Potentialities of molasses from cane sugar crystallization in food formulations
Bertrand Payet, Alain Shum Cheong Sing, Jacqueline Smadja

To cite this version:
hal-01282079

HAL Id: hal-01282079
http://hal.univ-reunion.fr/hal-01282079
Submitted on 3 Mar 2016

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
Introduction

Molasses are produced together with granulated sugar. Three kinds of molasses are obtained during fractional crystallization: A, B, C molasses issued from the first, the second and the third step of crystallization, respectively. Molasses are made up 40% to 60% of sugars (mainly sucrose). Several parameters such as the sucrose inversion, the presence of amino acids, water, and mineral salts, the alkaline pH, the sugar process duration (3 days) and the high temperature (60°C) favour Maillard reactions. These reactions generate coloured macromolecules and heterocycles which have a strong olfactive impact despite their low concentration and are responsible for the "grilled", "roasted", "caramel" and "burnt" olfactive notes of molasses.

Vanilla ice creams, sweet buns, butter cakes were made according to standard formulas. 10% to 20% of sugar quantity were substituted with A, B, C molasses. The traditional formulas and the new formulas were compared by tests relating to physicochemical and sensorial parameters.

Quantification of furans and pyrazines by HS/SPME/GC/MS

<table>
<thead>
<tr>
<th>Compounds</th>
<th>Molasses (ppm)</th>
<th>Olfactive notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furans and derivatives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-acetylfuran</td>
<td>2.5</td>
<td>caramel</td>
</tr>
<tr>
<td>2,5-dimethylfuran</td>
<td>18.9</td>
<td></td>
</tr>
<tr>
<td>2-furfuryl</td>
<td>71.9</td>
<td></td>
</tr>
<tr>
<td>2-furanethanol</td>
<td>9.7</td>
<td></td>
</tr>
<tr>
<td>2-furanethanol, acetaldehyde</td>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td>2-(1-furanil) ethanone</td>
<td>53.3</td>
<td></td>
</tr>
<tr>
<td>2-furanethanol, S-methyl ether</td>
<td>80.2</td>
<td></td>
</tr>
<tr>
<td>pyrazine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,5-dimethylpyrazine</td>
<td>18.9</td>
<td></td>
</tr>
<tr>
<td>2-ethyl-6-methylpyrazine</td>
<td>18.7</td>
<td></td>
</tr>
<tr>
<td>2-ethyl-6-methylpyrazine</td>
<td>15.0</td>
<td></td>
</tr>
<tr>
<td>total</td>
<td>131.6</td>
<td>115.0</td>
</tr>
</tbody>
</table>

Thirty two compounds were identified in the headspace of the molasses including fourteen furans and pyrazines.

During the cane sugar process, an increase of furan and pyrazine contents was observed from A molasses to C molasses according to the evolution of sugar composition.

Sensory analysis applied to butter cakes

- Traditional butter cake
- Butter cake with A molasse
- Butter cake with C molasse

Scale : hedonic evaluation

Sensory analysis applied to sweet buns

- Traditional sweet bun
- Sweet bun with A molasse
- Sweet bun with C molasse

Substitution of sugar by molasses in the butter cakes and in the sweet buns gave them flavour and better aromatic properties. The Maillard reaction products are responsible for the differences in aromatic profiles of these foodstuffs. Molasses gave candied and fruity notes to the baked products and also reminiscent of gingerbread. Cakes and buns prepared from standard formulas were less roasted than those prepared with A, B and C molasses. The deep colour given by the B and C molasses was, however, moderately well appreciated.

No differences were observed in term of mouthfeel for the four butter cakes. A and C molasses greatly improved the mouthfeel of the sweet buns.

Conclusion

Physicochemical parameters (humidity loss, melting temperature kinetic of ice creams) were not significantly modified by the addition of molasses to the food.

Nevertheless, in all cases, molasses changed sensorial aspects of the prepared foodstuffs. Differentiation between the molasses was possible in the formulated foods. Among the molasses, the C molasse was the most enriched in Maillard reaction products having a strong impact on aromatic notes and colour. The A molasse had a fewer impact on aromatic notes and colour but led to preferred formulated foods.

Instead of their uses in animal foods or as substrate for alcoholic fermentations, molasses could be considered as interesting sources of flavourings.

References

2. G. Verhin, Parfums, Cosmetiques, Arômes, 1979, 29, 77-86.