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Poly Suga®Mulse D9

100% Biobased Fragrance Solubilizer

INCI NAME	Sorbitan Oleate Decylglucoside Crosspolymer
CAS NUMBER	1443994-56-6
LISTINGS	TSCA (US), REACH (EU) Polymer Exempt

Poly Suga®Mulse D9

The first 100% naturally-derived, EO-free, 1,4-Dioxane free, PEG-free solubilizer

with no irritation

100% Natural Carbon Biobased

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Poly Suga®Mulse D9 is a PEG-free, nonionic fragrance solubilizer made from 100% biobased raw materials. It is hydrophilic, freely soluble or dispersible in water, and soluble in varying degrees in organic liquids. Poly Suga®Mulse D9 is used for oil-in-water (O/W) emulsification, dispersion or solubilization of fragrances and all types of oils. It is compatible with nonionic, cationic and anionic surfactants and is effective in systems with relatively high levels of electrolyte, acid, or base.

Poly Suga®Mulse D9 is an excellent solubilizer for fragrances in water-only and water-and-surfactant systems. Poly Suga®Mulse D9 compares favorably to ethoxylated materials (such as Tween® 20 and PEG-40 hydrogenated castor oil) in both ease-of-use and use levels. Poly Suga®Mulse D9 may also be used as a co-emulsifier in the formulation of creams and lotions.

APPLICATIONS

- Fragrance solubilizer in all systems
- Perfumed waters and essential oils
- Deodorants and after shaves
- Skin care products
- Shampoos, hair gels
- Body washes
- Wipes
- Household cleaners

BENEFITS

- 100% naturally derived
- EO-free, 1,4-Dioxane free, PEG-free
- Solubilizes a broad range of lipophilic substances in pure aqueous or aqueous alcoholic systems
- Offers excellent performance comparable to benchmark PEG-free solubilizers
- Stable over a broad pH range
- Easy to handle; cold or hot processed
- Freely soluble in water
- Minimal impact on color; no impact on odor in final formulation
- No impact on viscosity on the final formulation

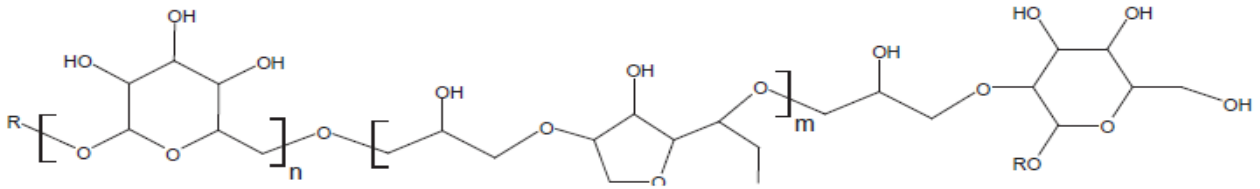
RECOMMENDED USE LEVELS

2 – 8% in rinse-off products; 1 – 3% in leave-on products.

TYPICAL PROPERTIES

Appearance, 25°C	Clear Liquid
pH, 10% aqueous	6.0 – 8.0
Solids, %	65.0 – 68.0
NaCl, %	6.5 Min.
Color, Gardner BYK	4 Max.
HLB	12 - 14

STRUCTURE



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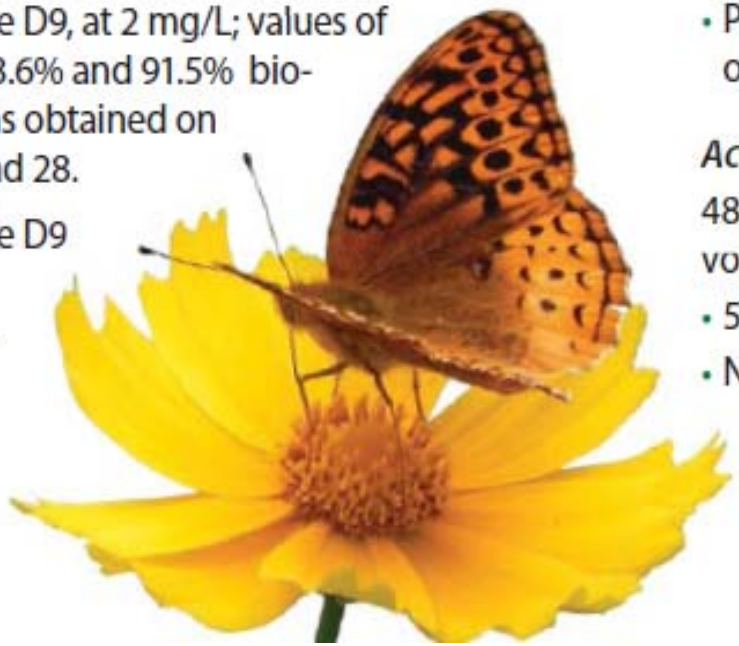
BIODEGRADABILITY

OECD 301 (301D) *Ready biodegradability test in an aerobic aqueous medium*

- Poly Suga®Mulse D9, at 2 mg/L; values of 81.1%, 90.4%, 98.6% and 91.5% biodegradation was obtained on Days 7, 14, 21 and 28.
- Poly Suga®Mulse D9 is readily biodegradable.



EYE / SKIN SENSITIVITY

Eye Irritation

HET-CAM - Hen's Egg Chorioallantoic Membrane Test

- Practically no ocular irritation potential in vivo, score of **2.25**

Acute Skin Irritation

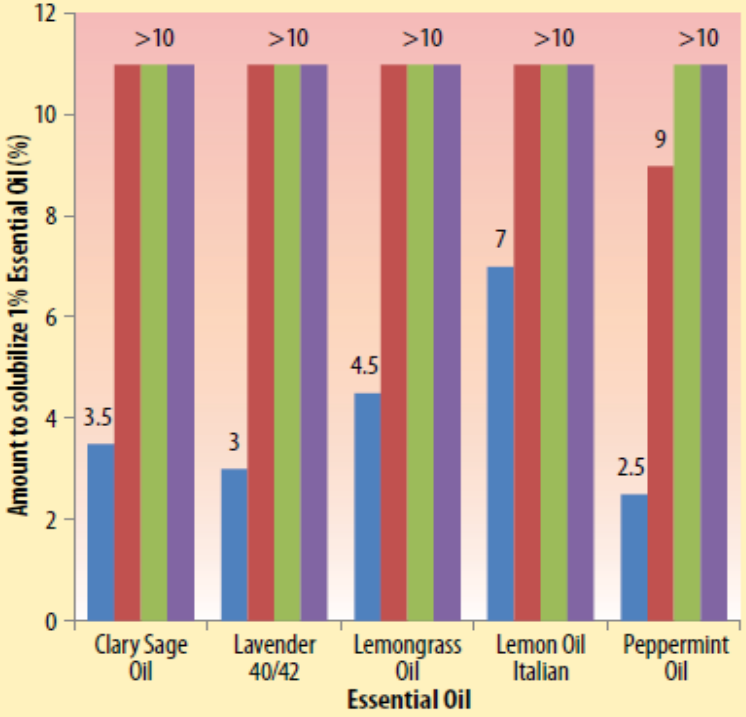
48 and 72 Hour Occlusive skin patch test on human volunteers - 53 Test Subjects

- 53/53 showed no visible skin reaction (**0**)
- No potential for dermal irritation

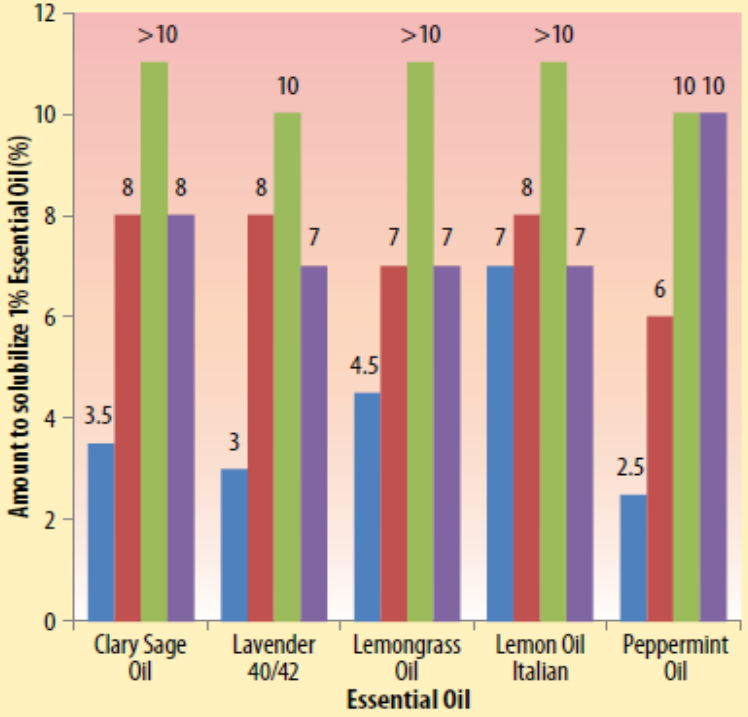
SOLUBILITY TESTING

Poly Suga®Mulse compares favorably in a variety of applications to both traditional ethoxylated solubilizers as well as other natural solubilizers. These graphs demonstrate the relative efficacy of Poly Suga®Mulse when compared to other selected solubilizers. Poly Suga®Mulse provides excellent efficiency when used either as a premix or when post-added to systems containing a wide range of essential oils.

PREMIXES WITH **NATURAL** SOLUBILIZERS



PREMIXES WITH **SYNTHETIC** SOLUBILIZERS



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% essential oil in the system.

Poly Suga®Mulse D9 and **Natural** Solubilizers Tested
- *Poly Suga®Mulse D9*
- Polyglycerol Esters
- Short Chain Glucoside
- Natural Solubilizer Blend

Poly Suga®Mulse D9 and **Synthetic** Solubilizers Tested
- *Poly Suga®Mulse D9*
- Polysorbate 80
- Polysorbate 20
- PEG-40 Hydrogenated Castor Oil

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Poly Suga®Mulse D9 Polyglycerol Esters
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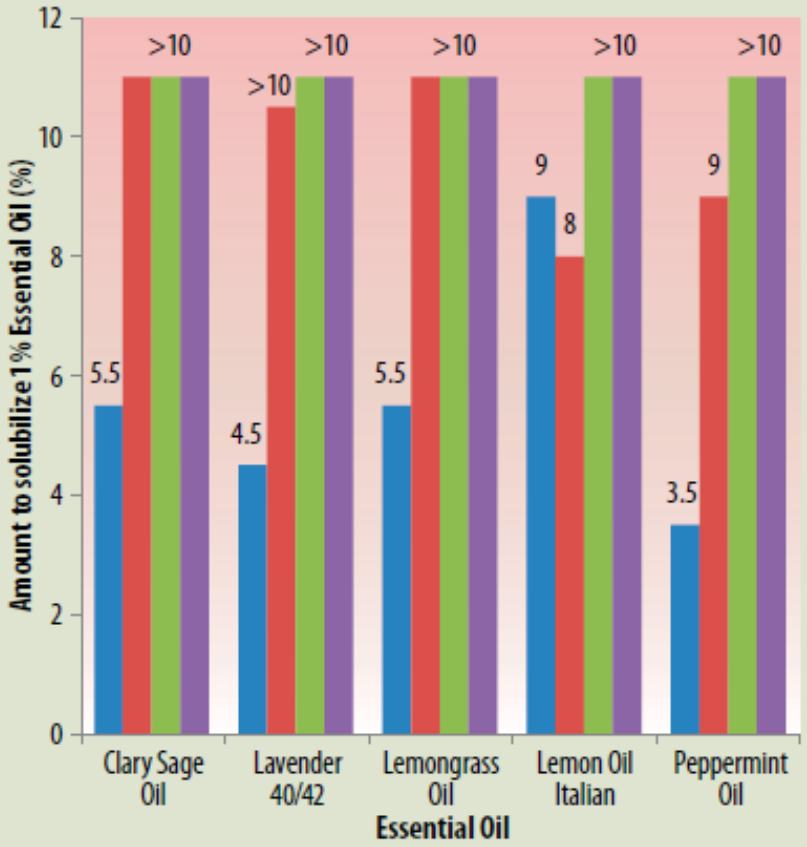

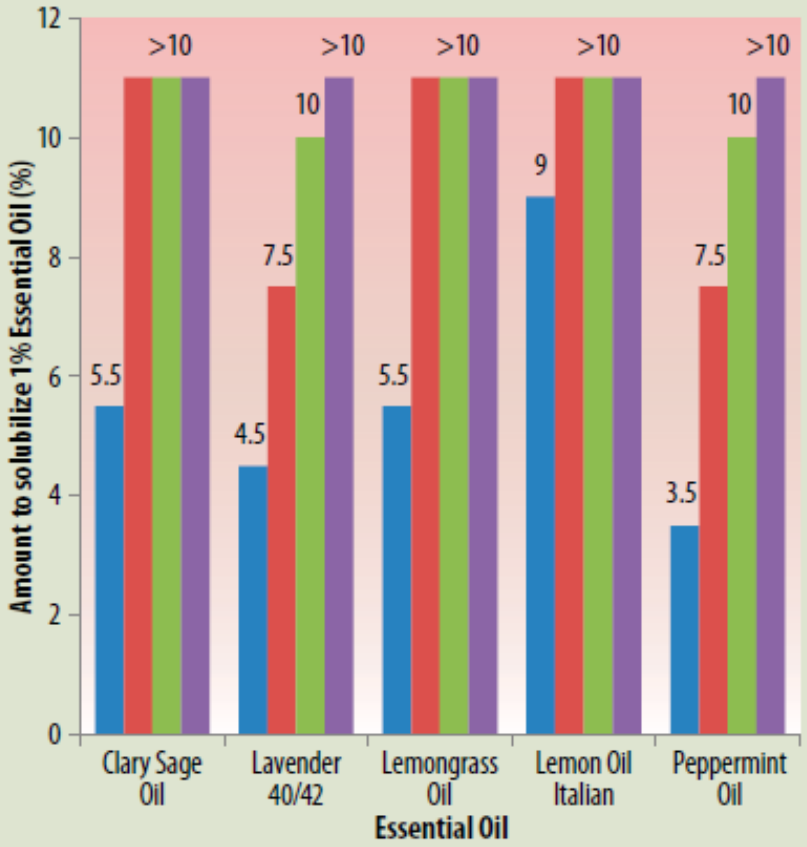

Post-Adds: 1 gram oil in 99 grams water, heated to 40°C. Solubilizer titrated in 0.5% increments with 5 minute mix time between increments until clear mixture obtained.

SUGGESTED USE EXAMPLE

1% lavender oil can be solubilized in water with 5% Poly Suga®Mulse D9.

FORMULATIONS

Micellar Solution

This non-comedogenic formulation produces a no-rinse solution for gentle cleansing of normal/combination skin. For effective make-up removal, simply apply to cotton wool and gently apply to face – without the need for additional rinsing. It is also safe for sensitive skin and around eyes. The formulation is soap-free, ethoxylate-free, alcohol-free, and paraben-free.

- ***This formula complies with EcoCert standards for natural formulations.***

	INGREDIENT	%
1	Water	qs to 100.00
2	MinaCare® Pentiol Green+	1.50
3	***Poly Suga®Mulse D9***	1.50
4	Glycerin	0.25
5	MicroCare® SB	0.50
6	Lavender 40/42 Oil	0.02
7	Lactic acid	qs to pH 4.50

PROCEDURE

Combine ingredients in order. Mix until clear, heating to 40°C if necessary.

TYPICAL PROPERTIES

Appearance	Clear liquid
pH	4.5
Viscosity	20 cps

Body Lotion with Argan Oil and Natural Moisturizers

The lightweight, moisture-enriching formulation is easily absorbed and leaves skin feeling softer and smoother with a non-greasy finish.

	INGREDIENT	%
A	Water	qs to 100.00
A	Cetyl Hydroxyethylcellulose (Natrosol™Plus 330 CS)	0.25
A	***Poly Suga®Mulse D6***	4.00
A	***Poly Suga®Mulse D9***	2.00
A	Glycerin	2.00
B	Ethylhexyl Palmitate	3.00
B	Isopropyl Palmitate	6.00
B	Argan Oil	3.00
B	Cetyl Alcohol	4.00
C	Diheptyl Succinate and Capryloyl Glycerin/ Sebacic Acid Copolymer (LexFeel® N5)	2.00
C	Euxyl® K220	0.07
C	*White Lily* Fragrance (Belle-Aire Fragrances)	0.10

PROCEDURE

Combine water and cetyl hydroxyethylcellulose. Hydrate according to manufacturer instructions. Add remaining phase A ingredients. Heat to 70°C. In a side vessel, combine phase B ingredients. Heat to 70°C. Once both phases are homogeneous and at temperature, add B to A slowly with good mixing. Slowly cool to 50°C and add phase C ingredients. Homogenize and fill containers.

TYPICAL PROPERTIES

Appearance	Clear
pH	6.0
Viscosity	15,000 cps