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AIMCAL (USA)



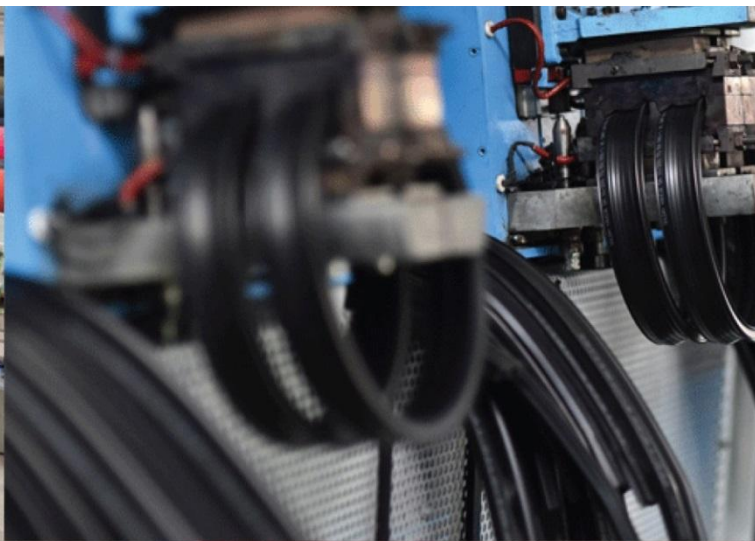
A.M.P.E.R.E (EUROPE)

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+Convection Heat Treatment  
for Sterilization of Moringa leaves powder**

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



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|            |  |
|------------|--|
| Customer : | M/s. AGF Pvt Ltd   |
| Process :  | Batch Microwave+Convection Heat Treatment for Sterilization of Moringa leaves powder |

**TEST REPORT No: 47/KRDC/LAB/17 Mum 25/02/2019**

Date Sample reception : 25/02/2019  
ID : 47/LAB/94

**SAMPLE DESCRIPTION:**

Sampling : As Requested  
Sample Condition : Acceptable  
Quantity : 10 kg  
Sampling date : 25/02/2019  
Product : Moringa leaves powder  
Requirement : Sterilization with 70°C product temperature  
Start Date test : 25/02/2019  
End Date test : 25/02/2019

**LABORATORY EXPERIMENTAL SET UP:**



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

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




#### ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

|                                     |                     |
|-------------------------------------|---------------------|
| Temperature (degree C)              | 30.5°C ( $\pm$ 5°C) |
| Humidity (%)                        | $\leq$ 30% RH       |
| Pressure (kN/m <sup>2</sup> 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



## EQUIPMENTS USED:

| Name of Equipment              | Picture of Equipment  | Specifications   |
|--------------------------------|---|--|
| Compact Thermal Imaging Camera |    | Model: FLIR E-30<br>Resolution: 160x 120<br>IR Thermal sensitivity of 0.10°C   |
| 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)  |
| Thermo Hygrometer              |  | Model No: HTC-2<br>Temperature accuracy: $\pm^{\circ}\text{C}$ (1.8°F)<br>Temperature resolution: 0.1°C (0.2°F)<br>Humidity range: 10%~99% RH<br>Humidity accuracy: $\pm 5\%$ RH<br>Humidity resolution: 1% RH |

## SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on given sample of leaves powder to speed up the drying rate for sterilization treatment. For this experimental run, after analyzing moisture content powder has been placed in microwave transparent tray and also seal packed in plastic bags. Trials have been taken in open condition and sealed condition with different parameters. The observations are made on the basis of weight loss, temperature on product and colour change in product.



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## ANALYTICAL RESULTS:

Initial Moisture Content: 3.5%

Weight taken for every trial: 500 grams

| Sr. No. | MW Power(kW) | Setting Temp(°C) | Time (minutes) | Temp. on product(°C) | Final Moisture Content(%) | Remarks, if any                          |
|---------|--------------|------------------|----------------|----------------------|---------------------------|--|
| 1.      | 1.2          | 80               | 5              | 45-47                | 3.1                       | No colour change with 1 gram weight loss |
| 2.      | 1.5          | 90               | 7              | 60-65                | 2.5                       | No colour change, no weight loss         |
| 3.      | 2            | 90               | 8              | 71-75                | 3.2                       | No colour change with 1 gram weight loss |

## THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

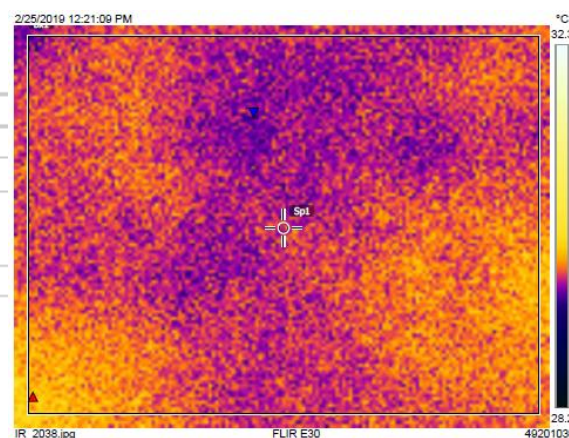
### 1. Before Heat Treatment:

#### Measurements

|     |         |         |
|-----|---------|---------|
| Bx1 | Max     | 30.2 °C |
|     | Min     | 29.3 °C |
|     | Average | 29.7 °C |
| Sp1 |         | 29.6 °C |

#### Parameters

|             |       |
|-------------|-------|
| Emissivity  | 0.95  |
| Refl. temp. | 20 °C |



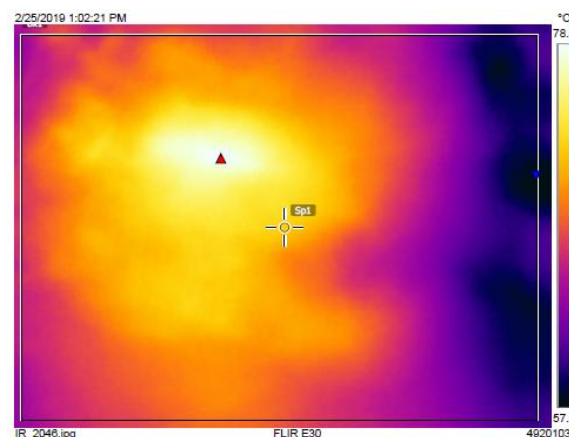
### 2. After Heat Treatment:

#### Measurements

|     |         |         |
|-----|---------|---------|
| Bx1 | Max     | 78.4 °C |
|     | Min     | 56.9 °C |
|     | Average | 67.7 °C |
| Sp1 |         | 72.6 °C |

#### Parameters

|             |       |
|-------------|-------|
| Emissivity  | 0.95  |
| Refl. temp. | 20 °C |



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## BEFORE AND AFTER PICTURES OF TREATED SPECIMEN SAMPLE:



## MOISTURE ANALYSIS REPORTS:

|   |   |   |   |
|---|---|---|---|
| <p>Drying started</p> <p>Date :25-02-2019<br/>Time :12:24:48<br/>Model:AGS200<br/>Serial number : 138</p> <p>Drying parameters</p> <p>Product : Test</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard<br/>Mode : Short mode<br/>Calculation : <math>((m_0 - m)/m_0) \times 100\%</math><br/>Finished : 3 samples</p> <p>Initial weight : 0.938 g<br/>Final weight : 0.905 g</p> <p>Drying time : 00:02:00s<br/>Sampling interval : 20 sec</p> <p>Moisture : 3.5 %</p> <p>NOTE Initial</p> <p>The analysis performed by:<br/>KKomal</p> | <p>Drying started</p> <p>Date :25-02-2019<br/>Time :12:53:10<br/>Model:AGS200<br/>Serial number : 138</p> <p>Drying parameters</p> <p>Product : Test</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard<br/>Mode : Short mode<br/>Calculation : <math>((m_0 - m)/m_0) \times 100\%</math><br/>Finished : 3 samples</p> <p>Initial weight : 0.885 g<br/>Final weight : 0.858 g</p> <p>Drying time : 00:02:00s<br/>Sampling interval : 20 sec</p> <p>Moisture : 3.1 %</p> <p>NOTE Trial No. 1 (Final)</p> <p>The analysis performed by:<br/>KKomal</p> | <p>Drying started</p> <p>Date :25-02-2019<br/>Time :13:06:10<br/>Model:AGS200<br/>Serial number : 138</p> <p>Drying parameters</p> <p>Product : Test</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard<br/>Mode : Short mode<br/>Calculation : <math>((m_0 - m)/m_0) \times 100\%</math><br/>Finished : 3 samples</p> <p>Initial weight : 0.871 g<br/>Final weight : 0.849 g</p> <p>Drying time : 00:02:00s<br/>Sampling interval : 20 sec</p> <p>Moisture : 2.5 %</p> <p>NOTE Trial No. 2 (Final)</p> <p>The analysis performed by:<br/>KKomal</p> <p>Signature.....</p> | <p>Drying started</p> <p>Date :25-02-2019<br/>Time :13:27:58<br/>Model:AGS200<br/>Serial number : 138</p> <p>Drying parameters</p> <p>Product : Test</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard<br/>Mode : Short mode<br/>Calculation : <math>((m_0 - m)/m_0) \times 100\%</math><br/>Finished : time over</p> <p>Initial weight : 1.057 g<br/>Final weight : 1.023 g</p> <p>Drying time : 00:01:13s<br/>Sampling interval : 20 sec</p> <p>Moisture : 3.2 %</p> <p>NOTE Trial No. 3 (Final)</p> <p>The analysis performed by:<br/>KKomal</p> <p>Signature.....</p> |
|---|---|---|---|

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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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#### **OBSRVATIONS:**

The Drying behavior of Moringa leaves powder has been investigated under the microwave irradiation mode dryer for sterilization treatment. As per physical investigation, it has been observed that there is no colour change in any of the sample with required temperature on product.

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