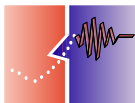
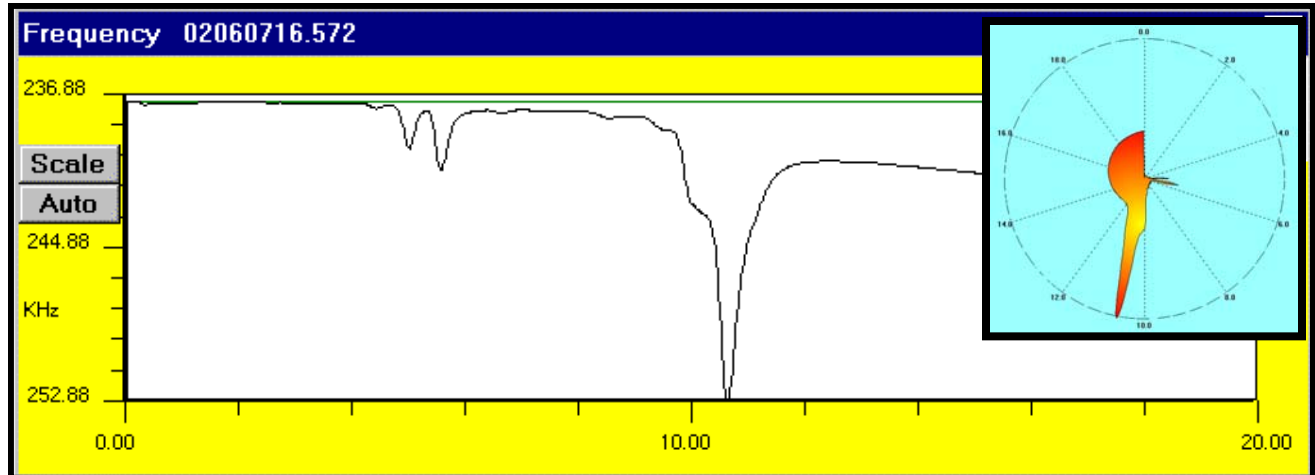
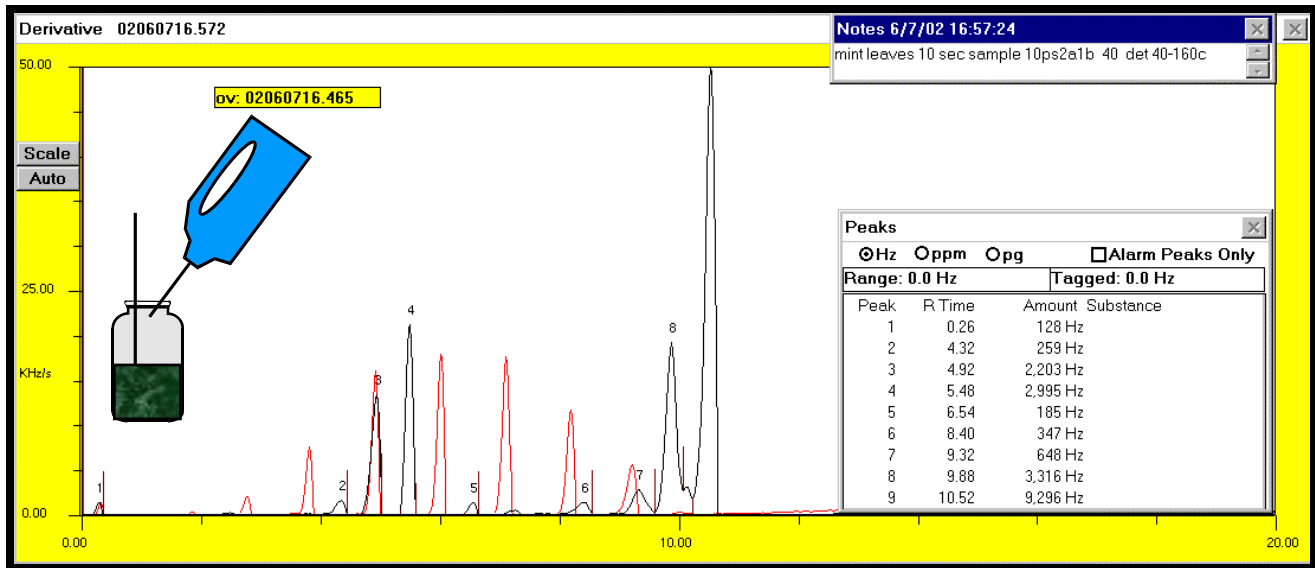

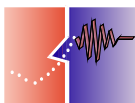
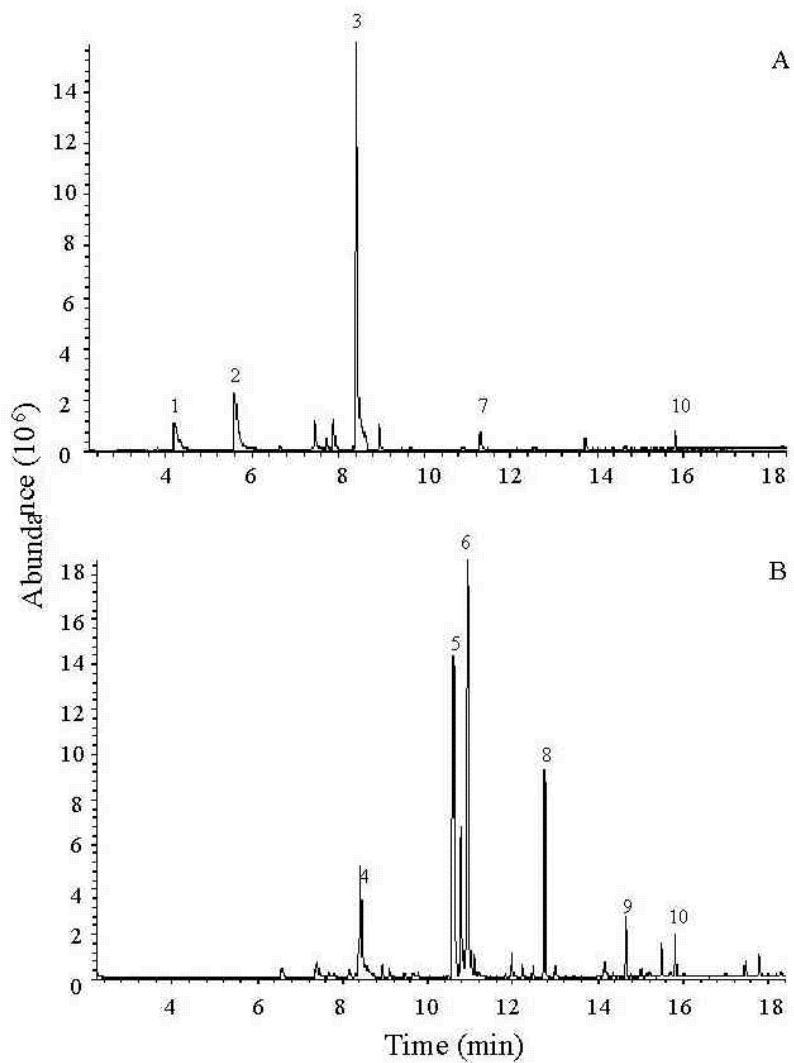
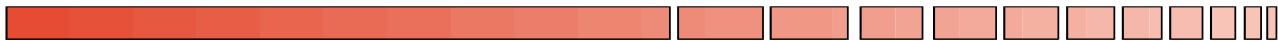


# Testing Fresh Mint Leaves

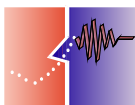


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- Peppermint (*Mentha piperita*, named for its pepper-like taste) and spearmint (*Mentha spicata*, named for its arrow-shaped flower spires) are related plants (*Labiatae*) that are rich in volatile oils called terpenes. These ethereal, complex organic compounds--mainly menthol and carvone--give mint the taste and aroma that make it a favorite for chewing gum, toothpaste, candy and medicine.
  - Herbs and spices get their flavor and aroma from "essential oils". These are secondary plant compounds that belong to the terpene or terpenoid class of chemical compounds. Terpenes are any of a group of hydrocarbons that are made up of building blocks of isoprene (C<sub>5</sub>H<sub>8</sub>) or similar five- carbon units, with a monoterpene made up of two units, a sesquiterpene made up of three units, and a diterpene made up of four units.
  - the enantiomers of carvone are the flavors mint and caraway.





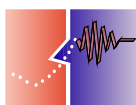
**Figure 4.** Total ion chromatograms from headspace SPME GC/MS analyses of: (A) chewing gum R; (B) chewing gum S. Peak identification: (1) ethyl butyrate, (2) isobutyl propionate, (3) limonene, (4) eucalyptol, (5) L-menthone, (6) menthol, (7) methyl salicylate, (8) menthyl acetate, (9) caryophyllene, (10) BHT.



- Chewing gums vary from flavor to flavor, as shown by the differences in the TICs (Figure 4). The TIC of chewing gum R (a mint-flavored gum) consisted of mostly early eluting compounds, with the most abundant compound identified as limonene. Menthol, L-menthone, and menthyl acetate (obtained from peppermint or mint oils) were just a few of the volatile flavor components identified in the TIC of chewing gum S (a fruit-flavored gum). These components were also identified in candies (data not shown). It is interesting to note that butylated hydroxytoluene (BHT), an antioxidant, was also identified in the TICs of both chewing gums.

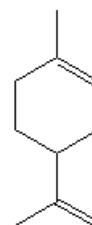
**Table 1:** Range, mean and NIRS correlation statistics for the essential oil content [ml/100g] and composition [%] in the dried leaves of *Mentha piperita* (n = 82).  
SECV = standard error of cross validation. R<sup>2</sup> = multivariate coefficient of determination.

parameter	range	mean	SECV	R <sup>2</sup>
oil content	0.63 - 3.63	2.13	0.19	0.93
limonene	0.00 - 6.47	1.25	0.62	0.82
1,8-cineol	1.15 - 6.04	3.59	0.47	0.80
menthofuran	0.00 - 4.20	1.01	0.64	0.62
menthone	10.10 - 56.90	30.91	4.00	0.88
isomenthone	2.02 - 8.44	4.16	0.98	0.53
menthol	15.90 - 58.60	38.13	3.93	0.86
menthyl acetate	0.77 - 7.89	3.78	1.11	0.57
pulegone	0.00 - 5.77	0.85	0.63	0.64
piperitone	0.41 - 2.38	1.25	0.34	0.60

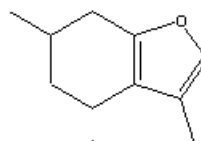


**Limonene [138-86-3]** Synonyms: Cajeputene; Cinene; Ciene; 1-methyl-4-(1-methylethenyl)cyclohexene; p-Mentha-1,8-diene; Acintene DP dipentene; Cyclil decene; Cyclohexene, 4-isopropenyl-1-methyl-; Dipenten; DL-p-mentha-1,8-diene; Eulimen; 4-Isopropenyl-1-methyl-1-cyclohexene; Mentha-1,8-diene; Mentha-1,8-diene, DL; Menthadiene; Methyl-4-(1-methylethenyl)cyclohexene; Methyl-4-isopropenyl-1-cyclohexene; Methyl-4-isopropenylcyclohexene; Monocyclic terpene hydrocarbons; Nesol; Terpodiene; 4-(1-methylethenyl)-1-methyl-cyclohexene; Dipentene, mixt. of limonene, 56-64%, and terpinolene, 20-25%; DL-LIMONENE

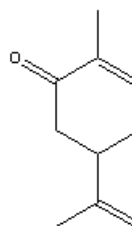
$C_{10}H_{16}$  136.2364



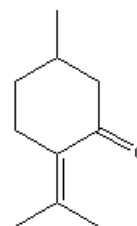
**Menthofuran [494-90-6]** Synonyms: 4,5,6,7-Tetrahydro-3,6-dimethyl-benzofuran;  $C_{10}H_{14}O$  150.22



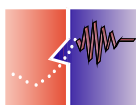
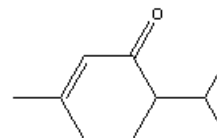
**Carvone [99-49-0]** Synonyms: 6,8-p-Menthadien-2-one; D-Cavone; 1'carvone (?);  $C_{10}H_{14}O$  150.22



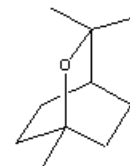
**Pulegone [89-82-7]** Synonyms: Delta-4,8-p-menthen-3-one; 1-Isopropylidene-4-methyl-2-cyclohexanone; 1-Methyl-4-isopropylidene-3-cyclohexanone; (+)-4(8)-para-Menthen-3-one; (R)-(+)-Pulegone; D-Pulegone;  $C_{10}H_{16}O$  152.2358



**Alpha-piperitone [6091-50-5]** Synonyms: 1-p-Menthen-3-one; Dextro-piperitone; p-menth-1-en-3-one; 4-isopropyl-1-methyl-1-cyclohexen-3-one;  $C_{10}H_{16}O$  152.2358

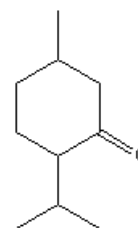


**1,8-Cineole [470-82-6] Synonyms:** Eucalyptol; 1,8-epoxy-p-menthane; cajeputol; limonene oxide; 1,8-oxido-p-menthane; 1,3,3-trimethyl-2-oxabicyclo[2.2.2.]octane;



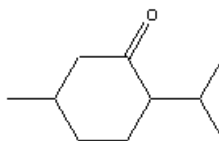
**C<sub>10</sub>H<sub>18</sub>O** 154.2516

**Menthone [10458-14-7] Synonyms:** 5-Methyl-2-(1-methylethyl)cyclohexanone; DL-Menthone; Menthone, mixture of isomers; **C<sub>10</sub>H<sub>18</sub>O**  
154.2516



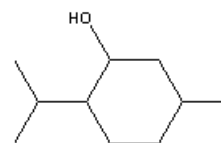
**Isomenthone [18309-28-9]**

**C<sub>10</sub>H<sub>18</sub>O** 154.2516



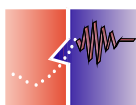
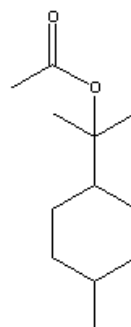
**Cyclohexanol, 5-methyl-2-(1-methylethyl)-, (1alpha,2beta,5alpha)- [89-78-1] Synonyms:** Menthol; 3-p-Menthanol;

**C<sub>10</sub>H<sub>20</sub>O** 156.2674



**menthyl acetate [89-48-5]**

**C<sub>12</sub>H<sub>22</sub>O<sub>2</sub>** 198.3046



No. <sup>z</sup>	Aroma quality <sup>y</sup>	FFAP	SE-54	FD factor	Aroma compound <sup>w</sup>	
1	Sweet, terpeny	996	919	32	$\alpha$ -Thujene	
2	Terpeny	1007	931	1024	$\alpha$ -Pinene	
3	Fruity	1045	855	32	Ethyl methylbutanoate	
4	Spicy, fruity	1075	949	64	Camphene	
5	Terpeny	1095	975	32	Sabinene	
6	Terpeny	1152	981	512	$\beta$ -Pinene	
7	Metallic	1158	988	16	Myrcene	
8	Light minty	1167	1005	64	$\alpha$ -Phellandrene	
9	Terpeny	1185	1025	16	$\alpha$ -Terpinene	
10	Light, lemon-like	1190	1029	64	Limonene	●
11	Light, peppermint-like	1194	1031	16	1,8-Cineole	●
12	Flowery	1250	1172	2048	trans- $\beta$ -Ocimene	
13	Terpeny	1256	1033	128	$\beta$ -Phellandrene	
14	Fruity, terpeny	1375	1112	32	p-Mentha-3,8-triene	
15	Terpeny	1432	1220	8	3-Carene	
16	Flowery	1446	1206	512	Myrtenol	
17	Flowery, pepperish	1450	1109	8192	Linalool	
18	Flowery, fatty	1497	1207	16	Decanal	
19	Flowery, lilac-like	1582	1195	8	$\alpha$ -Terpeniol	
20	Light mint, terpeny	1630	1184	16	Terpinen-4-ol	
21	Sweet, flowery	1750	--	2048	$\alpha$ -Farnesene	
22	Flowery	1762	1231	8	b-Citronellol	
24	Flowery, rose-like	1840	1256	64	Geraniol	
27	Sweet, camphoracious	2148	--	4	Fenchone	

db5

