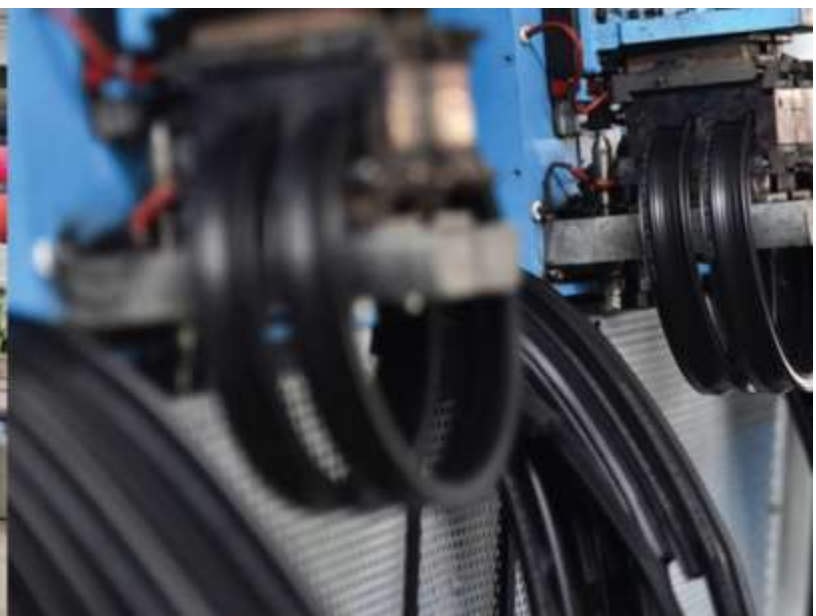


Kerone Research & Development Centre (KRDC)

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



**Batch 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 : | Batch Microwave Heat Treatment for Drying of Banana Fig and Tomato Slices |

Test Report No: 172/KRDC/LAB/17 Mum 02/01/2023

Date Sample reception : 28/12/2022
ID : 172/LAB/02

Sample Description:

Sampling : As Requested
Sample Condition : Acceptable
Sampling date : 28/12/2022
Product : Banana Fig and Tomato Slices
Start Date test : 28/12/2022
End Date test : 28/12/2022

Laboratory Experimental System -



System Specifications -

| | |
|---|---|
| Microwave Power | 2 KW (CW) |
| Frequency | 2450 MHz \pm 50 |
| Convective Power | 3.5 KW (airflow 350 I/min at 20°C) |
| Microwave Exposure Zone (Cavity) | 1 Cubic meter |
| Mode Stirrer | One |
| Thermal Monitoring System | Single Channel Fiber Optic: Range - 40 to 250°C |
| Exhaust Power | 1 HP |
| Tray size (width*height*depth) | 450*950*50 mm |

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, Ambernath (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 taken in the glass tray and placed in the MW heating system with suitable parameters.
- After the heating treatment, the sample was analyzed.

Analytical Results:

Trial 1- Banana Fig

Initial Weight – 192g

Initial Moisture – 64.7%

| Cycles | Cycle time (mins.) | Specifications of Microwave | On product temp | Remark |
|--------|--------------------|--|-----------------|--|
| 1 | After 5 mins. | Magnetron Power: 1.5 kW; Set temp: 70°C | (70-80) °C | Drying started |
| 2 | After 10 mins. | Magnetron Power: 1.5 kW; Set temp: 70°C | (88-93) °C | Drying Continuous |
| 3 | After 15 mins. | Magnetron Power: 1.5 kW; Set temp: 70°C | (100-120) °C | Drying Variants |
| 4 | After 20 mins. | Magnetron Power: 1.5 kW; Set temp: 70°C | (130-135) °C | Desired crispiness and color were obtained |

Final Weight – 37g

Final Moisture – 1.2%

Trials 2- Tomato Slices

Initial Weight – 70g

Initial Moisture – 93.5%

| Cycles | Cycle time (mins.) | Specifications of Microwave | On product temp | Remark |
|--------|--------------------|--|-----------------|-------------------------|
| 1 | After 5 mins. | Magnetron Power: 1.5 kW; Set temp: 70°C | (65-70) °C | Drying started |
| 2 | After 10 mins. | Magnetron Power: 1.5 kW; Set temp: 70°C | (73-79) °C | Drying Continuous |
| 3 | After 15 mins. | Magnetron Power: 1.5 kW; Set temp: 70°C | (75-80) °C | Drying Variants |
| 4 | After 20 mins. | Magnetron Power: 1.5 kW; Set temp: 70°C | (79-82) °C | Slight burning observed |
| 5 | After 25 mins. | Magnetron Power: 1.5 kW; Set temp: 70°C | (80-85) °C | Some dried as desired |

Final Weight – 10g

Final Moisture – 30.2%

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

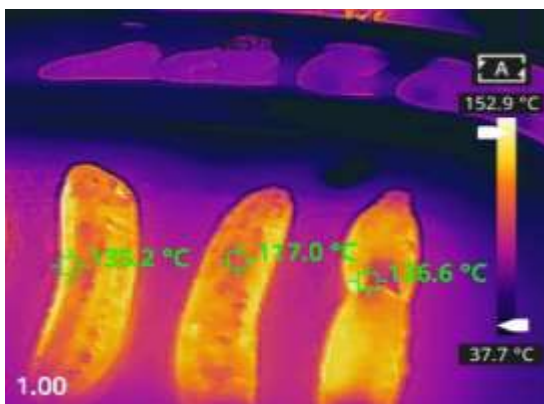
Thermal Images:

Measurements

| | |
|-----|---------|
| Sp1 | 135.2°C |
| Sp2 | 117.0°C |
| Sp3 | 126.6°C |

Parameters

| | |
|------------|---------|
| Emissivity | 1.00 |
| Temp. | 152.9°C |

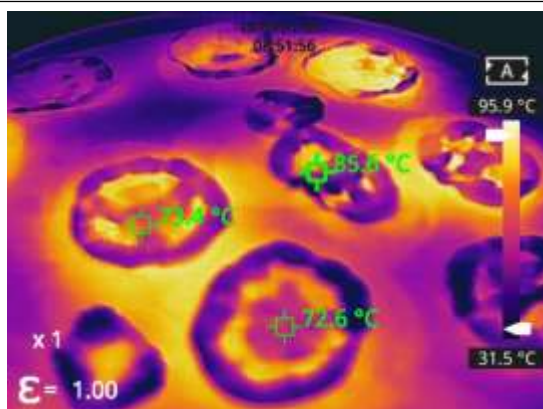


Measurements

| | |
|-----|--------|
| Sp1 | 85.6°C |
| Sp2 | 73.4°C |
| Sp3 | 72.6°C |

Parameters

| | |
|------------|--------|
| Emissivity | 1.00 |
| Temp. | 95.9°C |





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

Moisture Analysis Report:

Trial 1

| Drying started: | | Drying started: | |
|----------------------------|------------------------------------|----------------------------|------------------------------------|
| Date: | 17-03-2022 | Date: | 17-03-2022 |
| Time: | 17:30:28 | Time: | 17:30:28 |
| Model: | 405200 | Model: | 405200 |
| Serial number: | 138 | Serial number: | 138 |
| Drying parameters: | | Drying parameters: | |
| Product: | 1.0 | Product: | 1.0 |
| Drying temperature: | 105.0 °C | Drying temperature: | 105.0 °C |
| Drying profile: | standard | Drying profile: | standard |
| Mode: | Short mode | Mode: | Short mode |
| Calculation: | $\{(w_0 - w) / w_0\} \times 100\%$ | Calculation: | $\{(w_0 - w) / w_0\} \times 100\%$ |
| Finished: | 3 samples | Finished: | 3 samples |
| Initial weight: | 0.524 g | Initial weight: | 0.496 g |
| Final weight: | 0.185 g | Final weight: | 0.480 g |
| Drying time: | 00:19:20s | Drying time: | 00:21:40s |
| Sampling interval: | 20 sec | Sampling interval: | 20 sec |
| Moisture: | 64.7 % | Moisture: | 1.2 % |
| NOTE: Initial moisture | | NOTE: Final moisture | |
| The analysis performed by: | | The analysis performed by: | |
| Signature: <i>Angali</i> | | Signature: <i>Angali</i> | |

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

Trials 2

| Drying started | | Drying started | |
|----------------------------|----------------------------------|----------------------------|----------------------------------|
| Date : | 28-12-2022 | Date : | 28-12-2022 |
| Time : | 10:07:51 | Time : | 10:21:04 |
| Model : | AGS200 | Model : | AGS200 |
| 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 : | $((w_0 - w) / w_0) \times 100\%$ | Calculation : | $((w_0 - w) / w_0) \times 100\%$ |
| Finished : | 3 samples | Finished : | 3 samples |
| Initial weight : | 0.923 g | Initial weight : | 0.514 g |
| Final weight : | 0.060 g | Final weight : | 0.359 g |
| Drying time : | 00:34:00s | Drying time : | 00:11:20s |
| Sampling interval : | 20 sec | Sampling interval : | 20 sec |
| Moisture : | 93.3 % | Moisture : | 30.2 % |
| NOTE Initial moisture | | NOTE Final moisture | |
| The analysis performed by: | | The analysis performed by: | |
| Signature: <i>Aggarwal</i> | | Signature: <i>Aggarwal</i> | |

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 and 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 Drying of the product was achieved with desired color and crispiness of Banana figs. In Tomato slices before dried as desired some burning was observed.



Ms. Sayali Asole
(Tested By)