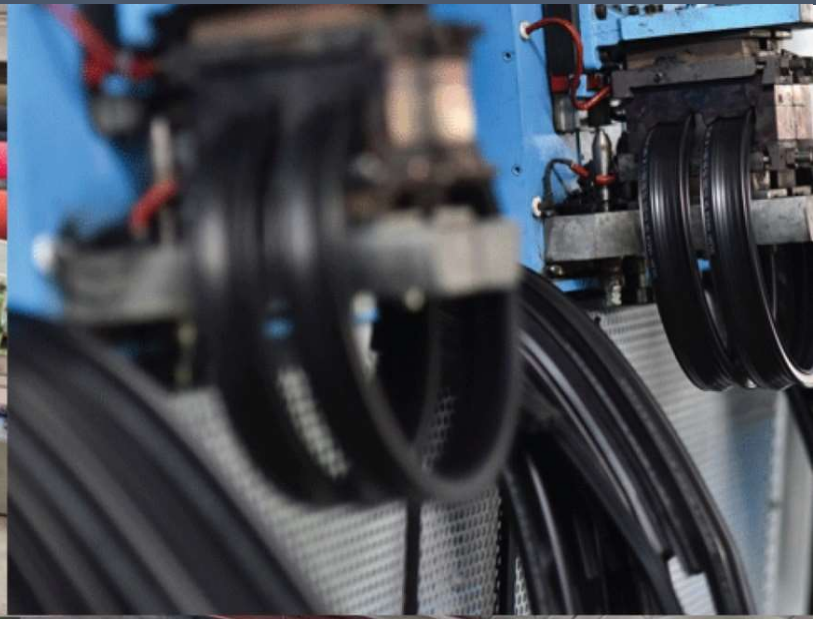


Kerone Research & Development Centre (KRDC)
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Continuous Infra-Red Heat Treatment for Drying of Millets



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| | |
|-------------------|--|
| Customer : | M/S. Raichur University |
| Process : | Convection Heat Treatment for Drying of Millet Grains |

Test Report No: 231/KRDC/LAB/17 Mum 31/08/2023

Date Sample reception : 30/08/2023
ID : KRDC/R&D/23-24/08/31

Sample Description:

Sampling : As Requested
Sample Condition : Acceptable
Sampling date : 30/08/2023
Product : Millets
Requirement : Drying of Millets
Start Date test : 30/08/2023
End Date test : 30/08/2023

Laboratory Experimental System -



Format: F/R&D/01



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System Specifications –

| | |
|----------------------------------|--|
| IR Power | 5 kW |
| Type of IR Emitters | Quartz Infrared |
| Rotary Drum Size | Φ324 mm x 800 mm long x 3mm Thick. |
| Thermal Monitoring System | Single Channel Fiber Optic: Range -40 to 250°C |
| Exhaust | Exhaust port with manual damper |
| Air Circulation Fan | Radial Fan FHP 0.5HP |

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: $\pm 0.1^\circ\text{C}$ (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) |
| Analytical Balances LINB-A10 |  | Capacity : 100 g Minimum weighing : 0.0004 g Resolution : 0.0001 g Pan size : ≈ 80 mm |

Procedure of the Experiment -

- The experiment was performed on Millets to speed up the heating rate.
- For this experimental run, the given sample was taken and then passed in the Continuous IR heating system with suitable parameters.
- After the heating treatment, the sample was analyzed.



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Analytical Results:

Trial - 01

| Trials | Cycle time | Initial weight | Initial Moisture | System Specifications | Final weight | Final Moisture | Remark |
|--------|------------|----------------|------------------|------------------------------|--------------|----------------|------------------|
| C1 | 40 mins | 300g | 6.1% | Set temp:120°C; RPM -0.15 | 205g | 2.7% | Dried as desired |

Trials - 02

| Trials | Cycle time | Initial weight | Initial Moisture | System Specifications | Final weight | Final Moisture | Remark |
|--------|------------|----------------|------------------|----------------------------------|--------------|----------------|------------------|
| C1 | 10 min | 300g | 6.1% | Set temp:250°C; RPM - 0.52rpm | 262g | 2.2% | Dried as desired |

Before and After images:

Trial -01



Format: F/R&D/01



ELECTRO MAGNETIC Innovative technologies

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Untreated Sample

Treated Sample

Trial -02



Untreated Sample

Treated Sample

Moisture Analysis Report:

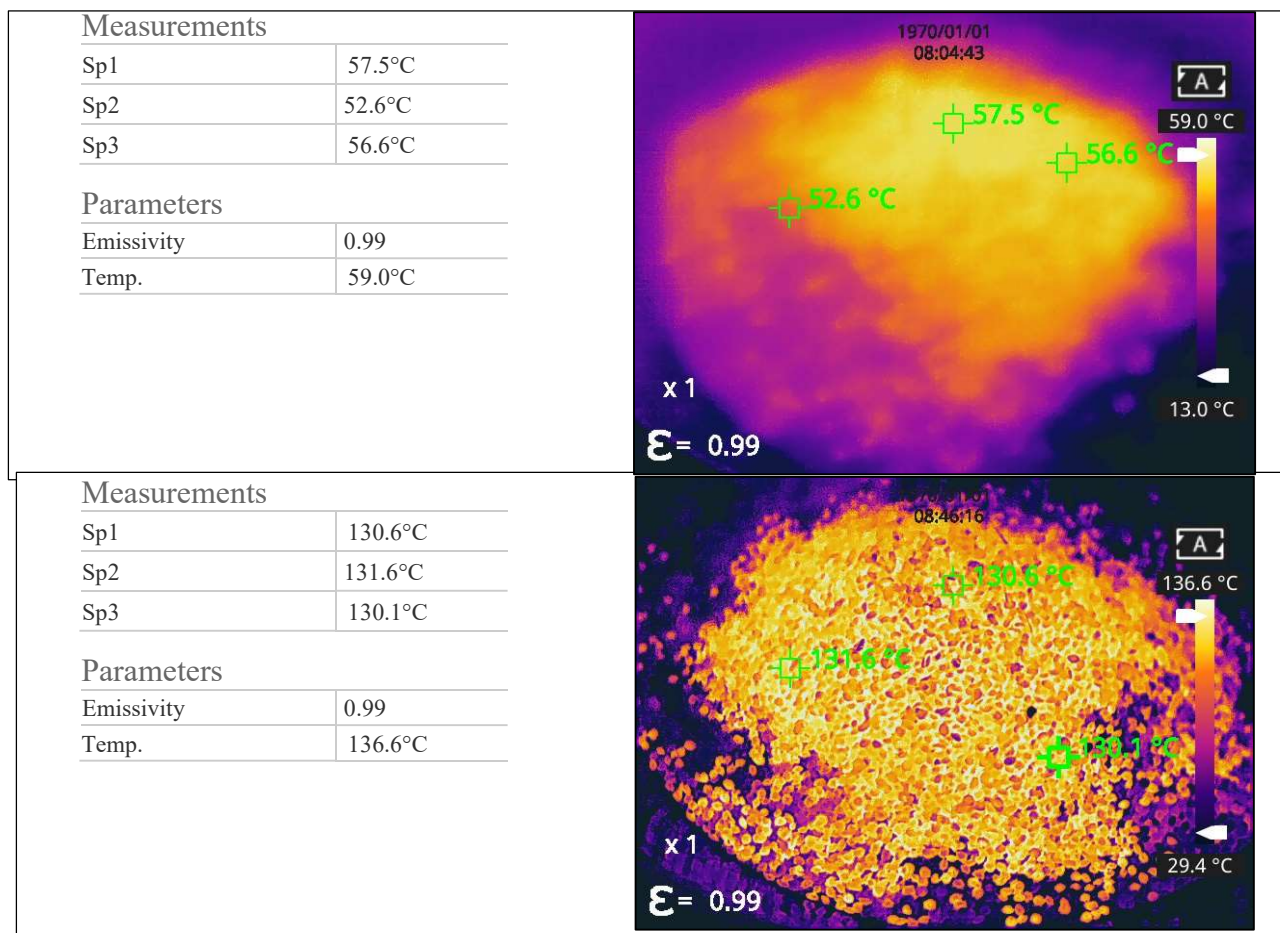
| | Trial-01 | Trial-02 |
|----------------------------|--------------------|--------------------|
| Drying started | | |
| Date | :30-08-2023 | :30-08-2023 |
| Time | :10:05:46 | :11:31:25 |
| Model | :AGS200 | :AGS200 |
| Serial number | : 138 | : 138 |
| Drying parameters | | |
| Product | : 0 | : 0 |
| Drying temperature | : 105.0 °C | : 105.0 °C |
| Drying profile | : standard | : standard |
| Mode | : Short mode | : Short mode |
| Calculation | : ((m0-m)/m0)*100X | : ((m0-m)/m0)*100X |
| Finished | : 3 samples | : 3 samples |
| Initial weight | : 1.530 g | : 1.112 g |
| Final weight | : 1.436 g | : 1.087 g |
| Drying time | : 00:08:40s | : 00:03:40s |
| Sampling interval | : 20 sec | : 20 sec |
| Moisture | : 6.1 % | : 2.2 % |
| NOTE | Initial Moisture | Final Moisture |
| The analysis performed by: | | |
| Signature | <i>[Signature]</i> | <i>[Signature]</i> |



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Thermal images:**Observations:**

The heating behavior of Millets was investigated under the Convection heating system. The heating rate was found to be increasing with respect to increasing in time. The physical investigation observed that the product was dried as desired without any charring effect. Also, the desired moisture content was obtained.

Mrs. Priya Tayde**(Tested By)**

Format: F/R&D/01