

# BioEstolides: a Sustainable Silicone Replacement for Personal Care Formulations.

By Biosynthetic Technologies

Thu, Apr 29, 12:00 PM EDT  
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**BIOSYNTHETIC**<sup>®</sup>  
TECHNOLOGIES



# Biosynthetic® Technologies BioEstolide™



**BioEstolides™** are an exciting  
new plant-based emollient with  
enhanced oxidative stability.



# BioEstolides Come in Three Viscosity Grades

**BioEstolide™ 30**



**INCI Name**  
*Ethylhexyl  
Acetoxystearate*

**BioEstolide™ 250**



**INCI Name**  
*Acetyl Ethylhexyl  
Polyhydroxystearate*

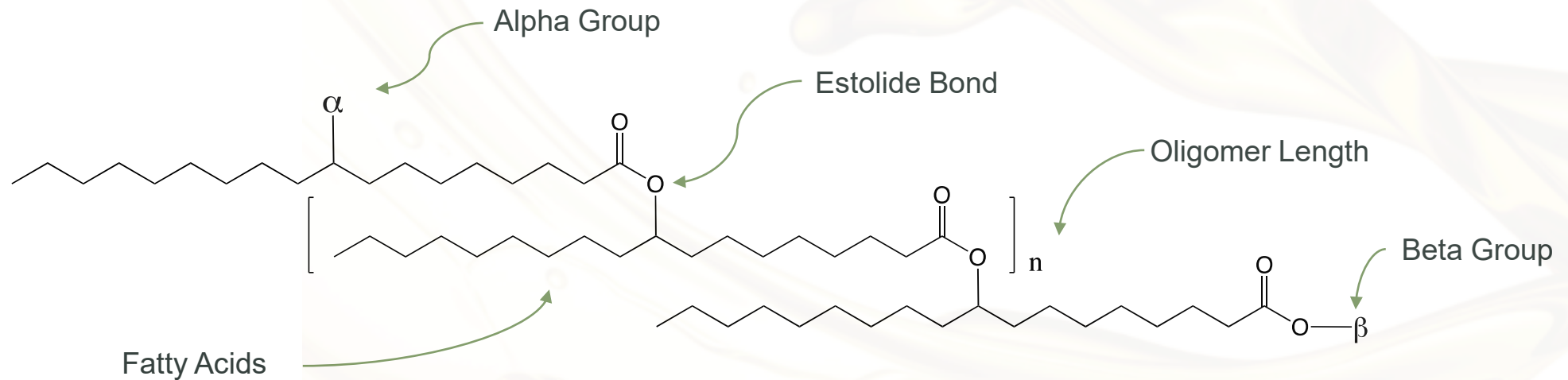
**BioEstolide™ 1300**



**INCI Name**  
*Acetyl Ethylhexyl  
Polyhydroxystearate*



## What is an Estolide?



BioEstolides are an oligomer made from fatty acids. These molecules are stable and offer enhanced stability since the ester bonds are protected. The molecule is also fully saturated reducing the risk of oxidation. While estolides can be made from almost any vegetable oil, BioEstolide are made using Castor Oil.

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## BioEstolide Benefits

- **Extremely Stable**
  - BioEstolides have excellent oxidative stability enhancing the shelf life of the product over other naturally derived oils.
- **Excellent Sensory Profile / Gentle Feel**
  - BioEstolides have a luxurious soft feel. Can be used as a silicone replacement in hair and skin care.
- **Enhances Moisturization**
  - BioEstolides hydrate, soften and smooth the skin surface without leaving an oily residue on the skin.
- **Environmentally Friendly**
  - BioEstolides are non-toxic, biodegradable with a high bio-content.



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## Additional BioEstolide Benefits



- **Silicone Replacement**
  - Serves as a biobased silicone replacement.
- **UV Protection**
  - BioEstolides have inherent UV blocking properties.
- **Water Resistance**
  - BioEstolide 1300 has water resistance benefits.
- **Thermal Protection**
  - Helps protect hair from being damaged when exposed to heat.
- **Healthy Shine**
  - Healthy look and feel
- **Lubricating Benefits**
  - Reduces friction
- **Suspension Benefits**
  - Holds pigment or UV filters.



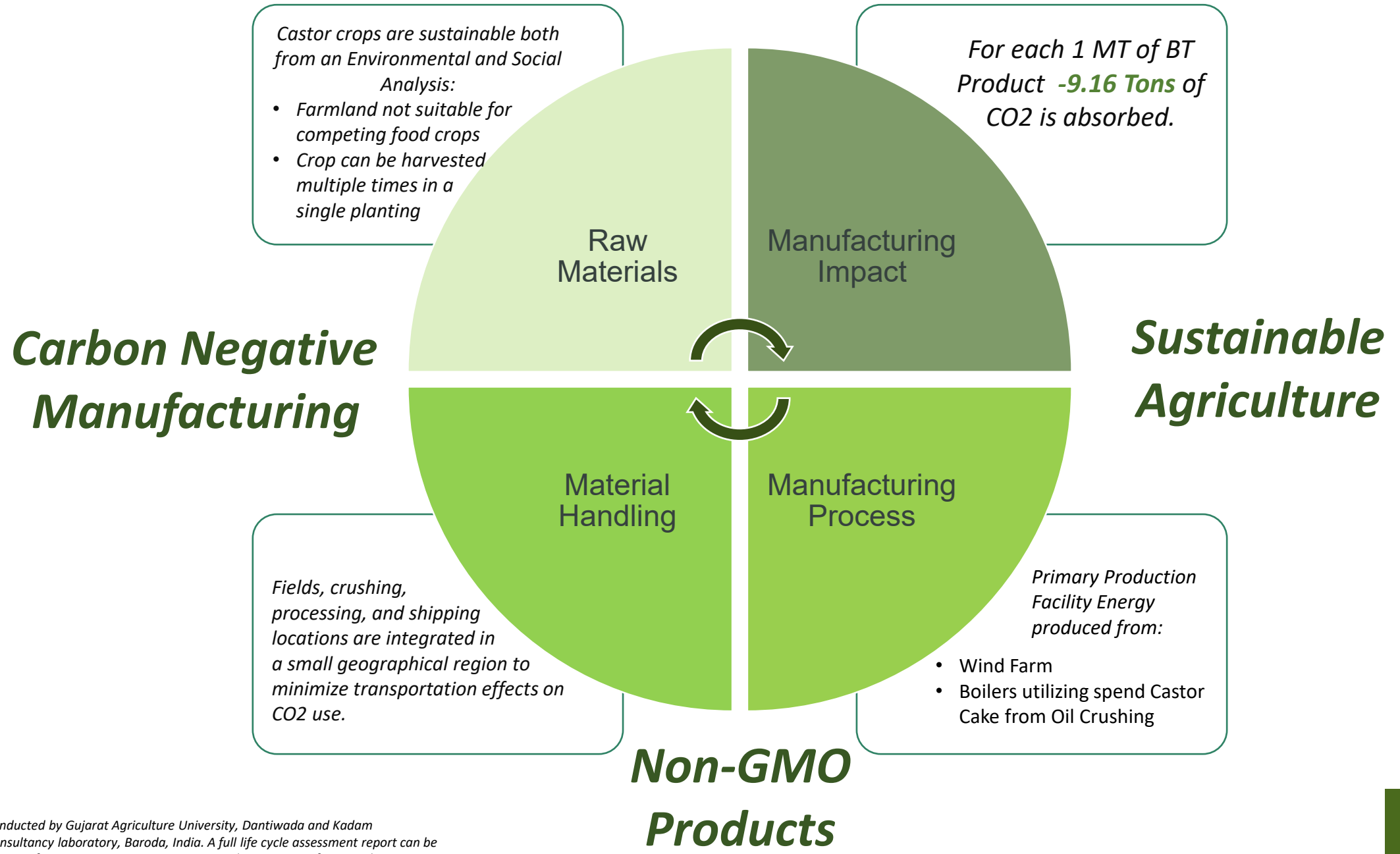
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# Environmental BioEstolide Benefits

- **Negative Carbon Footprint**
- **Biodegradable**
  - BioEstolides are biodegradable per OECD 301
- **Non-Bioaccumulative**
  - BioEstolides will not bioaccumulate per OECD 107
- **Non-Toxic**
- **Bio-Based**
  - BioEstolides are made using natural Castor Oil with renewable carbon levels ranging from 69% to 95% per ASTM D6866 and ISO 16128
- **Natural Origin Index**

• BioEstolide 30	0.69
• BioEstolide 250	0.86
• BioEstolide 1300	0.95





*Lifecycle study conducted by Gujarat Agriculture University, Dantiwada and Kadam Environmental consultancy laboratory, Baroda, India. A full life cycle assessment report can be delivered upon request for CO2, Water, NOx, SOx, COD, and TDS impacts from production.*

# Certification and Registration

Product	US	Canada	Europe, REACH	Environmental Claims		Food Contact	
	Approval	Approval	Approval	Eco Label LuSC List	BioPreferred	HX-1 InS	HX-1 NSF
BioEstolide 30	✓	✓	✓	✓	68% Biocontent	✓	✓
BioEstolide 250	✓	✓	✓	✓	86% Biocontent	✓	✓
BioEstolide 1300	✓	✓	✓	✓	94% Biocontent	✓	✓





# BioEstolides are Socially Conscious



**Halal Certified**



**Vegan Certified**

Don't contain any animal by-products



**Kosher Certified**



**Non-GMO**

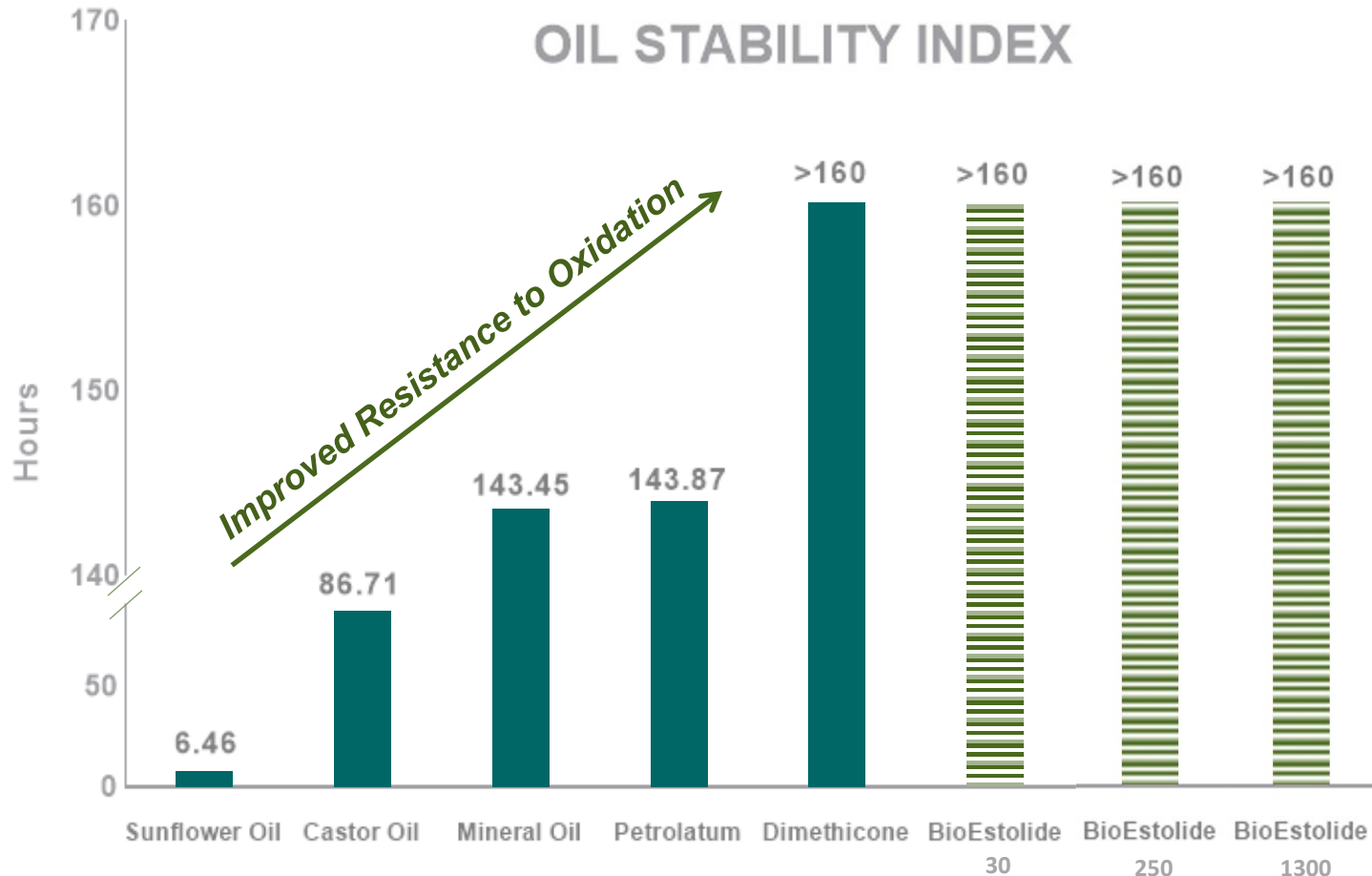
Non-GMO feedstock, made from castor oil



**BIOSYNTHETIC<sup>®</sup>**  
TECHNOLOGIES



# Oxidative Stability



***BioEstolides have strong oxidative stability***

- Test Method: Oil Stability Index
  - Official Method Cd 12b-92 of the American Oil Chemists' Society (AOCS)
  - Oils are heated and exposed to air. The oil is then monitored to measure the time it takes before the material oxidizes and goes rancid
- Conditions
  - Temp 110°C



# Sensory Benefits – Gentle Feel

*BioEstolides have a soft gentle feel*

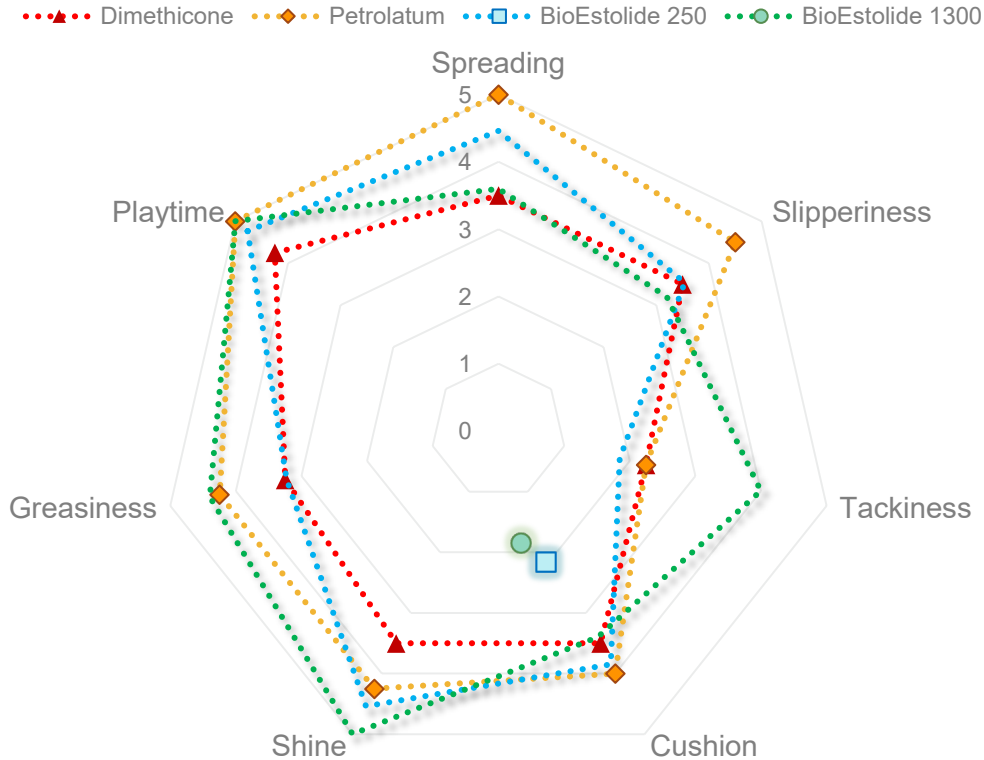
*BioEstolides spread easily with ample playtime.*

## BioEstolide vs Mineral Oil



# Sensory Benefits – Silicone Replacement

## BioEstolide, Silicone, Petrolatum



***BioEstolides are now being used as a silicone replacement in various applications including hair care***

***BioEstolides provide a sensation of both slipperiness and cushion which results in a soft satiny feel***

***BioEstolides give skin a healthy glow***

# BioEstolide™ & Hair Care







- **Thermal Protection**
  - BioEstolides offer heat protection up to **450°F**
  - BioEstolides are one of least volatile oils on the market and very thermally stable
- **Healthy Shine**
  - BioEstolides outperformed a quality silicone-based product in shine when tested by a third-party lab
- **Friction Reduction**
  - BioEstolides have strong lubricating properties
- **Bio-Based Silicone Replacement**
  - Used as a silicone replacement due to its unique properties and benefits

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# Hair Care Study

- **Objective**
  - Compare BioEstolides to a typical silicone used in hair for conditioning and heat protection in a blind study
- **Hair Type**
  - Textured Hair
- **Products Tested**
  - BioEstolides vs Silicone Quat Microemulsion
  - Simple example formulations were used primarily based on water, an emulsifier and the test ingredient with BioEstolide in one and silicone in the other at the same treat rate.



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# Hair Care Testing

## Hair Type: Textured Hair

- Hair types were all textured and varied from coarse, heavy, kinky hair to fine, curly thin/sparse hair



Coarse, Thick



Fine, Thin



## Hair Results - Improved Shine, Curl Definition



All images are side by side comparisons of the two products on the same head



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## Results – Impr. Shine, Curl Definition, Combing Dry/Wet, Ease of Flat Ironing



All images are side by side comparisons of the two products on the same head

## Results – Impr. Shine, Curl Definition, Combing Dry, Ease of Flat Ironing



**Flat ironed hair Left/Silicone Right/BE30**



**Flat ironed hair Left/Silicone Right/BE30**

All images are side by side comparisons of the two products on the same head



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## Results – Improved Shine

All BioEstolide products showed improved shine over the market leading silicone product

*“Both samples delivered sheen to the hair but the BioEstolide had more gloss. The BioEstolide based product delivered a higher sheen as compared to the silicone-based product which was not dull or matte in sheen but not as glossy as the BioEstolide.”*

– third party testing lab  
Carrie Ella’s Salon

Silicone Based



BioEstolide 1300

Side by side comparison on same head

## Hair Care Testing - Results Summary

Category	Silicone	BioEstolide 30	BioEstolide 250	BioEstolide 1300
Shine	3.17	5	5	4.5
Combing	4.33	3.5	4.5	3.5
Smoothness	4.5	3.5	4	3.5
Initial Weight	4.5	2.5	3.5	3
Ease of Blow Drying	4.5	3.5	4.5	3.5
Ease of Flat Ironing	4	4.5	4.5	3.5
Residual Weight on Hair	4.5	2	3.5	3
Dry Hair Smoothness	4.17	4.5	4.5	3.5
Dry Hair Combing	4.5	4.5	4.5	3.5
Body	4.5	3.5	4	3.5
Volume	4.5	3.5	4	3.5
Overall Performance	4.5	3.5	4.5	3

Results for each category are shown in a rating of 1 to 5 with 5 being the best.

BioEstolides performed well compared to a leading silicone in performance while still being biodegradable, nontoxic, and bio-based thereby offering industry a safe alternative to silicone.

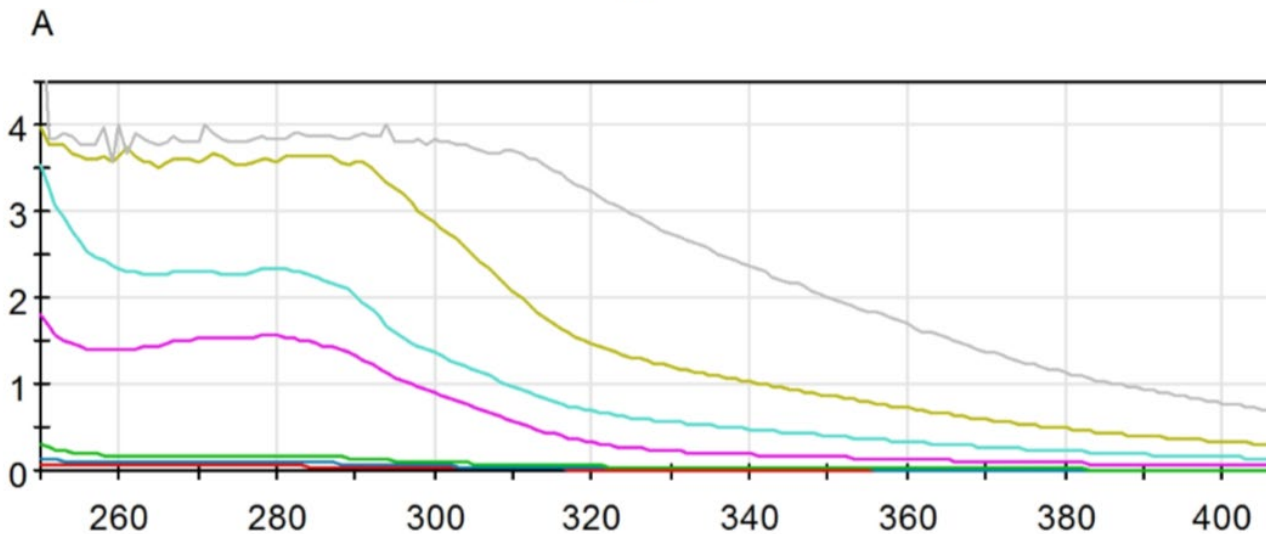
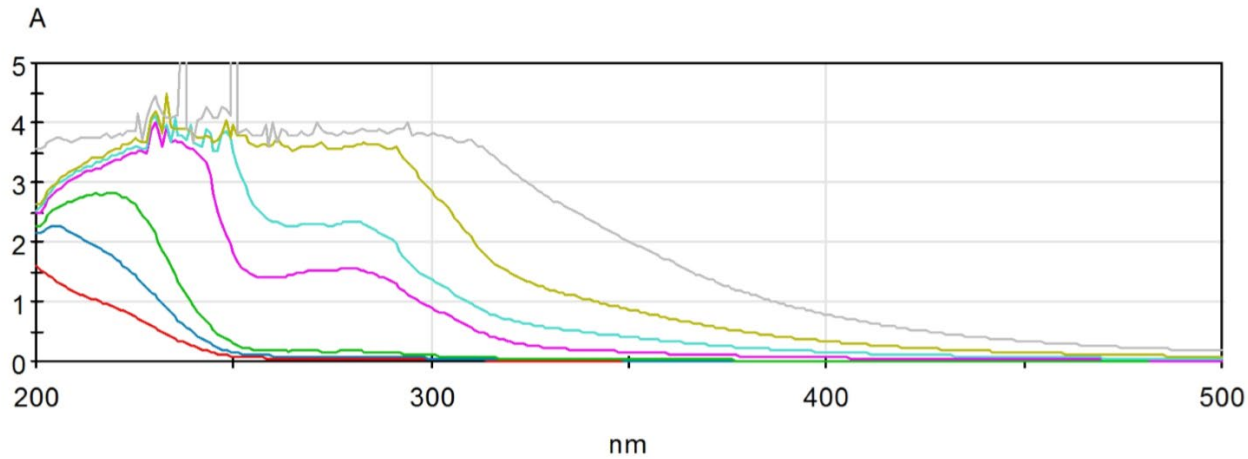


# BioEstolide™ & UV Blocking



# UV Blocking – BioEstolide 1300

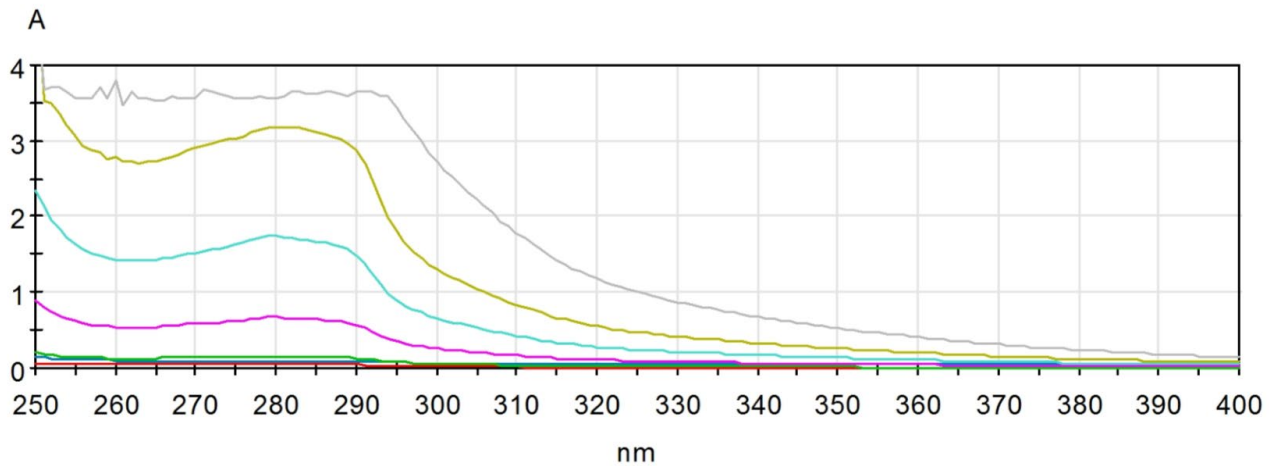
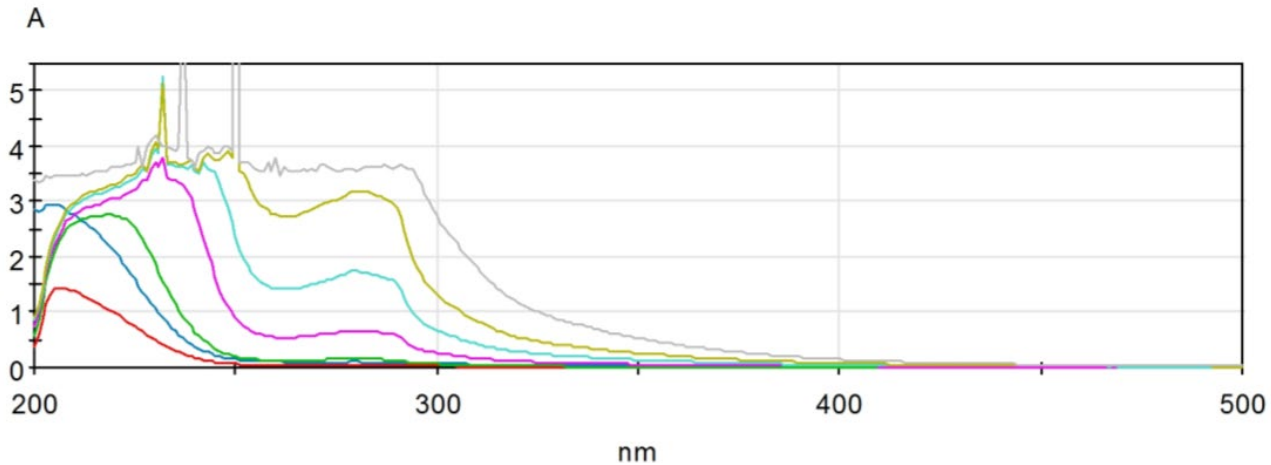
BioEstolide 1300 exhibits some inherent UV absorption properties



Legend	Sample	Absorbance (A)	Transmittance (%)	SPF
<span style="color: red;">—</span>	0.5 wt% BioEstolide 1300	0.052	88.72	0.26
<span style="color: blue;">—</span>	1 wt% BioEstolide 1300	0.092	80.91	0.47
<span style="color: green;">—</span>	2 wt% BioEstolide 1300	0.171	67.45	0.85
<span style="color: magenta;">—</span>	10 wt% BioEstolide 1300	1.559	2.76	7.55
<span style="color: cyan;">—</span>	25 wt% BioEstolide 1300	2.349	0.45	11.90
<span style="color: yellow;">—</span>	50 wt% BioEstolide 1300	3.578	0.03	24.43
<span style="color: grey;">—</span>	BioEstolide 1300 (neat)	3.827	0.01	37.30

# UV Blocking – BioEstolide 250

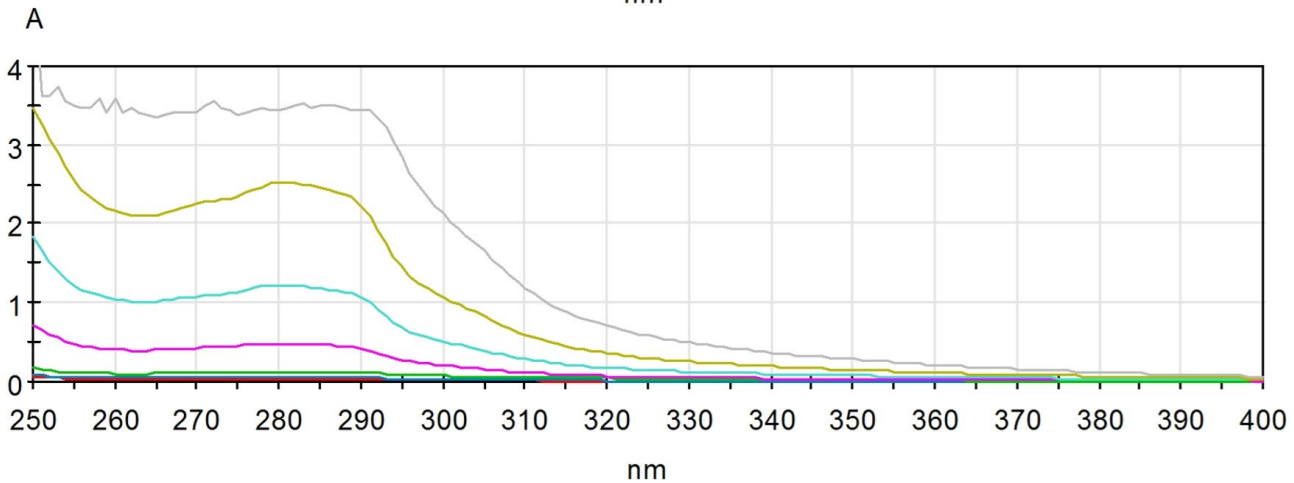
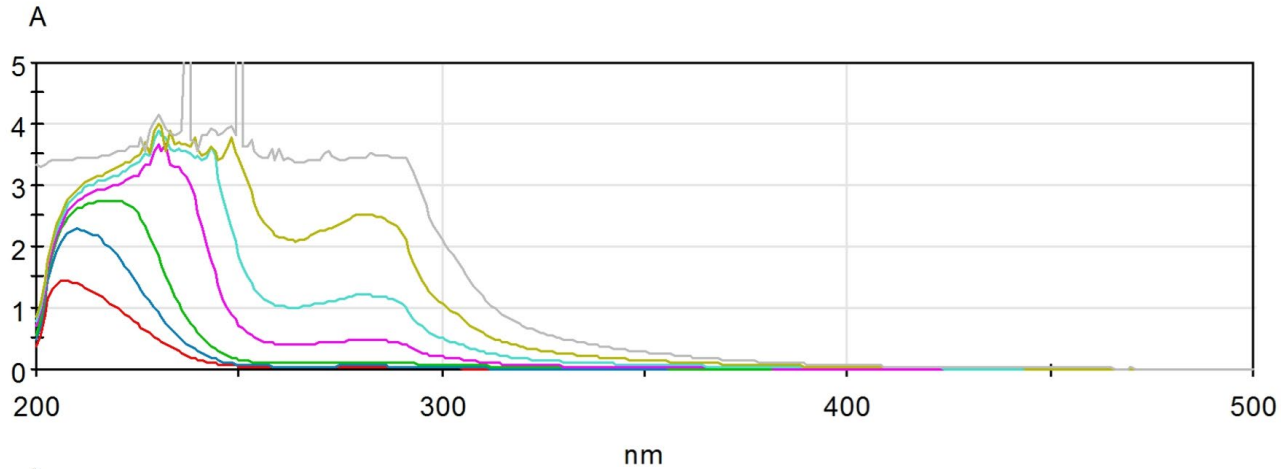
BioEstolide 250 exhibits some inherent UV absorption properties



Legend	Sample	Absorbance (A)	Transmittance (%)	SPF
<span style="color: red;">—</span>	0.5 wt% BioEstolide 250	0.048	89.54	0.11
<span style="color: blue;">—</span>	1 wt% BioEstolide 250	0.093	80.72	0.57
<span style="color: green;">—</span>	2 wt% BioEstolide 250	0.146	71.45	0.44
<span style="color: magenta;">—</span>	10 wt% BioEstolide 250	0.662	21.78	2.14
<span style="color: cyan;">—</span>	25 wt% BioEstolide 250	1.734	1.845	5.64
<span style="color: yellow;">—</span>	50 wt% BioEstolide 250	3.169	0.07	11.25
<span style="color: grey;">—</span>	BioEstolide 250 (neat)	3.558	0.03	23.19

# UV Blocking – BioEstolide 30

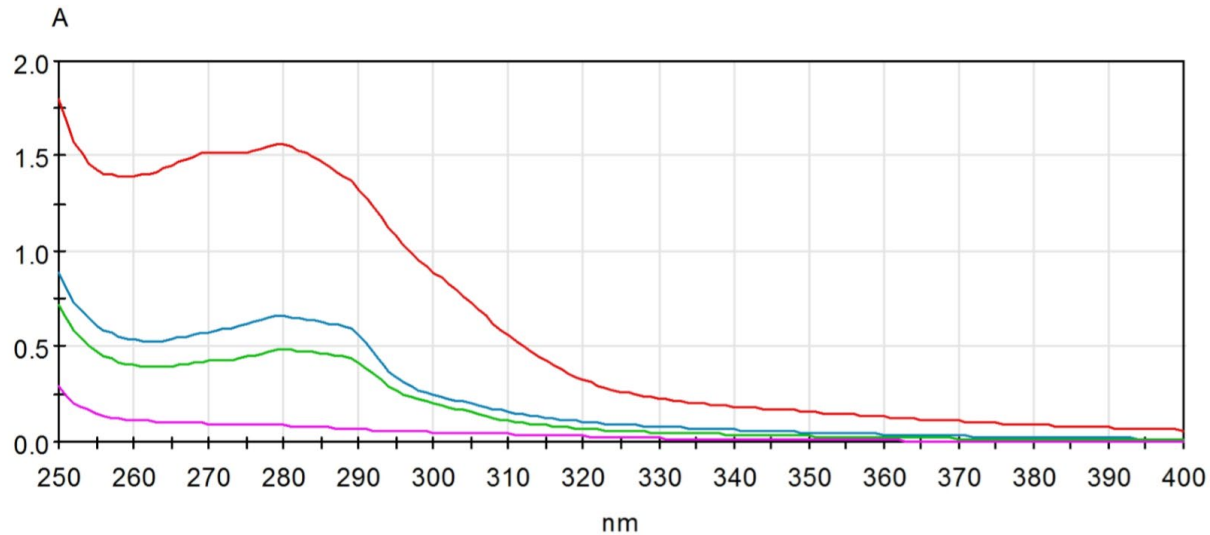
BioEstolide 30 exhibits some inherent UV absorption properties



Legend	Sample	Absorbance (A)	Transmittance (%)	SPF
	0.5 wt% BioEstolide 30	0.035	92.26	0.12
	1 wt% BioEstolide 30	0.052	88.72	0.18
	2 wt% BioEstolide 30	0.119	76.03	0.61
	10 wt% BioEstolide 30	0.482	32.96	1.64
	25 wt% BioEstolide 30	1.222	6.00	4.15
	50 wt% BioEstolide 30	2.526	0.30	8.78
	BioEstolide 30 (neat)	3.441	0.04	17.37



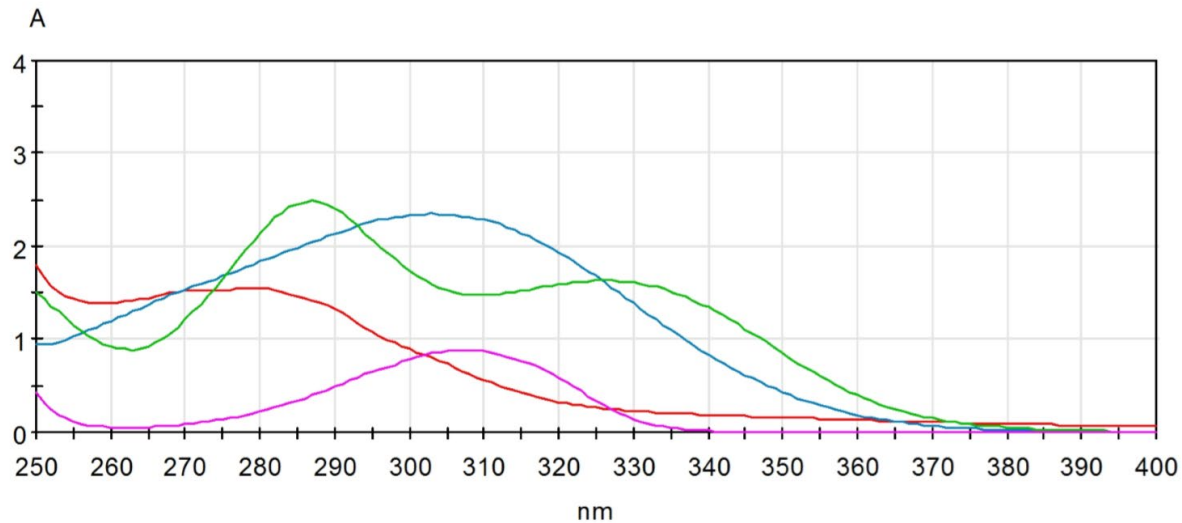
# UV Blocking – BioEstolide vs Isopropyl Myristate (10%)



- BioEstolides provide more UV protection than IPM

Legend	Sample	Absorbance (A)	Transmittance (%)	SPF
—	10 wt% BioEstolide 1300	1.559	2.76	7.55
—	10 wt% BioEstolide 250	0.662	21.78	2.14
—	10 wt% BioEstolide 30	0.482	32.96	1.64
—	10 wt% IPM	0.084	82.41	0.45

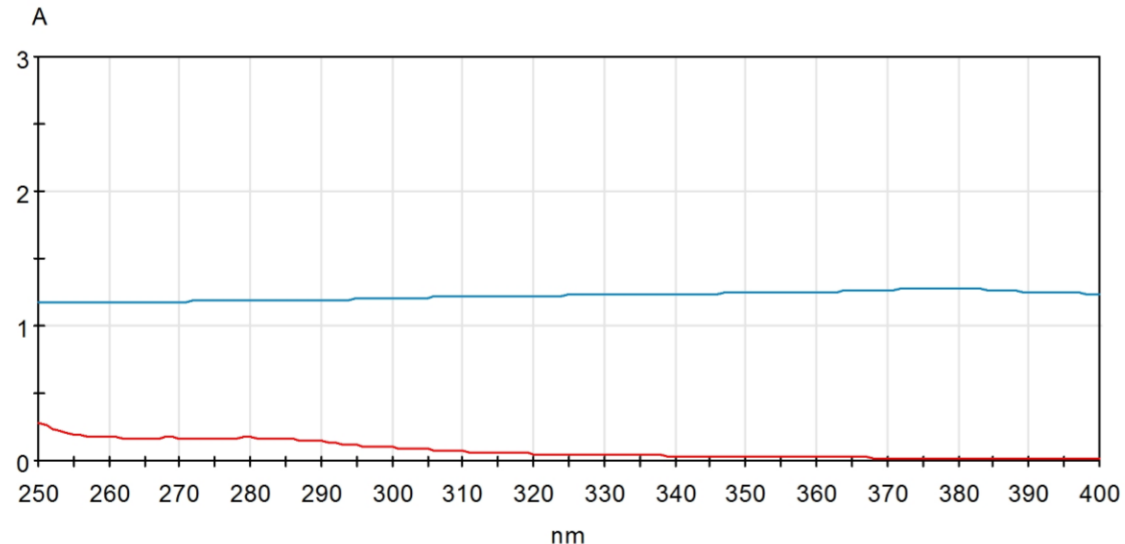
# UV Blocking – BioEstolide vs Chemical Filters



Legend	Sample	Peak Absorbance (A)	Transmittance (%)	SPF
—	10 wt% BioEstolide 1300	1.559	2.76	7.55
—	0.01 wt% Octocrylene	2.349	0.45	22.95
—	0.005 wt% Oxybenzone	2.493	0.32	16.38
—	0.01 wt% Homosalate	0.883	13.09	8.06

- Chemical filters are far more potent UV filters than BioEstolides
- The UV protection of BioEstolides can be built up with concentration

# UV Blocking – BioEstolide vs Physical Filters



Legend	Sample	Absorbance (A)	Transmittance (%)	SPF
—	2 wt% BioEstolide 1300	0.171	67.45	0.85
—	0.25 wt% ZnO	1.285	5.19	12.11

- ZnO provides much more UV protection than BioEstolides
- ZnO also provides broad spectrum protection while chemical filters often have to be used together to achieve broad spectrum protection

# BioEstolide™ & Pigment Dispersion





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## Pigment Dispersion - BioEstolide 1300 shows excellent dispersion properties

### Zinc Oxide in BioEstolide 1300



Pigment wt%    0%    5%    10%    15%    20%

### Titanium Dioxide in BioEstolide 1300



0%    5%    10%    15%    20%

Duration: Samples allowed to sit for 3 days after mixing

# Pigment Dispersion - BioEstolide 250 shows excellent dispersion properties

## Zinc Oxide in BioEstolide 250



**Pigment wt%**      **0%**    **5%**    **10%**    **15%**    **20%**

## Titanium Dioxide in BioEstolide 250



**0%**    **5%**    **10%**    **15%**    **20%**

Duration: Samples allowed to sit for 3 days after mixing

# Pigment Dispersion - BioEstolide 30 not for pigment or UV filter

## Zinc Oxide in BioEstolide 30



Pigment wt%    0%    5%    10%    15%    20%

## Titanium Dioxide in BioEstolide 30



0%    5%    10%    15%    20%

Duration: Samples allowed to sit for 3 days after mixing

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# Applications

- **Skin Care**

- Lotions, creams, facial oils, deodorants, shower gels



- **Lip Care**

- Chapstick, Lipstick, lip gloss



- **Color Cosmetics**

- mascara, body makeup, eye shadow



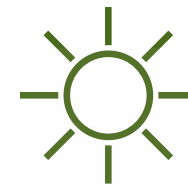
- **Hair Care**

- Rinse off and leave in conditioners, pomades, shampoos



- **Sun Care**

- Reef-safe sunscreens





# BioEstolide™ Typicals



<b>BioEstolide™ Product Typical</b>	<b>BioEstolide™ 30</b>	<b>BioEstolide™ 250</b>	<b>BioEstolide™ 1300</b>
<b>Kinematic Viscosity, 100 °C, cSt</b>	4.7	22.0	75.9
<b>Kinematic Viscosity, 40 °C, cSt</b>	20.7	153.0	668.4
<b>Viscosity Index</b>	153	170	195
<b>Dynamic Viscosity, 25 °C, cP</b>	34	259	1300
<b>Specific Gravity, 15 °C</b>	0.9065	0.9174	0.9190
<b>Flash Point (Open), °C</b>	242	268	288
<b>Flash Point (Closed), °C</b>	216	221	251
<b>Pour Point, °C</b>	-21	-23	-21
<b>Cloud Point, °C</b>	-16	-21	n/a
<b>ASTM Color</b>	1	1	1
<b>Iodine Value, g I2/100g</b>	1.0	2.0	2.0
<b>Acid Value, mg KOH/g</b>	0.1	0.3	0.3
<b>Refractive Index, 20 °C</b>	1.45	1.46	1.47
<b>Water Content, wt%</b>	0.1 max	0.1 max	0.1 max
<b>Molecular Weight, g/mol</b>	455	1426	2680
<b>Odor</b>	Low	Low	Low
<b>Appearance</b>	Light Yellow	Light Yellow	Light Yellow
<b>Sensory After Feel</b>	Light, Satiny	Light, Satiny	Light, Satiny
<b>Renewable Carbon, %</b>	69%	86%	95%

*\* Typical product values. While BT holds itself to strict quality control standards, actual product properties may vary slightly*



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### Distribution Through Univar Solutions

- [Biosynthetic Technologies | Univar Solutions](#)

### For more on BioEstolides information please visit

- [www.biosynthetic.com/personalcare](http://www.biosynthetic.com/personalcare)

### Or Follow BioEstolides on LinkedIn

- [www.linkedin.com/showcase/64699130](http://www.linkedin.com/showcase/64699130)



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# Q&A

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