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Blending & Formulating with Essential Oils

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Overview

- Essential Oil Chemistry
- Blending principles
- Usage rates
- Safety
- Regulatory
- Other considerations

Essential oil chemistry

- Fragrance is blending of 20 – 100 (or more) aroma chemicals
  - Blended purposely by perfumer
  - Top, middle and base notes
  - Generally quite substantive and strong
  - Can be manipulated by the perfumer
    - strength & substantivity
    - notes
    - stability

Lily-of-the-Valley base					
Material	**Upper Limit**	**Normal function**	**Variant 1**	**Variant 2**	**Variant 3**
Lyral	83	B	83	83	83
Cyclamen aldehyde	8	B		8	
Linalyl cinnamate	28	T			17
Heliotropine, 20%	70	B		25	
Hexylcinnamic aldehyde	22	B		9	
Alpha-Ionone	25	M	20	12	
Indole, 10%	10	M			1
Phenylethyl alcohol	28	T			24
Benzaldehyde, 1%	28	T	1	1	
Alpha-Terpineol (purest grade)	41	T		13	
Citronellol	44	T	28	28	38
Benzyl acetate	14	T	5	15	1
Cis-3-Hexenyl acetate, 1%	15	T	20	15	15

From 'An Introduction to Perfumery, 2nd Ed'. Curtis, T & Williams D, Micelle Press: 2001

Essential oil chemistry

- Essential oils naturally contain multiple aroma chemicals
  - have top, middle and base notes within them
  - have predominant notes and durability
- Generally:
  - less substantive or powerful
  - less stable
- Combining them means understanding:
  - chemistry
  - compatibility
  - stability
  - substantivity
  - aroma profiles – immediate and over time

Essential oil chemistry

Lavender Oil	Orange Oil
Limonene <1.00%	Orange Terpenes 90-97%
Cineole <2.50%	Acetaldehydes (Octanol) 0 – 0.5%
3-Octanone 0.1-2.5%	Alpha Pinene 0.4-1.5%
Camphor <1.2%	Beta Pinene 0.2-1.0%
Linalool 20 -45%	Myrcene 0 – 5%
Linalyl Acetate 25 – 46%	Linalool 0.2 – 1%
Terpinene-4-ol >0.2%	Beta –Carene 0 – 0.5%
Lavanduyl Acetate 0 – 0.5%	Decanal 0 – 0.5%
Lavandulol >0.1%	
a-terpineol <2.0%	

Blending principle 1: Notes

- All essential oils have top, middle and base notes but have PREDOMINANT notes for blending purposes
  - Top notes: 20-30%
  - Body notes: 40-80%
  - Base notes: 10-25%
- Some have relatively even profile
- Example: Lavender (predominant in body notes)
  - Top: FRE, LHT, SWE, FRU
  - Body(4): HER, LVD, FLO
  - Dry out: HER, FLO, WDY (24 hours)

Top Notes	Middle Notes	Base Notes
Bergamot	Chamomile, German	Carrot seed
Clove	Cardamom	Cedarwood
Cinnamon	Geranium	Cistus
Grapefruit	Ginger	Clary sage
Lemon	Lavender	Frankincense
Lemongrass	Marjoram, sweet	Myrrh
Lime	Palmarosa	Patchouli
Mandarin	Pine	Peru balsam
Neroli	Rosemary	Sandalwood, East Indian
Petitgrain	Rosewood	Spikenard
Orange, sweet	Ylang ylang	Vetiver
Peppermint		
Thyme		

Table 1: Top, middle and base notes of common essential oils
From: Battaglia, Salvatore, 2003. *The Complete Guide to Aromatherapy, 2nd Edition.* The International Centre of Holistic Aromatherapy: Brisbane. p362

Blending principle 2: Aroma type

- Compatibilities essential so that aromas:
  - don't degrade overtime
  - smell good
  - smell balanced
  - 4-5 maximum

	Floral	Fruity	Green	Herb.	Camph.	Spicy	Woody	Earthy
Floral e.g. Ylang Ylang	√	√	√	C	X	X	√	√
Fruity e.g Roman Chamomile	√	√	√	C	X	C	X	√
Green e.g. Neroli	Suitable with all types in small amounts							

Blending principle 2: Aroma type (cont.)

	Floral	Fruity	Green	Herb.	Camph.	Spicy	Woody	Earthy
Herbaceous e.g. Clary sage	C	C	√	√	√	C	√	√
Camphorous e.g. Marjoram	X	X	√	√	√	√	√	√
Spicy e.g. Myrrh	Use only in small amounts with care; may not be suitable in any amount							
Woody e.g. Sandalwood	√	X	√	√	√	√		√
Earthy e.g. Patchouli	Suitable in most blends up to 10%							

Blending principle 3: Extending

- Extend more expensive oils (jasmine, rose, neroli) with other less expensive oils
- Must carry similar aroma components desired in the more expensive oils

Battaglia provides the following example, to extend rose (p363):

Palmarosa	10%
Rose absolute	20%
Rosewood	60%
Patchouli	10%

Usage rates

Part of the body/consumer group	Typical maximum input (w/w)
Face products	Up to 0.5%
Body products	Up to 1.5%
Wash off products (body and hair)	Up to 1.8%
Around the eyes and mucous membranes	Up to 0.3%
Baby products	Up to 0.3%

Safety

- NATURAL DOES NOT MEAN SAFE!!!!!
- Have active principles – can affect pregnant women
- Some are affected by sunlight e.g. lime, bergamot

Effect	Example oils
Estrogenic agents	Aniseed, fennel
Emmenagogue agents	Cedarwood, cinnamon, clary sage, cypress, asmine, peppermint, rosemary, rose, sweet marjoram, thyme
Teratogenic agents	Wormwood, sage
Abortifacient agents	Mugwort, parsley seed, pennyroyal, rue, thuja, tansy, wormwood

Regulatory

- EU:
  - leave on products with >0.001% or rinse off products with >0.01% of substances listed in Annex III, entries 67-92, must be listed on the label
  - allergens typically found in MOST essential oils
  - need SDS to see % present
  - if exceeds these inputs, must list on the label
  - e.g. citral, geraniol, limonene, linalool

Regulatory

- Other checks:
  - CosIng for other limits that may apply
  - Aus TGA SUSMP

BERGAMOT OIL **except**:

a) when steam distilled or rectified;

b) in preparations for internal use;

c) in preparations containing 0.4 per cent or less of bergamot o

d) in soaps or bath or shower gels that are washed off the skin;

e) in medicines for human therapeutic use when compliant with the requirements of the Required Advisory Statements for Medicine Labels; or

f) in other preparations when packed in containers labelled with the statement:

Application to the skin may increase sensitivity to sunlight.

LIME OIL **except**:

a) when steam distilled or rectified;

b) in preparations for internal use;

c) in preparations containing 0.5 per cent or less of lime oil;

d) in soaps or bath or shower gels that are washed off the skin;

e) in medicines for human therapeutic use, when compliant with the requirements of the Required Advisory Statements for Medicine Labels; or

f) in other preparations when packed in containers labelled with the statement:

Application to the skin may increase sensitivity to sunlight.

Other considerations

- Botanical names: be specific!
  - Chamomiles: German/Blue (*Matricaria recutita*), Maroc (*Ormenis multicaulis*), Roman (*Anthemis nobilis*)
- Plant part: twig/stem vs flower vs whole plant
- Adulteration: how natural is natural?
- Seasonal variations
- Distillation methods:
  - E.g. Ylang ylang extra, I, II, III and complete
- Oxidation
- Extra input required = stability and substantivity issues
- COST!!!

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- Questions?
- Comments?

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