

Kerone Research & Development Centre (KRDC), B/47, Addl. MIDC. Anand Nagar, Ambarnath (East), Thane- 421 506, India  
Tel- +91-251-2620542/13/44/45/46, Email-[info@kerone.com](mailto:info@kerone.com), [www.kerone.com](http://www.kerone.com)

Customer :	Amalgamated Plantations Private Limited, Kolkata.
Process :	Continuous Infra-red Heat Treatment for Drying of Ginger

**TEST REPORT No: 47/KRDC/LAB/17 Mum 22/01/2018**

Date Sample reception : 22/01/2018  
ID : 47/LAB/15

**SAMPLE DESCRIPTION:**

Sampling : As Requested  
Sample Condition : Acceptable  
Quantity : 1.5 kilograms  
Sampling date : 22/01/2018  
Product : Ginger  
Requirement : Dried product must contain 30% moisture  
Start Date test : 22/01/2018  
End Date test : 23/01/2018

**LABORATORY EXPERIMENTAL SET UP:**



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### LAB INFRARED HEATING SYSTEM SPECIFICATIONS:

IR Medium Wave Emitters	6 Nos (-each having 0.5 kW, 445 mm heating length)
Short Wave IR Emitter with special reflectors	6 Nos (-each having 1 kW, 406 mm heating length)
IR Emitter to Object Distance	120 mm (- in medium wave zone)
IR Emitter to Object Distance	100 mm (- in short wave zone)
Overall IR Heating Zone length	1400 mm
Web width	400 mm
IR wavelength range	0.7 to 10 microns
Direct Exposure of MW IR	500 mm
Direct Exposure of SW IR	750mm
Temperature Range	0-400°C

### Environment-laboratory Ambient Conditions:

Temperature (degree C)	28 degrees C ( $\pm 5$ degrees C)
Humidity (%)	$\leq 36$ % 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

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### EQUIPMENTS USED:

Name of Equipment	Picture of Equipment	Specifications
Compact Thermal Imaging Camera		Model: FLIR E-30 Resolution: 160 x 120 IR 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)

### SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on ginger slices without adding any additive to speed up the drying rate. The ginger slices on a perforated tray has placed in such a manner that none of the pieces are touching and there is some space around each slice for air to circulate for achieving even drying characteristics.

For this experimental run, some amount of sample was taken and chopped into slices of thickness about 3-5 mm and placed it on perforated tray and passed through continuous infra-red heating system with low conveyor speed. Observations are made after every 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: 1000 grams

Initial Moisture Content: 87.26%

Sr. No.	Time (minutes)	Temperature (°C)	Weight noted (grams)	Weight loss (grams)	Remarks, if any
1.	After 10	70	938	62	Drying rate started

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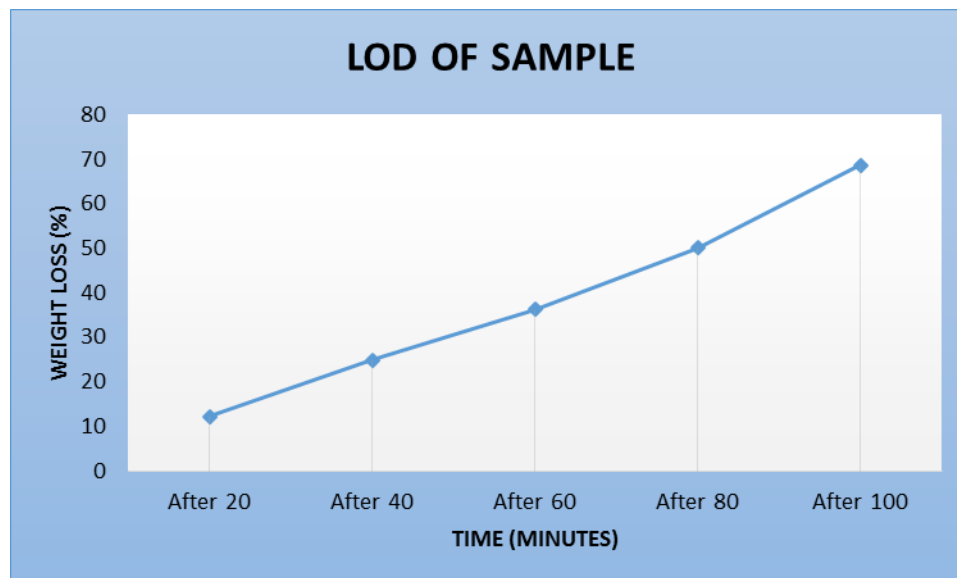
2.	After 20	70	878	122	Drying phase continue
3.	After 30	70	812	188	Variant of Drying rate
4.	After 40	70	752	248	Variant of Drying rate
5.	After 50	70	692	308	Variant of Drying rate
6.	After 60	70	638	362	Variant of Drying rate
7.	After 70	70	587	413	Variant of Drying rate
8.	After 80	70	500	500	Variant of Drying rate
9.	After 90	70	460	540	Variant of Drying rate
10.	After 100	70	313	687	Required drying rate

Sample weight after drying: 313 grams

Total weight loss on drying: 687 grams

Final Moisture Content: 31.47 %

#### GRAPHICAL REPRESENTATION OF DRYING PARAMETERS:



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## THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

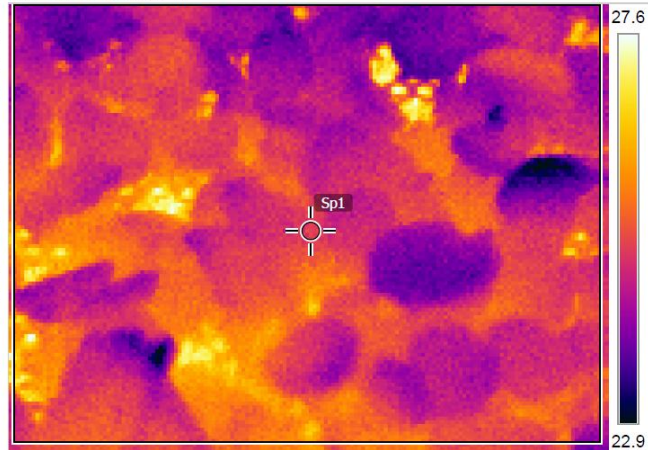
### 1. Before Heat Treatment

Measurements °C 22/01/2018 3:28:50 PM

Ar1	Max	27.8
	Min	22.8
	Average	24.9
Sp1		25.1

#### 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



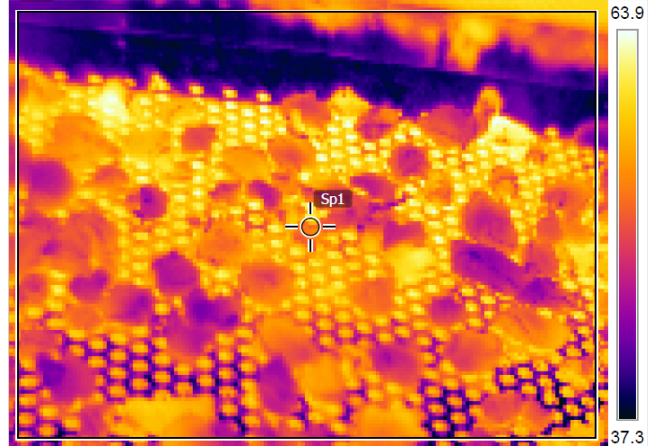
### 2. After Heat Treatment:

Measurements °C 23/01/2018 10:27:38 AM

Ar1	Max	64.4
	Min	36.0
	Average	51.0
Sp1		51.8

#### 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:



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**Observation:**

The Drying behavior of ginger slices has been investigated under the continuous infra-red 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 colour change and still some softness is there due to moisture.



**Miss Komal Bhoite**  
Tested By



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

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