Natural Fragrance Solubilizers

Dennis Abbeduto
Colonial Chemical, Inc.

Outline

- Brief solubilizer overview
- Naturally derived solubilizers
- Performance evaluation

Solubilizer Overview

What is Fragrance Solubilization?

- Emulsion or dispersion characterized by particle size
- Generally less than ~600A
- Surfactant alone is water soluble
- Fragrance generally soluble in the surfactant
- High ratio of surfactant to oil
- Usually tolerate infinite dilution

Fragrance Characteristics

Odor Class	Relative Polarity	Examples
Floral	High	Jasmine, rose, lilac, carnation
Fruity	Medium	Esters, aldehydes, fruity lactones
Menthe	Medium	Peppermint, spearmint, menthol
Spice/Herbs	Medium/Low	Spice oils (eugenol)
Citrus	Low	Terpenes, limonene
Woody	Low	Cedar, sandalwood, pinene
Medicinal	Low	Camphor, thymol
Animal	Low	Ambergris, civet, musk

Solubility Parameter

- Measure of cohesive forces between molecules
- Higher numbers tend to be more polar
- Molecules with similar numbers will be miscible
- Molecules with values >9 will tend to be easier to solubilizer into water
- Polar oils are easier to solubilize than nonpolar oils

Solubilizer Overview

Using the HLB system	
Formulation Function	Required HLB
Defoaming of aqueous systems	1 – 3
W/O emulsification	4 – 6
Wetting	7 – 9
O/W emulsification	8 – 18
Solubilization	11 – 18
Detergency	13+

Solubilizer Overview

Solubilizers with approximate HLB value	
Oleth-10	12
PEG-40 Hydrogenated Castor Oil	15
Polysorbate 80	15
Oleth-20	15
Polysorbate 20	17
PEG-60 Hydrogenated Castor Oil	17
Steareth-100	19

Solubilizer Overview

Why are solubilizers made by ethoxylation?

- Simple surfactants
- Easily vary the HLB
- Cost

Solubilizer Overview

- A by-product of ethoxylation is 1,4-Dioxane:

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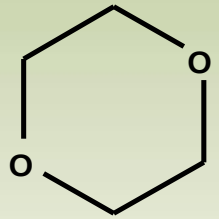

Ethylene Oxide

1,4-Dioxane

Naturally Derived Solubilizers

What is “Naturally Derived”?

12 Principles of Green Chemistry:

- Major raws from renewable sources
- No waste or toxic by-products
- Safe process methods
- Readily biodegradable
- Non-toxic solvents

Must produce products with comparable performance

Sorbitan Oleate Decylglucoside Crosspolymer (SODC)

- HLB Value: 13
- 65% solids in water
- Moderate foamer
- Straw color
- “Co”polymer of Decyl Glucoside and Sorbitan Monoleate, using biobased linker
- Patented
- Ecocert/COSMOS, NPA, NSF, 100% Biobased (USDA)

Heptyl Glucoside

- 70% active in water
- Non-foaming
- Low color
- Glucoside from castor oil-derived heptyl alcohol
- Patented
- Ecocert/COSMOS, Ecolabel, 100% Biobased (ACDV)

Sulfoacetate Blend

- Aqua (and) Pentylene Glycol (and) Sodium Lauryl Sulfoacetate (and) Sodium Oleoyl Sarcosinate (and) Sodium Chloride (and) Disodium Sulfoacetate (and) Sodium Oleate (and) Sodium Sulfate
- 55% solids in water
- Low foaming
- Low color
- Patent pending
- Primarily PEG-free, no NGO approvals

Natural Glucosides Blend

- Caprylyl/Capryl Wheat Bran/Straw Glycosides (and) Aqua (and) Fusel Wheat Bran/Straw Glycosides (and) Polyglyceryl-5 Oleate (and) Sodium Cocoyl Glutamate (and) Glyceryl Caprylate
- 70% active in water
- Moderate foam
- Amber color
- Suggested formulation pH 4.5 – 7.5
- Ecocert/COSMOS

Polyglycerol Ester Blend

- Polyglyceryl-4 Caprylate (and) Decyl Glucoside (and) Sodium Lauroyl Glutamate (and) Diglycerin (and) Water
- X% active in water
- Moderate foam
- Low color
- Suggested formulation pH > 7
- Ecocert/COSMOS

Polyglyceryl Esters

- Polyglyceryl-6 Caprylate (and) Polyglyceryl-4 Caprylate (and) Polyglyceryl-4 Cocoate (and) Polyglyceryl-6 Ricinoleate
- 100% active in water
- Low color
- Low foam

Performance Evaluation

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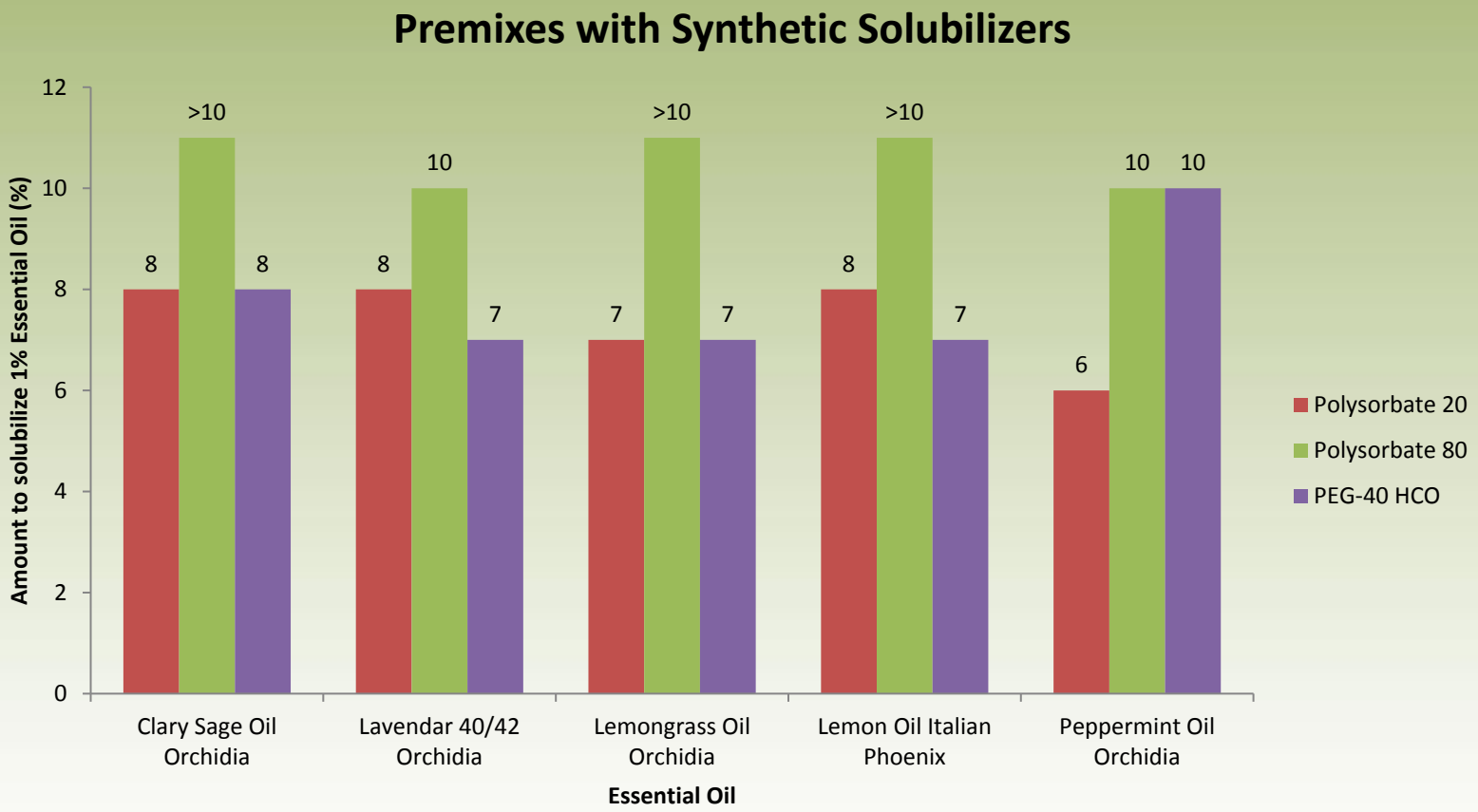
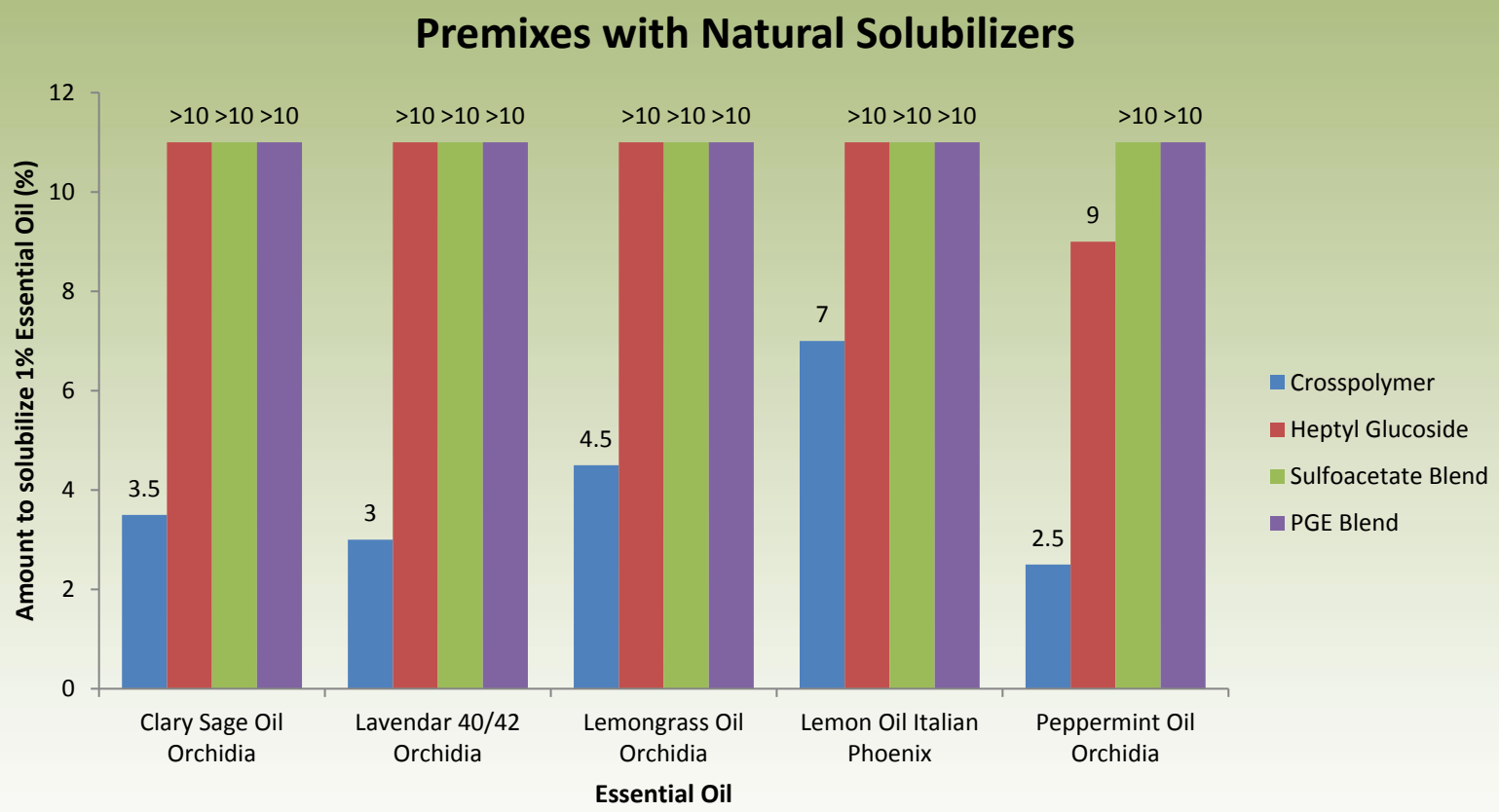


Premixes of oil and solubilizer were added to DI water and mixed at 40°C for 5-10 minutes until a clear mixture was obtained. In all tests, there was 1% fragrance in the system.

Performance Evaluation



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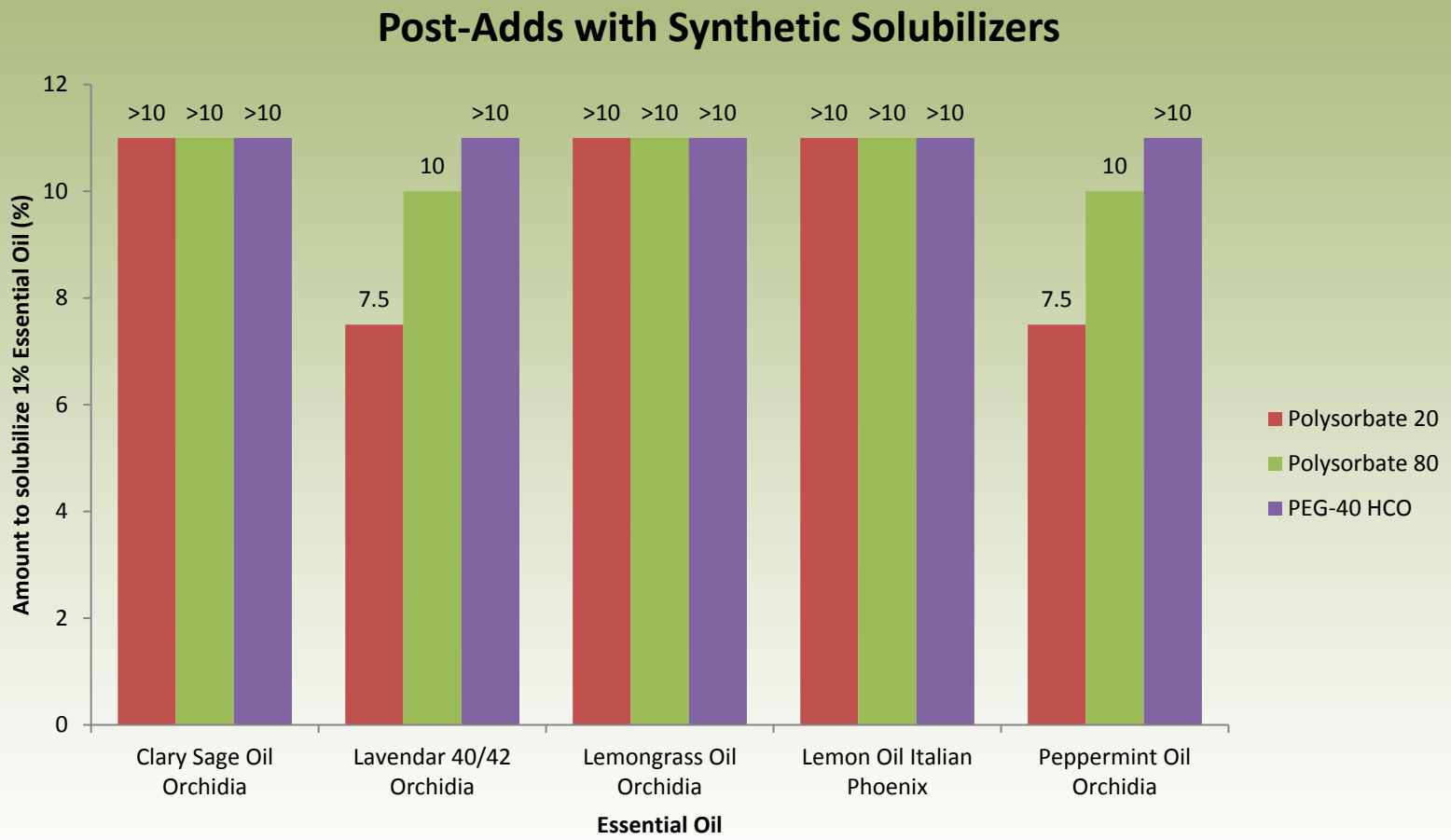

1 gram oil in 99 grams water, heated to 40°C. Solubilizer titrated in 0.5% increments with 5 minute mix time between increments until clear mixture obtained.

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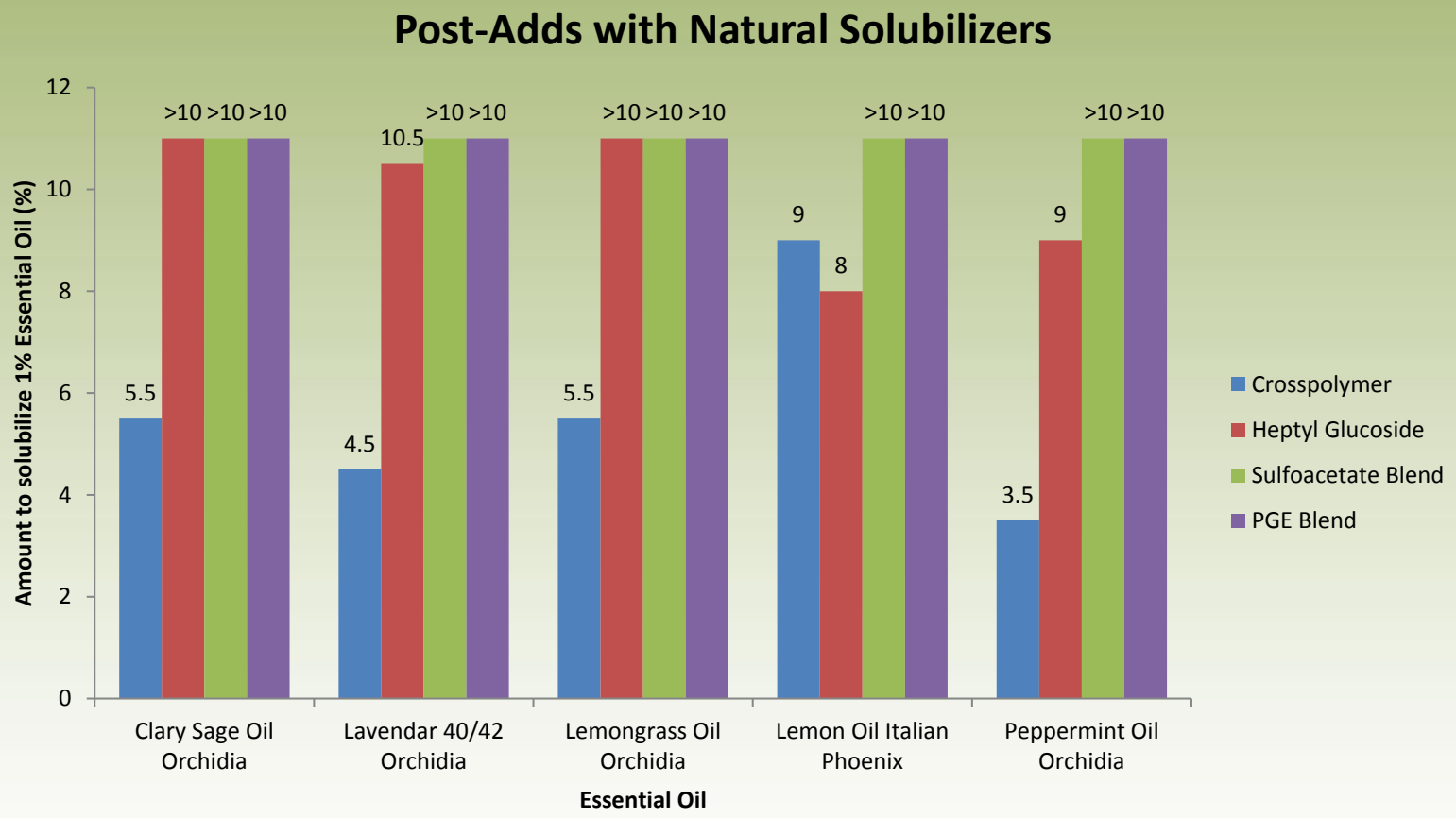

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Conclusions

- Naturally derived fragrance solubilizers with broad regulatory, NGO approvals increasing
- Non-ethoxylated options offer similar, if not better performance than traditional offerings
- Formulators must be mindful of advantages and drawbacks for each technology

Questions?

Thank you!