

BioEstolides – High Temperature Accelerated Shelf Life

Biosynthetic® Technologies is a specialty product company that supplies BioEstolides™ to the Beauty and Personal Care industry. We produce non-toxic, eco-friendly, sustainable, biobased, biodegradable oils with enhanced performance properties available in commercial volumes. Our vision at Biosynthetic Technology is to deliver high performing, sustainable solutions for a sustainable future.

1. Summary

The objective of this report is to provide data on BioEstolide's shelf life based on high temperature accelerated aging. Over the course of this study samples were placed in an oven at 50°C where 1 month of accelerated aging equals 1 year of shelf life. BioEstolides 30, 250, and 1300 were tested over 5 months along with castor oil for comparative data. Parameters tested include viscosity, total acid number (TAN), and color.

2. Materials

- BioEstolide 30: Biosynthetic Technologies (LOT# BT001-190-1)
- BioEstolide 250: Biosynthetic Technologies (LOT# 12417-22-3D2T)
- BioEstolide 1300: Biosynthetic Technologies (LOT# JHA2-179-1)
- Castor Oil: Walgreens Inc.
- 4 oz Jars: Quality Environmental Containers (QEC), (Type III Soda-Lime Glass, Flint)

3. General Procedure

- Fill 4oz jars with samples (6 jars per sample).
- Label jars with test dates (every 4 weeks).
- Place samples in oven at 50°C.
- Pull samples on designated dates and run SVM, TAN, and color (ASTM B1500 & Gardner).

4. Results

Table 1. Viscosity, TAN, and color of BioEstolides and castor oil over the course of the study.

PRODUCT	SAMPLE ST001-	DURATION (WEEKS)	KINEMATIC VISCOSITY 40	KINEMATIC VISCOSITY 100	VISCOSITY INDEX	TAN	GARDNER	ASTM B1500
BE 30	1	0	21.503	4.7093	142.60	0.0368	2.5	<1.0
	3	4	21.565	4.7221	143.01	0.0573	2.7	<1.0
	5	8	21.463	4.6998	142.24	0.0300	2.6	<1.0
	7	12	21.567	4.7192	142.73	0.0478	2.6	<1.0
	8	16	21.435	4.6944	142.10	0.0690	2.7	<1.0
	9	20	21.449	4.7039	142.80	0.0497	2.6	<1.0
BE 250	10	0	136.38	20.033	169.15	0.2840	1.4	<0.5
	12	4	136.90	20.100	169.27	0.2671	1.6	<0.5
	14	8	136.22	19.997	168.94	0.2519	1.4	<0.5
	16	12	136.92	20.083	169.06	0.1877	1.5	<0.5
	17	16	136.57	20.039	168.98	0.2201	1.6	<0.5
	18	20	136.27	19.981	168.71	0.2047	1.5	<0.5
BE 1300	19	0	693.54	693.54	78.535	0.4611	4.8	<2.0
	21	4	695.73	695.73	78.816	0.4799	4.5	<2.0
	23	8	690.23	690.23	78.414	0.4708	4.3	<2.0
	25	12	695.05	695.05	78.707	0.3265	4.4	<2.0
	26	16	691.77	691.77	78.338	0.3457	4.4	<2.0
	27	20	690.52	690.52	78.385	0.3465	4.4	<2.0
CASTOR OIL	28	0	254.82	19.292	84.78	1.3234	0.8	<0.5
	24	4	256.71	19.723	87.56	1.3500	1.0	<0.5
	30	8	255.01	19.359	85.27	1.3525	0.9	<0.5
	31	12	257.79	19.782	87.6	1.0000	1.0	<0.5
	32	20	255.97	19.395	85.19	0.3568	1.1	<0.5



Figure 1. BioEstolide 30 at 0 weeks (left) and 20 weeks (right).



Figure 2. BioEstolide 250 at 0 weeks (left) and 20 weeks (right).



Figure 3. BioEstolide 1300 at 0 weeks (left) and 20 weeks (right).



Figure 4. Castor oil at 0 weeks (left) and 20 weeks (right).

Conclusion

Overall, the BioEstolide samples remained relatively stable over the course of the study. The viscosity and color of all of the samples remained constant with negligible amounts of change. TAN produced the most variability amongst the samples. This variability was likely due to a combination of the samples breaking down and the tolerances of the machine used to calculate TAN. Overwhelmingly, BioEstolides greatly outperformed castor oil when comparing TAN. The highest amount of change in TAN for the BioEstolides occurred in BioEstolide 1300 and was approximately 0.12; however, castor oil underwent a change of nearly 1. The general trend showed BioEstolides and castor oil become more basic when exposed to elevated temperatures for an extended time. While the TAN of the samples needs to be considered, BioEstolides possess a high shelf life in terms of viscosity and color.

BioEstolide™ Performance and Applications

BioEstolides™ are suitable for use in skin care, hair care, sun care and color cosmetics. Using castor based fatty acids as the base of our product lines, we have developed a class of molecules that offer exceptional moisturization, are easy to apply, and have ample playtime. BioEstolides™ offer enhanced oxidative, hydrolytic, and thermal stability. The BioEstolide line is available in multiple viscosity grades to offer the formulator the latitude to create products. Lower viscosity grades offer excellent solubility while the higher viscosity grades disperse heavier particles and can be used as thickener.

BioEstolides™ are used to formulate creams, lotions, balms, gels, serums, aerosols, solids, and solid and gel sticks. In color cosmetics, they are used in tinted moisturizers, foundations, blush, bronzer, highlighters, lip balms, oils and sticks, mascara, and eye make-up. In sun care formulations, they solubilize chemical sunscreens or aid in the dispersion of physical sunscreens for reef-safe products. In haircare, they are used to improve manageability, create shine, and protect the hair cuticle in shampoos, rinse-out conditioners, leave-in conditioners, thermal protectants, hair dyes, hair lighteners, hair relaxers and other styling aids.

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