Naturally Derived Silicone Alternative: Floramac® 10

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Introduction

Floramac® 10 (INCI: Ethyl macadamiate) is a moisturizing mix of macadamia esters offering a soft silky after-feel comparable to leading market silicones. This non-greasy, light ester is derived from macadamia oil, which is a desirable plant source due to its sustainability profile. The macadamia plant is promoted as an alternative crop to small farmers in developing regions of the world since it has a relatively low input requirement, and it can continue to yield seeds for decades.[2,3] It can consequently provide crops for a variety of industries and allow growers to maximize the benefits of the land while having minimal impact compared to other crops. Mimicking the skin feel of silicone coupled with a natural origin of 99.95%, Floramac 10 is answering a market need to formulate more sustainably.

"Silicone-free" claims continue to grow year after year as consumers seek more naturally derived ingredients. Brands are continually looking for silicone alternatives to increase naturality without sacrificing. New data on Floramac 10 demonstrates that sensory can be matched and moisturization can be surpassed compared to dimethicone and cyclopentasiloxane, two commonly used silicones in personal care products. Floramac 10 also provides more moisturization than most other silicone alternatives.

Its stability and high compatibility with other ingredients gives Floramac 10 advantages over other silicone alternatives allowing formulators to reduce or replace silicones entirely. Performing well in all categories including skin, hair, makeup and sun care, this versatile emollient provides multifunctional benefits of sensory and hydration from a plant-based source.

Cargill Beauty
Unleashing Nature
Sustainably

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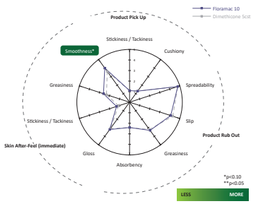
REFERENCES and FOOTNOTES

1. Naturally derived according to ISO 16128.
2. https://businessmirror.com.ph/2017/04/26/da-promotes-planting-of-macadamia-nuts-as-alternative-cash-crop/
3. https://east-fruit.com/en/news/macadamia-is-the-fastest-growing-nut-crop-in-the-world/
4. Glossymeter GL 200 and Corneometer CM 825 are products of Courage + Khazaka (Köln, Germany).

Skin Care Benefits

Matching the Sensory Profile of Silicones Floramac 10 vs. Dimethicone 5cst



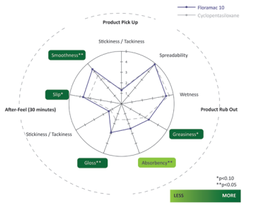
Sensory profile of 2 neat materials (n=24 females)

Pick-up: Floramac 10 has similar pick up to Dimethicone 5cst

Rub-out: Floramac 10 felt similar to Dimethicone 5cst during application

Immediately after application: Floramac 10 leaves skin smoother than Dimethicone 5cst

Floramac 10 vs. Cyclopentasiloxane



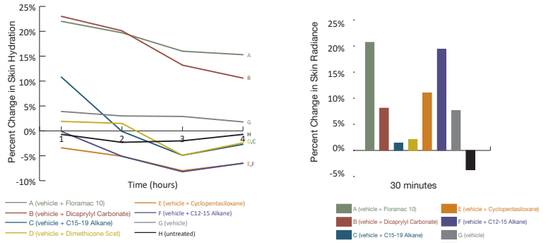
Sensory profile of 2 neat materials (n=27 females)

Pick-up: Floramac 10 has similar pick up to Cyclopentasiloxane

Rub-out: Floramac 10 is greasier and less absorbent during application than Cyclopentasiloxane

30 minutes after application: Floramac 10 leaves skin smoother, glossier, and more slippery than Cyclopentasiloxane

Increased Skin Hydration & Radiance



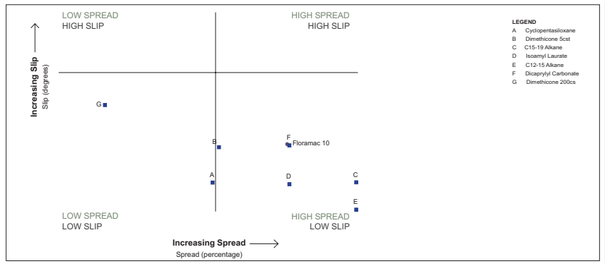
Method: Skin hydration (Corneometer) and Skin radiance (Glossymeter) of a lotion with 5% Floramac 10 compared to silicones and other natural silicone alternatives after 1 application on the legs of female subjects (n=17)

Results: Floramac 10 increased skin hydration statistically significantly ($p<0.05$) better than C15-19 Alkane, Dimethicone 5cst, and C12-15 Alkane at 1, 2, and 4 hours post application and better than and Cyclopentasiloxane and the vehicle at all time points.

Floramac 10 increased skin radiance statistically significantly ($p<0.05$) better than Dimethicone 5cst, C12-15 Alkane, and Cyclopentasiloxane 30 minutes post application.

Formula: Water (93.0%), Test emollient (5.0%), Sclerotium Gum (1.0%),and Phenoxyethanol (and) Ethylhexylglycerin (1.0%)

Slip and Spread of Floramac 10 compared to silicones and silicone alternatives



Method: Slip refers to the angle in degrees from vertical at which a standard weight, lubricated by the test emollient, will begin to slide on an inclined plane. Spread refers to the portion, as a percentage of standard P5 filter paper, over which 20 drops of the test emollient will spread in 10 minutes. Larger values represent higher amounts for both slip and spread.

Results: Floramac 10 and the other silicone alternatives have similar slip but higher spread than Dimethicone 5cst and Cyclopentasiloxane.

Consumer Evaluation in a Primer

Method: Sensory evaluations were performed in a split face study over the course of 4 days of use within a primer comparing 10% Floramac 10 to 10% Dimethicone 5cst. Evaluations were made during application, immediately after applying, and after eight hours of wear. Subjects rated each statement for each product as Strongly Disagree, Somewhat Disagree (negative responders), Neither Agree Nor Disagree (neutral responders), Strongly Agree, or Somewhat Agree (positive responders).

Results: Floramac 10 and dimethicone 5cst were scored in a similar fashion to one another when included within a finished formulation, and both products contributed to producing a light/pleasant texture that was easy to spread and left the skin smoother. The results in the Table (right) show the statistically significant percentage of positive responders for the specified questions for each product.

Evaluation Time	Question	Floramac 10	Dimethicone 5cst
Immediately after primer application	I felt the texture of Primer was Light/Pleasant during the application	82%**	77%**
	I felt Primer was Easy to Spread and Apply	91%**	91%**
1-3 minutes after primer application	I felt my skin was Smoother with Primer	70%**	70%**

Sunscreen Solubility/Compatibility

Volatile silicones like dimethicone 5cst are often included within sunscreens and color cosmetic products to impart a silky, smooth sensory experience. Additional requirements of such formulas include pigment/mineral sunscreen wetting and dispersion, and sunscreen solubilization.

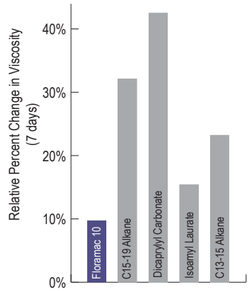
Method: Floramac 10 was evaluated compared to Dimethicone 5cst for the solubilization / dispersion of a variety of sunscreen actives. The sunscreen actives were loaded into the emollients between 10-35% to determine compatibility. Samples were heated to 70°C in cases where the mixtures weren't homogeneous.

Results: Floramac 10 is more effective at dispersing sunscreen actives and performs similarly to the positive control (C12-15 Alkyl Benzoate).

	Powder				Liquid			
	Avobenzone	Ethylhexyl Triazone	Diethylamino Hydroxybenzoyl Hexyl Benzoate	Diethylhexyl Butamido Triazone	Octyl Salicylate	Homosalate	Bis-Ethylhexyloxyphenol Methoxyphenyl Triazine	Octyl Methoxycinnamate
Floramac 10	20%*	20%*	35%*	35%*	35%	35%	35%	35%
Dimethicone 5cst	IS	IS	IS	IS	35%	35%	IS	15%
Positive Control	35%*	30%*	35%*	35%*	35%	35%	35%	35%

*Indicates heat was necessary / IS = insoluble

Pigment Dispersion Stability



Method: The pigment blend was added to a beaker followed by the emollient for a total of 60 grams (40% pigment blend + 60% emollient) and allowed to rest for 24 hours undisturbed. The mixture was mixed by hand at room temperature until uniform, and then placed on a 3-roll roller mill and rolled through 4 times. Viscosity measurements were taken of each mixture immediately after milling, and 7 days after milling. A change in viscosity over time is indicative of pigment agglomeration.

Results: Floramac 10 resulted in small viscosity changes over time, which is indicative of less pigment agglomeration when compared to other silicone alternatives.

Conclusion

Consumers and brands are looking for more sustainable and natural ingredients and ultimately finished produts, but texture and sensory experience continue to be an important part of choosing personal care products.

- Floramac 10 is a light emollient with excellent oxidative stability, high spread, and low slip.
- The silky and smooth sensory profile matches the highly used personal care silicones, dimethicone and cyclopentasiloxane, while offering the extra benefit of increased hydration and radiance.
- Floramac 10 provides additional formulation benefits such as solubilization and dispersion of other ingredients like sunscreen actives and pigments, which is not a typical function of volatile silicones.
- Additional studies have demonstrated that Floramac 10 not only functions in skin care, but also performs well in hair care, makeup, and sun care applications.
- Floramac 10's versatility and compatibility across both naturally derived and synthetic systems gives formulators the opportunity to slowly transition primarily synthetic formulas to be more eco-friendly in composition. Floramac 10 not only offers functionality both during formulation and to the skin within finished products, but also meets the growing trends of botanical sourcing and chemistry without sacrificing the pleasant skin feel provided by silicones.