



## **A RESEARCH ON FORMULATION OF POLY HERBAL ULTRASONIC GEL FOR SONOGRAPHY**

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### **ABSTRACT**

*In this formulation some available chemicals and natural ingredient were used which has no harmful effect to human skin. Chemicals that used were Carbopol 934, sodium benzoate, glycerin, tri-ethanolamine and natural ingredient is aloe & Strawberry Extract. Aloe vera extract which shows effective activity against allergic, irritation and inflammation problem due to its synergistic property.*

*Firstly, aloe gel was extracted by ethanol extraction. Gel was formulated combining all ingredients. To justify the effectiveness of any formulation, results of evaluation tests are very important.*

*For this, necessary physicochemical properties such as appearance, transparency, consistency, homogeneity, pH, thermal stability, conductivity, spreadability, viscosity etc. were evaluated.*

*The results were satisfactory. No microbial growth was found during the incubation period for the prepared ultrasound gel. Also, no adverse effect to the human skin like irritation, allergy, inflammation etc. was observed. Ultrasound gel usually acts as a conductive medium and the conductivity result provides the information about the image quality. Conductivity of this formulated gel was 4.05  $\mu\text{S}/\text{cm}$ . Using this formulated ultrasound gel during ultrasonography, clear image was found which was also of good quality. The overall results suggest that this formulation can be considered as successful and used with no harmful effect compared to the synthetic ones.*

*The present study focuses on the formulation and evaluation of an ultrasound-assisted polyherbal gel designed for enhanced transdermal delivery and therapeutic efficacy. Utilizing the synergistic properties of selected medicinal plants, the polyherbal formulation incorporates extracts known for their anti-inflammatory, antimicrobial, and wound-healing properties. Ultrasound (sonophoresis) was employed to improve the penetration of phytoconstituents through the skin barrier, thereby optimizing bioavailability and therapeutic action. The gel was formulated using biocompatible polymers and characterized for its physicochemical properties including pH, viscosity, spreadability, and stability.*

*In vitro and ex vivo studies demonstrated enhanced permeation and sustained release of active constituents when ultrasound was applied, compared to conventional topical application.*

*The results indicate that ultrasound-assisted delivery significantly enhances the effectiveness of the polyherbal gel, making it a promising candidate for the treatment of various dermatological conditions.*

**KEY WORDS:** - Ultrasonography, Carbopol 934, Aloe Extract, Strawberry extract, Ultra Sound Gel.

### **INTRODUCTION**

Ultrasound is widely used in rehabilitation, primarily for improving connective tissue extensibility and for promoting tissue healing and remodeling. The level of clinical benefit from therapeutic ultrasound remains uncertain, and depends on the application. Risk of harm is considered low when used properly, making ultrasound for physical therapy a treatment of modest efficacy but low risk. Topical analgesics will activate superficial thermal response receptor, providing hot or cold sensation. Topical herbal extracts suspended in aqueous gel are more effective in transmitting ultrasound energy, compared to cream-based agents which are less effective. Diagnostic ultrasound utilizes high-frequency sound waves to produce images of body internal organs and soft tissues. But sound waves cannot travel very well through air, that's why ultrasound gel is required. This gel serves as conductive medium that covers tiny pockets of air in the skin, enabling a tight bond between the skin and the transducer, letting the waves transmit directly to the tissues beneath and to the parts that image to be needed. Ultrasound gel is a medicine gel. It is used frequently in most hospitals, clinics and therapist centers. It helps to **avoid intense sound reflections caused by air pockets** at the borderline between the ultrasonic probe and skin. The best ultrasonic media is free of air bubbles to ensure perfect sound transmission. It is formulated in such a way that gel can act as a coupling agent and reduce static. The ultrasound waves have a hard time travelling through air, so the gel prevents any extra air space between the probe and human skin in order to create a clear image of the fetus. In recent years, ultrasound gel has become commonly used as a conductive medium in many diagnostic procedures such as electrocardiography, ultrasonography, endoscopy, and transesophageal echocardiogram examinations. Unfortunately, some chemicals are being used for the preparation of ultrasound gel those are allergenic to skin, such as phenoxyethanol, methylisothiazolinone and isothiazolinones which are used as preservatives for many industrial and



cosmetics products and there are many publications dealing with patients who have developed allergic dermatitis as a result of using these chemicals in the formulation of the gel. Moreover, women, in particular, may develop sudden allergic reactions to these above stated chemicals during pregnancy, which is often a result of the massive hormonal changes they go through. Aloe vera has anti-inflammatory action, anti-oxidant, anti-ageing action, antimicrobial, antifungal properties and promote wound healing. Aloe vera shows synergistic effects because it has 75 active components which provide special activities to healing allergic dermatitis, cancer, skin diseases, liver problems and AIDS. Specialized gels for ultrasound are prepared using aloe vera which does not contain impure additives that may irritate the skin. Hence, they will be generally safer and better for people with skin sensitivity issue.

## 1. Materials & Methods

### 1.1 Materials

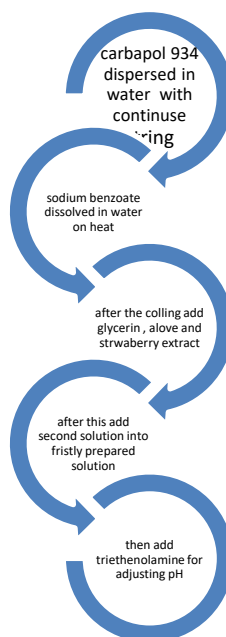
Sr. no	Chemicals	Quantity
1	Carbopol 934	6 gm
2	Sodium benzoate	1 gm
3	Glycerin	3 ml
4	Aloe extract	2 ml
5	Triethanolamine	3 ml
6	Strawberry extract	2 ml
7	Distilled water	1000 ml

### 1.2 Methods

- 1) Preparation Of aloe vera extract.
- 2) Preparation of strawberry extract.
- 3) Ultrasound gel formulation.

### Procedure

1. Prepare aloe vera gel by extracting a aloe vera
2. Prepare a Frist solution: - Carbopol 934 (6gm/1Lit) Dispersed in a distilled water with continues string using mechanical stirrer.
3. secondly Required quantity of Sodium benzoate dissolved in dist. Water and heated on water bath to dissolve properly. The solution was cool and the glycerin add aloe vera extract was added
4. finally mix both prepared solution
5. then add sufficient quantity of strawberry extract
6. finely try ethanol amine was added drop wise to the formulation for adjustment of pH to Obtain Required consistency.





## Ingredients

- a) **Carbopol 934:** - Enhance Viscosity, spread ability.
- b) **Sodium benzoate:** - extending the shelf life of product & preventing microbial Contamination.
- c) **Glycerin:** - Moisturizing and skin conditioning properties.
- d) **Aloe vera extract:** - **Potentially** reduce inflammation & promote wound healing
- e) **Triethanolamine:** - PH adjuster, Stabilizer, Emulsifiers & Contributing to the gel's overall stability & Performance.
- f) **Strawberry extract:** -Antioxidant protection help to protect skin from damage, UV damage protection (help to protect skin from UV damage)

## 2. Evaluation of Prepared Ultrasound Gel

### a) Visual Clarity and Appearance

Prepared gel formulation was inspected visually for its clarity, appearance, color, and consistency against a black and white background.

### b) Transparency

Approximately 5 mL of formulated gel was taken in the 10 mL test tube and its transparency was checked visually.

### c) Homogeneity

The formulation was tested for the homogeneity by visual appearance and by touch.

### d) pH

The pH meter was calibrated using standard buffer solution. About 0.5 g of the gel was weighed and dissolved in 50.0 mL of distilled water and its pH was measured.

### e) Thermal Stability

With the help of a spatula, the gel was inserted into a glass bottle and tapped to settle at the bottom. Two-third of the bottle was filled up and plug was inserted into it and then the cap was tightened. This filled bottle was kept erect inside the incubator at 45°C for 48 hours

### f) Removal

The ease of removal of the gel applied was examined by rubbing the applied part with tissue paper.

### g) Skin Irritation Test

Skin irritation test was performed for the prepared ultrasound gel by applying it on human volunteers to find out any irritation problems which could make it unsuitable for use. Three human volunteers were selected to check skin irritancy test. 1 gm of the sample was topically applied to the hand over a 2 square inch. In this test, the three human volunteers signed an informed consent letter for their agreement to participate. Observation for any lesions, irritation, edema or redness was performed at regular intervals for about 24 hrs and recorded

### h) Microbial Growth Test

The formulated gel was inoculated on the plates of agar media by streak plate method and a control was prepared by omitting the gel. The plates were placed inside the incubator and kept at 37°C for 24 hours. After the incubation period, plates were taken out and the microbial growth was checked by comparing it with the control





Sr.No	Parameter	F1	F2
1	Visual clarity and appearance	Good	Good
2	Transparency	Clear	Clear
3	Homogeneity	Good	Good
4	pH	6.8	6.5
5	Thermal Stability	To Paas the test	Pass the test
6	Removal	Easy	slightly sticky
7	Spreadability test	Good	Good
8	Viscosity		
9	Skin irritation Test	Safe For Use	Safe for use
10	Microbial growth test	Nil	Nil

**Physicochemical properties of the formulated ultrasound gel.**

**RESULTS & DISCUSSIONS**

**Visual Clarity and Appearance**

Clarity is one of the most important characteristic features of ultrasound gels. This formulation was of high clarity, transparent, with blue color, smooth homogeneous texture, and glossy appearance.

**Transparency**

The formulated gel was transparent.

**Homogeneity**

The formulation was tested for the homogeneity by visual appearance and by touch, result showed appearance and touch was good and non-greasy.

**pH of the Gel**

The pH of the gel was found to be 6.8 which is good for skin.

**Thermal Stability Test**

The formulation was passed the test.

**Removal**

The gel applied on skin was easily removed by rubbing with tissue paper.

**Spreadability Test**

The spreadability test showed that formulation has good spreadable property.

**Viscosity**

The viscosity of gel was very good which indicates that the gel is easily spreadable by small amounts of shear. The formulation was shown viscosity.

**Skin Irritation Test**

The formulation shows no redness, oedema, inflammation and irritation during irritancy studies. This formulation is safe to use for skin.

**Microbial Growth Test**

There were no signs of microbial growth after incubation period of 24 hours at 37°C for the sample gel compared with the control.

**Image Quality**

The formulated ultrasound transmission gel was applied to a pregnant woman for ultrasonography and hence a clear and good quality image of the fetus was obtained from the ultrasonogram. This proved that the gel was acceptable for ultrasonography as no other problem was arrived.

**CONCLUSION**

Pure aloe vera extract has an anti-inflammatory effect on the skin & strawberry extract has a Antioxidant protection helps to protect skin from damage, UV damage protection (help to protect skin from UV damage). This extract is obtained from the aloe vera plant which is well-known for its healing power since centuries. It provides improved conductivity; hence the formulated ultrasound gel using it creates an optimal contact between the device and the skin. Aloe vera is cheaper and widely available too. Gentle formulation with it is perfect for patients with sensitive skin due to its hypoallergenic properties.

The overall results suggest that the formulation can be considered a successful herbal ultrasound gel which is cheap and good compared to synthetic ones. The prepared formulation showed good spreadability, no evidence of phase separation and good consistency during the study Period.



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