QUALITY ATTRIBUTES OF PALM SUGAR CONTAINING CHOCOLATE USING ALTERNATIVE PROCESSING (F.FT.09)

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INTRODUCTION

The most common sugar used in the production of chocolate is sucrose. However, the demand for healthier sweeteners in chocolate, and foods in general, is increasing.

**Palm sugar**, highly produced in Asian Countries, is claimed to be a healthy alternative:
- Minerals and vitamins
- Exhibits a low *glycemic index* (GI)

Also contains small amount of
- Crude protein
- reducing sugars etc

However:
- Contains high moisture

**The main objective** was to investigate the impact of sucrose replacement by palm sugar on the quality attributes of dark chocolate produced by means of alternative processing.

The production of *palm sugar* is achieved by boiling sap, collected from palm tree flowers, under agitation until supersaturation, whereby crystals are formed.
INTRODUCTION

Chocolate Production

1. Palm Sugar
2. Cocoa Butter
3. Cocoa Mass
4. Lecithin

(i) Stephen Mixer (+ vacuum pump)
(ii) Ball mill refiner
(iii) Molten Chocolate

(3) Quality Attributes Analysis

- **Color**
  Minolta Model CM-2500D Spectrophotometer, Tokyo, Japan

- **Hardness**
  Texture analyzer, Instron 5942, Norwood, MA, Canada

- **Melting profile**
  Q1000 Differential Scanning Calorimetry, TA Instruments New Castle, USA

- **Flow behaviour**
  AR2000 rheometer, TA instruments, New Castle, Delaware, USA

- **Fineness**
  Laser Diffraction, Malvern Instruments Ltd., Worcestershire equipped with 300 RF Lens

- **Aroma Profile**
  HS - SPME GC MS

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Chocolate Processing:

<table>
<thead>
<tr>
<th>Processing Method</th>
<th>Chocolate Processing Steps</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Mixing</td>
</tr>
<tr>
<td>Conventional Method</td>
<td>Planetary mixer</td>
</tr>
<tr>
<td>Alternative Method</td>
<td>Stephan Mixer (Low Shear)</td>
</tr>
</tbody>
</table>

* Prior to ball mill processing

RESULTS

\[ F = (\text{solid particles, moisture, amorphous/crystalline ratio, fat content etc}) \]
Quality Attributes Of Palm Sugar Containing Chocolate Using Alternative Processing

**Melting Profile of Solid Chocolates**

![Melting Profile Graph](image)

- $F = \text{(cocoa butter, amorphous/crystalline part, moisture etc)}$

**Flow Behavior of Liquid Chocolates**

![Flow Behavior Graph](image)

- $F = \text{(particle size distribution, fat content, moisture, particle density etc)}$

**Fineness of Chocolates**

<table>
<thead>
<tr>
<th>Chocolates</th>
<th>Particle Size Distribution (PSD)</th>
<th>Derived Diameter (μm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Distribution Percentiles (μm)</td>
<td>D (4,3)</td>
</tr>
<tr>
<td></td>
<td>$D (\nu,0.9)$</td>
<td>$D (\nu,0.5)$</td>
</tr>
<tr>
<td>BMCPS1</td>
<td>$18.9 \pm 0.7$</td>
<td>$5.5 \pm 0.3$</td>
</tr>
<tr>
<td>BMCPS2</td>
<td>$14.9 \pm 0.3$</td>
<td>$5.2 \pm 0.2$</td>
</tr>
<tr>
<td>BMC</td>
<td>$15.8 \pm 0.5$</td>
<td>$5.4 \pm 0.2$</td>
</tr>
<tr>
<td>RFC</td>
<td>$20.4 \pm 0.6$</td>
<td>$6.5 \pm 0.2$</td>
</tr>
</tbody>
</table>

- $F = \text{(grinding duration etc)}$
Sucrose replacement in dark chocolate by palm sugar results in somewhat different physical quality attributes due to increased particle-particle interactions (higher residual moisture, lower sugar density, higher amorphous/crystalline ratio).

Palm sugar has potency to be used as sweetener of dark chocolate with an improved health and distinct flavour profile.

Flavour improvement using alternative processing needs to be further adapted for the production of high-quality chocolates.

Conclusions
Thank you for your attention

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