Drying Process of Microencapsulated Red Palm Oil

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Palm oil: potential source of carotenoids (mainly β-carotene)

INTRODUCTION

Utilization of palm oil carotene as food ingredient and food supplement

Crude palm oil (CPO) → Red palm oil (RPO)
High carotene content of RPO: ±250 ppm

Sensitivity of carotene to O₂, light, heat

Protection by microencapsulation process

Microencapsulated RPO
INTRODUCTION

- RPO
- Microencapsulation materials

Materials

RPO emulsion

- Homogenization

MRPO

- Drying

Boundary conditions:
- High viscosity of RPO
- Susceptibility of \( \beta \)-carotene to high \( T \)

Suitable dryer
OBJECTIVES

1. to determine the most suitable drying equipment for producing MRPO

2. to study the drying parameters of the chosen drying equipment
METHODS

- RPO was produced in pilot plant scale of oil line production at SEAFAST Center.
METHODS

Material formulation

Emulsification

Drying of the emulsion

Mikroencapsulated RPO
METHODS

- The drying experiments were conducted by using tray dryer, drum dryer, and spray dryer.
- The drying time and drying process performance were evaluated, and quality attributes of MRPO were measured.
## RESULTS: DRYING PERFORMANCE

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spray Dryer ( T_{in} 150^\circ C, T_{out} 70^\circ C )</th>
<th>Drum Dryer 3 rpm, ( T 95,5^\circ C )</th>
<th>Tray Dryer ( T 50 ^\circ C )</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.C. (% d.b.)</td>
<td>3,94</td>
<td>4,85</td>
<td>6,01</td>
</tr>
<tr>
<td>Carotene content (ppm)</td>
<td>160</td>
<td>78</td>
<td>230</td>
</tr>
<tr>
<td>Carotene Retention (%)</td>
<td>55,70</td>
<td>31,52</td>
<td>74,76%</td>
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<tr>
<td>Solubility (%)</td>
<td>88,6</td>
<td>86,64</td>
<td>90,71</td>
</tr>
<tr>
<td>Colour (+b)</td>
<td>25,07</td>
<td>23,63</td>
<td>27,98</td>
</tr>
<tr>
<td>Drying system</td>
<td>Kontinyu</td>
<td>Kontinyu</td>
<td>Batch (8 h/batch)</td>
</tr>
<tr>
<td>Drying rate (g emulsion/hour)</td>
<td>0,5 kg/h</td>
<td>0,6 kg/h</td>
<td>0,24 kg/h</td>
</tr>
</tbody>
</table>
MICROENCAPSULATED RED PALM OIL

Spray dryer

Drum dryer

Tray dryer
The position of the tray and the thickness of the RPO emulsion layer affected the drying time, moisture content, and drying rate.

The thickness of the emulsion layer will determine drying time and drying rate to achieve the same moisture content.

The recommended emulsion layer thickness with good drying process parameters for tray dryer was 1.5 mm.
CONCLUSIONS

- Tray dryer can be used for producing high quality of MRPO, regarding of β-carotene contents and recovery during drying process.
- The process efficiency of tray dryer must be improved by using continuous drying system.
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