

pentane/dichloromethane (P/D). The representativeness of each extract with regard to the natural aroma of vanilla was then evaluated by sensorial analysis. The aroma compounds in these different organic extracts were identified by mass spectrometry (GPC-MS) and quantified by gas phase chromatography (GPC-FID). Their respective olfactive intensities were then determined by GPC olfactometry (GPC-O).

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Results

GPC-MS analysis showed that the P/E extract contained the largest number of aroma compounds (65); these were mainly acids (25), phenols (15) and alcohols (10). Furthermore, sensorial analysis of the aroma of the organic extracts showed that the P/E extract was not significantly different from natural vanilla aroma (powder), whereas significant differences were found with extracts E and P/D. The P/E extract was therefore chosen for the quantification of volatile compounds by GPC-FID and for olfactive characterisation by GPC-O.

The vanillin content of the extract chosen forms 85% of total aroma compounds. However, GPC-O enabled the identification of 25 other scent compounds. The olfactive intensities of substances such as gaiacol, 4-methylgaiacol and acetovanillin are similar to that of vanillin although the concentrations are 1000 times smaller. Other compounds such as methyl salicylate, p-cresol, methyl cinnamate and anisyl alcohol also display strong olfactive intensities although the concentrations are 10,000 times less than that of vanillin. All these compounds contribute soft, woody, balsamic, spicy, grilled and vanilla notes.



Methodology for the analysis of the aroma compounds of vanilla

Aroma compounds identified by GPC-O in the pentane/ether extract of powdered vanilla.

Compound		Concentration (µg/g)	Descriptor	Intensity
Phenols	gaiacol	9.3	Medicine, sweet	+++
	4-methylgaiacol	3.8	Sweet, wood	+++
	p-cresol	2.6	Balsamic, spicy	4.1
	4-vinylgaiacol	1.2	Medicine	+
	4-vinylphenol	1.8	Sweet, wood	++
	vanillin	19,118.0	Vanilla, sweet	+1+
	acetovanillin	13.7	Vanilla, sweet, honey	+1+
	vanillic alcohol	83.8	Vanilla note	+1 F
	p-hydroxybenzaldehyde	873.3	Vanilla note, cake	++
	p-hydroxybenzylic alcoho	65.1	Vanilla note, sweet	H 1
Aliphatic acids	acetic acid 1	24.3	Vinegar	4.1
	isobutyric acid	1.7	Butter	4.1
	butyric acid	<1	Butter, oily	H.
	isovaleric acid	3.8	Butter, oily	4 1-
	valeric acid	1.5	Checse	+ +-+
2,3-butanediol alcohols (isomer 2)		8.0	Floral	4
	anisyl alcohol	2.4	Herbal	+ 1
Aldehydes	2-heptenal	2.1	Green, oil	н
	(E)-2-decenal	1,8	Green, floral	3.1
	(E, Z)-2,4-decadienal	1.4	Green, fresh	H 4
	(E, E)-2,4-decadienal	1.2	Oil	++
Esters	methyl salicylate	<1	Chalk	+++
	methyl cinnamate	1.1	Sweet, fruit	++
	ethyl linolenate	13.5	Grilled, sweet	++
Ketone	3-hydroxy-2-butanone	14.6	Butter, mushroom	+
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Conclusion

GPC-O analysis of a representative extract of vanilla aroma showed that in addition to vanillin, volatile phenols (e.g. gaiacol and p-cresol)are of capital importance in the natural aroma of vanilla, even at very small concentrations.

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