Potentialities of molasses from cane sugar crystallization in food formulations

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Bertrand PAYET*, Alain SHUM CHEONG SING, Jacqueline SMADJA (bpayet@univ-reunion.fr)

Laboratoire de Chimie des Substances Naturelles et des Sciences des Aliments – Faculté des Sciences et Technologies Université de La Réunion – France

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).[1]

Several parameters such as the sucrose inversion, the presence of aminoacids, water, and mineral salts, the alkaline pH, the sugar process duration (3 days) and the high temperature (90°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 "burned" olfactive notes of molasses.[2]

Vanilla ice creams, sweet buns, butter cakes were made according to standard formulas. 10% to 20% of sugar quantity were substituted by 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

Compounds	Molasses (ppb) A	B	C	Olfactive notes[3]
Furans and derivated				
2-methylfuran		92.0	58.1	
2,5-dimethylfuran		27.8	68.4	
2-butylfuran	8.9	43.7	46.0	
2-pentylfuran		79.8	72.1	
2-furancarboxaldehyde	19.7	59.9	79.8	caramel
2-furanmethanol, acetate		4.8	42.8	smooth, floral
1-(2-furanyl) ethanone			53.3	
2-furancarbothioic acid, S-methyl ester			80.2	
5-methylfurancarboxaldehyde		16.1	44.0	spicy, caramel
2-furanmethanol	12.2	63.5	191.6	warm, burnt
total	**40.7**	**387.6**	**736.4**	
Pyrazines and derivated				
2,5-dimethylpyrazine	12.7	37.9	24.7	peanut, roasted
2,6-dimethylpyrazine	18.9	58.1	38.4	cocoa, roasted
2-ethyl-6-methylpyrazine			18.7	peanut, roasted
2-ethenyl-6-methylpyrazine		15.0	14.1	
total	**31.6**	**111.0**	**95.9**	

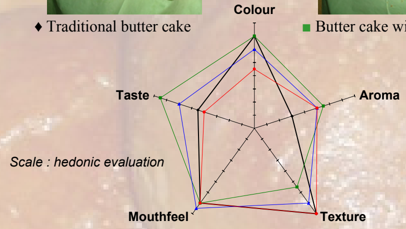
Thirty two compounds were identified in the headspace of the molasses including fourteen furans and pyrazines.

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.[4]

Sensory analysis applied to butter cakes


♦ Traditional butter cake


■ Butter cake with A molasse



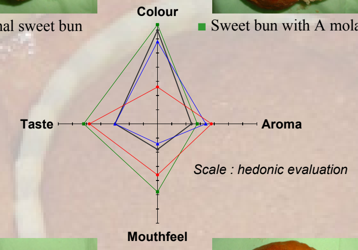

▲ Butter cake with B molasse


● Butter cake with C molasse

Sensory analysis applied to sweet buns


♦ Traditional sweet bun


■ Sweet bun with A molasse




▲ Sweet bun with B molasse


● Sweet bun with C molasse

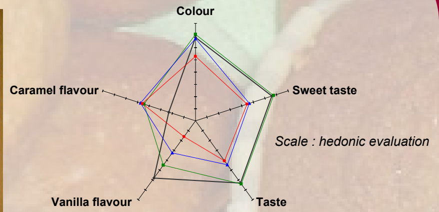
Substitution of sugar by molasses in the butter cakes and in the sweet buns gave them flavour and better aromatic properties. The Maillard reaction products are responsible for the differences in aromatic profiles of these foodstuffs. Molasses gave candied and fruity notes to the baked products and also 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.

Sensory analysis applied to vanilla ice creams

■ Vanilla ice cream with A molasse ♦ Traditional vanilla ice cream



▲ Vanilla ice cream with B molasse ● Vanilla ice cream with C molasse

The molasses gave "amber", "golden", "caramel-like" colour to the ice creams. Sweetness of the ice cream was considerably enhanced by the molasses and was very pleasant for the ice cream with A molasse.

The sweet taste of the ice creams with B and C molasses was very intense and too excessive, formulas with smaller amounts of these products should be considered. A caramel flavour was given to the vanilla ice creams by the molasses and malaga note was often cited for the ice creams containing A and B molasses. The vanilla flavour of ice creams was masked by the use of molasse C.

Vanilla ice cream with A molasse was the most appreciated for its colour and taste.

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

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