**

**OBSRVATIONS:**

**The drying behavior of Sprouted Mung Beans has been investigated under the Microwave+IR Heating 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. In the processed sample, as per physical investigation, it has been observed that there is change in colour on sample with required temperature on product.**

**Miss. Komal Bhoite**
**Tested By**