Evaluation of process conditions in bigels production: a multivariate analysis

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Introduction

Bigels: Complex biphasic gels
Organogel and hydrogel
Vehicle for hydrophilic and lipophilic compounds
Food, pharmaceutical and cosmetic applications

To our knowledge there are no papers evaluating the effects of process conditions on their properties

Methods

Organogel and Hydrogel preparation

<table>
<thead>
<tr>
<th>Organogel</th>
<th>Hydrogel</th>
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</thead>
<tbody>
<tr>
<td>Gellan gum (1.0 – 1.5 % w/w)</td>
<td>Water</td>
</tr>
<tr>
<td>Water:</td>
<td>80 °C 30 min</td>
</tr>
<tr>
<td>Glycerol monostearate (5 – 15 % w/w)</td>
<td></td>
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<tr>
<td>High oleic sunflower oil</td>
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</tbody>
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Bigel preparation

Organogel:Hydrogel
Variable Mixing velocity
Variable Time
25 formulations

Analysis

- Rheology
- Frequency sweeps
- Mechanical properties
- Double compression
- Optical microscopy
- Mean diameter \( d_{50} \)

Results

Patterns obtained

- Water-in-oil bigels
- Hydrogel particles
- Organogel in continuous medium

Mutivariate analysis (PCA)

- Two factors were sufficient to explain 85.6 % of the variance
- Spreadability, consistency and \( G^* \) are positively correlated
- They are opposed to diameter, cohesiveness and adhesiveness
- Horizontal axis corresponds to Organogel:Hydrogel ratio
- \( G^* \): more structured systems
- Organogel ratio: Spreadability and consistency
- Vertical axis corresponds to mixing velocity
- Interactions among parameters evaluated
- Synergistic effects

Conclusions

- Organogel:Hydrogel ratio was the parameter that exerted more influence on bigels' production process
- Different physicochemical properties can be obtained by tuning the parameters involved in the bigels' production process
- Softer or harder gels, with higher or lower spreadability, bigger or smaller particle size can be produced, depending on the desired final product and application

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The 19th Gums & Stabilisers for the Food Industry Conference: Hydrocolloid multifunctionality