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Formulation and Evaluation of Anti-Aging Facial Serum Containing Resveratrol-Rich Red Grape Skin Extract

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Abstract

The growing demand for natural and plant-based cosmetic products has increased interest in the development of herbal formulations with anti-aging properties. Resveratrol, a polyphenolic compound abundantly present in red grape (*Vitis vinifera*) skin, possesses potent antioxidant, anti-inflammatory, and photoprotective activities that may help prevent premature skin aging. The present study aimed to formulate and evaluate an anti-aging facial serum containing resveratrol-rich red grape skin extract.

Red grape skins were collected, shade-dried, powdered, and subjected to extraction using 70% ethanol by the maceration method. The obtained extract was concentrated and incorporated into a facial serum formulation containing suitable excipients such as glycerin, hyaluronic acid, propylene glycol, preservative, and purified water. The formulated serum was evaluated for organoleptic characteristics, pH, viscosity, spreadability, homogeneity, stability, and antioxidant activity.

The prepared facial serum exhibited a smooth appearance, good homogeneity, acceptable viscosity, and a skin-compatible pH range. The formulation showed satisfactory stability under storage conditions without significant changes in its physical properties. The presence of resveratrol-rich grape skin extract contributed to notable antioxidant activity, suggesting its potential to protect the skin from oxidative stress and age-related damage. The serum also demonstrated desirable cosmetic attributes suitable for topical application.

The findings indicate that a facial serum formulated with ethanolic red grape skin extract is a promising natural anti-aging cosmetic preparation. The antioxidant properties associated with resveratrol may help improve skin health and reduce the visible signs of aging. Further studies involving quantitative estimation of resveratrol and clinical evaluation are recommended to establish its efficacy and safety for long-term use.

Keywords: Facial serum, Red grape skin extract, *Vitis vinifera*, Resveratrol, Anti-aging, Antioxidant activity, Herbal cosmetics, Ethanolic extract.

1. Introduction

The skin is the largest organ in the human body. It acts as a barrier against ultraviolet (UV) radiation, microbes, and environmental pollutants. Skin aging is a complex biological process. It is influenced by external factors like UV exposure, pollution, smoking, and lifestyle choices. Internal factors such as genetics and chronological aging also play a role. Antioxidants have become popular in cosmetic products for preventing and treating skin aging.[3,4]

The layers of skin diagram is mentioned in **Figure 1.**

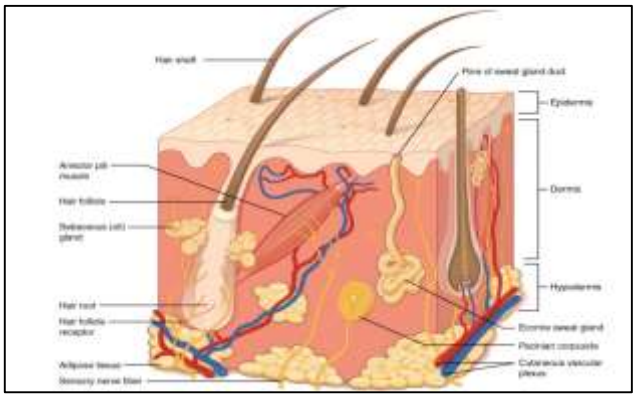

Figure 1. Layers of Skin

The consumer's has been a phenomenon in recent years. Herbal cosmetics contain plant derived bio active chemicals, which protect against oxidative damage and promote skin health. Polyphenols are among these phytochemicals which have attracted attention due to their strong antioxidant and anti-inflammatory properties.[3,5]

Figure 2: Red grape

Red grapes (Vitis vinifera L.) are a rich source of many polyphenolic substances including flavonoids, anthocyanins, catechins and resveratrol (Figure 2). These active ingredients occur in the skin of red grapes in much higher concentrations than in the flesh. The skin of the grape is a useful source of natural antioxidants and has potential uses in cosmetics. It is often discarded as a by-product of the juice and wine industries. [6,7]

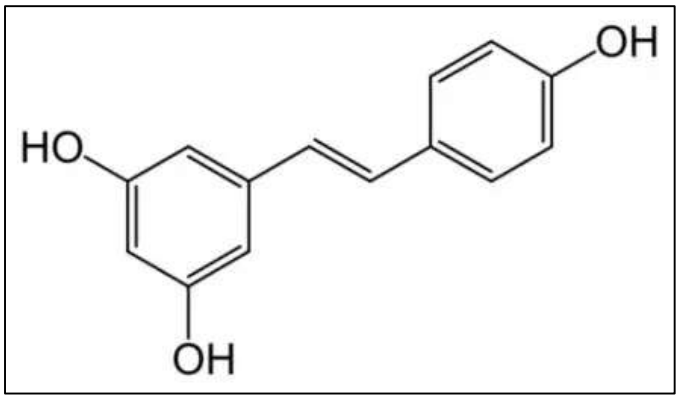

Figure 3: Chemical structure of Rasveratrol

Grape peels are the primary source of resveratrol (3,5,4'-trihydroxystilbene), a naturally occurring polyphenolic phytoalexin (Figure 3). It exhibits powerful antioxidant, anti-inflammatory, anti-aging, and photoprotective effects. Research has shown that resveratrol shields the skin against oxidative stress and cellular damage caused by UV radiation. Additionally, it prevents collagen degradation, lowers inflammation, and shields skin cells from premature ageing.[8,9,10]

The capacity of resveratrol to scavenge free radicals and improve the appearance of skin has made its topical administration a point of interest in the cosmeceutical industry. Resveratrol-containing formulations have demonstrated an improved skin defence against environmental stress and may help to reduce wrinkles, fine lines and other visible signs of ageing. [8,10]

Facial serums are concentrated cosmetic preparations designed to deliver active ingredients to the skin. Serums are less viscous and spread more easily than traditional creams and lotions so they also penetrate the active chemicals more deeply. Facial serums are one of the most common dosage forms of anti-aging skin care products today because of their low weight and fast absorption. [11, 12]

Ethanol is a commonly used extraction solvent for polyphenolic chemicals due to its efficacy, safety, and ability to effectively extract resveratrol from plant materials. A resveratrol-rich extract was obtained from red grape skin by extraction with ethanol for use in topical treatments. So the future natural way to do anti-aging skin care is to create a face serum with the ethanolic extract of red grape skin.[6,13]

The present study was performed to formulate and evaluate an anti-aging facial serum using resveratrol rich ethanolic extract of red grape skin (Vitis vinifera) to utilise the antioxidant potential of the extract to prevent the oxidative damage of the skin and age associated changes in the skin. [6,14]

2. Drug Profile

2.1 Biological classification of Red Grapes

Red grapes belong to the genus *Vitis* and are classified in **Table 1**.

Table 1: Classification of Red grapes

Taxonomic Rank	Classification
Kingdom	Plantae
Subkingdom	Tracheobionta (Vascular Plants)
Superdivision	Spermatophyta (Seed Plants)
Division	Magnoliophyta (Flowering Plants)

Class	Magnoliopsida (Dicotyledons)
Subclass	Rosidae
Order	Vitales
Family	Vitaceae
Genus	*Vitis*
Species	*Vitis vinifera* L.
Common Name	Red Grape
Marathi Name	द्राक्ष (Draksha)

3. Materials

Fresh grapefruit peels came from ripe fruits bought at the local market. The extraction solvent was 95% ethanol. The gelling agent was used as the gelling agent. Propylene glycol and glycerin served as penetration enhancers and humectants. Preservatives included propyl and methyl paraben. Triethanolamine was used. Distilled water was used throughout the study. **Table 2**

Table 2: Excipients and its functions

Category	**Excipient**	**Function**
Active Ingredient	Resveratrol	Antioxidant, anti-aging agent
Solubilizer	Propylene Glycol	Enhances solubility and penetration
Co-solvent	Ethanol	Dissolves resveratrol
Humectant	Glycerin	Moisturizes skin
Gelling Agent	Carbopol 940	Provides serum consistency
Penetration Enhancer	Propylene Glycol or PEG-400	Improves skin absorption
Preservative	Phenoxyethanol	Prevents microbial growth
Chelating Agent	Disodium EDTA	Improves stability
Antioxidant Stabilizer	Vitamin E	Protects resveratrol from oxidation
pH Adjuster	Triethanolamine	Adjusts pH to 5.5–6.5
Vehicle	Purified Water	Base of formulation

4. Formulation preparation

Three formulations, F1, F2, and F3, were created by changing the amounts of Resveratrol while keeping the excipients the same, as shown in Table 3.

Table 3: Formulation Table For Rasveratrol Face Serum (30ml)

Ingredients	**F1 (30 mL)**	**F2 (30 mL)**	**F3 (30 mL)**
Resveratrol	0.15 g (0.5%)	0.30 g (1.0%)	0.45 g (1.5%)

Carbopol 940	0.15 g	0.15 g	0.15 g
Propylene Glycol	3.0 mL	3.0 mL	3.0 mL
Glycerin	1.5 mL	1.5 mL	1.5 mL
Ethanol	3.0 mL	3.0 mL	3.0 mL
Vitamin E Acetate	0.15 mL	0.15 mL	0.15 mL
Disodium EDTA	0.03 g	0.03 g	0.03 g
Phenoxyethanol	0.24 mL	0.24 mL	0.24 mL
Triethanolamine	q.s.	q.s.	q.s.
Purified Water	q.s. to 30 mL	q.s. to 30 mL	q.s. to 30 mL

4.1 Preparation of Resveratrol Face Serum

The Carbopol 940 gel base method was used to make the resveratrol face serum. First, 0.15 g of Carbopol 940 was dissolved in a sufficient amount of filtered water. It was left to hydrate for two to four hours to create a clear, lump-free gel. In another container, 3 mL of ethanol and 3 mL of propylene glycol were mixed with the required amount of resveratrol: 0.15 g for F1, 0.30 g for F2, and 0.45 g for F3. This mixture was stirred continuously until it became clear. For the humectant phase, 1.5 mL of glycerin, 0.03 g of disodium EDTA, and 0.15 mL of vitamin E acetate were carefully mixed in a separate beaker. After that, this humectant mixture was added to the resveratrol solution. The mixture was stirred constantly to ensure it blended well. [11,15]

To achieve a uniform dispersion, we gradually added the mixture to the hydrated Carbopol gel base while continuously stirring. Next, we added 0.24 mL of phenoxyethanol as a preservative and mixed it well. We added triethanolamine drop by drop while gently shaking to adjust the formulation's pH to between 5.5 and 6.5. Then, we increased the final volume to 30 mL by adding purified water, and we swirled the mixture until it turned into a clear, uniform serum. After that, we poured the serum into sterile amber-colored glass vials, sealed them carefully, and stored them at room temperature away from heat and light until further analysis.[16,17,18]

5. Evaluation of face serum

5.1 Organoleptic Evaluation

The color, odor, appearance, clarity, uniformity, and consistency of the produced serum compositions were visually checked. The results for each formulation were recorded and compared. [19,20,21,22]

5.2 pH Determination

A calibrated digital pH meter measured the serum's pH. The pH was checked at room temperature after dissolving about 1 milliliter of serum in 10 milliliters of distilled water. We took three measurements and recorded the average value. [20,23,24]

5.3 Viscosity Measurement

A calibrated digital pH meter measured the serum's pH. The pH was checked at room temperature after dissolving about 1 milliliter of serum in 10 milliliters of distilled water. We took three measurements and recorded the average value. [20,25,26,27]

5.4 Spreadability

Spreadability test was conducted by using the parallel plate method. Two plates of glass were used with a certain volume of serum placed between them, with a certain weight placed above the top glass. Spreadability is measured using the formula below, after the time taken for the top glass to move a certain distance is measured.: [19,28,29,30,31]

$S=M\times L/T$

Where:

- S = Spreadability (g·cm/s)
- M = Weight tied to the upper slide (g)
- L = Length moved by the glass slide (cm)
- T = Time taken (s)

5.5 Homogeneity

The formulations were examined after preparation for homogeneity, phase separation, aggregation, and lump formation. Evidence of good homogeneity was found in the smooth appearance free from any particle.[20,30,32,33]

5.6 Drug Content Determination

A known volume of serum having 10 mg of resveratrol was added to ethanol solution and suitably diluted. Absorbance of this solution was determined by using UV-Visible spectrophotometer at the set wavelength of maximum absorbance of resveratrol. Drug concentration was calculated from calibration curve. [34,35,36,37]

Drug Content (%) = Theoretical Drug Content/Actual Drug Content×100

5.7 Antioxidant Activity

The DPPH free radical scavenging experiment was used to see how well the serum can fight off the guys. We used a tool called a UV-visible spectrophotometer to measure how much the serum affected the DPPH solution. We mixed amounts of the serum extract with the DPPH solution and then we left it alone in the dark for 30 minutes. After that we used the UV- spectrophotometer to measure the absorbance of the DPPH solution, at 517 nm to see what the serum did to it. The DPPH free radical scavenging experiment helped us understand the serums activity. [38,39,40,41]

5.7.1 Preparation of DPPH Solution

To make a 0.1 mM DPPH solution you need to weigh out 3.94 mg of DPPH. Then you dissolve it in 100 mL of methanol. The container needs to be covered with aluminum foil so that light does not get into the DPPH solution you just made. [38,40,41,42]

5.7.2 Preparation of Standard Solution

You have to weigh out 10 milligrams of pure resveratrol. Then you put it into a 100 mL flask. To make a stock solution that has 100 µg/mL of resveratrol you need to dissolve the resveratrol and add methanol to fill up the flask. The stock solution of resveratrol is then diluted to make solutions that have 20, 40 60 80 and 100 µg/mL of resveratrol. [43,44,45,46]

5.7.3 Preparation of Sample Solution

Weigh out 1 gram of the serum formulation carefully. Pour it into a 100 milliliter flask. To make sure that resveratrol and other antioxidant parts are fully taken out add methanol and use a sonicator for 15 minutes. Add methanol to make the volume 100 milliliters. Then filter it through Whatman No. 1 Filter paper. Make dilutions as needed to get concentrations of 20, 40 60 80 and 100 micrograms, per milliliter. The

serum formulation was used to make these concentrations. Resveratrol and antioxidant components were checked in the serum formulation. The serum formulation has components and resveratrol. These concentrations were made from the serum formulation.[34,43,44,47]

5.7.4 Procedure

3 mL of 0.1 mM DPPH solution and 1 mL of either the standard solution or the sample solution were added to each test tube. A control solution was made by mixing 1 mL of methanol and 3 mL of DPPH solution. The mixtures were shaken well. Then kept in the dark at room temperature for 30 minutes to prevent DPPH from breaking down due to light. After that a UV-Visible spectrophotometer was used to measure how light each solution absorbed at 517 nm with methanol, as a reference. The average absorption values were. Each measurement was done three times to ensure accuracy. [38,40,41,48]

The percentage inhibition was calculated using:

% Inhibition = A0−A1/A0×100

Where, A0 = Absorbance of control

A1 = Absorbance of sample

5.8 Skin Irritation Test

After getting permission healthy volunteers took part in a skin irritation study. A small area on their skin 2 cm by 2 cm was covered with 0.5 g of a special serum. A patch that was designed not to cause allergic reactions was put on the area and left there for a day. The patch was removed after a day. The area was checked for any skin problems like redness, swelling, itching, burning, dryness or rashes. The skin irritation study was done to see if the serum caused any problems. The volunteers were checked away and again 2 days later to see if there were any delayed reactions. A control site, without any serum was also checked for comparison. The serum and patch were tested on the skin to see if they caused irritation. The skin was checked for redness, swelling, itching, burning, dryness or rashes. The volunteers were part of a skin irritation study to test the serum. [49,50,51,52,53]

5.9 Washability

The skin was treated with a serum and then cleaned with tap water. We looked at how easy it was to remove the serum from the skin. We did this by looking at it. [29,30,34,54]

5.10 Stability Study

The formulated serum was subjected to stability studies according to ICH guidelines. The formulations were stored at:

- 25 ± 2°C / 60 ± 5% RH
- 40 ± 2°C / 75 ± 5% RH

for a period of three months. Samples were withdrawn at predetermined intervals and evaluated for appearance, pH, viscosity, homogeneity, and drug content. [55,56,57,58]

5.11 Centrifugation Test

We checked the serum compositions to see if they were stable. To do this we spun them around fast in a special machine for 30 minutes. The machine went around 3000 times per minute. We wanted to see if the different parts of the serum compositions would separate or if anything would settle at the bottom. We looked for any signs that the serum compositions were not mixing together properly. We did this by looking for things like precipitation or separation, in the serum compositions. [30,59,60,61]

5.12 Microbial Limit Test

To make sure the products are safe the formulations were checked for things, like bacteria and fungus by

counting how many of them are in there. This was done in a way that pharmacists usually do. To make a mix we took one gram of the serum formulation and put it in a very clean flask with nine milliliters of clean normal saline. We shook the mixture well so that everything was evenly spread out.

We used saline to make more mixes that were even weaker. We took one milliliter of the mix we wanted and carefully put it into clean Petri dishes. Then we filled each dish with fifteen to twenty milliliters of melted Soybean Casein Digest Agar that was kept warm at forty-five degrees Celsius. After that we gently mixed everything together by spinning the dish in a circle. [62,63,64,65]

After allowing the plates to harden, they were incubated for 48–72 hours at 30–35°C. Following incubation, the total aerobic microbial count was determined as colony-forming units per gram (CFU/g) of the sample by counting all visible bacterial colonies.

To calculate the number of fungi To create a 10^{-1} dilution, one gram of serum was aseptically added to nine milliliters of sterile saline solution and carefully mixed. As needed, additional serial dilutions were made.

Sterile Petri dishes were filled with one milliliter of the chosen dilution. Each plate was filled with molten Sabouraud Dextrose Agar that had been cooled to about 45°C and thoroughly mixed.

For five to seven days, the plates were incubated at 20 to 25°C. Fungal colonies (molds and yeasts) were enumerated and expressed as colony-forming units per gram (CFU/g) of formulation after incubation. [62,63,64,65,66]

6. Result And Discussion

6.1 Organoleptic Evaluation

Table 4: Organoleptic Evaluation

Parameter	F1	F2	F3
Color	Light pink	Pink	Dark pink
Odor	Characteristic	Characteristic	Characteristic
Appearance	Clear	Clear	Slightly opaque
Homogeneity	Good	Excellent	Good
Consistency	Smooth	Smooth	Slightly thick

The formulations we looked at had good properties that we can see and feel. F2 was very uniform and clear which means that the resveratrol and other ingredients were mixed in properly. F3 had a bit of cloudiness because it had more resveratrol in it but that was to be expected.

6.2 pH determination

Table 2. pH

Formulation	pH (Mean ± SD)
F1	5.42 ± 0.03
F2	5.86 ± 0.02
F3	6.31 ± 0.04

All formulations had values between 5.0 and 6.5. This range is good for skin. F2 was considered best for use. It had a pH to natural skin pH. F2s pH was closest to skin pH, among all formulations..

6.3 Viscosity measurement

Table 3. Viscosity

Formulation	Viscosity (cP)
F1	2850 ± 15
F2	3125 ± 18
F3	3850 ± 22

The F2 stuff worked well because it had the right consistency. This made it easy to put on. It stayed on the skin surface nicely. The F2 was just right. On the hand the F1 was a bit too thin and runny. The F3 was the opposite it was too thick and hard to work with. The F2 was better, than the F1 and the F3 because of its viscosity.

6.4 Spredability

Table 4. Spreadability

Formulation	Spreadability (g·cm/s)
F1	19.82 ± 0.41
F2	24.35 ± 0.37
F3	17.48 ± 0.45

The product F2 was really easy to apply. It spread out evenly on the skin. This is because F2 showed the spreadability. The product F2 has ease of application and uniform distribution on the skin. The product F3 did not spread easily as the product F2. The product F3 has reduced spreadability. This may be because the product F3 has viscosity, than the product F2.b.

6.5 Drug content

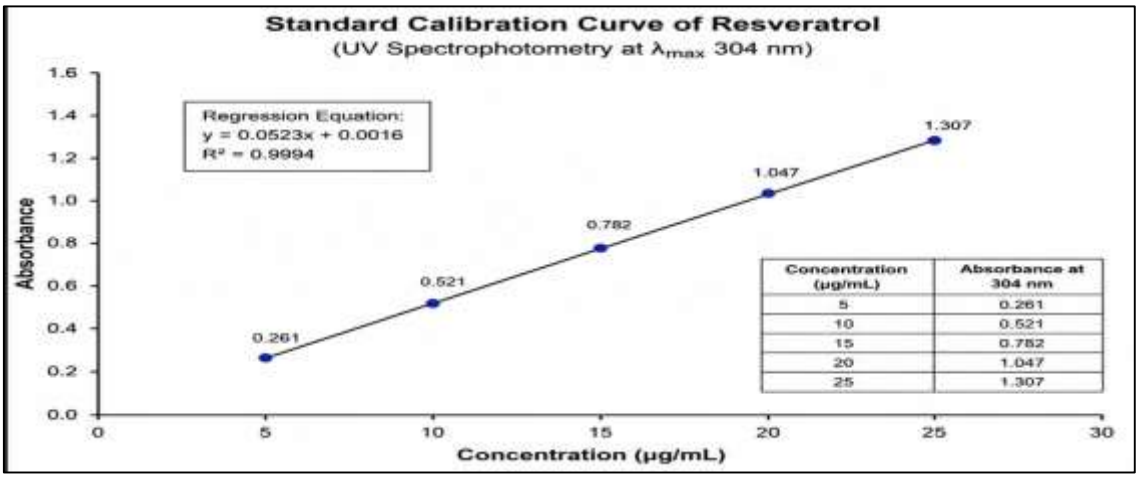

Figure 4: Calibration curve of Rasveratrol

Table 5. Drug Content

Formulation	Drug Content (%)
F1	95.14 ± 0.52
F2	99.28 ± 0.41
F3	96.87 ± 0.48

The analysis of the drug content showed that the resveratrol was spread evenly in all the versions. The version called F2 had the most drug content, which means it was made well and not much of the drug was

lost when it was being prepared. This is really good because it means that the people making the drug did a job of putting the right amount of resveratrol in the F2 version. The drug content of resveratrol in F2 was the highest, which's a great thing, for the formulation of resveratrol.

6.6 Anti-oxidant activity

Table 6. Antioxidant Activity (DPPH Assay)

Formulation	% Radical Scavenging Activity
F1	74.21 ± 0.64
F2	89.76 ± 0.55
F3	91.24 ± 0.49

The new resveratrol face serum's antioxidant capability was shown by the DPPH experiment. Resveratrol reduced absorbance at 517 nm by efficiently scavenging DPPH free radicals by donating hydrogen atoms. The serum's potential for shielding the skin from oxidative stress and free radical-induced damage linked to early aging is confirmed by the observed antioxidant activity. The most promising formulation among the generated batches was the optimized formulation (F2), which demonstrated a favorable balance between antioxidant activity, stability, and skin friendliness.

6.7 Skin Irritation test

Table 7. Skin Irritation Test

Formulation	Redness	Swelling	Itching	Irritation Score
F1	Absent	Absent	Absent	0
F2	Absent	Absent	Absent	0
F3	Mild redness in some volunteers	Absent	Mild	1

F1 and F2 did not cause any problems, for the people who used them. Some people who used F3 got a red and this might be because F3 has more of the things that make it work. We found out that F1 and F2 are completely safe and do not irritate the skin, F2, which is really gentle. F2 is a choice because it is non-irritating and harmless just like we thought F2 would be.

6.8 Washability

Table 8. Washability

Formulation	Observation
F1	Easily washable
F2	Easily washable
F3	Moderately washable

F2 showed excellent washability without leaving residue on the skin surface.

6.9 Centrifugation test

Table 9. Centrifugation Test

Formulation	Observation
F1	No phase separation
F2	No phase separation
F3	Slight sedimentation observed

F2 remained physically stable after centrifugation and showed no evidence of phase separation or precipitation.

6.10 Microbial limit test

Table 10. Microbial Limit Test

Formulation	TAMC (CFU/g)	TYMC (CFU/g)	Pathogens
F1	45	6	Absent
F2	32	3	Absent
F3	68	8	Absent

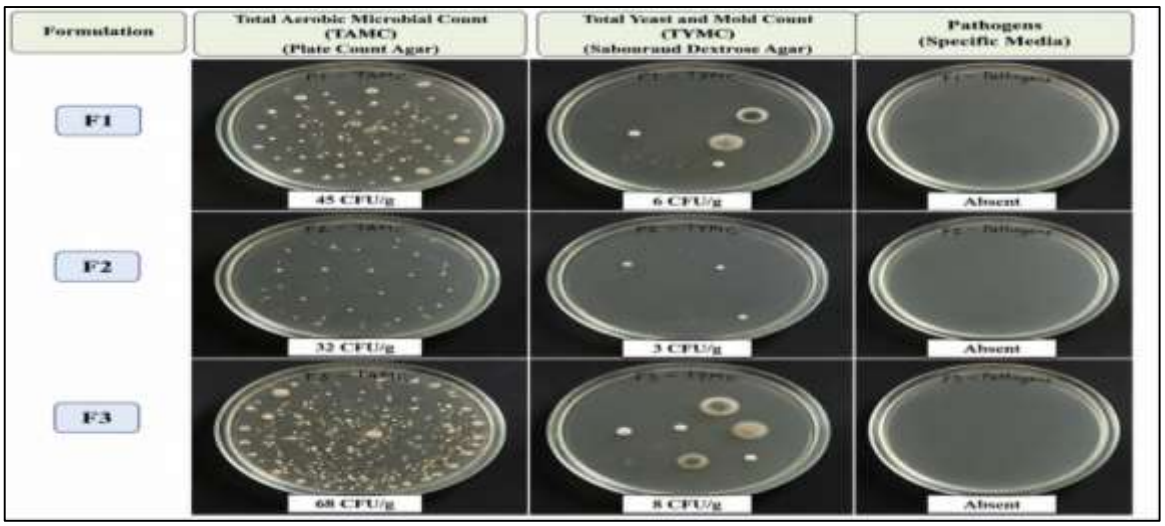

Figure 5: Microbial limit test results of Resveratrol Face serum formulation

All the medicine formulations met the required standards for limits. The F2 formulation had the microbes, which means it did a better job of keeping the microbes under control and staying fresh. The F2 formulation really showed that it has microbial stabilization and preservation which is important, for the F2 formulation itself.

6.11 Stability study

Table 11. Accelerated Stability Study (1 Months)

Parameter	F1	F2	F3
Appearance	Stable	Stable	Slight darkening
pH Change	Minimal	Negligible	Moderate
Viscosity Change	Slight	Negligible	Noticeable
Drug Content Retained (%)	93.8	98.1	91.5
Phase Separation	Absent	Absent	Slight

The F2 formula stayed the same throughout the study with very small changes, in how it looked its pH, how thick it was and how much drug it contained. The F3 formula was a little unstable because it had an amount of active ingredients.

7 Overall Comparison of Formulations

Evaluation Parameter	F1	F2	F3
Appearance	Pass	Pass	Acceptable
pH	Pass	Pass	Pass
Viscosity	Pass	Excellent	Acceptable
Spreadability	Good	Excellent	Fair
Drug Content	Good	Excellent	Good
Antioxidant Activity	Good	Excellent	Excellent
Skin Irritation	Pass	Pass	Mild irritation
Centrifufation	Pass	Pass	Marginal
Microbial Limit Test	Pass	Pass	Pass
Stability Study	Good	Excellent	Fair

8 Discussion

The goal of this study was to make and test a face serum that has resveratrol in it. This face serum is for anti-aging. It has antioxidants in it. The scientists used the skin of grapes to make this serum. Red grapes have a lot of things in them like resveratrol and other helpful chemicals. These chemicals are very good at stopping damage to the skin. They can help keep the skin from getting old too fast. They are often used in beauty products to protect the skin from harm and keep it looking young. The scientists wanted to see if this face serum with resveratrol, from grapes would really work to keep the skin looking young and healthy.

Because ethanol effectively removes polyphenolic chemicals and is safe, affordable, and appropriate for cosmetic purposes, the ethanolic extraction method was chosen. UV-visible spectrophotometry was used to standardize the extracted material for resveratrol. The calibration curve showed good linearity over the concentration range of 5–25 µg/mL, and the λmax of resveratrol was determined to be 304 nm, supporting the analytical method's appropriateness for quantitative measurement of resveratrol in the established serum formulations.

The thing that made the serum thick was carbopol 940. This helped the serum feel a way. The serum got. Absorbed by the skin because of propylene glycol. It was like a helper. To stop the skin from getting too dry they used glycerin. This was good, for the skin. The thing that stopped the serum from going bad was phenoxyethanol. This was important. They also added vitamin E acetate to stop the serum from breaking down. All of these things were used to make the F1, F2 and F3 types of serum. Each of these serums had some resveratrol in them. The people who made the serum chose these things because they wanted the serum to work well not spoil be easy to put on the skin and help keep the skin hydrated. They wanted the carbopol 940 propylene glycol, glycerin, phenoxyethanol and vitamin E acetate to all work to make a good serum.

The people who made the formulations looked at lots of things like how they felt and looked. All of the formulations were nice and smooth and looked good when people looked at them. One of them called F3 was not as clear as the others because it had more resveratrol in it. On the hand F2 was very clear and uniform. The pH of all the formulations was between 5.42 and 6.31. This is a range for the skin. So, it seems like these formulations will not irritate the skin when people put them on. The tests for how thick the formulations were and how well they spread showed that F2 was the best. This means it will be easy to put on the skin. It will stay on the skin. F3 had more of the ingredient in it but this made it thicker and

harder to spread. This is a problem because it affects how people like the formulation. The resveratrol formulations, like F3 had some issues, with how they felt and looked. The resveratrol formulations were still important to consider.

The resveratrol was mixed into the serum well. We checked the amount of medication in the serum. Found that F2 had the most, with 99.27 percent. This means that not much of the medication was lost when we made the serum and the amount of medication was the throughout. We used a tool to measure the amount of resveratrol in the serum and it worked well. We tested the serum to see if it could stop radicals, which are bad for the skin. The test showed that all of the serums we made could stop these radicals and the more resveratrol they had the better they worked. F2 was the serum because it had a good balance of stopping free radicals looking nice and not falling apart. This is even though F3 was a little better at stopping radicals because it had more resveratrol in it. The resveratrol, in F2 made it a good choice.

The skin compatibility of the product was really good. There was no redness, swelling, itching or burning feeling on the skin of people in groups F1 and F2. This is what the skin irritation research found out. Some people in group F3 got a little redness. This means that if you put more of the ingredient on the skin it might cause some irritation in people who have sensitive skin.

When the product was checked for microbes no bad germs were found. The number of microbes in all the formulations was very low. This is what the microbiological analysis showed. The product F2 had the number of bacteria. This means that F2 is very good at keeping microbes and the way it is preserved is working well. The total number of microbes and yeast and mold in all the products were, within the allowed limits.

The serum we made stayed stable when we stored it which's what the test was supposed to show. We did a test to see how the serum would hold up over time. When we looked at F3 it got a little darker and thicker when we stored it and that might be because it has more of chemicals. But F2 did not change much it looked the same had the pH was the same thickness had the same amount of the good stuff in it and was not contaminated with bad things. The F2 formulation with 1% resveratrol is the one we made. It has all the qualities we were looking for. The F2 formulation has physical and chemical characteristics it is easy to spread it has a lot of the good stuff in it it helps stop things from getting old it is clean and safe for the skin and it stays good for a long time. These results show that the F2 formulation is a choice for a natural face serum that helps stop aging and it is safe to put on the skin. The F2 formulation is a natural antioxidant and anti-aging face serum and it is perfect, for putting on the skin.

According to a study red grape skin extract is a natural way to get resveratrol. This can be used to make skin care products. The new formula is a way to protect skin from damage and may help reduce signs of aging. To know more about the resveratrol face serum we need to do more research, on how it works on skin how long it lasts and how it works on people.

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