



Organoleptic Characteristics of Flavor Materials

The history, composition, applications and organoleptic properties of mint

Gerard Mosciano

Gerard Mosciano is joined by Judith Michalski, senior creative flavorist, Edlong Flavors; Carl Holmgren, chief creative flavorist, director of flavor development, Brooklyn by Perfetti Ltd.; and Douglas Young, principle flavorist, Symrise, in the organoleptic evaluations presented here.

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Mint plants are very easily grown herbaceous perennials. In fact, to call this plant invasive would be a major understatement. This should not be a surprise to anyone who has ever planted a small pot of peppermint for garnishing tall iced juleps or summertime ice teas, only to find their next years garden infested with an uncontrollable invasive pest whose roots system could be a suitable topic for a Stephen King novel or an episode of the Twilight Zone.

While peppermint's invasive nature is a home gardener's bane, it is a thing of beauty for the commercial mint grower. Mint has been grown commercially, initially in England, since the 1750s. Today, the United States supplies about 75 percent of the world's output of peppermint oil. The plant is an important commercial crop in Indiana, Wisconsin, Oregon, Washington and Idaho. The essential oil represents about 0.3-0.4 percent of the weight of the fresh leaves and is separated from the

leaves by rapid, in-field, steam distillation. The oil produced has had a long history as an herbal remedy with medicinal properties, and has been long associated with cleanliness, hygiene and (primarily) freshness. Peppermint oil has shown antibacterial and antiviral activity, and today is considered among the growing constellation of nutraceutical products. The material is more popular than ever: a recent Google search for peppermint yielded 32,000 results!

Composition

Brian Lawrence, in the November/December 1989 issue of *Perfumer & Flavorist*, outlined the major components of typical American peppermint oil and dementholated corn mint oil, respectively.

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	American peppermint (percent)	Cornmint oil (percent)
1,8-cineole	7.30	0.90
menthone	18.70	26.00
menthofuran	3.00	-
isomenthone	2.50	9.00
menthyl acetate	3.50	3.80
menthol	40.00	35.00
pulegone	1.20	0.80
piperitone	2.40	0.30

One can easily see why corn mint oil is a natural peppermint “enhancer.”

Character

Menthol, the characterizing ingredient in peppermint oil, imparts the definitive trigeminal sensitivity. Barry Green, in his article “Oral Chemesthesis: An integral component of flavour,” stated that the sharp coolness of menthol is a chemesthesis quality that interacts with gustatory and olfactory stimuli.¹ Of course, a flavorist’s interest in peppermint oil is not its alleged nutraceutical efficacy, but its established organoleptic properties. The essential oils of mint and its components are widely used to flavor oral care products such as toothpaste, mouthwash and antacids, confections, breath fresheners (such as Altoids, Tic Tacs, chewing gum and cream mint patties), and other applications such as cordials. Mint oils are also often used as a secondary flavor additive for mint creams, herbal mints and other “cool” flavor nuances. Cigarettes have long been associated with mentholated, or cool, flavors. This broad range of applications illustrates why mint is the third largest global taste trend, outranked only by vanilla and citrus flavors.²

As with any natural product, not all end users are content with the organoleptic effects that peppermint oil contributes, some particularity large end users are always seeking an enhancer that will allow them to reduce their usage of this variable flavor commodity or some confectioner wants more cooling after notes or a more impacting “vapor action” top note.

Evaluations

Alpha Fenchone

Source: Aldrich

FEMA# 2479, CAS# 4695-62-9, Nature identical

Natural occurrence: Basil, caraway, cedar leaf oil, cloves, dill, fennel, licorice and thyme.

Odor: @ 1.0 percent. Cooling camphoreous, terpy, spicy, sweet mentholic pine-like.

Taste: @ 5 PPM. Cooling camphoreous, with green citrus lime nuances.

Possible applications: Lime, anise, lemon, nutmeg, spice nuances, menthol cooling notes for peppermint.

►Aldrich; tel: 414-273-3850; www.sig-maaldrich.com

2-sec-Butyl Cyclohexanone (synonym: Freskomenthe)

Source: Aldrich

FEMA# 3261, CAS# 14765-30-1, Artificial,

Not reported found in nature

Odor: @ 1.0 percent. Impacting cooling minty, menthol-like, spearmint green, slightly spicy, woody with a vapor action note.

Taste: @ 20 PPM. Impacting minty, cooling candy cane peppermint with a slight green nuance.

Possible applications: Passion fruit, spearmint, menthol booster, peppermint lift, addition of freshness to oral care products.

►Aldrich; tel: 414-273-3850; www.sig-maaldrich.com

Camphene

Source: Millennium Chemicals

FEMA# 2229, CAS# 79-92-5, Nature identical

Natural occurrence: Carrot, dill, fennel, tarragon, marjoram, thyme, nutmeg, parsley and pepper.

Odor: @ 1.0 percent. Woody, camphoraceous, cooling minty, green eucalyptus, citrus lime, woody with tropical nuances.

Taste: @ 100 PPM. Minty cooling, woody pine and resinous, medicinal Vicks VapoRub, citrus lime-like and eucalyptus.

Possible applications: Pine, mint, oral care products, nutmeg, black pepper and other spice reconstructions, herbal notes, lemon and lime, mango nuances.

► **Millennium Chemicals;** tel: 410-229-4400; www.millenniumchem.com

Cornmint Oil, *Mentha arvensis*

Source: Ungerer
CAS# 68917-18-0, Natural

Odor: @ 1.0 percent. Harsh, cooling mentholic with a dirty note.

Taste: @ 10 PPM. Peppermint-like, minty, mentholic coolness.

Possible applications: Peppermint booster, menthol replacers, oral care and confection products.

► **Ungerer & Co.;** tel: 973-628-0600; www.ungererandcompany.com

6,6-Dimethyl-2-Oxymethylbicyclo- {1.1.3}-Hepten-2-ene (synonym: Myrtenol)

Source: initially from Bush Boake Allen, but available from Aldrich
FEMA# 3439, CAS# 515-00-4, Nature identical

Natural occurrence: Bilberry, buchu oil, hop oil, myrtle oil, pepper, raspberry, scotch spearmint, strawberry, Virginia tobacco.

Odor: Camphoraceous, woody pine, cooling, minty, slightly medicinal with a terpy nutmeg-like nuance.

Taste: @ 50 PPM. Cooling minty, camphor-like with a green mentholic spice nuance.

Possible applications: Mint flavors, raspberry, blackberry, mouthwash and oral care products, and kola nuances.

► **Aldrich;** tel: 414-273-3850; www.sigmaaldrich.com

Ethyl 2-iso Propyl -5-Methyl-Cyclohexane Carboxamide (synonym: WS-3)

Source: Millennium Chemicals
FEMA# 3455, CAS# 39711-79-0, Artificial

Odor: @ 1.0 percent. Virtually odorless.

Taste: @ 10-100 PPM. Intense lingering cooling. The cooling sensation builds

slowly but steadily, and grows to a lingering cooling mouth feel with a slight camphoraceous and minty character.

Possible applications: Cooling notes (the effect works on both skin surface and mouth), mint blends, spice blends, oral care, children's novel confections, chewing gums and mint enhancers.

► **Millennium Chemicals;** tel: 410-229-4400; www.millenniumchem.com

Eucalyptol (synonym: 1,8-Cineole)

Source: was Bush Boake Allen, now available via DGF
FEMA# 2465, CAS# 470-82-6, Natural

Natural occurrence: Cardamom, cranberry, laurel, pepper, rosemary and sweet marjoram.

Odor: @ 1.0 percent. Sweet, cooling, fresh, chemical pine, slightly minty with a spicy cardamom nuance.

Taste: @ 5 PPM. Cooling, fresh, oily, green, spicy, pine-like.

Possible applications: Mouth washes and other oral care products, mint enhancers, spice blends, tropical nuances, continental — particularly Italian mint flavors.

► **Gerard; DGF? Contact info?**

Iso Phorone (synonym: 3,3,5-Trimethyl-2-Cyclohexen-1-one)

Source: Aldrich
FEMA# 3553, CAS# 78-59-1, Nature identical

Natural occurrence: Burley tobacco, cranberry, macadamia nuts, peas, roasted filbert, saffron, wine and osmanthus.

Odor: @ 1.0 percent. Cooling, woody, camphoraceous, slightly green and herbal.

Taste: @ 30 PPM. Sweet, green waxy, pungent camphoreous, cooling minty.

Possible applications: Mint nuances, citrus, fruit notes, woody nuances.

► **Aldrich;** tel: 414-273-3850; www.sigmaaldrich.com

2-Iso Propyl-N-2,3-Trimethyl Butyramide (synonym: WS-23)

Source: Fontarome
FEMA# 3804, CAS# 51115-67-4, Artificial

Odor: @ 5.0 percent. Slight cooling impact with little character.

Taste: @ 20 PPM. High-impacting cooling that lasts on the tongue and palate.

Possible applications: Cooling agents for oral care, chewing gum, and other confections and pharmaceuticals.

► **Fontarome Chemical;** tel: 414-744-3993; www.fontaromechemical.com

Menthe Fraiche Absolute

Source: Robertet
Natural

Odor: @ 1.0 percent. Sweet, fresh, cooling, minty, green and mentholic with fresh leafy undertones.

Taste: @ 5 PPM. Sweet minty, cooling, mentholic, candy-like with a clean herbal nuance.

Possible applications: Chewing gum, fresh mint top notes, oral care products.

► **Robertet Inc.;** *tel:* 201 337 7100; *www.robertet.com*

Menthol

FEMA# 2665, CAS# 89-78-1, Nature identical

Natural occurrence: *Mentha* species.

Odor: @ 1.0 percent. Cooling menthol with a penetrating minty eucalyptus note.

Taste: @ 25 PPM. Cooling, camphoreous, minty with a clean eucalyptus note.

Possible applications: Oral care products, tobacco flavorings, lift for spice and general flavor work, peppermint enhancers.

L-Menthone

Source: Berje

FEMA# 2667, CAS# 89-80-5, Nature identical

Natural occurrence: *Mentha* species.

Odor: @ 1.0 percent. Minty, cooling, sweet, refreshing, peppermint fresh, slightly dirty woody, camphoraceous with a green herbal anise nuance.

Taste: @ 50 PPM. Cooling peppermint, fresh green minty, herbal, dirty mentholic with a refreshing camphoraceous nuance.

Possible applications: Mint peppermint, herbal notes, blueberry, peach, oral care, raspberry, thyme spice, black currant.

► **Berje;** *tel:* 973-748-8980; *e-mail:* berje@berjeinc.com

Note: Natural menthone fractions were available from Fleurchem, Symrise and IFF ex. buchu leaf oil.

Menthyl Acetate

Source: Robertet

FEMA# 2668, CSA# 249-409-8, Nature identical

Natural occurrence: *Mentha arvensis*, peppermint, scotch spearmint, raspberry, mango, buchu oil, lemon balm, ginger and orange juice.

Odor: @ 1.0 percent. Cool, minty, sweet woody raspberry, berry, pine.

Taste: @ 25 PPM. Cool minty, green woody, berry, tropical fruity, melon, guava-like.

Possible applications: Berry, raspberry, blueberry, herbal notes, mint enhancers, tropical body, melon and guava.

► **Robertet Inc.;** *tel:* 201 337 7100; *www.robertet.com*

Menthyl Mono Succinate

Source: Alfrebro

FEMA# 3810, CAS# 77341-67-4, Artificial

Odor: @ 1.0 percent. Little or no apparent aroma.

Taste: @ 100 PPM. Lingering cooling with a slightly oily mouth feel.

Possible applications: Wherever a lingering coolness is desirable.

► **Alfrebro/Degussa;**
www.flavors-fruit-systems.com

3-Methyl Cyclohexanone

Source: Aldrich
FEMA# 3947, CAS# 591-24-2, Nature identical

Natural occurrence: Peppermint oil, cornmint oil, penny royal oil, buchu oil and heater beef fat.

Odor: @ 1.0 percent. Minty cooling, clean and impacting with a slight medicinal solvent nuance.

Taste: @ 15 PPM. Minty, sweet, lifting cooling with a slight ethereal solvent like impact; fresh and slightly medicinal.

Possible applications: Mint enhancers, tropical nuances, mouthwashes and other oral care products, confections and chewing gum flavors.

► **Aldrich;** *tel: 414-273-3850;*
www.sigmaaldrich.com

L-Methyl Lactate (synonym: Frescolat ML)

Source: Aldrich
FEMA# 3748, CAS# 59259-38-0, Artificial
Odor: @ 1.0 percent. Menthol-like, cooling with a sweet salicylate nuance.

Taste: @ 25 PPM. A mouthwash-like effect with an aromatic mentholic coolness.

Possible applications: Chewing gum, mouthwashes, toothpaste flavors, horehound enhancers, spearmint, peppermint and alcohol boosters, cooling agents.

► **Aldrich;** *tel: 414-273-3850;*
www.sigmaaldrich.com

Pulegone

Source: Givaudan
FEMA# 2963, CAS# 89-82-7, Nature identical

Natural occurrence: Buchu oil, native spearmint, pennyroyal, peppermint, scotch spearmint and thyme.

Odor: @ 1.0 percent. Minty cooling, herbal green, sweet, clean spicy, with winter-green nuances.

Taste: @ 20 PPM. Minty, terpy, cooling, woody pine, citrus lime, with fresh green peppermint notes.

Possible applications: Mint and peppermint for chewing gum applications, lime, blueberry, blackcurrant, winter-

green, cinnamon candy, oral care products.

► **Givaudan;** *tel: 201-833-7500;* *www.givaudan.com*

Star Anise Oil CO2 Extract

Source: Danisco
CAS# 84650-59-9, Natural.

Odor: @ 1.0 percent. Rich deep anise, ouzo-like with a slight creamy mouth feel and imparting an intense anisic estragole note.

Taste: @ 5 PPM. Herbal anise, anethole, slightly creamy with a characteristic licorice black jelly bean aftertaste.

Possible applications: Anise cordials, jelly bean and other confections, oral care sweeteners, spice and herbal nuances.

► **Danisco;** *tel: 45 3266 2000;* *www.danisco.com*

Theaspirine

Source: Givaudan
FEMA# 3774, CAS# 36431-72-8, Nature identical
Natural occurrence: Black choke berry, grape, white wine, raspberry, passion fruit juice and cherimoya.

Odor: @ 1.0 percent. Cooling minty, woody pine-like, mentholic, camphorous with a slight green ethereal nuance.

Taste: @ 10 PPM. Cooling green, mentholic, woody pine and cedar-like with an herbal nuance.

Possible applications: Mint enhancers, berry seedy nuances, lift effects, fresh tea nuances, tropical notes.

► **Givaudan;** *tel: 201-833-7500;* *www.givaudan.com*

2,6,6-Trimethyl

Source: Abaco Inc.
FEMA# 3395, CAS# 564-94-3, Nature identical
Natural occurrence: Cumin seed, juniper berry, pepper, peppermint, scotch spearmint.

Odor: @ 1.0 percent. Cooling, green minty with a spicy woody nuance.

Taste: @ 30 PPM. Woody piney, minty, green cooling, slightly powdery and spicy.

Possible applications: Peppermint, mint nuances, medicinal and oral care products, blueberry, berry, melon and lime.

► **Abaco Inc.;** *tel: 706-779-0001*

There are several other cooling agents that have been approved in foods in GRAS# 20 and seem to have been lost in my database. They are:

- Frescolat MGC: Menthol Ethylene Glycol Carbonate, FEMA# 3805
- Frescolat MPC: Menthol-1 or 2-Propylene Glycol Carbonate, FEMA# 3806
- Frescolat MPC Racemic: Menthol Propylene Glycol Carbonate, FEMA# 3992

References

1. Green, Barry, *Oral chemesthesis: an integral component of flavor*. In: *Flavor Perception*. Edits., Andrew Taylor and Deborah Roberts.
2. *Cool freshness for a best-seller*. www.symrise.com/en/flavors/mint.php. ■

