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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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HEAT TREATMENT FOR DRYING OF MANGO AND SAPOTA

ISO 9001-2008 | ISO 9001-2015 | EMS 14001 | OHSAS 18001
In Association with SVCH-Technologii, Moscow (Russia)

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Customer :	**M/s Sachin Nale**
Process :	**Heat Treatment for Drying of Mango and Sapota**

TEST REPORT No: 60/KRDC/LAB/17 Mum 04/04/2022

Date Sample reception : 09/04/2022
ID : 60/LAB/04

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Sampling date : 09/04/2022
Product : Mango and Sapota
Requirement : Removal of moisture content till the desired crispiness is achieved
Start Date test : 09/04/2022
End Date test : 10/04/2022

LABORATORY EXPERIMENTAL SET UP:

LAB BATCH MICROWAVE+CONVECTION HEATING SYSTEM

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LAB BATCH MICROWAVE+CONVECTION SYSTEM SPECIFICATIONS:

Microwave Power	2 KW (CW)
Frequency	2450 MHz ± 50
Convective Power	3.5 KW (airflow 350 l/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

LAB VACCUM HEATING SYSTEM

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LAB VACCUM HEATING 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	560W, 220V/50Hz, 2880rpm
Free Air Displacement	10.7 CFM
Vacuum Pump (LxWxH)	430x200x300

ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (^{o}C)	30^{o}C (±5^{o}C)
Humidity (%)	≤74% 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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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)**
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**

SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on Mango and Sapota to speed up the drying rate. For this experimental run, given sample has been placed on different heating system with suitable parameters. Observations are made after decided time period on the basis of weight of the product, moisture content and appearance.

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ANALYTICAL RESULTS: BATCH MICROWAVE+CONVECTION HEATING SYSTEM

Trail 1:

Product: Mango
Initial moisture: 78.8%
Initial weight: 125g

No. of cycle	Cycle time (min)	Microwave Power (kW)	Microwave Temp (˚C)	Heater Temp (˚C)	Remark, if any
1	After 30 min.	1	55	60	Charring started

Total cycle time:30 min.
No. of cycle: 1
Final moisture:10.9%
Final weight:20g

Trail 2:

Product: Mango
Initial moisture: 78.8%
Initial weight: 125g

No. of cycle	Cycle time (min)	Microwave Power (kW)	Microwave Temp (˚C)	Heater Temp (˚C)	Remark, if any
1	After 45 min.	0.2	55	60	Started drying
2	After 45 min.	0.2	55	60	Patches of charring

Total cycle time:90 min.
No. of cycle: 2
Final moisture:28.4%
Final weight:30g

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Trail 3:

Product: Sapota
Initial moisture: 73.6%
Initial weight: 125g

No. of cycle	Cycle time (min)	Microwave Power (kW)	Microwave Temp (˚C)	Heater Temp (˚C)	Remark, if any
1	After 15 min.	0.8	55	60	Started drying
2	After 15 min.	0.8	55	60	Patches of charring

Total cycle time:30 min.
No. of cycle: 2
Final moisture: 6.6%
Final weight: 45 g

BEFORE AND AFTER PICTURES OF TREATED SPCIMEN SAMPLE:

Trial 1

a) Untreated

b) Treated

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Trial 2

a) Untreated

b) Treated

Trial 3

a) Untreated

b) Treated

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ANALYTICAL RESULTS: VACCUM HEATING SYSTEM

Trail 4:

Product: Mango
Initial moisture: 78.8%
Initial weight: 125g

No. of cycle	Cycle time (min.)	Microwave intensity (%)	Remark, if any
1	30	100	Charred

Total cycle time: 30 min.
Final moisture:58.5%
Final weight:64g

Trail 5:

Product: Mango
Initial moisture: 78.8%
Initial weight: 125g

No. of cycle	Cycle time (hr.)	Microwave intensity (%)	Remark, if any
1	30	90	Charred

Total cycle time: 60 min.
Final moisture:21.5%
Final weight:31g

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Trail 6:

Product: Mango
Initial moisture: 78.8%
Initial weight: 125g

No. of cycle	Cycle time (hr.)	Microwave intensity (%)	Remark, if any
1	30	80	No effect

Total cycle time: 60 min.
Final moisture: 69.2%
Final weight:31g

BEFORE AND AFTER PICTURES OF TREATED SPCIMEN SAMPLE:

Trial 4

a) Untreated

b) Treated

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Trial 5

a) Untreated

b) Treated

Trial 6

a) Untreated

b) Treated

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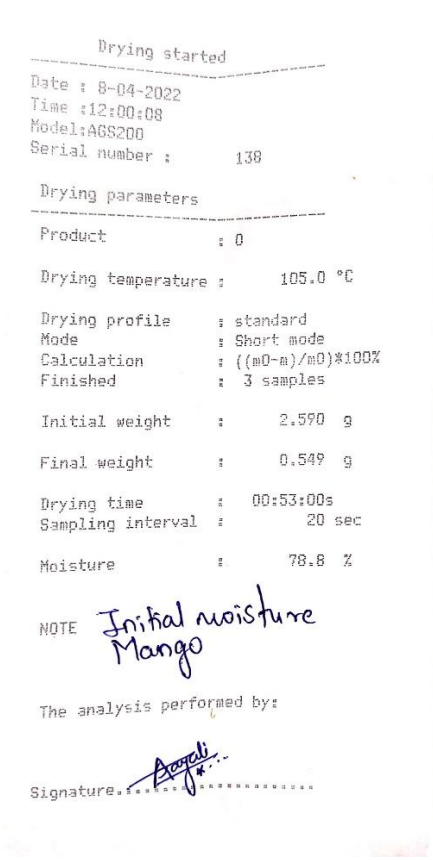
MOISTURE ANALYSIS REPORT: BATCH MICROWAVE+CONVECTION HEATING SYSTEM



Drying started

Date : 8-04-2022
Time :12:00:08
Model:AGS200
Serial number : 138

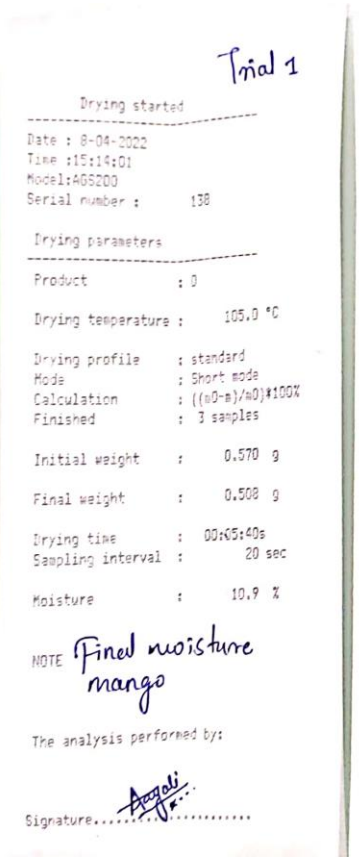
Drying parameters

Product : 0
Drying temperature : 105.0 °C
Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples
Initial weight : 2.590 g
Final weight : 0.549 g
Drying time : 00:53:00s
Sampling interval : 20 sec
Moisture : 78.8 %

NOTE Initial moisture Mango

The analysis performed by:

Signature.....



Trial 1

Drying started

Date : 8-04-2022
Time :15:14:01
Model:AGS200
Serial number : 138

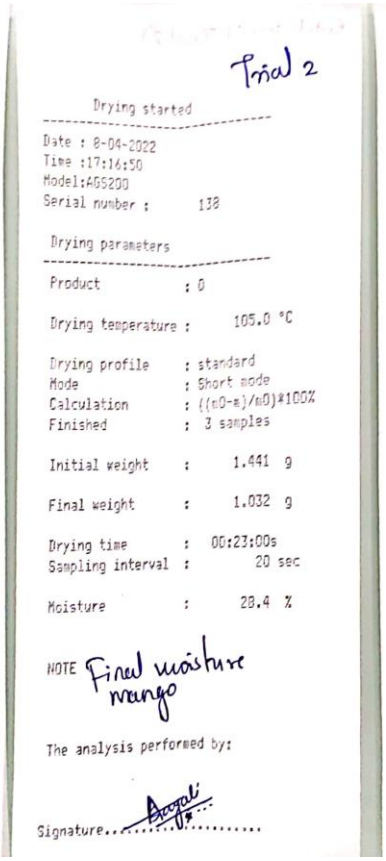
Drying parameters

Product : 0
Drying temperature : 105.0 °C
Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples
Initial weight : 0.570 g
Final weight : 0.508 g
Drying time : 00:05:40s
Sampling interval : 20 sec
Moisture : 10.9 %

NOTE Final moisture mango

The analysis performed by:

Signature.....



Trial 2

Drying started

Date : 8-04-2022
Time :17:16:50
Model:AGS200
Serial number : 138

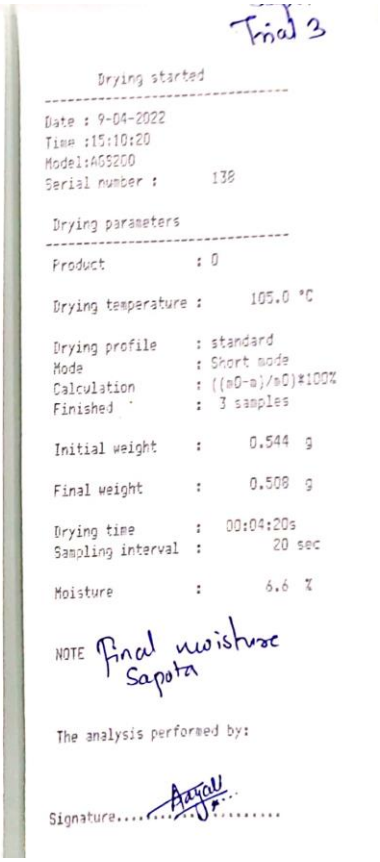
Drying parameters

Product : 0
Drying temperature : 105.0 °C
Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples
Initial weight : 1.441 g
Final weight : 1.032 g
Drying time : 00:23:00s
Sampling interval : 20 sec
Moisture : 28.4 %

NOTE Final moisture mango

The analysis performed by:

Signature.....



Trial 3

Drying started

Date : 9-04-2022
Time :15:10:20
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 : 0.544 g
Final weight : 0.508 g
Drying time : 00:04:20s
Sampling interval : 20 sec
Moisture : 6.6 %

NOTE Final moisture Sapota

The analysis performed by:

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MOISTURE ANALYSIS REPORT: VACCUM HEATING SYSTEM

Drying started
Date : 8-04-2022
Time :12:00:08
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 : 2.590 g
Final weight : 0.549 g
Drying time : 00:53:00s
Sampling interval : 20 sec
Moisture : 78.8 %

NOTE Initial moisture Mango

The analysis performed by:

Signature.....

Trial 4

Drying started
Date : 8-04-2022
Time :14:47:04
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 : 1.137 g
Final weight : 0.472 g
Drying time : 00:35:00s
Sampling interval : 20 sec
Moisture : 58.5 %

NOTE Final moisture mango

The analysis performed by:

Signature.....

Trial 5

Drying started
Date : 8-04-2022
Time :15:28:02
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 : 0.721 g
Final weight : 0.566 g
Drying time : 00:12:40s
Sampling interval : 20 sec
Moisture : 21.5 %

NOTE Final moisture mango

The analysis performed by:

Signature.....

Trial 6

Drying started
Date : 9-04-2022
Time :12:10:55
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 : 1.060 g
Final weight : 0.326 g
Drying time : 00:28:20s
Sampling interval : 20 sec
Moisture : 69.2 %

NOTE Final moisture mango

The analysis performed by:

Signature.....

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OBSERVATION:

The drying behavior of Mango and Sapota has been investigated under the Microwave + Convection heating system, Vacuum heating system. The drying rate is found to be increasing with respect to increase in time. It has been found that the product's weight is affected after drying. As per physical investigation, it has been observed that there is no degradation of product except in Microwave system and vacuum system.

Ms. Sayali Asole
(Tested By)