

A Formulation of Skin Rejuvenating Serum.

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ABSTRACT

Serum is a concentrated substance that is commonly used in Aesthetics. In professional cosmetology, the name is derived from itself. The cosmetic serum is equally rich in water or oil as any other cream. 'Successful ageing' challenges the conventional view of ageing as a disease, and is increasingly associated with reducing age indications on the skin, face, and body. Acne is a widespread chronic skin condition that affects around 85% of adults and 50% of individuals aged 20 and over. The serum was created by combining multiple ingredients in varying concentrations such as salicylic acid, L-ascorbic acid (Vit C), and propylene glycol. The formula was created and physically characterised in terms of colour, homogeneity, pH. For over 2000 years, salicylic acid has been utilised as a topical medication in the treatment of a wide range of skin disorders. It is also used for its comedolytic properties and because it is easily absorbed via the skin. We created a novel formulation of salicylic acid in polyethylene glycol. Salicylic in polyethylene glycol topical treatment changes photodamaged skin without systemic absorption. The literature on vitamin C for skin benefits is more extensive, demonstrating evidence for this ingredient's favourable effect on dermal matrix formation, UV-induced harm to the skin, and oxidative stress, indicating that vitamin C may be of relevance to target skin ageing, photoprotection. It increases the elasticity of the skin by promoting collagen formation, resulting in less fine lines and wrinkles. The nutrient vitamin C is a strong antioxidant. It is also beneficial for the treatment of discoloration. Vitamin C has been used widely as a depigmenting agent in dermatology. poses anti-inflammatory properties that are appraisal in the treatment of acne. Acne conditions improve following the use of a new facial serum combination containing salicylic acid (SA) The several uses and

mechanism of action of vitamin C and salicylic acid will be studied and discussed in this article

Keywords: Salicylic acid, L-ascorbic acid, skin aging, discoloration, photoprotection.

I. INTRODUCTION:

Serum has a quick absorption and ability to penetrate deep layers of the skin, as well as an oil-free finish and a deep formula with a very high amount of active ingredients. Based on these properties, the purpose of this work was to make serum using salicylic acid and ascorbic acid as main ingredients. Rising global cost of living has led to an increase in demand for cosmetic products. The value of cosmetics has increased as more and more people want to stay young and attractive. Serum is a skin care product that contains a gel or lightweight lotion or moisturizer and has the ability to penetrate deep to bring the active ingredients to the skin. A good skin serum may give your skin firmness, a smooth texture, make the pores appear smaller and increase moisture levels. A skin serum is not a moisturizer, like a lotion or cream, says Dr. Abigail Waldman, instructor of dermatology at Harvard Medical School. Rather, they are highly concentrated formulations that are designed to sink into the skin quickly, delivering an intensive dose of ingredients that can address common skin complaints. "I definitely recommend serums for anyone who is concerned about aging. It's a really good way to get extra anti-aging effects, more than your typical moisturizer and sunscreen," says Dr. Waldman. Cosmeceuticals are skin care products that combine cosmetics with medications. "Cosmetic Product" according to a description from the Guide to the Control of Cosmetic Products, Health Sciences Authorities, revised 2014, is any product intended to be integrated with various external body parts, such as the epidermis, hair system, nails, lips, eyes, teeth, and oral mucosa and external genitals

primarily for cleansing, perfuming, changing their appearance, adjusting body odor, protecting or keeping them in good condition. Skin care and maintenance includes moisturizers, massage oils, creams, fairness creams, and antiseptics. Serum is one of the highest concentrated cosmetic products in its active formula for providing a deep nourishing deep skin layer and a non-oily skin product suitable for skin. Cosmetic serum was classified according to its level of absorption and the ability to penetrate deep layers of the skin. Topical application of antioxidants may be beneficial for protecting the skin against environmental factors. Antioxidant compounds play an important key ingredient in skin caring products which have received importance in the present scenario.

OBJECTIVE:

The purpose of the research was to formulate a serum having properties to make skin feel young. Serum was prepared using salicylic acid and ascorbic acid known as vitamin C as main ingredients. Salicylic acid is known to show its keratolytic and comedolytic properties. Whereas being an antioxidant vitamin C shows a variety of properties like photoprotection, collagen synthesis, depigmentation and even acts as an anti-inflammatory agent. After the synthesis of desired serum all the properties were tested and were evaluated. Due to an increased awareness about skin care people have started hydrating and moisturizing skin. A serum with vitamin C and salicylic acid helps to lock in hydration for skin and provides moisturization.

MATERIALS AND METHODS:

Materials used are:

- **Apparatus:** Beaker, stirrer, thermometer,
- **Chemicals:** L-ascorbic acid, salicylic acid, propylene glycol, distilled water, sodium citrate, sodium bicarbonate, rose oil.

CHEMISTRY OF ASCORBIC ACID:

Ascorbic acid is an organic compound with formula $C_6H_8O_6$, originally called hexuronic acid. It is a white solid, but impure samples can appear yellowish. It dissolves well in water to give mildly acidic solutions. It is a mild reducing agent. Ascorbic acid is a furan-based lactone of 2-ketogluconic acid. L-ascorbic acid mainly exhibits antioxidant properties. Vitamin C has a 5-hydrocarbon ring similar to that of glucose. With

an attached hydrogen ion, LAA becomes a weak sugar acid, similar to other alpha hydroxy acids used in dermatology. With a metal ion, it forms a mineral ascorbate. There is a marked interest in synthesis of physiologically active and chemically stable ascorbate molecules as LAA is unstable in nature, especially when exposed to light. Vitamin C, the most plentiful antioxidant in human skin, forms a part of the complex group of enzymatic and non-enzymatic antioxidants that co-exist to protect the skin from reactive oxygen species (ROS). As Vitamin C is water soluble, it functions in the aqueous compartments of the cell. When the skin is exposed to UV light, ROS such as the superoxide ion, peroxide and singlet oxygen are generated. Vitamin C protects the skin from oxidative stress by sequentially donating electrons to neutralize the free radicals. The oxidized forms of Vitamin C are relatively non-reactive. Furthermore, they can be converted back to Vitamin C by the enzyme dehydroascorbic acid reductase in the presence of glutathione. Exposure to UV light reduces the availability of Vitamin C in the skin. The harmful effects of ROS occur as direct chemical alterations of the cellular DNA, the cell membrane and the cellular proteins, including collagen.

Under physiological conditions, Vitamin C plays a role in photoprotection, skin strengthening, immunomodulation and cancer therapy and is used for the removal of hyperpigmented spots. It is also a potent antioxidant. Vitamin C interacts with the copper (Cu) ions at the tyrosinase active site and inhibits action of the enzyme tyrosinase, thereby reducing melanin formation. It also acts on the perifollicular pigment. However, it is an unstable compound. Therefore, it is used as a treatment modality in depigmentation of hyperpigmented spots on the skin.

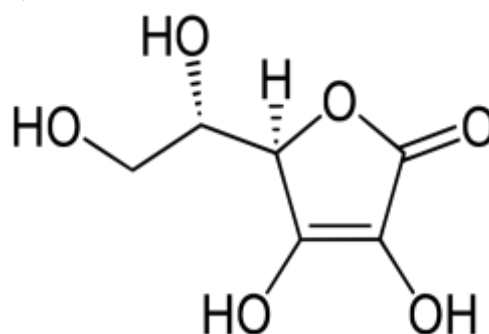


Figure no. 1: L-ascorbic acid.

CHEMISTRY OF SALICYLIC ACID:

Chemically, SA is 2-hydroxybenzoic acid or orthohydrobenzoic acid. Sources of SA and salicylates include willow bark, sweet birch, and wintergreen leaves. However, SA can also be synthesized artificially. SA has carboxyl (-COOH) and hydroxyl (-OH) groups directly attached to an aromatic benzene ring, unlike a true β -hydroxy acid, which contains an aliphatic carbon atom chain.

It is possible that SA was labeled as a β -hydroxy acid at a time when β -hydroxy acid peels were introduced in the market in order to exploit the benefit of the popularity of α -hydroxy acids. SA is absorbed readily when applied topically to the skin, and can be detected in urine within 24 hours applied to skin with erythroderma. The absorption of SA can be increased topically when it is combined with a hydrophilic base or kept under occlusion. Salicylic acid has been used to treat various skin disorders for more than 2,000 years. The ability of salicylic acid to exfoliate the stratum corneum makes it a good agent for peeling. In particular, the comedolytic property of salicylic acid makes it a useful for patients with acne. Once considered as a keratolytic agent, the role of salicylic acid as a desmolytic agent, because of its ability to disrupt cellular junctions rather than breaking or lysing intercellular keratin filaments, SA is now recognized SA has keratolytic and comedolytic properties, although the exact mechanisms involved are not clear. SA also decreases secretion of sebum in patients with acne, which adds to its therapeutic effect in these patients. Salicylic acid, a mild keratolytic and anti-inflammatory agent that inhibits PG synthesis,

was used to remove follicular clog in various formulations, particularly an alcoholic solution for cleansing.

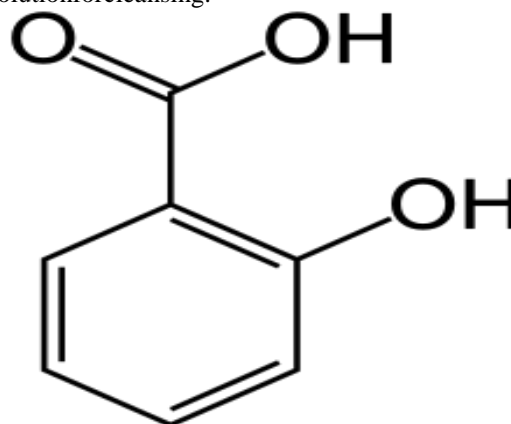


Figure No. 2: salicylic acid.

FORMULATION OF SERUM:

Pour 84.80 gms of distilled water into a beaker. Heat the water up to 50 degrees Celsius. While in another beaker take 10 gms of propylene glycol and add 1.5 gms of Salicylic acid and dissolve it properly. Keep it aside for some time and then the mixture until it completely dissolves. Sodium citrate helps to ensure salicylic acid remains dissolved and does not crystallize. Also add 1 gm ascorbic acid to the solution. Now dissolve 0.7 gm of sodium bicarbonate to help adjust pH of solution. Then add in the dissolved salicylic acid to the beaker as well. Mix well. Now add 0.5 gms of propyl paraben to the serum. Even add 1 or 2 drops of rose oil to the serum for fragrance.

FORMULA:

INGREDIENTS	QUANTITY	CATEGORY
Propylene glycol	10 gm	
Salicylic acid	1.5 gm	Keratolytic agent
Vitamin C	1 gm	Antioxidant
Sodium bicarbonate	0.7 gm	Buffering agent
Paraben	0.5	Preservative

Rose oil	2 drops	Perfume
Distilled water	q.s	Vehicle
Sodium citrate	1gm	

Table 1: Formulation of Serum.



Figure No. 3: Prepared serum.

EVALUATION TEST OF SERUM

1. Physical evaluation:

The Color and appearance of the formulation was observed visually. The formulation procedure uniform distribution of extracts. This test was confirmed by visual appearance and by touch.

2. PH Test :

2gms of serum is dissolved in 8 gms of water and mix well then by dipping the ph paper into the solution ph of serum was determined. The skin has an acidic range and the pH of the skin serum should be in the range of 4.1-6.7.

3. Leak Test:

Filled containers are allowed to sink in warm water (500C) for 10 sec. Immediately after filling, the bubbling in water is being identified as leakage in container.

4. Homogeneity: The formulations were tested for the homogeneity by visual appearance and by touch.

5. Irritancy Test:

Mark an area (1sq.cm) on the left hand dorsal surface. The cream was applied to the specified area and time was noted. Irritancy, erythema, edema, was checked if any for regular intervals up to 24 hours and reported.

6. Accelerated Stability Testing:

The purpose of stability testing is to provide evidence on how the quality of drug substance or drug product varies with time under the influence of variety of environmental factors such as temperature, humidity and light and enables to recommend storage condition and to predict the shelf life.

7. Phase Separation:

The prepared cream was transferred in a suitable wide mouth container. Set aside for storage the oil phase and aqueous phase separation were visualizing after 24 hours.

8. Cyclic Temperature test: These test is not carried out at any fixed temperature and humidity. In this test, temperature was changed cyclically every day. At room temperature and

frizzing temperature to stimulates the changes in temperature.

II. RESULTS AND DISCUSSION:

1. Physical Evaluation:

Colour	Transparent
Odour	Smell like rose
Taste	Tasteless
Texture	Smooth on skin

Table no. 2: Physical Evaluation

- 2. **PH test:** The pH of formulation was found to be 4. As the skin having an acidic pH around 4 -6.7, this range of formulation is suitable for skin.
- 3. **Leak test:** The container was found to be leak proof after testing.
- 4. **Homogeneity:** The formulation produce a uniform distribution. This was confirmed by visual appearance and by touch.
- 5. **Irritancy test:** The formulation shows no redness, edema, inflammation and irritation after applying to the skin. These formulations are safe to use for skin.

Evaluation Parameters	Observations
Irritation	No
Redness	No
Inflammation	No

Table no. 3: Irritation Evaluation.

- 6. **Accelerated Stability testing:** When formulation was subjected for long term stability studies, i.e. for about a period of 20 days, it was found that there is no change in properties of cream like pH, color and odour . Stability study for serum was performed at accelerated condition i.e. $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ / $75\% \text{RH} \pm 5\% \text{RH}$. The formulations were kept both at room and elevated temperature and observed on 0,5th, 10th, 15th and 20th day for the various parameters.
- 7. **Phase Separation:** After 24 hours of observation there was no separation of oil and aqueous phase.
- 8. **Cyclic Temperature test:** At the frezzing temperature the formulation was found to be unstable whereas at the room temperature the formulation was found to be stable.



Figure No.4 : Serum.

III. DISCUSSION:

Both intrinsic aging and extrinsic aging of the skin are mediated by oxidative stress and are accompanied by a decrease in the synthesis of ECM components and an increase in their decomposition. Therefore, the function of AA as an antioxidant is very important in maintaining skin health and preventing skin aging. The formulation is effective in treating signs of facial ageing. The paper demonstrates the procedure for preparation of serum and even evaluation done on it. The serum was suitable for application. It has considerably good homogeneity. There is uniformity in formulation prepared the prepared serum survived in all the stability test and no change was found. The formulation is safe to be use on skin. From the above study the serum is guaranteed for Rejuvenating Facial skin.

IV. CONCLUSION:

The current study is done with an aim to produce cosmeceutical having photoprotective, depigmentation, anti-acne, anti-wrinkle properties. Cosmeceuticals show both cosmetic and drug effect. Use of ingredients which are helpful for the skin nourishes the skin and gives beneficial effects. The active ingredients in the formulation are L-ascorbic acid (vitamin C) and salicylic acid. LAA has variety of effects such as anti-inflammation, collagen synthesis, antioxidant, anti-photoageing, etc. Salicylic acid shows benefits such

as decreases in both the number and size of microcomedones in acne-prone skin, reduces serum secretion and water loss from skin, shrinks the enlarged skin pores giving smooth texture to the skin. The serum is safe to use on skin. It can be used regularly for desired effects. Stability studies revealed that there was no significant difference in the physical and pH parameter. The use of serum will restore the ingredients required for to function at its optimal level and lead to young looking skin.

BIBLIOGRAPGY:

- [1]. Yussif NM, Zayed SO, Hasan SA, Sadek SS. Evaluation of injectable Vitamin C as a depigmenting agent in physiologic gingival melanin hyperpigmentation: A clinical trial. *Rep Opin.* 2016;8:113–20. [[Google Scholar](#)]
- [2]. ZD Draelos, *Vitamins and Healthy Skin, Cosmetic Dermatology*, 22 8 400–403 (August 2009)
- [3]. Zhang L, Lerner S, Rustrum WV, Hofmann GA. Electroporation mediated topical delivery of Vit C for cosmetic applications. *Bioelectrochem Bioenerg.* 1999;48:453–61. [[PubMed](#)] [[Google Scholar](#)]
- [4]. Kim HM, An HS, Bae JS, Kim JY, Choi CH, Kim JY, et al. Effects of palmitoyl-KVK-L-ascorbic acid on skin wrinkles and pigmentation. *Arch Dermatol*

- Res. 2017;309:397–402. [[PubMed](#)] [[Google Scholar](#)]
- [5]. 21. Jaros A, Zasada M, Budzisz E, Dębowska R, Gębczyńska-Rzepka M, Rotszejn H. Evaluation of selected skin parameters following the application of 5% vitamin C concentrate. *J Cosmet Dermatol.* 2019;18:236–41. [[PubMed](#)] [[Google Scholar](#)]
- [6]. 22. Higgins JP, Green S, editors. *Cochrane Handbook for Systematic Reviews of Interventions Version 510 (Updated March 2011)* The Cochrane Collaboration. 2011. [Last accessed on 20-4-2020]. Available from: <http://www.handbookcochrane.org>.
- [7]. 23. Takenouchi K, Aso K. The relation between melanin formation and ascorbic acid. *J Vitaminol (Kyoto)* 1964;10:123–34. [[PubMed](#)] [[Google Scholar](#)]
- [8]. SR Pinnell, Topical L-Ascorbic Acid: Percutaneous Absorption Studies, American Society for Dermatologic Surgery 21 137–142 (Feb 2001)
- [9]. Matsuda S, Shibayama H, Hisama M, Ohtsuki M, Iwaki M. Inhibitory effects of novel ascorbic derivative VCP-IS-2Na on melanogenesis. *Chem Pharm Bull.* 2008;56:292–7. [[PubMed](#)] [[Google Scholar](#)]
- [10]. 6. Burke KE. Interaction of Vit C and E as better Cosmesuticals. *Dermatol Ther.* 2007;20:314–9. [[PubMed](#)] [[Google Scholar](#)]
- [11]. Gollnick, C. and Schramm, M. Topical therapy in acne. *J. Eur. Acad. Dermatol. Venereol.* 11, S8–S12 (1998).
- [12]. Kaminsky, A. Less common methods to treat acne *Dermatology* 206, 68–73 (2003).
- [13]. Shalita, A.R. Comparison of a salicylic acid cleanser and a benzoyl peroxide wash in the treatment of acne vulgaris. *Clin. Ther.* 11, 264–267 (1989).
- [14]. Hashimoto, Y., Suga, Y., Mizuno, Y. et al. Salicylic acid peels in polyethylene glycol vehicle for the treatment of comedogenic acne in Japanese patients. *Dermatol. Surg.* 34, 276–279 (2008)
- [15]. Ruamrak, C, Lourith, N. and Nata-kankitkul, S. Comparison of clinical efficacies of sodium ascorbyl phosphate, retinol and their combination in acne treatment. *Int. J. Cosmet. Sci.* 31, 41–46 (2009).
- [16]. Perricone, N.V. The photoprotective and anti-inflammatory effects of topical ascorbyl palmitate. *J. Geriatr. Dermatol.* 1, 5–10 (1993).
- [17]. Amer, M., Bahgat, M.R., Tosson, Z. et al. Serum zinc in acne vulgaris. *Int. J. Dermatol.* 21, 481–484 (1982).
- [18]. Dreno, B., Moyse, D., Alirezai, M. et al. Multicenter randomized comparative double-blind controlled clinical trial of the safety and efficacy of zinc gluconate versus minocycline hydrochloride in the treatment of inflammatory acne vulgaris. *Dermatology* 203, 135–140 (2001).
- [19]. Carter, E.L. Antibiotics in cutaneous medicine: an update. *Semin. Cutan. Med. Surg.* 22, 196–211 (2003).
- [20]. Scheinfeld, N.S., Tuttrone, W.D., Torres, O. and Weinberg, J.M. Macrolides in dermatology. *Clin. Dermatol.* 21, 40–49 (2003).
- [21]. Katsambas, A. and Papakonstantinou, A. Acne: systemic treatment. *Clin. Dermatol.* 22, 412–418 (2004)
- [22]. Yin, X.; Chen, K.W.; Cheng, H.; Chen, X.; Feng, S.; Song, Y.D.; Liang, L. Chemical Stability of Ascorbic Acid Integrated into Commercial Products: A Review on Bioactivity and Delivery Technology. *Antioxidants* **2022**, *11*, 153. [[Google Scholar](#)] [[CrossRef](#)] [[PubMed](#)]
- [23]. Ebihara, M.; Akiyama, M.; Ohnishi, Y.; Tajima, S.; Komata, K.; Mitsui, Y. Iontophoresis promotes percutaneous absorption of L-ascorbic acid in rat skin. *J. Dermatol. Sci.* **2003**, *32*, 217–222. [[Google Scholar](#)] [[CrossRef](#)]
- [24]. Hori, Y.; Akimoto, R.; Hori, A.; Kato, K.; Chino, D.; Matsumoto, S.; Kamiya, S.; Watanabe, Y. Skin collagen reproduction increased by ascorbic acid derivative iontophoresis by frequent-reversal bipolar electric stimulation. *J. Cosmet. Sci.* **2009**, *60*, 415–422. [[Google Scholar](#)] [[CrossRef](#)] [[PubMed](#)]
- [25]. Jacknowitz AI. External analgesic products. In: Feldmann EG, ed. *Handbook of non-prescription drugs.* 9th ed. Washington, DC: American

- Pharmaceutical Association, 1990: 871–87.
- [26]. Shevchuk YM. External analgesics. In: Carruthers-Czyzewski P, ed. Self-medication: a reference for health professionals. 4th ed. Ottawa, ON: Canadian Pharmaceutical Association, 1993: 39–48.
- [27]. Krogh CME, ed. Compendium of pharmaceuticals and specialties. 30th ed. Ottawa, ON: Canadian Pharmaceutical Association, 1993: 66, 735, 768, 1075.
- [28]. Harvey SC. Topical drugs. In: Osol A, ed. Remington's pharmaceutical sciences. Easton, PA: Mack Publishing Co., 1980: 716–33.
- [29]. Yip ASB, Chow WH, Tai YT, Cheung KL. Adverse effect of topical methylsalicylate ointment of warfarin anticoagulation: an unrecognized potential hazard. *Postgrad Med J* 1990; 66: 367–9.
- [30]. Ueda S, Mitsugi K, Ichige K, et al. New formulation of chemical peeling agent: 30% salicylic acid in polyethylene glycol. Absorption and distribution of ¹⁴C-salicylic acid in polyethylene glycol applied topically to skin of hairless mice. *J Dermatol Sci.* 2002;28:211–218.
- [31]. Weirich EG, Longauer JK, Kirkwood AH. Dermatopharmacology of salicylic acid. III. Topical contra-inflammatory effect of salicylic acid and other drugs in animal experiments. *Dermatologica.* 1976;152:87–99.25.
- [32]. Adam BH, Julio CC, Dana MK, Andrew NL. Agents used for treatment of hyperkeratosis. In: Wolverson SE, editor. *Comprehensive Dermatologic Drug Therapy.* 3rd ed. New York, NY, USA: Elsevier Saunders; 2013.
- [33]. Kligman D, Kligman AM. Salicylic acid peels for the treatment of photoaging. *Dermatol Surg.* 1998;24:325–328.
- [34]. Skin Inc. The Fitzpatrick Skin Type Classification Scale. November, 2007. Available from: <http://www.skininc.com/skinscience/physiol-ogy/10764816.html>. Accessed January 7, 2014.
- [35]. Grimes PE. The safety and efficacy of salicylic acid chemical peels in darker racial-ethnic groups. *Dermatol Surg.* 1999;25:18–22.
- [36]. Mendelsohn JE. Update on chemical peels. *Otolaryngol Clin North Am.* 2002;35:55–72.
- [37]. Lee HS, Kim IH. Salicylic acid peels for the treatment of acne vulgaris in Asian patients. *Dermatol Surg.* 2003;29:1196–1199