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ASSESSMENT OF AROMA OF CHOCOLATE PRODUCED FROM TWO GHANAIAN COCOA FERMENTATION TYPES

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INTRODUCTION

The fermentation of cocoa is critical for the formation of precursors that develop the characteristic chocolate aroma in the roasted beans. Most Ghanaian cocoa farmers practise the heap fermentation method (Fig. 1) but the Cocoa Research Institute of Ghana has developed a new method called 'Tray' (Fig. 2), in which beans are fermented in 10 cm deep wooden tray to allow for more even and better fermentation. This investigation aims at assessing the chemical basis for aroma differences between chocolates produced from heap and tray fermentations.

EXPERIMENTAL

Two types of chocolate were produced from heap- and tray-fermented Ghanaian cocoa beans, using the same recipe.

Volatile compounds were sampled by dynamic headspace sampling, separated and identified using GC-MS. Key compounds important to aroma of both chocolates were identified by GC-O using a trained panel of three.

RESULTS AND DISCUSSION

- A total of sixty-three volatile aroma components were identified in 'heap' and 'tray' chocolates using GC-MS.

REFERENCE

1.Gill, M. S., Macleod, A. J. & Moreau, M. (1984). Volatile components of cocoa with particular reference to glucosinolate products. Phytochemistry 23, 1937-1942.

Table 1 Ranking of key odorants detected by GC-O analysis of chocolates produced from heap- and tray-fermented Ghanaian cocoa beans (odorant detected by all judges and ranked according to total minutes it was detected). Peak areas are from GC-MS.

No.	'tray' chocolate		'heap' chocolate	
	compound	peak area[a] x10^3	compound	peak area[a] x 10^3
1	3-methylbutanal	512	3-methylbutanal	438
2	3-methyl butanoic acid	912	acetic acid	3596
3	acetic acid	4686	3-methyl butanoic acid	1453
4	hexanoic acid	108	1-phenyl ethanone	131
5	benzyl acetate	9	phenethyl acetate	14
6	2,3,5-trimethylpyrazine	388	2,3,5-trimethyl-6-ethylpyrazine	39
7	2,5(or 6)-dimethyl-3-ethylpyrazine	21	2,3,5-trimethylpyrazine	35
8	unknown	n.d	2,3-dimethylpyrazine	61
9	phenethyl acetate	667	dimethyl trisulfide	12
10	dimethyl trisulfide	10	tetramethylpyrazine	2393
11	octanal	22	furfuryl alcohol	14
12	ethylpyrazine	16	unknown	n.d
13	benzaldehyde	267	octanal	30
14	phenylacetaldehyde	121	benzyl alcohol	61
15	2-phenethyl alcohol	324	2,5(or 6)-dimethyl-3-ethylpyrazine	35
16	tetramethylpyrazine	1042		
17	2,5-dimethylpyrazine	76		
18	linalool	47		
19	1-phenyl ethanone	70		

[a]mean of five replicates

- Twenty-three odorants in 'heap' chocolate and 24 odorants in 'tray' chocolate were identified by GC-O.
- Two acids, acetic acid and 3-methyl butanoic acid had very high peak areas and seemed to contribute significantly to the aroma of both chocolates

Fig. 1. Heap cocoa fermentation

Fig. 2. Tray cocoa fermentation (4 stacks of tray)

- 3-methyl butanal was the most important odorant in both types of chocolate.
- Odorants exclusively important in 'heap' chocolate alone included 2,3-dimethylpyrazine, 2,3,5-trimethyl-6-ethylpyrazine, furfuryl alcohol and benzyl alcohol.
- Seven odorants were exclusively important to 'tray' chocolate alone; these included 2,5-dimethylpyrazine, ethylpyrazine, benzaldehyde, phenylacetaldehyde, benzyl acetate, linalool and hexanoic acid.
- Although some of the key odorants, mostly pyrazines and aldehydes are normally derived during the chocolate production process, the acids and alcohols are known to be related to the cocoa fermentation method and have persisted in the chocolate.
- Linalool, identified as key odorant in 'tray' chocolate but not in 'heap' chocolate is known to give flowery, tea-like odor to cocoa (1).

CONCLUSION

Considerable differences were identified in key odorants, and these are expected to result in sensory differences between chocolate produced from heap- and tray-fermented cocoa beans. Further analyses are being carried out to verify this.

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