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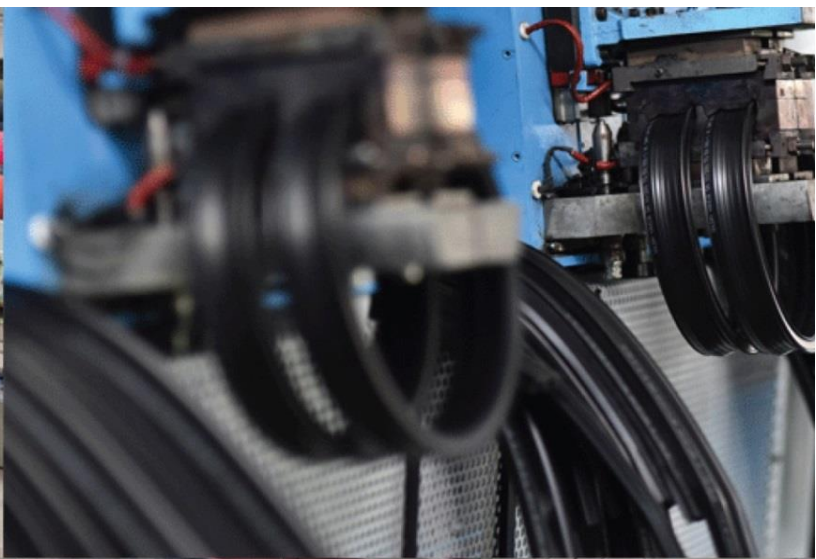
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In Association With



ELECTRO MAGNETIC innovative technologies

Kerone Research & Development Centre (KRDC),
B/47, Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/43/44/45/46, Email-info@kerone.com, www.kerone.com



**BATCH MICROWAVE+CONVECTION HEATING
SYSTEM FOR DRYING OF EXTRUDE ARECA**

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



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Customer:	M/s. D. S. GROUPS.
Process:	Batch Microwave + Convection Heat Treatment for Drying of Extrude Areca.

TEST REPORT No: 55/KRDC/LAB/17 Mum 02/03/2022

Date Sample reception : 02/03/2022

ID : 55/LAB/02

SAMPLE DESCRIPTION:

Sampling : As Requested

Sample Condition : Acceptable

Sampling date : 02/03/2022

Product : Extrude Areca.

Requirement : Final Product must be dried fully and moisture content should be less than 4%

Start Date test : 02/03/2022

End Date test : 02/03/2022

LABORATORY EXPERIMENTAL SET UP FOR TRIAL:



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LAB BATCH MICROWAVE+CONVECTION HEATING SYSTEM SPECIFICATIONS:

Microwave Power	2 KW (CW)
Frequency	2450 MHz \pm 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

ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (degree C)	27.1°C (\pm 5°C)
Humidity (%)	\leq 70% RH
Pressure (kN/m ² 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: 160x 120IR 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 Extrude Areca without adding any additive to speed up the drying rate. For this experimental run, given sample has been placed on Glass tray in MW + Convection heating system with suitable parameters. Observations are made on the final moisture content of sample, weight and appearance Also, initial weight before drying and final weight after drying was taken.

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ANALYTICAL RESULTS:

TRIAL-A:

Sample: B2

Initial Wt.: 200g

Initial Moisture: 24.8%

Cycles	Specifications of Microwave	Cycle Time (min.)	Moisture Content.	Remarks.
C1	Magnetron Power: 0.5 kW; Set temp. of MW:40°C; Set temp. of Heater: 30°C; Fan speed: 100%	After 40 min	8.3%	Drying Start
C2	Magnetron Power: 0.5 kW; Set temp. of MW:40°C Set temp. of Heater: 30°C; Fan speed: 100%	After 90 min	4.8%	Drying Continues.
C3	Magnetron Power: 0.5 kW; Set temp. of MW:40°C Set temp. of Heater: 30°C; Fan speed: 100%	After 110 min	3.7%	Drying Continues.

Total time: 1 hr. 50 min

Final Weight: 146 g

Final Moisture: 3.7%

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Sample: B3

Initial Wt.: 375g

Initial Moisture: 24.2%

Cycles	Specifications of Microwave	Cycle Time (min.)	Moisture Content.	Remarks.
C1	Magnetron Power: 0.5 kW; Set temp. of MW:40°C; Set temp. of Heater: 30°C; Fan speed: 100%	After 50 min	12.2%	Drying Start
C2	Magnetron Power: 0.5 kW; Set temp. of MW:40°C Set temp. of Heater: 30°C; Fan speed: 100%	After 70 min	5.5%	Drying Continues.
C3	Magnetron Power: 0.5 kW; Set temp. of MW:40°C Set temp. of Heater: 30°C; Fan speed: 100%	After 95 min	3.4%	Dried as Desired.

Total time:1 hr. 35 min

Final Weight: 290g

Final Moisture content: 3.4%

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TRIAL-B:

ANALYTICAL RESULTS:

Sample: B2

Initial Wt.: 200g

Initial Moisture: 24.8%

Cycles	Specifications of Microwave	Cycle Time (min.)	Moisture Content.	Remark.
C1	Magnetron Power: 0.8 kW; Set temp. of MW:40°C; Set temp. of Heater: 30°C; Fan speed: 100%	After 40 min	4.6%	Drying Starts
C2	Magnetron Power: 0.8 kW; Set temp. of MW:40°C Set temp. of Heater: 30°C; Fan speed: 100%	After 80 min	3.3%	Drying Continues.

Total time: 1hr. 20 min

Final Weight: 150g

Final Moisture content: 3.3 %

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Sample: B3

Initial Wt.: 200g

Initial Moisture: 24.2%

Cycles	Specifications of Microwave	Cycle Time (min.)	Moisture Content.	Remark.
C1	Magnetron Power: 0.8 kW; Set temp. of MW:40°C; Set temp. of Heater: 30°C; Fan speed: 100%	After 40 min	6.4%	Drying Starts
C2	Magnetron Power: 0.8 kW; Set temp. of MW:40°C Set temp. of Heater: 30°C; Fan speed: 100%	After 80 min	5.7%	Drying Continues.
C3	Magnetron Power: 0.8 kW; Set temp. of MW:40°C Set temp. of Heater: 30°C; Fan speed: 100%	After 90 min	2.7%	Dried as Desired.

Total time: 1 hr. 30 min

Final Weight: 164 g

Final Moisture content: 2.7 %

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BEFORE AND AFTER PICTURES OF TREATED SPECIMEN SAMPLE:

SMAPLE B2



a) UNTREATED SPECIMEN.



b) TREATED UNDER BATCH MW SYSTEM.

MOISTURE ANALYSIS REPORTS:

B2		B2		B2	
Drying started		Drying started		Drying started	
Date : 2-03-2022		Date : 2-03-2022		Date : 2-03-2022	
Time : 10:57:57		Time : 17:56:02		Time : 17:02:21	
Model: AGS200		Model: AGS200		Model: AGS200	
Serial number : 138		Serial number : 138		Serial number : 138	
Drying parameters		Drying parameters		Drying parameters	
Product : 0		Product : 0		Product : 0	
Drying temperature : 105.0 °C		Drying temperature : 105.0 °C		Drying temperature : 105.0 °C	
Drying profile : standard		Drying profile : standard		Drying profile : standard	
Mode : Short mode		Mode : Short mode		Mode : Short mode	
Calculation : $((n0-n)/n0)*100\%$		Calculation : $((n0-n)/n0)*100\%$		Calculation : $((n0-n)/n0)*100\%$	
Finished : 3 samples		Finished : 3 samples		Finished : 3 samples	
Initial weight : 0.596 g		Initial weight : 0.731 g		Initial weight : 0.578 g	
Final weight : 0.448 g		Final weight : 0.704 g		Final weight : 0.559 g	
Drying time : 00:07:20s		Drying time : 00:03:20s		Drying time : 00:03:20s	
Sampling interval : 20 sec		Sampling interval : 20 sec		Sampling interval : 20 sec	
Moisture : 24.8 %		Moisture : 3.7 %		Moisture : 3.3 %	
NOTE Final moisture B2 sample		NOTE Final moisture B2 sample 0.5 KW		NOTE Final moisture B2 sample 0.8 KW	
The analysis performed by:		The analysis performed by:		The analysis performed by:	
Signature: <i>Aravali</i>		Signature: <i>Aravali</i>		Signature: <i>Aravali</i>	
Initial moisture					

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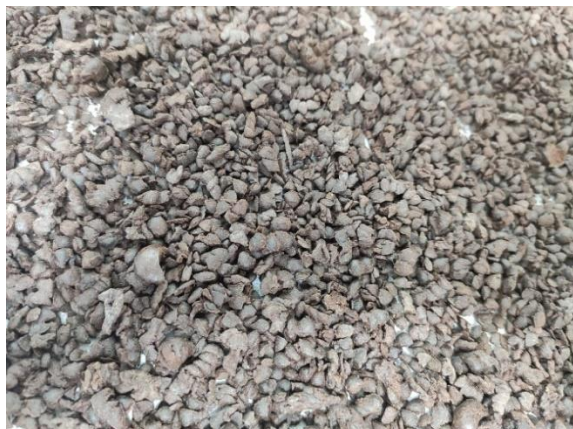


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SMAPLE B3



a) UNTREATED SPECIMEN.



b) TREATED UNDER BATCH MW SYSTEM.

MOISTURE ANALYSIS REPORTS:

B ₃		B ₃		B ₃	
Drying started		Drying started		Drying started	
Date : 2-03-2022		Date : 2-03-2022		Date : 2-03-2022	
Time : 11:18:21		Time : 15:14:53		Time : 18:07:51	
Model: AGS200		Model: AGS200		Model: AGS200	
Serial number : 138		Serial number : 138		Serial number : 138	
Drying parameters		Drying parameters		Drying parameters	
Product : 0		Product : 0		Product : 0	
Drying temperature : 105.0 °C		Drying temperature : 105.0 °C		Drying temperature : 105.0 °C	
Drying profile : standard		Drying profile : standard		Drying profile : standard	
Mode : Short mode		Mode : Short mode		Mode : Short mode	
Calculation : $((m_0-m)/m_0)*100\%$		Calculation : $((m_0-m)/m_0)*100\%$		Calculation : $((m_0-m)/m_0)*100\%$	
Finished : 3 samples		Finished : time over		Finished : 3 samples	
Initial weight : 0.644 g		Initial weight : 1.010 g		Initial weight : 0.636 g	
Final weight : 0.488 g		Final weight : 0.976 g		Final weight : 0.619 g	
Drying time : 00:11:40s		Drying time : 00:04:34s		Drying time : 00:02:40s	
Sampling interval : 20 sec		Sampling interval : 20 sec		Sampling interval : 20 sec	
Moisture : 24.2 %		Moisture : 3.4 %		Moisture : 2.7 %	
NOTE Initial moisture B ₃ sample		NOTE Final moisture B ₃ sample 0.5 fw		NOTE Final moisture B ₃ sample 0.5 fw	
The analysis performed by:		The analysis performed by:		The analysis performed by:	
Signature: <i>Aravali</i>		Signature: <i>Aravali</i>		Signature: <i>Aravali</i>	
Initial moisture					

Format: F/R&D/01

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OBSERVATION:

The drying behavior of extrude Areca has been investigated under the Microwave + Convection heating system. The drying rate is found to be increasing with respect to increase in time. As per physical investigation, it has been observed that there is no enzymatic browning of product and there is hardness in texture. Also the desirable moisture content as required is obtained without charring.

Ms. Sayali Asole
(Tested By)