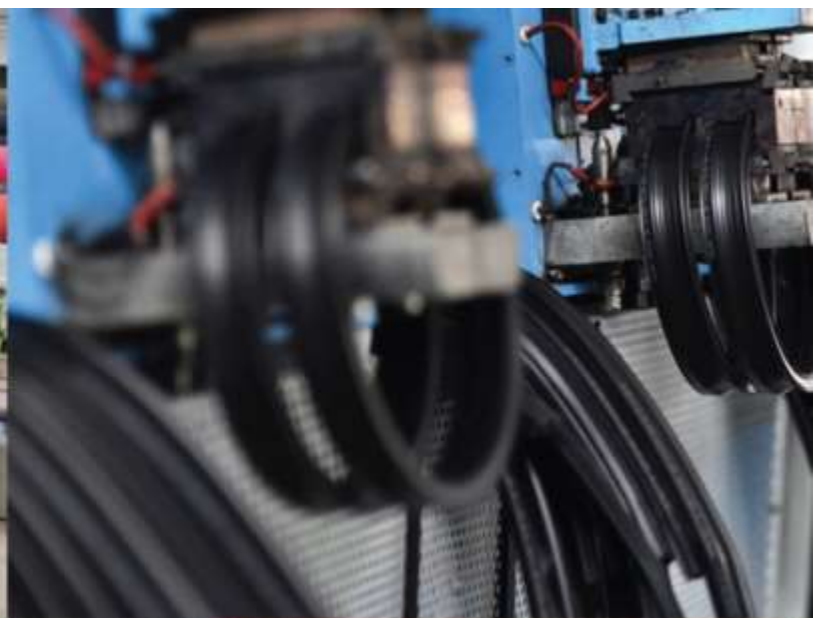


Kerone Research & Development Centre (KRDC)

B/47, Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com



**Continuous Microwave Heat Treatment for
Drying of Banana Fig and Tomato Slices**



Kerone Research & Development Centre (KRDC)

B/47, Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com

Customer :	M/s. Mani Gowtham
Process :	Continuous Microwave Heat Treatment for Drying of Banana Fig and Tomato Slices

Test Report No: 174/KRDC/LAB/17 Mum 03/01/2023

Date Sample reception : 02/01/2023
ID : 174/LAB/03

Sample Description:

Sampling : As Requested
Sample Condition : Acceptable
Sampling date : 02/01/2023
Product : Banana Fig and Tomato Slices
Start Date test : 02/01/2023
End Date test : 02/01/2023

Laboratory Experimental System -



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, www.kerone.com

System Specifications -

Microwave Power	1.45 kW(CW)
Frequency	2450 \pm 50 MHz
Microwave Exposure Zone (Cavity)	1000 mm length wise
Product surface temp. range	Max. 120 deg cells
Conveyor width	380mm
Conveyor Speed	Variable 0.2 to 2MPM
Conveyor Motor Drive	0.5HP AC Induction with VFD
Entry Vestibule length	1200mm
Exit Vestibule Length	1200 mm
Exhaust Power	0.5 HP

Laboratory's Environmental Conditions -




Temperature (degree C)	29.4°C (\pm 5°C)
Humidity (%)	\leq 50% 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- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com

Equipment Used –

Name of Equipment	Picture of Equipment	Specifications
Compact Thermal Imaging Camera		Model: FLIR E-30 Resolution: 160x 120IR 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
Moisture Analyzer		Make: Axis Balance Description: Moisture range: 1%(sample 0.02/0.05g), 0.1% (Sample 0.5/5g), 0.01%(Sample>5g)

Format: F/R&D/01

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.

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, www.kerone.com

Procedure of the Experiment -

- The experiment was performed on Banana Fig and Tomato Slices to speed up the heating rate.
- For this experimental run, the given sample was placed on the conveyor of the MW heating system with suitable parameters.
- After the heating treatment, the sample was analyzed.

Analytical Results:

Trial 1 – **Banana Fig**

Initial Weight – 140g

Initial Moisture – 63.7%

Cycle	Heating Zone Cycle Time	System Specification	On product temperature (°C)	Remark
C1	After 6 mins 50 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	60-70	Drying started
C2	After 13 mins 40 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	75-80	Drying Continuous
C3	After 20 mins 30 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	80-88	Drying Variants
C4	After 27 mins 20 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	89-93	Drying Variants
C5	After 34 mins 10 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	95-98	Drying Variants
C6	After 41 mins	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	98-100	Drying Variants
C7	After 47 mins 50 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	100-102	Drying Variants
C8	After 54 mins 40 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	103-106	Drying Variants
C9	After 61 mins 30 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	108-110	Drying Variants
C10	After 68 mins 20 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	120-126	Dried as desired

Total Heating Zone Cycle Time – 1 hour 22 mins.

Final Weight – 41g

Final Moisture – 12.1%

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, www.kerone.com

Trial 2 – Tomato Slices

Initial Weight – 80g

Initial Moisture – 93.5%

Cycle	Heating Zone Cycle Time	System Specification	On product temperature (°C)	Remark
C1	After 6 mins 50 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	40-43	Drying started
C2	After 13 mins 40 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	40-45	Drying Continuous
C3	After 20 mins 30 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	43-45	Drying Variants
C4	After 27 mins 20 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	45-50	Drying Variants
C5	After 34 mins 10 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	50-52	Drying Variants
C6	After 41 mins	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	53-55	Drying Variants
C7	After 47 mins 50 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	50-56	Drying Variants
C8	After 54 mins 40 sec	MW Intensity:100%;Belt Speed:0.8rpm;Set temp:70°C	56-63	Dried as desired

Total Heating Zone Cycle Time – 54 mins. 40 sec.

Final Weight – 5g

Final Moisture – 10.7%

Kerone Research & Development Centre (KRDC)

B/47, Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com

Trials Images:



Untreated Sample



Treated Sample



Untreated Sample



Treated Sample

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, www.kerone.com

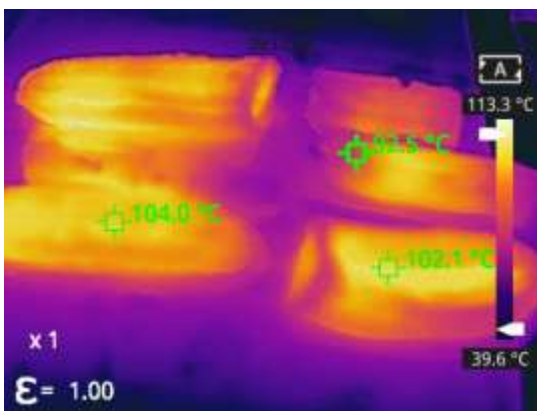
Thermal Images:

Measurements

Sp1	104.0°C
Sp2	102.1°C
Sp3	92.5°C

Parameters

Emissivity	1.00
Temp.	113.3°C

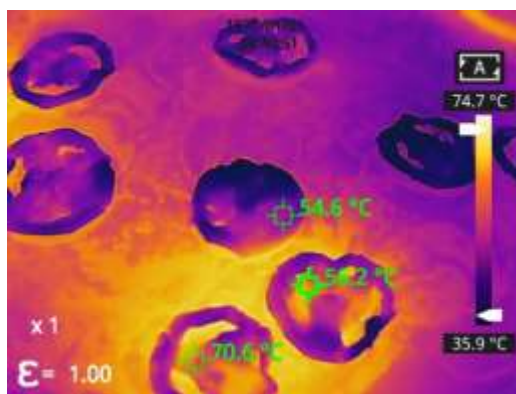


Measurements

Sp1	54.6°C
Sp2	56.2°C
Sp3	70.6°C

Parameters

Emissivity	1.00
Temp.	74.7°C



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, www.kerone.com

Moisture Report:

Trial 1

Drying started		Drying started	
Date :	2-01-2023	Date :	2-01-2023
Time :	15:59:53	Time :	17:11:31
Model :	AGS200	Model :	AGS200
Serial number :	130	Serial number :	130
Drying parameters		Drying parameters	
Product :	0	Product :	0
Drying temperature :	105.0 °C	Drying temperature :	105.0 °C
Drying profile :	standard	Drying profile :	standard
Mode :	Short mode	Mode :	Short mode
Calculation :	$[(m_0 - m) / m_0] \times 100\%$	Calculation :	$[(m_0 - m) / m_0] \times 100\%$
Finished :	3 samples	Finished :	3 samples
Initial weight :	1.053 g	Initial weight :	0.770 g
Final weight :	0.382 g	Final weight :	0.642 g
Drying time :	00:34:40s	Drying time :	00:16:40s
Sampling interval :	20 sec	Sampling interval :	20 sec
Moisture :	63.7 %	Moisture :	12.1 %
NOTE	Initial Moisture	NOTE	Final moisture
The analysis performed by:		The analysis performed by:	
Signature: 		Signature: 	

Format: F/R&D/01

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.

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, www.kerone.com

Trial 2

Drying started		Drying started	
Date :	2-01-2023	Date :	2-01-2023
Time :	17:59:18	Time :	18:00:09
Model :	AGS100	Model :	AGS100
Serial number :	138	Serial number :	138
Drying parameters		Drying parameters	
Product :	0	Product :	0
Drying temperature :	105.0 °C	Drying temperature :	105.0 °C
Drying profile :	standard	Drying profile :	standard
Mode :	Short mode	Mode :	Short mode
Calculation :	$\frac{(n0-n)}{n0} \times 100\%$	Calculation :	$\frac{(n0-n)}{n0} \times 100\%$
Finished :	3 samples	Finished :	3 samples
Initial weight :	0.661 g	Initial weight :	0.552 g
Final weight :	0.093 g	Final weight :	0.493 g
Drying time :	00:22:40s	Drying time :	00:07:40s
Sampling interval :	20 sec	Sampling interval :	20 sec
Moisture :	93.5 %	Moisture :	10.7 %
NOTE	Initial Moisture	NOTE	Final Moisture
The analysis performed by:	Aravali	The analysis performed by:	Aravali

Kerone Research & Development Centre (KRDC)

B/47, Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com

Observations:

The heating behavior of Banana Fig & Tomato Slices was investigated under the Microwave heating system. The heating rate was found to be increasing with respect to increasing in time. As per the physical investigation, it was observed that the product was dried as desired without any charring effect.



Ms. Sayali Asole
(Tested By)