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ELECTRO MAGNETIC innovative technologies

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



**Continuous Microwave Heat Treatment for
Drying of Extrude Areca**





EMitech Research & Development Centre



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Customer:	M/s. D. S. GROUPS.
Process:	Continuous Microwave 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

Date test : 02/03/2022

LABORATORY EXPERIMENTAL SET UP FOR TRIAL:



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LAB CONTINUOUS MICROWAVE HEATING SYSTEM SPECIFICATIONS:

Microwave Power	1.45 kW(CW)
Frequency	2450 \pm 50 MHz
Microwave Exposure Zone (Cavity)	1000 mm length wise
Product surface temp. range	Max. 120 deg cells
Conveyor width	380mm
Conveyor Speed	Variable 0.2 to 2MPM
Conveyor Motor Drive	0.5HP AC Induction with VFD
Entry Vestibule length	1200mm
Exit Vestibule Length	1200 mm
Exhaust Power	0.5 HP

ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (degree C)	30°C (\pm 5°C)
Humidity (%)	\leq 70% 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: 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)

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 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	Total Cycle Time	Microwave exposure time	Moisture Content.	Remarks.
C1	Microwave intensity: 80%; Belt speed: 0.25 mpm	After 39 min	12 min 45 sec	15.5%	Drying Start
C2	Microwave intensity: 80%; Belt speed: 0.25 mpm	After 78 min	25 min 30 sec	9.3%	Drying Continues.
C3	Microwave intensity: 80%; Belt speed: 0.25 mpm	After 90 min	29 min 45 sec	3.2%	Drying Continues.

Total time: 1 hr. 30 min**Final Weight: 153 g****Final Moisture: 3.2 %****Sample: B3****Initial Wt.:150 g****Initial Moisture: 24.2%**

Cycles	Specifications of Microwave	Total Cycle Time (min.)	Microwave exposure time (min.)	Moisture Content.	Remarks.
C1	Microwave intensity: 100%; Belt speed: 0.33 mpm	After 27 min	10 min 30 sec	12%	Drying Start
C2	Microwave intensity: 100%; Belt speed: 0.33 mpm	After 59 min	21 min	5.6%	Drying Continues.
C3	Microwave intensity: 100%; Belt speed: 0.33 mpm	After 72 min	28 min	3.6%	Dried as Desired.

Total time: 1 hr. 12min**Final Weight: 116 g****Final Moisture content: 3.6%**

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BEFORE AND AFTER PICTURES OF TREATED SPECIMEN SAMPLE:



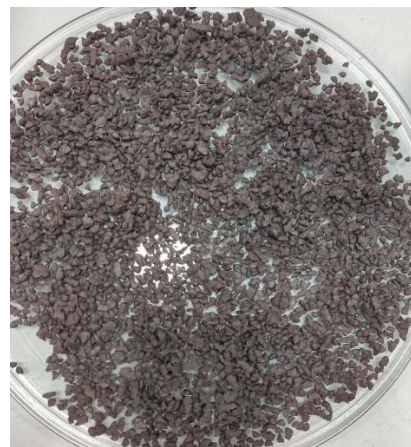
a) Untreated sample B2



b) Treated sample B2



a) Untreated sample B3



b) Treated sample B3



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MOISTURE ANALYSIS REPORTS:

B ₂		B ₂		B ₃		B ₃	
Drying started		Drying started		Drying started		Drying started	
Date : 2-03-2022		Date : 2-03-2022		Date : 2-03-2022		Date : 2-03-2022	
Time : 10:57:57		Time : 13:18:45		Time : 11:18:21		Time : 17:27:40	
Model: AGS200		Model: AGS200		Model: AGS200		Model: AGS200	
Serial number : 138		Serial number : 138		Serial number : 138		Serial number : 138	
Drying parameters		Drying parameters		Drying parameters		Drying parameters	
Product : 0		Product : 0		Product : 0		Product : 0	
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	
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 : $\{(m_0-m)/m_0\} \times 100\%$	
Finished : 3 samples		Finished : 3 samples		Finished : 3 samples		Finished : 3 samples	
Initial weight : 0.596 g		Initial weight : 0.783 g		Initial weight : 0.644 g		Initial weight : 0.807 g	
Final weight : 0.448 g		Final weight : 0.758 g		Final weight : 0.488 g		Final weight : 0.778 g	
Drying time : 00:07:20s		Drying time : 00:04:00s		Drying time : 00:11:40s		Drying time : 00:03:40s	
Sampling interval : 20 sec		Sampling interval : 20 sec		Sampling interval : 20 sec		Sampling interval : 20 sec	
Moisture : 24.8 %		Moisture : 3.2 %		Moisture : 24.2 %		Moisture : 3.6 %	
NOTE Initial moisture B ₂ sample		NOTE Final moisture B ₂ sample		NOTE Initial moisture B ₃ sample		NOTE Final moisture B ₃ sample	
The analysis performed by:		The analysis performed by:		The analysis performed by:		The analysis performed by:	
Signature: <i>Aravali</i>		Signature: <i>Aravali</i>		Signature: <i>Aravali</i>		Signature: <i>Aravali</i>	

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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)

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