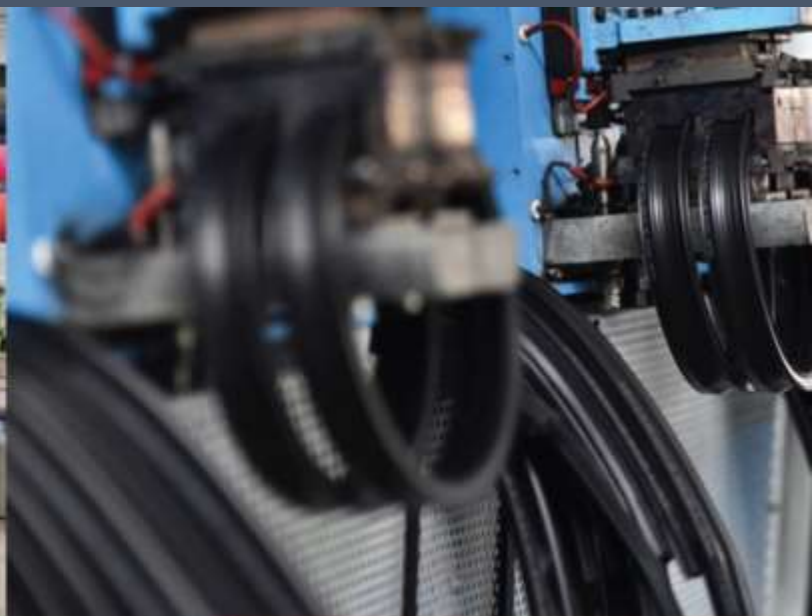


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**Batch Vacuum Microwave Heat
Treatment for Puffing of Dried Fruits**

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Customer :	M/s. Elven Agri Co. Ltd.
Process :	Batch Vacuum Microwave Heat Treatment for Puffing of Dried Fruits

Test Report No: 154/KRDC/LAB/17 Mum 15/11/2022

Date Sample reception : 03/09/2022
ID : 154/LAB/15

Sample Description:

Sampling : As Requested
Sample Condition : Acceptable
Sampling date : 12/11/2022
Product : Dried Mango
Start Date test : 12/11/2022
End Date test : 12/11/2022

Laboratory Experimental System –



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System Specifications -

Magnetron Power Generator Rating	Air Cooled 1.45KW/2450+50 MHZ x 1 No.
Convection Power	1.5 KW
Total Heater Power	3 KW (MW 1.45KW + Convection 1.5KW)
Supply Voltage required	230V- 2Ph supply
MW Overall (LxWxH) in mm	620X670X640
Cavity Chamber (INNER) in mm	L-300 & Φ220
Vacuum Pump Rating	1/2HP, 1440rpm

Laboratory's Environmental Conditions –

Temperature (degree C)	29.4°C (±5°C)
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: $\pm^{\circ}\text{C}$ (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)

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Procedure of the Experiment -

- The experiment was performed on Dehydrated Fruits to speed up the heating rate.
- For this experimental run, the sample was placed in the MW heating system with suitable parameters.
- After the heating treatment, the sample was analyzed.

Analytical Results:

Sample 1 – **Mango**

Trial	Sample Wt. (gms.)	Initial Moisture (%)	Cycle Time	Specifications of Microwave	Final Moisture (%)	Remark
1	50	8.5	3 mins.	MW intensity: 100%; Set temp: 80°C; Vacuum:300mmHg	2.0	Browning Puffing effect observed On product temp: (170-180)°C
2	50	8.5	5 mins.	MW intensity: 100%; Set temp: 60°C; Vacuum:300mmHg	4.0	No charring Puffed as desired On product temp: (140-170)°C
3	50	8.5	5 mins.	MW intensity: 100%; Set temp: 60°C; Vacuum:100mmHg	1.5	No charring Puffed as desired On product temp: (120-125)°C

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Trial images:



Untreated Sample (Mango)



Treated Sample (Trial 1, Trial 2, Trial 3)

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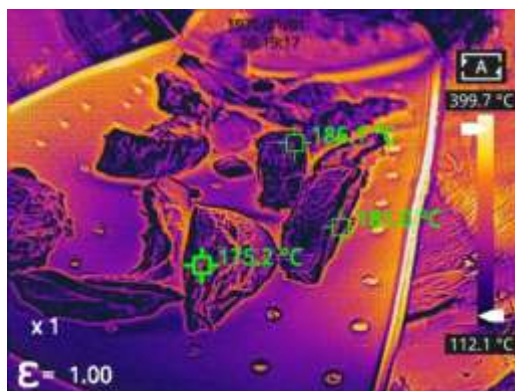
Thermal Images:

Measurements

Sp1	175.2°C
Sp2	186.1°C
Sp3	181.0°C

Parameters

Emissivity	1.00
Temp.	399.7°C

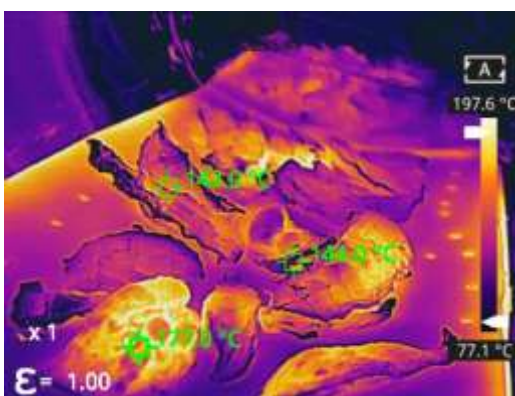


Measurements

Sp1	142.0°C
Sp2	144.0°C
Sp3	177.0°C

Parameters

Emissivity	1.00
Temp.	197.6°C

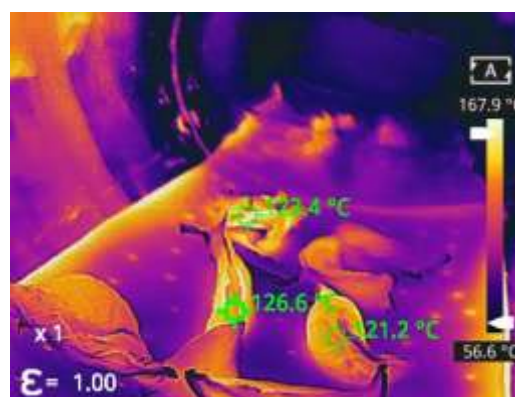


Measurements

Sp1	123.4°C
Sp2	126.6°C
Sp3	121.2°C

Parameters

Emissivity	1.00
Temp.	167.9°C



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Moisture Analysis Report:

Trial 1

Trial 2

Trial 3

Drying started		Drying started		Drying started		Drying started	
Date: 11-11-2022	Date: 11-11-2022	Date: 11-11-2022	Date: 11-11-2022	Date: 11-11-2022	Date: 11-11-2022	Date: 11-11-2022	Date: 11-11-2022
Time: 11:00:10	Time: 11:17:10	Time: 11:10:10	Time: 11:10:10	Time: 11:04:00	Time: 11:04:00	Time: 11:04:00	Time: 11:04:00
Model: AOS200	Model: AOS200	Model: AOS200	Model: AOS200	Model: AOS200	Model: AOS200	Model: AOS200	Model: AOS200
Serial number: 130	Serial number: 130	Serial number: 130	Serial number: 130	Serial number: 130	Serial number: 130	Serial number: 130	Serial number: 130
Drying parameters		Drying parameters		Drying parameters		Drying parameters	
Product: 10	Product: 10	Product: 10	Product: 10	Product: 10	Product: 10	Product: 10	Product: 10
Drying temperature: 105.0 °C	Drying temperature: 105.0 °C	Drying temperature: 105.0 °C	Drying temperature: 105.0 °C	Drying temperature: 105.0 °C	Drying temperature: 105.0 °C	Drying temperature: 105.0 °C	Drying temperature: 105.0 °C
Drying profile: Standard	Drying profile: Standard	Drying profile: Standard	Drying profile: Standard	Drying profile: Standard	Drying profile: Standard	Drying profile: Standard	Drying profile: Standard
Mode: Short mode	Mode: Short mode	Mode: Short mode	Mode: Short mode	Mode: Short mode	Mode: Short mode	Mode: Short mode	Mode: Short mode
Calculation: $((m_0 - m) / m_0) \times 100\%$	Calculation: $((m_0 - m) / m_0) \times 100\%$	Calculation: $((m_0 - m) / m_0) \times 100\%$	Calculation: $((m_0 - m) / m_0) \times 100\%$	Calculation: $((m_0 - m) / m_0) \times 100\%$	Calculation: $((m_0 - m) / m_0) \times 100\%$	Calculation: $((m_0 - m) / m_0) \times 100\%$	Calculation: $((m_0 - m) / m_0) \times 100\%$
Finished: 3 samples	Finished: 3 samples	Finished: 3 samples	Finished: 3 samples	Finished: 3 samples	Finished: 3 samples	Finished: 3 samples	Finished: 3 samples
Initial weight: 0.571 g	Initial weight: 0.614 g	Initial weight: 0.576 g	Initial weight: 0.576 g	Initial weight: 0.588 g	Initial weight: 0.588 g	Initial weight: 0.588 g	Initial weight: 0.588 g
Final weight: 0.495 g	Final weight: 0.603 g	Final weight: 0.553 g	Final weight: 0.553 g	Final weight: 0.576 g	Final weight: 0.576 g	Final weight: 0.576 g	Final weight: 0.576 g
Drying time: 00:03:40s	Drying time: 00:02:20s	Drying time: 00:04:30s	Drying time: 00:04:30s	Drying time: 00:01:40s	Drying time: 00:01:40s	Drying time: 00:01:40s	Drying time: 00:01:40s
Sampling interval: 20 sec	Sampling interval: 20 sec	Sampling interval: 20 sec	Sampling interval: 20 sec	Sampling interval: 20 sec	Sampling interval: 20 sec	Sampling interval: 20 sec	Sampling interval: 20 sec
Moisture: 0.5 %	Moisture: 2.0 %	Moisture: 4.0 %	Moisture: 4.0 %	Moisture: 1.5 %	Moisture: 1.5 %	Moisture: 1.5 %	Moisture: 1.5 %
NOTE Initial moisture	NOTE Final moisture	NOTE Final moisture	NOTE Final moisture	NOTE Final moisture	NOTE Final moisture	NOTE Final moisture	NOTE Final moisture
The analysis performed by:	The analysis performed by:	The analysis performed by:	The analysis performed by:	The analysis performed by:	The analysis performed by:	The analysis performed by:	The analysis performed by:
Signature: <i>Angeli</i>	Signature: <i>Angeli</i>	Signature: <i>Angeli</i>	Signature: <i>Angeli</i>	Signature: <i>Angeli</i>	Signature: <i>Angeli</i>	Signature: <i>Angeli</i>	Signature: <i>Angeli</i>

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Observations:

The heating behavior of Dehydrated Fruit was investigated under the Microwave heating system. The heating rate was found to be increasing with respect to the increase in time. As per the physical investigation, it was observed that the puffing and drying of the product were obtained as desired.



Ms. Sayali Asole
(Tested By)