

## Formulation and Stability Studies of a Topical Anti Aging Product Regimen.

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**Abstract:** This article investigates the physical integrity of anti-aging product regimen and determines the key factors that contribute to the overall efficacy. "EI Pro Retinol Series", a complete treatment regimen that contains three different retinoid serums, a moisturizer, and a sunscreen that are developed for sensitive skin. The objectives of this study included the development and formulation of an anti-aging product series. The products were tested for stability in PP (Polypropylene) plastic storage containers. Accelerated stability tests were performed on the anti-aging products over a period of 180 days at a temperature between  $40\pm 2^{\circ}\text{C}$  and  $70\pm 5\%$  RH. Products were tested for physical, chemical, and aesthetic standards at different intervals during the study, and reports suggest that all the products were stable and passed the accelerated stability test.

**Keywords:** Physical integrity, stability studies, stability testings, Anti aging, Anti oxidant, Retinoids

### I. Introduction:

A well-designed topical retinoid dosage form, like any other topical formula, should have a stable and effective formula that includes active ingredients that are supported by scientific research and have proven anti-aging benefits.<sup>(1)</sup> Additives (inactive ingredients) play an important role in the texture and stability of a formulation, and the delivery system ensures the efficacy and safety of active ingredients and contribute to the overall physical integrity of a dosage form.<sup>(2)</sup> The physical integrity of a product also relies on the packaging compatibility and stability within the storage conditions. The packaging of an anti-aging product should protect its formula from environmental factors such as light, air, and moisture, which can degrade the active

ingredients, thus reducing the physical integrity of the product and finally decreasing their efficacy.<sup>(3,4)</sup> Anti-aging products must be subjected to stability testing to evaluate their accelerated stability studies and determine if the efficacy is maintained over time. Temperature, pH, viscosity, color change, and exposure to varied environments may have an impact on the stability. Finally, preserving the physical integrity of anti-aging products is critical to provide users with safe, effective, and stable products.<sup>(3)</sup> Thus, the stability tests were carried out on the newly developed "EI PRO Retinol Series" and it showed that all physical integrity tests that were performed were within the range which are discussed below in the results part.

Retinoids are unstable molecules that can degrade or lose efficacy if not formulated properly and are prone to degradation when exposed to light, air, and heat.<sup>(5)</sup> The additives in the formula help protect the retinoids from degradation and ensure its stability, availability, and thus optimal delivery to the skin. Retinoids need to penetrate into the epidermal layers of the skin effectively to exert its benefits. Certain additives can enhance the absorption and penetration of active ingredients into the skin, allowing them to exert their desired effects more effectively.<sup>(5)</sup> The additives should include synergistic ingredients like antioxidants, peptides, hyaluronic acid, or other skin-replenishing and nourishing ingredients that enhance the efficacy and benefits of retinoids. Retinoids can cause adverse effects like skin irritation and sensitivity, especially at higher concentrations. The additives formulation should aim to minimize these adverse effects by incorporating anti-irritant, soothing and moisturizing benefits, as well as optimal concentration of

retinoids.<sup>(6)</sup> The skin's natural barrier function becomes compromised with age, making it more vulnerable to environmental stressors and moisture loss.<sup>(7)</sup> Thus, including moisturizing and hydrating agents, skin barrier-enhancing substances, such as ceramides or natural butters help strengthen the protective barrier of the skin, this contributes to improved skin health and reduced signs of aging.<sup>(7,8)</sup> The choice of additives influence the final texture, ensuring that the product feels pleasant on the skin and is easy to apply.<sup>(9)</sup> Lightweight textures are preferred as they facilitate easy application, absorption and penetration into the skin. And finally, the finished formulation should be compatible with the chosen packaging in maintaining the stability of the formula throughout the accelerated life of the formulation.

#### Experimental part:

##### Manufacturing procedure for EI Pro Retinol

**Serums:** Phase A (aqueous phase): Take a vessel, add Sodium Gluconate, Aqua, Zemea, and Sepinov EMT 10, and heat it to 75°C to 80°C at 30-35 RPM for 15 minutes. Phase B (oil phase): Take a vessel, add Palmsurf IPM 98, Arlachel 2121, a combination of Sorbitan stearate (non-ionic) and Sucrose cocoate (non-ionic) as primary emulsifier, and Optinov Green, a combination of Sorbitan stearate, Cetearyl alcohol (non-ionic), and cetearyl glucoside (non-ionic) as secondary emulsifiers, and heat it to 75°C to 80°C at 30-35 RPM for 15 minutes, then add phase B to phase A, and then an emulsification process takes place. Consider it as the main vessel. Add Rovisome retinol moist (retinol) and Nanoactive retinaldehyde (retinal) as primary actives in Alpha Serum; take Retinol, Retinal and Granactive retinoid as primary actives in Beta Serum; and take Retinol, Retinal and Retinyl Palmitate as primary actives in Gamma serum. Add these primary actives with Sepiclear G7 (solubilizer), then add wk pep coll into the main vessel, and add Oligo Sodium Hyaluronate, Genecare osms BA, Aquaxyl, Pentavitin, Aloe Vera extract, and Hydranov PA (moisturizing agents) directly into the main vessel. 3,o-Ethyl Ascorbic acid, Vitamin E (antioxidant), Niacinamide, Cucumber Extract, Bisabolol, and Allantoin (soothing) consecutively into the main vessel at 40°C, allowing for uniform mixing. Finally, add Euxyl K 712 (preservative) to the main vessel, mix well, and adjust pH to 5.7 to 6.20. <sup>(3)</sup>

##### Manufacturing procedure for EI Pro Retinol

**Moisturizer:** Phase A (aqueous Phase): Take a vessel, add Aqua, Disodium EDTA, and Biopol

crystal, and heat them at 75°C. Phase B (oil phase): Take another beaker and add Shea butter, Suru mango and Suru cocoa (moisturizing agents), and Cresmer Ew, a combination of Cetearth-20, Cetostearyl alcohol, and Canarcel 165 V, a combination of glyceryl stearate (non-ionic) and PEG 100 stearate (non-ionic) Cetyl alcohol as primary emulsifiers, Alpha GMS SE as Glyceryl monostearate (non-ionic), Optinov Green combination of Sorbitan stearate, Cetearyl alcohol (non-ionic), and Cetearyl glucoside (non-ionic) were taken as secondary emulsifiers (non-anionic), Radia 7104, Dub 810 C, SF 1202, Element 14 PDMS 350 (conditioning agents) were added and heated to 75°C. Mix both the oil phase and water phase and homogenize well. Consider this as the main vessel. Genecare osms BA, 5M Hyaskin, Hydranov PA, DS-Ceramix (moisturizing agents) Niacinamide, Alpha-arbutin, Neuvachiol, Vitamin E, Renouvellance and WKPep Coll consecutively to the main vessel and mix well. Finally, add Euxyl PE 9010 (preservative) and mix well, and adjust the pH to 5.50-6.50. <sup>(3)</sup>

##### Manufacturing procedure for EI Pro Retinol

**Sunscreen:** Take a vessel, add Sodium Gluconate, Aqua, Propylene glycol and Pemulen EZ-4U, allow it to mix uniformly. Add Suncate De (UVA and UVB filters) to the main vessel and mix well. In another beaker, add Avobenzone (UVA filter) with Radia 7104, allow it to heat until it becomes transparent, then add this to the main vessel, and mix well, and add Renouvellance (SPF booster). Add 3,o-Ethyl Ascorbic Acid, add Vitamin E Acetate, Carrot Seed oil, 5M Hyaskin, and Sepimat CP 5 to the main vessel and mix well. Finally, add Euxyl K712 (preservative) to the main vessel, and mix well, and adjust pH to 5.50-6.50. <sup>(3)</sup>

Tests must be conducted under accelerated conditions to assure product stability, physical stability, chemical stability, and compatibility between contents and container. Accelerated stability studies are commonly accepted for analyzing physical integrity of the product. <sup>(3,10)</sup>

##### The accelerated stability test: The accelerated

**stability test:** This form of stability test is conducted at higher temperatures and humidity to determine the decomposition of "EI PRO Retinol Series". These accelerated tests focus primarily on photochemical stability and moisture absorption. The accelerated stability studies make it simple to estimate the product's shelf life by subjecting the product to various stress conditions, such as elevated

temperatures or humidity, thereby reducing the time required to determine the product's stability. The storage conditions for accelerated stability experiments are  $40\pm 2^{\circ}\text{C}$  and  $70\pm 5\%$  RH. Samples of the "EI PRO Retinol Series" were incubated at various intervals, and their stability was evaluated. The accelerated stability test was performed for the EI Pro Retinol Series at multiple time points, the time points are on the initial day, 30, 60, 90, 120, and 180 days between  $40\pm 2^{\circ}\text{C}$  and  $70\pm 5\%$  RH and at the end of the study, samples were analyzed for physical properties and viscosity. The results are listed in Tables (3–7). During the accelerated stability test, the appearance, color, pH, viscosity, storage conditions, packaging, irritation test, and phase integrity of "EI PRO Retinol Series" were evaluated at every interval (initial, 30, 60, 90, 120, and 180 days).<sup>(10)</sup>

#### pH

**Method:** The three serum samples (Alpha, Beta and gamma) were taken individually into the beakers, then immerse the pH meter electrode into the samples, ensuring they are fully submerged. Allow the pH meter to stabilize and record the pH reading displayed on the meter. For moisturizer and sunscreen, weigh 5 grams of the sample and then add 45 ml of distilled water, then immerse the pH meter electrode into the sample, ensuring it is fully submerged, once it is stabilized record the value. The whole process is done at  $25^{\circ}\text{C}$  (room temperature). pH was reported at every interval during the study (initial, 30, 60, 90, 120 and 180 days).<sup>(10)</sup>

#### Viscosity

**Method:** Instrument used was Anton paar, The samples of the "EI PRO Retinol Series" (Alpha, Beta, Gamma, Moisturizer and Sunscreen) were placed individually in the viscometer's test chamber. The viscometer's spindle is immersed in the sample. The spindle is set into rotational motion at a constant speed, often referred to as the shear rate. As the spindle rotates, the product experiences shear stress, and its resistance to flow is measured as torque or rotational speed. The torque or rotational speed reading is used to calculate the viscosity of the product based on the specific viscometer model and calibration; this method is done at  $25^{\circ}\text{C}$ . Viscosity was tested at every study interval (initial, 30, 60, 90, 120, and 180 days).<sup>(10)</sup>

**Weight loss:** The initial weight of the bottle and the final weight of the bottle were measured for all the products, as sometimes the chemicals might evaporate due to exposure to air, light, or heat, and chances of degradation of the product and weight loss in the bottle might occur. The weight loss was

calculated at regular intervals of time on the initial day, 30, 60, 90, 120, and 180 days.

## II. Results:

The pH scale ranges from 0 to 14, with a neutral pH value of 7. Below 7 indicates acidity, while above 7 indicates alkalinity. The pH of all three serums, moisturizer and sunscreen were within the range (5.5 - 6) and was good for skin pH, which is shown in Tables (3-7) and Graphs (1-5). The viscosities of the serums (Alpha, Beta, and Gamma) were in the range of 500–2500 cps, which indicates that the serums are easily spreadable on the skin and easily penetrated. The viscosity of moisturizer was in the range of 50,000–1,50,000 cps, and sunscreen viscosity was in the range of 5,000–20,000 cps, which is stated to show good spreadability. It was found that there was no weight loss, no degradation, and no evaporation in the "EI Pro Retinol Series" during the multiple intervals of the study (initial, 30, 60, 90, 120, and 180 days). In packaging, it was found that there was no deterioration or interaction of "EI PRO Retinol Series" with the containers during the time intervals of the study.

## III. Discussion:

"EI PRO Retinol Series" is divided into three categories based on their functions or effects, They are moisturizing agents, antioxidants, and physiological actives that are listed in Tables 1 and 2.<sup>(7)</sup> This article discusses the ingredients for scavenging free radicals, repairing cells, moisturizing, and blocking Ultraviolet radiation. The active ingredients in the "EI Pro Retinol Series" are selected for their proven efficacy in addressing signs of aging.<sup>(1)</sup> Roisome Retinol moist (retinol), Nanoactive Retinaldehyde (retinal), Granactive retinoid, and Retinyl Palmitate are all derivatives of vitamin A used in "EI PRO Retinol Serums".<sup>(11)</sup> These ingredients help improve the appearance of fine lines, wrinkles, and uneven skin tone.<sup>(12)</sup> Some retinoids may cause skin to irritate and cause redness (edema and erythema), thus Allantoin,  $\alpha$ -Bisabolol, Cucumis sativus were added in all serums for soothing the itchy skin.<sup>(13,14)</sup> Moisturizing agents like Oligo Hyaluronic Acid, Genecare Osms BA, Aloe vera extract, Aquaxyl, Pentavitin, Hydrinov PA, Zemea, Propylene Glycol, Shea Butter, Suru Mango, Suru Cocoa, DS-Ceramix, and 5M Hyaskin were added for easy penetration, hydrating, barrier repair, and strengthening the barrier.<sup>(11)</sup> Renouvellance, Suncat DE, Chem 1789, and Carrot seed oil were added to "EI PRO Retinol Sunscreen" for SPF boosting.<sup>(15)</sup> Safeset emulsifiers like Optinov Green,

Arlacel 2121, Alpha GMS SE, Vegarol 1698, Cresmer Ew, and Canarcel 165 V were added to “EI PRO Retinol Serums” and Moisturizer to achieve a stable formulation. Vitamin C (3-o-ethyl ascorbic acid) is an essential ingredient in the “EI Pro Retinol Serums” regimen due to its antioxidant properties and ability to promote collagen synthesis.<sup>(16)</sup> However, the pH of a regimen containing Vitamin C is indeed crucial for its physical integrity and effectiveness. Ethyl Ascorbic Acid is sensitive to pH and can degrade easily under certain conditions. It is most stable at a pH range of 3 to 4. At lower pH values (more acidic), Vitamin C tends to be more stable and effective. As the pH increases, Ascorbic acid loses its stability, leading to degradation over time.<sup>(17)</sup> While the pH of a product is also important for skin compatibility, the natural pH of the skin ranges from 4.5 to 5.5 being slightly acidic.<sup>(18)</sup> Thus, “EI Pro Retinol Series” is formulated with Ethyl Ascorbic acid, a stable form of Vitamin C with a wider pH range that is compatible with the skin and helps minimize potential irritation or disruption to the skin's barrier function and without degradation of the product. However, Ethyl Ascorbic acid is also sensitive to light and air, which can further accelerate its degradation. The “EI PRO Retinol Series” are packed in an opaque, airtight containers that minimizes the exposure to light and air.<sup>(19)</sup> Intrinsic factors like UV light, infrared, and radiation exposure and extrinsic factors like air pollution, solar exposure, environmental pollutants, and free radicals generated by UV radiation break down hyaluronic acid (HA) present in the skin. Products with HA can mitigate this by recovering HA loss.<sup>(20)</sup> Thus HA was added to the “EI PRO Retinol Series” and although its rheological properties in aqueous solutions are affected by concentration, pH, and temperature, as these factors increase, the viscosity of HA decreases significantly, indicating a weakening of the interactions between the polymer chains. Particularly, HA is extremely sensitive to pH changes, in acidic and alkaline environments, a critical equilibrium between repulsive and attractive forces takes place, and HA breaks down when the pH is below four or above eleven. Thus, the pH level and thermal stability need to be considered to maintain the overall efficacy of the regimen.<sup>(21)</sup> Peptides have varying degrees of stability at various pH levels, stability of peptides varies based on its amino acid composition and the existence of certain amino acid residues that may be more vulnerable to pH-induced alterations.<sup>(22)</sup> Extreme pH levels, such as those seen in very acidic or alkaline environments, may cause peptide breakdown or structural alterations.

Maintaining an ideal pH range may aid in the preservation of peptide stability and functioning. Peptides are susceptible to temperature variations. Peptide denaturation, aggregation, or degradation may occur at high temperatures, impacting their structure and function. The peptide sequence, secondary structure, and existence of stabilizing interactions are all significant factors in peptide stability. Some peptides may be naturally stable, while others may need special settings or additions to improve their thermal stability. Some of these methods include modifying the peptide sequence or incorporating specific amino acids with enhanced stability, such as D-amino acids or non-natural amino acids.<sup>(22,23)</sup> Thus, peptides (palmitoyl tripeptide-5) were carefully taken into “EI PRO Retinol Serums” and Moisturizer.

**Packaging:** Airless containers (material of construction - polypropylene) were chosen for the “EI Pro Retinol Series”. Individually loaded polypropylene bottles were subjected to degradation tests (photostability test and accelerated stability test) to simulate the stress conditions that products may encounter during an accelerated study. The characteristics of the packaging materials in direct contact with the product were evaluated as a part of the stability test, as they might affect the safety of the final product as some contaminants may migrate from the container into the product.<sup>(3)</sup> Compatibility testing was done to provide an interactions between the product and the container and was evaluated for potential deterioration of the product in contact with the packaging, which may be affected by the external environment. This test was performed at regular intervals during the accelerated study which were on day 1, 30, 60, 90, 120, 180 days.<sup>(3,10)</sup>

**Storage conditions:** Retinoid products often come with specific storage instructions to maintain their physical integrity. They need to be stored in a cool, dry place, away from direct sunlight and extreme temperatures. Adhering to the recommended storage conditions is important to ensure the product's stability and longevity.<sup>(3)</sup>

**After feel:** The “EI PRO Retinol Serums” were easy to penetrate, absorption was good, Moisturizer and sunscreen were non-greasy, had no white cast, and the amount of residue left after the application of a fixed amount of cream was found to be good.

**Appearance:** The “EI Pro Retinol Series” were kept for 6 months of study intervals; it was found that there was no change in color at every interval when analyzed. Thus, it was clear that the formulations were stable during the study.

**Phase integrity:** There were no phase separations in all three serums, moisturizer and sunscreen when kept for 6 months of time interval in an accelerated condition. This test was done visually.<sup>(2)</sup>

**Conclusion:** The above results and discussion conclude that the quality control of the developed "EI Pro Retinol Series" showed an acceptable antiaging preparation with a positive appearance and sufficient physico-chemical and pharmacotechnical (pH,

viscosity) capabilities. It was also found that there was no degradation, evaporation, and no change in the stability of the final formulation of the "EI Pro Retinol Series" from the initial day to 180 days of studies. In packaging, it was found that there was no deterioration or interaction of "EI PRO Retinol Series" with the containers during the time intervals of the study.

**Table 1. Actives present in EI PRO Retinol Series**

BRAND NAME	GENERIC NAME	ALPHA SERUM	BETA SERUM	GAMMA SERUM	MOISTURIZER	SUNSCREEN
ROVISOME RETINOL MOIST (RETINOL)	AQUA, PENTYLENE GLYCOL, LECITHIN, ALCOHOL, RETINOL; POLYSORBATE 20; POTASSIUM PHOSPHATE	✓	✓	✓	X	X
NANOACTIVE RETINALDEHYDE	RETINALDEHYDE	✓	✓	✓	X	X
GRANACTIVE RETINOID	DIMETHYL ISOSORBIDE (AND) HYDROXYPINACOLONE RETINOATE)	X	✓	X	X	X
RETINYL PALMITATE	RETINYL PALMITATE	X	X	✓	X	X
AC VCE	3-O-ETHYL ASCORBIC ACID	✓	✓	✓	✓	✓
OLIGO HYALURONIC ACID	OLIGO SODIUM HYALURONATE	✓	✓	✓	X	X
WK PEP COLL	PALMITOYL TRIPEPTIDE-5	✓	✓	✓	✓	X
NIACINAMIDE	NIACINAMIDE	✓	✓	✓	✓	X
GENENCARE® OSMS BA	BETAINE	✓	✓	✓	✓	X
ALOE VERA EXTRACT	ALOE BARBADENSIS LEAF EXTRACT	✓	✓	✓	X	X
AQUAXYL	XYLITYLGLUCOSIDE & ANHYDROXYLITOL & XYLITOL	✓	✓	✓	X	X
CUCUMBER EXTRACT	CUCUMIS SATIVUS (CUCUMBER) FRUIT EXTRACT.	✓	✓	✓	X	X
PENTAVITIN	SACCHARIDE ISOMERATE (AND) AQUA	✓	✓	✓	X	X

	(AND) CITRIC ACID (AND) SODIUM CITRATE					
HYDRONOV PA	AQUA (AND) PHENETHYL ALCOHOL (AND) SODIUM CARRAGEENAN (AND) SEA SALT	✓	✓	✓	✓	X
RONACARE BISABOLOL	BISABOLOL	✓	✓	✓	X	X
VITAMIN E	TOCOPHERYL ACETATE	✓	✓	✓	✓	✓
ALLANTOIN (SALLITON)	ALLANTOIN	✓	✓	✓	X	X
ALPHA ARBUTIN	ALPHA ARBUTIN	X	X	X	✓	X
SHEA BUTTER	BUTYROSPERMUM PARKII (SHEA) BUTTER	X	X	X	✓	X
DS-CERAMIX	CERAMIDE NP (AND) CERAMIDE AP (AND) GLYCOSPHINGOLIPIDS (AND) HYDROGENATED LECITHIN (AND) TETRAACETYL PHYTOSPHINGOSINE (AND) CHOLESTEROL (AND) STEARIC ACID (AND) WATER (AND) XANTHAN GUM (AND) CAPRYLIC/CAPRIC TRIGLYCERIDE (AND) GLYCERIN (AND) GLYCERYL STEARATE (AND) CETEARYL ALCOHOL (AND) 1,2-HEXANEDIOL	X	X	X	✓	X
5M HYASKIN	SODIUM HYALURONATE	X	X	X	✓	✓
NEUVACHIOL	BAKUCHIOL	X	X	X	✓	X
RENOUVELLANCE	GLYCERIN (AND) WATER (AND) PORPHYRIDIUM CRUENTUM EXTRACT	X	X	X	✓	✓
SUNCAT DE	WATER (AND) ETHYLHEXYL METHOXYCINNAMATE (AND) BUTYL METHOXYDIBENZOYL METHANE (AND) BENZOPHENONE-3 (AND) PHOSPHOLIPIDS (AND) 1,3-BUTYLENE GLYCOL	X	X	X	X	✓
CHEM 1789	AVOBENZONE	X	X	X	X	✓

CARROT SEED OIL	DAUCUS CAROTA SATIVA SEED OIL	X	X	X	X	✓
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**Table 2. Additives present in EI PRO Retinol Series**

BRAND NAME	GENERIC NAME	ALPHA SERUM	BETA SERUM	GAMMA SERUM	MOISTURIZER	SUNSCREEN
ZEMEA	1,3 PROPANEDIOL	✓	✓	✓	X	X
SODIUM GLUCONATE	SODIUM GLUCONATE	✓	✓	✓	X	✓
SEPINOV EMT 10	HYDROXYETHYL ACRYLATE/SODIUM ACRYLOYLDIMETHYL TAURATE COPOLYMER	✓	✓	✓	X	X
PALMSURF IPM 98 ISOPROPYL MYRISTATE	ISOPROPYL MYRISTATE	✓	✓	✓	X	X
OPTINOV GREEN	SORBITAN STEARATE, CETEARYL ALCOHOL, CETEARYL GLUCOSIDE	✓	✓	✓	X	X
ARLACEL 2121	SORBITAN STEARATE & SUCROSE COCOATE	✓	✓	✓	X	X
SEPICLEAR G7	HEPTYL GLUCOSIDE	✓	✓	✓	X	X
EUXYL K712	SODIUM BENZOATE (AND) POTASSIUM SORBATE (AND) AQUA	✓	✓	✓	X	✓
NATPURE XFINE SPIRULINA SL615	SPIRULINA PLATENSIS EXTRACT & TREHALOSE	X	✓	✓	X	X
CASTOR OIL	RICINUS COMMUNIS SEED OIL	X	✓	✓	X	X
SURU MANGO	MANGIFERA INDICA (MANGO) SEED BUTTER	X	X	X	✓	X
SURU COCOA	THEOBROMA CACAO (COCOA) SEED BUTTER	X	X	X	✓	X
RADIA 7104	CAPRYLIC/CAPRIC TRIGLYCERIDE	X	X	X	✓	✓
DUB 810C	COCO-CAPRYLATE/CAPRATE	X	X	X	✓	X
ALPHA GMS SE	GLYCERYL MONOSTEARATE	X	X	X	✓	X
VEGAROL 1698	CETYL ALCOHOL	X	X	X	✓	X
CRESMER EW	CETEARETH-20, CETOSTEARYL ALCOHOL	X	X	X	✓	X

BRAND NAME	GENERIC NAME	ALPHA SERUM	BETA SERUM	GAMMA SERUM	MOISTURIZER	SUNSCREEN
CANARCEL 165 V	GLYCERYL STEARATE & PEG 100 STEARATE	X	X	X	✓	X
ELEMENT 14 PDMS 350	DIMETHICONE	X	X	X	✓	X
SF 1202	CYCLOPENTASILOXANE	X	X	X	✓	X
BIOPOL CRYSTAL	CARBOMER	X	X	X	✓	X
EDTA	DISODIUM EDTA	X	X	X	✓	X
EUXYL PE 9010	ETHYLHEXYL GLYCERIN & PHENOXYETHANOL	X	X	X	✓	X
SODIUM HYDROXIDE	SODIUM HYDROXIDE(50% SOLUTION)	X	X	X	✓	✓
PROPYLENE GLYCOL	1,2 PROPANEDIOL	X	X	X	X	✓
SEPIMAT CP5	METHYLMETHACRYLATE CROSSPOLYMER	X	X	X	X	✓
PEMULEN EZ 4U	ACRYLATES/C10-30 ALKYL ACRYLATE CROSSPOLYMER	X	X	X	X	✓
AQUA	AQUA	✓	✓	✓	✓	✓

**Table 3. EI PRO Retinol Alpha Serum**

Tests	Initial	30 days	60 days	90 days	120 days	180 days	Specification
	10-10-2022	14-11-2022	12-12-2022	10-01-2023	13-02-2023	11-04-2023	
Description (color)	Complies	Complies	Complies	Complies	Complies	Complies	Light yellow colored serum
pH	5.9	5.7	5.6	5.4	5.32	5.4	4-9
Viscosity	1080	1080	1140	1210	1290	1330	500-2500 cps
Phase separation	No phase separation	No phase separation	No phase separation	No phase separation	No phase separation	No phase separation	No oil/Phase separation
Weight loss	30 ml	30 ml	30 ml	30 ml	30 ml	30 ml	NMT 1.5% of the initial weight (30 ML)



**Table 4 . EI PRO Retinol Beta Serum**

Tests	Initial	30 days	60 days	90 days	120 days	180 days	Specification
	10-10-2022	14-11-2022	12-12-2022	10-01-2023	13-02-2023	11-04-2023	
Description	Complies	Complies	Complies	Complies	Complies	Complies	Light yellow colored serum
pH	5.8	5.8	5.6	5.5	5.3	5.1	4-9
Viscosity	1080	1080	1120	1165	1200	1280	500-2500 cps
Thermal stability	No phase separation	No phase separation	No phase separation	No phase separation	No phase separation	No phase separation	No oil/Phase separation
Weight loss	30 ml	30 ml	30 ml	30 ml	30 ml	30 ml	NMT 1.5% of the initial weight (30 ML)

**Table 5. EI PRO Retinol Gamma Serum**

Tests	Initial	30 days	60 days	90 days	120 days	180 days	Specification
	10-10-2022	14-11-2022	12-12-2022	10-01-2023	13-02-2023	11-04-2023	
Description	Complies	Complies	Complies	Complies	Complies	Complies	Light yellow colored serum
pH	5.8	5.8	5.75	5.69	5.5	5.3	4-9
Viscosity	580	620	660	675	690	740	500-2500 cps
Thermal stability	No phase separation	No phase separation	No phase separation	No phase separation	No phase separation	No phase separation	No oil/Phase separation
Weight loss	30 ml	30 ml	30 ml	30 ml	30 ml	30 ml	NMT 1.5% of the initial weight (30 ML)

**Table 6. EI PRO Retinol Moisturizer**

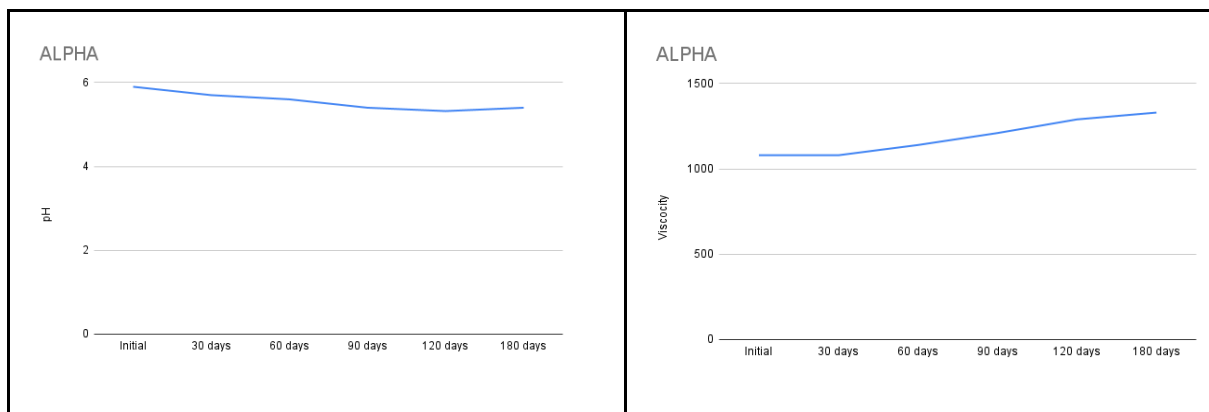
Tests	Initial	30 days	60 days	90 days	120 days	180 days	Specification
	10-10-2022	14-11-2022	12-12-2022	10-01-2023	13-02-2023	11-04-2023	
Description	Complies	Complies	Complies	Complies	Complies	Complies	White colored cream
pH	6.1	6.1	6.15	6.3	6.3	6.4	4-9
Viscosity	1,05,200	1,05,300	1,05,800	1,10,400	1,11,400	1, 12, 500	50,000-1,50,000 cps
Thermal stability	No phase separation	No phase separation	No phase separation	No phase separation	No phase separation	No phase separation	<b>No oil/Phase separation</b>

Weight loss	50 ml	50 ml	50 ml	50 ml	50 ml	50 ml	NMT 1.5% of the initial weight (50 ML)
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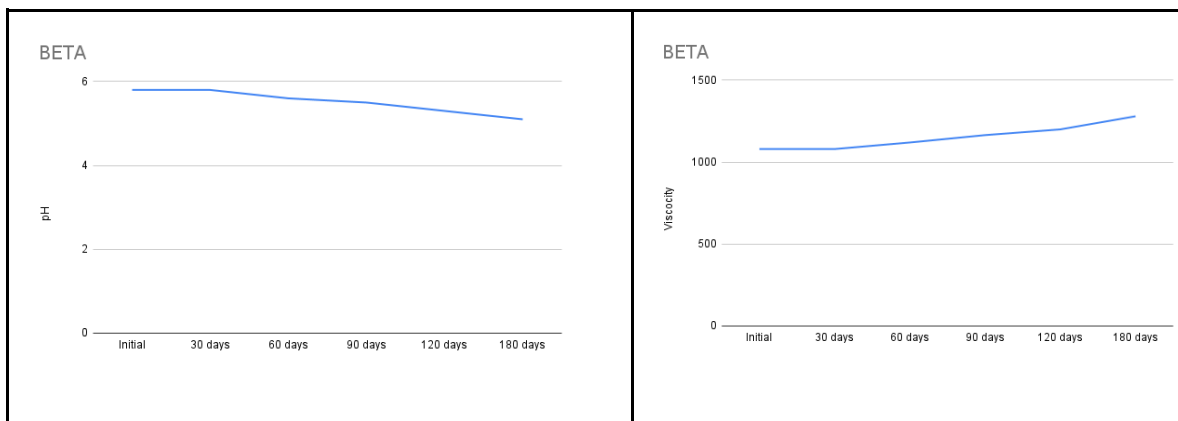
**Table 7. EI PRO Retinol Sunscreen**

Tests	Initial	30 days	60 days	90 days	120 days	180 days	Specification
	10-10-2022	14-11-2022	12-12-2022	10-01-2023	13-02-2023	11-04-2023	
Description	Complies	Complies	Complies	Complies	Complies	Complies	White colored cream
pH	5.8	5.9	5.9	6.0	6.2	6.3	4-9
Viscosity	10,900	11,010	11,030	11,090	11,500	11,900	5,000-20,000 cps
Thermal stability	No phase separation	No phase separation	No phase separation	No phase separation	No phase separation	No phase separation	No oil/Phase separation
Weight loss	50 ml	50 ml	50 ml	50 ml	50 ml	50 ml	NMT 1.5% of the initial weight (50 ML)

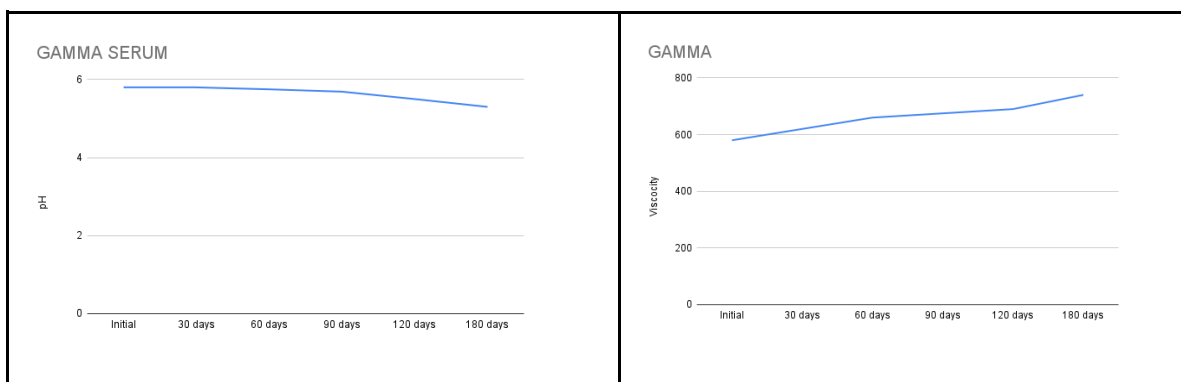
**Graph 1. EI PRO Retinol Alpha pH and Viscosity**



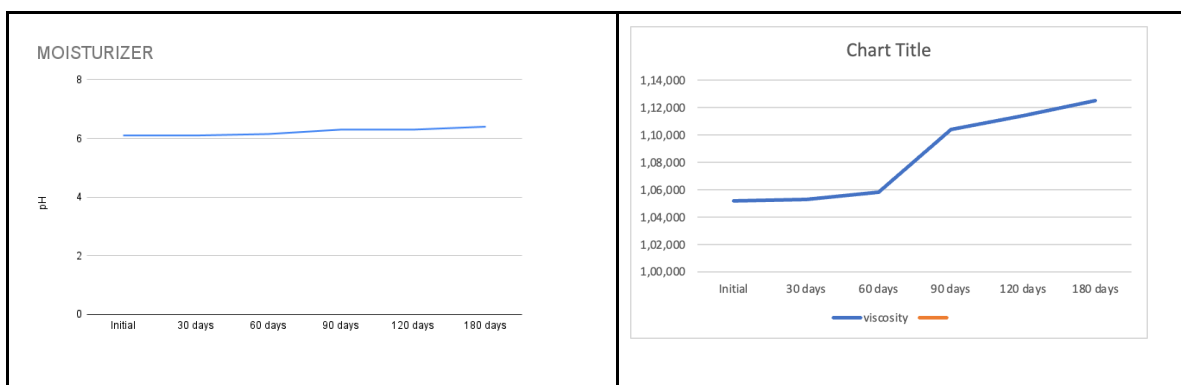
**Graph 2. EI PRO Retinol Beta pH and Viscosity**



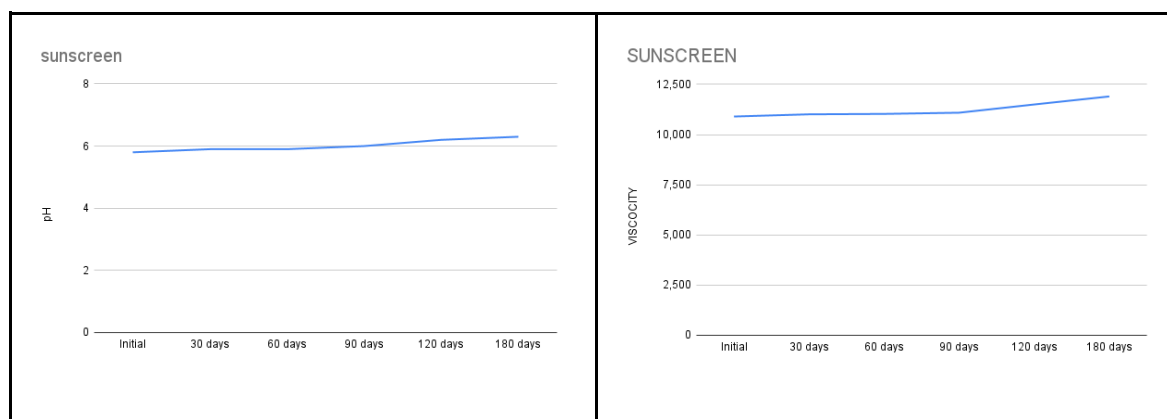
**Graph 3. EI PRO Retinol Gamma pH and Viscosity**



**Graph 4. EI PRO Retinol Moisturizer pH and Viscosity**



**Graph 5. EI PRO Retinol Sunscreen pH and Viscosity**



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