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Kerone Research & Development Centre (KRDC)
B/47, Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
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Batch Microwave + Convection Heat Treatment for Drying of Whole Chilli

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Customer :	**M/s. Fresh Ground**
Process :	**Batch Microwave + Convection Heat Treatment for Drying of Whole Chilli**

Test Report No*: *136/KRDC/LAB/17 Mum 07/09/2022

Date Sample reception : 07/09/2022
ID : 136/LAB/07

***Sample Description*:**

Sampling : As Requested
Sample Condition : Acceptable
Quantity : 1 kg approx.
Sampling date : 07/09/2022
Product : Whole Chilli
Start Date test : 07/09/2022
End Date test : 07/09/2022

Laboratory Experimental System -

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System Specifications -

Microwave Power	2 KW (CW)
Frequency	2450 MHz ± 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)	29.4ºC (±5ºC)
Humidity (%)	≤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

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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: ±°C (1.8°F)** **Temperature resolution: 0.1°C (0.2°F)** **Humidity range: 10%~99% RH** **Humidity accuracy: ±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)**

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Procedure of the Experiment -

- The experiment was performed on the Whole Chilli to speed up the heating rate.
- For this experimental run, the given sample was taken in glass tray and placed in the MW + Convection heating system with suitable parameters.
- After the heating treatment, the sample was analyzed.

Analytical Results:

Trial 1 –

Initial Weight – 200g
Initial Moisture – 12.4%

Cycles	Cycle time (mints.)	System Specifications	Moisture Content (%)	On Product temperature	Remark
C1	After 5 mints.	Magnetron Power: 0.5 kW; Set temp: 50ºC	15	(60-70)˚C	Drying started
C2	After 10 mints.	Magnetron Power: 0.5 kW; Set temp: 50ºC	11.2	(70-75)˚C	Drying continuous
C3	After 15 mints.	Magnetron Power: 0.5 kW; Set temp: 50ºC	7.4	(75-80)˚C	Drying Variants
C4	After 20 mints.	Magnetron Power: 0.5 kW; Set temp: 50ºC	6.7	(75-80)˚C	Dried as desired

Final Weight – 190g
Final Moisture – 6.7%
Total Cycle time - 20 mints.

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Trial 2 –

Initial Weight – 200g
Initial Moisture – 12.4%

Cycles	Cycle time (mints.)	System Specifications	Moisture Content (%)	On Product temperature	Remark
C1	After 15 mints.	Magnetron Power: 0.5 kW; Set temp: 50ºC	10.2	(70-75)˚C	Drying started
C2	After 5 mints.	Magnetron Power: 0.5 kW; Set temp: 50ºC	7.6	(70-77)˚C	Dried as desired

Final Weight – 188g
Final Moisture – 7.6%
Total Cycle time - 20 mints.

Trial 3 –

Initial Weight – 200g
Initial Moisture – 12.4%

Cycles	Cycle time (mints.)	System Specifications	Moisture Content (%)	On Product temperature	Remark
C1	After 10 mints.	Magnetron Power: 0.7 kW; Set temp: 75ºC	8	(70-75)˚C	Drying started
C2	After 10 mints.	Magnetron Power: 0.7 kW; Set temp: 75ºC	5.1	(75-83)˚C	Dried as desired

Final Weight – 189g
Final Moisture – 5.1%
Total Cycle time - 20 mints.

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Trial 4 –

Initial Weight – 200g
Initial Moisture – 12.4%

Cycles	Cycle time (mints.)	System Specifications	Moisture Content (%)	On Product temperature	Remark
C1	After 20 mints.	Magnetron Power: 0.7 kW; Set temp: 75 ºC; Heater temp: 80 ºC	4.1	(70-82)˚C	Dried as desired

Final Weight – 186g
Final Moisture – 4.1%
Total Cycle time - 20 mints.

Before and After Treatment Images:

Initial Sample

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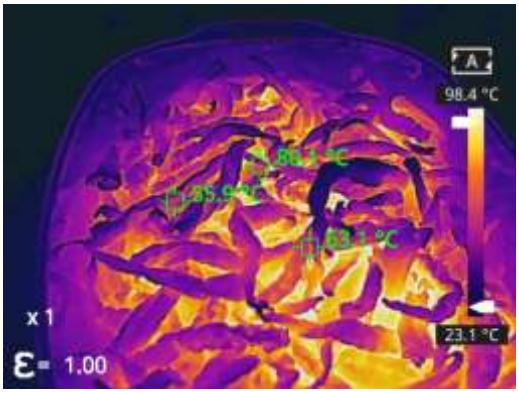
Final Sample (Trial 1, Trial 2)

Final Sample (Trial 3, Trial 4)

Thermal Images:

Measurements	
Sp1	80.1°C
Sp2	55.9 °C
Sp3	63.1°C

Parameters	
Emissivity	1.00
Temp.	98.4°C



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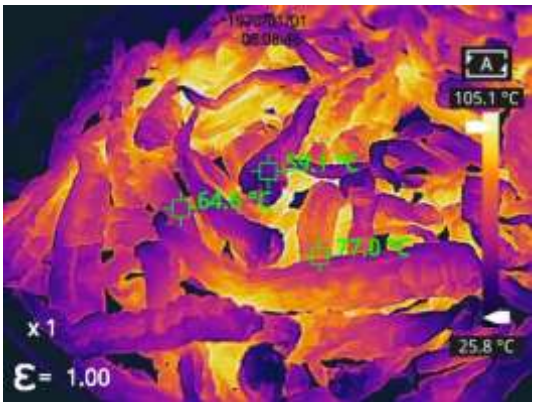
Measurements

Sp1	59.1 °C
Sp2	64.6 °C
Sp3	77.0 °C

Parameters

Emissivity	1.00
Temp.	105.1 °C

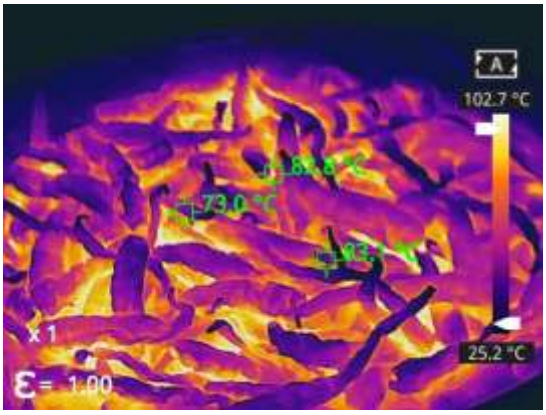


Measurements

Sp1	82.8°C
Sp2	73.0 °C
Sp3	83.1 °C

Parameters

Emissivity	1.00
Temp.	102.7 °C

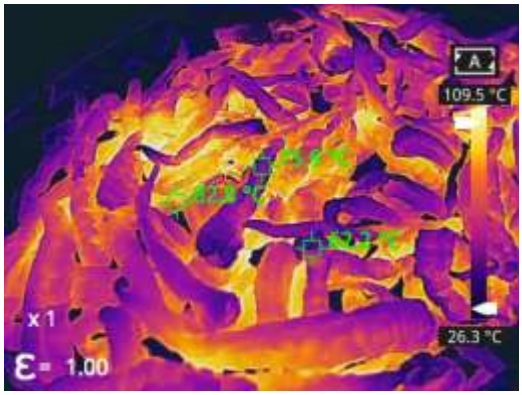


Measurements

Sp1	75.9 °C
Sp2	82.8 °C
Sp3	62.2 °C

Parameters

Emissivity	1.00
Temp.	109.5 °C



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Moisture Report:

Drying started

Date : 7-09-2022
Time :12:50:42
Model:AGS200
Serial number : 130

Drying parameters

Product : 0
Drying temperature : 105.0 °C
Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples
Initial weight : 0.541 g
Final weight : 0.474 g
Drying time : 00:04:00s
Sampling interval : 20 sec
Moisture : 12.4 %

NOTE Initial moisture

The analysis performed by:

Signature...

Drying started

Date : 7-09-2022
Time :13:15:09
Model:AGS200
Serial number : 130

Drying parameters

Product : 0
Drying temperature : 105.0 °C
Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples
Initial weight : 0.582 g
Final weight : 0.543 g
Drying time : 00:03:00s
Sampling interval : 20 sec
Moisture : 6.7 %

NOTE Trial 1 final moisture

The analysis performed by:

Signature...

Drying started

Date : 7-09-2022
Time :17:51:40
Model:AGS200
Serial number : 130

Drying parameters

Product : 0
Drying temperature : 105.0 °C
Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples
Initial weight : 0.705 g
Final weight : 0.654 g
Drying time : 00:05:00s
Sampling interval : 20 sec
Moisture : 7.8 %

NOTE Trial 2 final moisture

The analysis performed by:

Signature...

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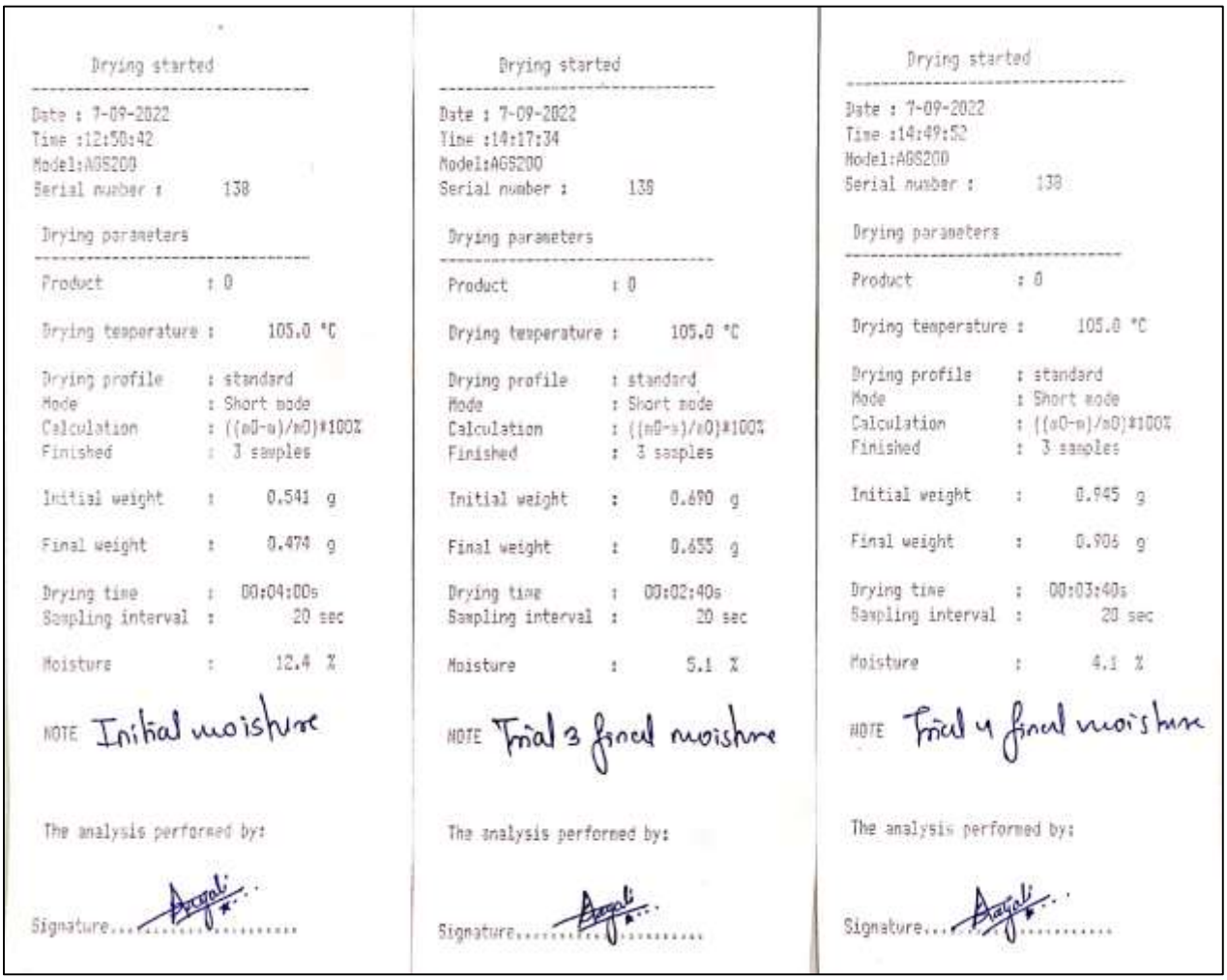

Drying started

Date : 7-09-2022
Time :12:50:42
Model:AGS200
Serial number : 138

Drying parameters

Product : 0
Drying temperature : 105.0 °C
Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples
Initial weight : 0.541 g
Final weight : 0.474 g
Drying time : 00:04:00s
Sampling interval : 20 sec
Moisture : 12.4 %

NOTE Initial moisture

The analysis performed by:

Signature.....

Drying started

Date : 7-09-2022
Time :14:17:34
Model:AGS200
Serial number : 138

Drying parameters

Product : 0
Drying temperature : 105.0 °C
Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples
Initial weight : 0.690 g
Final weight : 0.655 g
Drying time : 00:02:40s
Sampling interval : 20 sec
Moisture : 5.1 %

NOTE Trial 3 final moisture

The analysis performed by:

Signature.....

Drying started

Date : 7-09-2022
Time :14:49:52
Model:AGS200
Serial number : 138

Drying parameters

Product : 0
Drying temperature : 105.0 °C
Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples
Initial weight : 0.945 g
Final weight : 0.906 g
Drying time : 00:03:40s
Sampling interval : 20 sec
Moisture : 4.1 %

NOTE Trial 4 final moisture

The analysis performed by:

Signature.....

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Observations:

The heating behavior of Chilli 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 crispiness of the product after the treatment was achieved in the sample with moisture content below 5%, and desired moisture was achieved without any charring effect.

Ms. Sayali Asole
(Tested By)