**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 :** | **Laboratory Experimental Analysis** |
| **Process :** | **Continuous Microwave Heat Treatment for Drying of Turmeric Slices** |

## TEST REPORT No: 47/KRDC/LAB/17 Mum 02/02/2018

Date Sample reception : 02/02/2018
ID : 47/LAB/17

## SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : 3 kilograms
Sampling date : 03/02/2018
Product : Green turmeric
Requirement : Dried product must with lowest moisture content
Start Date test : 03/02/2018
End Date test : 03/02/2018

## LABORATORY EXPERIMENTAL SET UP:


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## Lab Microwave Heating System Specifications:

| | |
|---|---|
| **Microwave Power** | 1.45 kW(CW) |
| **Frequency** | 2450 MHz ± 50 |
| **Infra-red Power** | 6 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 degrees C (±5 degrees C) |
| **Humidity (%)** | ≤ 22 % 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

## EQUIPMENTS USED:

| Name of Equipment | Picture of Equipment | Specifications |
|---|---|---|
| **Compact Thermal Imaging Camera** |  | **Model: FLIR E-30**<br>**Resolution: 160 x 120 IR Thermal sensitivity of 0.10°C** |

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| | | |
|---|---|---|
| **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 turmeric slices, which were dried in continuous infra-red heating system up to 30% moisture content without adding any additive to speed up the drying rate. These partial dried turmeric slices on microwavable glass tray has placed in such a manner that every slice get uniform exposure of microwaves and this tray passed through continuous microwave heating system with low conveyor speed.

The observations are made after every 1 pass of 10 minutes on the basis of LOD method by checking weight loss. Also, initial weight before drying and final weight after drying was taken.

## ANALYTICAL RESULTS:

**Initial sample weight: 352 grams**
**Intensity: 70%**

| Sr. No. | Time (minutes) | Product temperature($^oC$) | Weight noted (grams) | Weight loss (grams) | Remarks, if any |
|---|---|---|---|---|---|
| 1. | After 10 | 49.1 | 291 | 61 | Drying rate started |
| 2. | After 20 | 51.3 | 238 | 114 | Drying phase continue |
| 3. | After 30 | 51.9 | 186 | 166 | Variant of Drying rate |
| 4. | After 40 | 53.3 | 146 | 206 | Required Drying rate |

**Sample weight after drying: 146 grams**
**Total weight loss on drying: 206 grams**
**Final Moisture Content: 1.43%**

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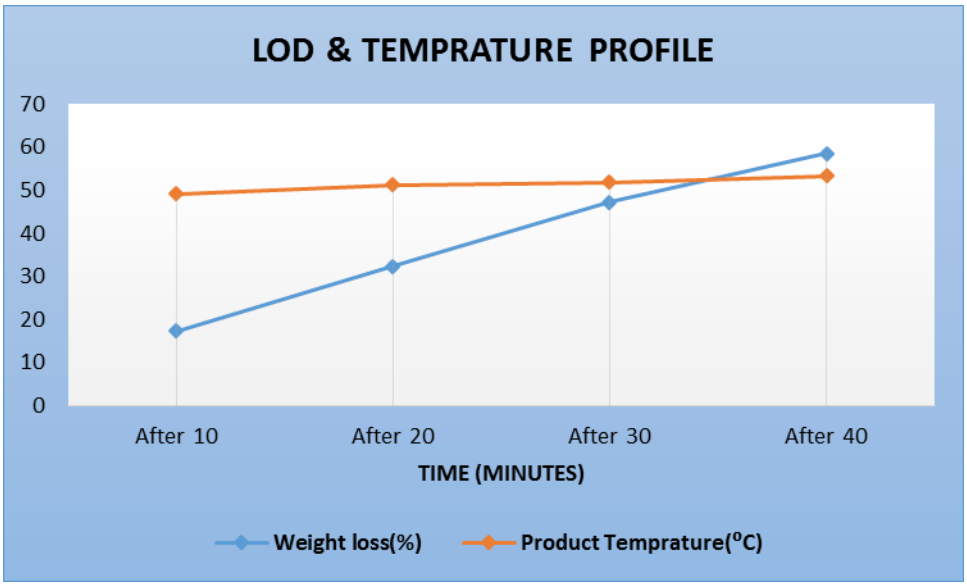
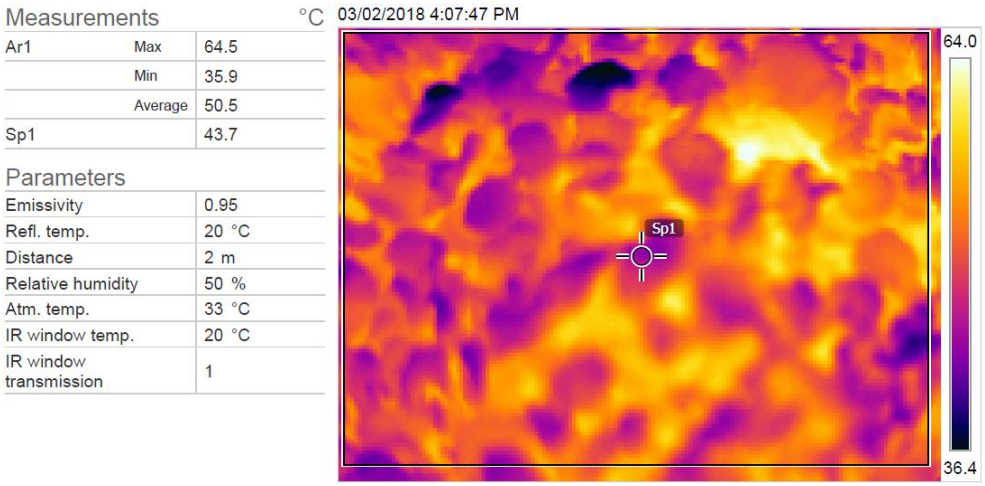
## GRAPHICAL REPRESENTATION OF DRYING PARAMETERS:




## THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

### 1. Before Heat Treatment



| Measurements | | °C |
|---|---|---|
| Ar1 | Max | 64.5 |
| | Min | 35.9 |
| | Average | 50.5 |
| Sp1 | | 43.7 |

| Parameters | |
|---|---|
| Emissivity | 0.95 |
| Refl. temp. | 20 °C |
| Distance | 2 m |
| Relative humidity | 50 % |
| Atm. temp. | 33 °C |
| IR window temp. | 20 °C |
| IR window transmission | 1 |



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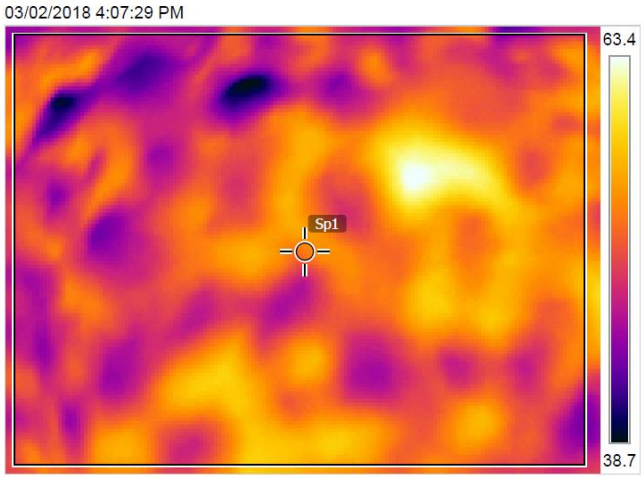
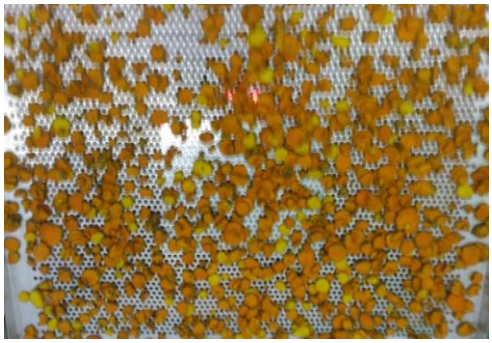
## 2. After Heat Treatment:

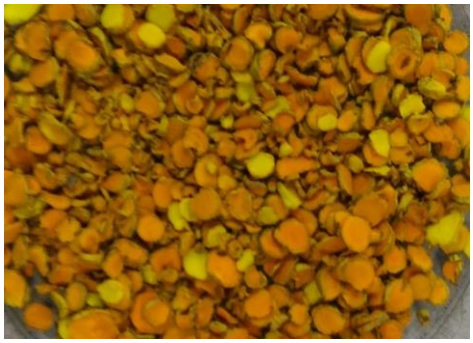
| Measurements | | °C |
|---|---|---|
| Ar1 | Max | 63.7 |
| | Min | 38.6 |
| | Average | 51.6 |
| Sp1 | | 53.3 |

| Parameters | |
|---|---|
| Emissivity | 0.95 |
| Refl. temp. | 20 °C |
| Distance | 2 m |
| Relative humidity | 50 % |
| Atm. temp. | 33 °C |
| IR window temp. | 20 °C |
| IR window transmission | 1 |




## BEFORE AND AFTER PICTURES OF SPECIMEN SAMPLE:





**Observation:**

**The Drying behavior of turmeric slices has been investigated under the continuous microwave heating system. The drying rate is found to be decreasing 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, the fat, fiber, textural and color content has to analyze. As per physical investigation, it has been observed that there is no enzymatic browning, also there is hardness in texture and color change.**

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

**Dr. Uttam K. Goswami**
**Approved By**

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