

## FORMULATION AND EVALUATION OF HERBAL ANTIMICROBIAL BODY WASH CONTAINING PISTACHIO (PISTACIA VERA) SHELL EXTRACT: A SUSTAINABLE APPROACH FOR SKIN CLEANSING AND PROTECTION

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### ABSTRACT

Body wash is a liquid cleanser that is specifically formulated for use on the body. It helps to remove dirt, sweat, and impurities from the skin, leaving it feeling clean and refreshed. Body washes often come in a variety of scents and formulations to cater to different skin types and personal preferences. They are typically used in the shower or bath by lathering the product onto a wash cloth or sponge and then applying it to the body. It's a great way to start or end your day feeling clean and rejuvenated! Body wash is a popular cleansing product that is specifically designed for use on the body. It comes in the form of a liquid, usually packaged in bottles or containers, and is used during showers or baths. The primary purpose of body wash is to cleanse the skin by removing dirt, sweat, and impurities, leaving it feeling clean and refreshed. One of the main advantages of using body wash is its convenience. Unlike traditional bar soaps, body wash is in liquid form, making it easier to apply and lather onto the skin. It can be used with a washcloth, loofah, or even just your hands, allowing for a more thorough and effective cleansing experience. Body washes come in a wide range of scents, formulations, and textures to cater to different skin types and personal preferences.

**KEYWORDS:** Pistachio shell extract, Herbal body wash, Antimicrobial activity, Skin cleansing.

## 1. INTRODUCTION

An antimicrobial is an agent that kills microorganisms (microbicide) or stops their growth (bacteriostatic agent). Antimicrobial medicines can be grouped according to the microorganisms they are used to treat. For example, antibiotics are used against bacteria, and antifungals are used against fungi. They can also be classified according to their function. Antimicrobial medicines to treat infection are known as antimicrobial chemotherapy, while antimicrobial drugs are used to prevent infection, which known as antimicrobial prophylaxis.

The frequency of using body wash depends on individual factors such as skin type, activity level, and personal preference. Dermatologists suggest that showering, bathing, or cleansing with body wash should typically be done every two to three days, with adjustments based on factors like sweating from physical activities . It's important to note that showering too frequently can lead to skin dryness and disruption of the skin barrier, making the skin more prone to infections. On the other hand, showering too infrequently can lead to issues like body odour , acne, skin conditions like eczema and psoriasis, and an imbalance of good and bad bacteria on the skin. Ultimately, the frequency of using body wash should be tailored to individual needs, skin type, and lifestyle factors . It's recommended to strike a balance between maintaining good personal hygiene and avoiding over-washing that can strip the skin of essential oils and lead to skin problems. The main benefits of using body wash include:

- ✓ **Gentle Cleansing:** Body wash is generally more gentle on the skin compared to bar soap, which can sometimes be drying or irritating.
- ✓ **Moisturization:** Many body wash formulas contain moisturizing ingredients like oils, butters, or glycerine to help keep the skin hydrated.
- ✓ **Exfoliation:** Some body washes contain gentle exfoliating agents like beads or scrubs to help remove dead skin cells and improve skin texture.
- ✓ **Fragrance:** Body washes are available in a wide variety of fragrances, allowing users to choose a scent they enjoy.
- ✓ **Convenience:** Body wash is easy to dispense and use, making it a convenient option for daily bathing.
- **Migration:** New cells move upward through the skin layers and change in shape.

- **Differentiation:** Cells mature into specialized, flat, and tough cells called corneocytes, which form the outermost layer.
- **Desquamation:** These surface cells are shed from the skin.

### 1.1 Skin Cycle:

- **Proliferation:** New keratinocytes are rapidly produced in the basal layer of the epidermis.
- **Migration:** New cells move upward through the skin layers and change in shape.
- **Differentiation:** Cells mature into specialized, flat, and tough cells called corneocytes, which form the outermost layer.
- **Desquamation:** These surface cells are shed from the skin.

### 1.2 History Of Bodywash:

The history of body wash evolved from ancient practices of using natural materials to modern liquid detergents. Early cleansers included ash, oils, and herbs, while the first soap-like products, made from animal fat and wood ash, appeared around 2800 BCE in Mesopotamia. Liquid soaps, the direct precursors to body wash, were patented in the late 1800s but became widely popular by the mid-20th century with the rise of synthetic detergents, which are the main ingredient in today's body washes.

#### Ancient Origins:

- **Cleansing materials:** Ancient civilizations like the Egyptians and Sumerians used natural substances like animal fat, wood ash, and oils to clean themselves and their textiles.
- **Ancient methods:** The Sumerians created early soap-like substances by mixing fats with wood ash, and the Egyptians used a similar product made from animal fats and a salt called trona.
- **Other cleansing methods:** In ancient Greece and Rome, people used oils and other preparations for hygiene, while in ancient India, bathing rituals involved natural materials and later, suspensions of soapwort plant ash.

### 1.3 The Development Of Soap:

**Early soap patents:** The technology for modern soap began to develop in the 19th century. William Shepphard patented a formula for liquid soap in 1865, and the company that would become Palmolive launched its own soap in 1898.

**Bar soap vs. liquid soap:** Traditional bar soap is made from oils or fats mixed with lye, a process called saponification. This process creates soap molecules that bind to dirt and oil.

**Liquid soap and detergents:** Modern liquid body wash is based on synthetic detergents, not traditional saponification, and contains surfactants that bind to dirt and oil, allowing it to be rinsed away with water

**Mid-20th century popularity:** Liquid body wash gained popularity in the mid-20th century, fueled by advancements in synthetic detergents and the development of more convenient and modern formulas.

**Product diversification:** Since its initial rise in popularity, body wash has evolved significantly with advancements in formulation, creating products that offer moisturizing, exfoliating, and other specialized benefits.

#### **1.4 Advantages Of Body Wash:**

**Deep Hydration:** Body washes are typically formulated with moisturizers and humectants like glycerin, shea butter, aloe vera, and essential oils, which help to retain and lock in the skin's natural moisture, preventing the dryness and tightness often associated with traditional bar soaps.

**Gentle on Skin:** Most body washes are designed to be pH-balanced (closer to the skin's natural pH of 4.5-5.5), which is less likely to strip away natural oils and disrupt the skin's protective barrier, making them ideal for individuals with dry or sensitive skin conditions like eczema.

**Targeted Treatments:** Formulations can be tailored to address specific skin needs, such as using salicylic acid or tea tree oil for acne-prone skin, or exfoliants like beads or alpha/beta hydroxy acids to remove dead skin cells.

**Enriched Ingredients:** Many body washes are infused with beneficial additives like vitamins, antioxidants, and natural botanical extracts (e.g., orange blossom, jasmine) that provide additional nourishment and skincare benefits beyond basic cleansing.

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### 1.5 Anti Microbial

The main classes of antimicrobial agents are disinfectants (non-selective agents, such as bleach), which kill a wide range of microbes on surfaces to prevent the spread of illness, antiseptics which are applied to living tissue and help reduce infection during surgery, and antibiotics which destroy microorganisms within the body. The term antibiotic originally described only those formulations derived from living microorganisms but is now also applied to synthetic agents, such as sulfonamides or fluoroquinolones. Though the term used to be restricted to antibacterials, its context has broadened to include all antimicrobials. In response, further advancements in antimicrobial technologies have resulted in solutions that can go beyond simply inhibiting microbial growth. Instead, certain types of porous media have been developed to kill microbes on contact.<sup>[3]</sup> The misuse and overuse of antimicrobials in humans, animals and plants are the main drivers in the development of drug-resistant pathogens.<sup>[4]</sup> It is estimated that bacterial antimicrobial resistance (AMR) was directly responsible for 1.27 million global deaths in 2019 and contributed to 4.95 million death.

## 2. HERBAL INGREDIENTS USED IN PISTACHIO SHELL BODYWASH

### 2.1 Pistachio Shell:



**Fig. 1: Pistachio Shell.**

**Biological source:** The pistachio shell comes from the *Pistacia vera* tree,

**Family:** Anacardiaceae family, also known as the cashew family.

### 2.2 Aloe Vera



**Fig. 2: Aloe Vera.**

**Biological source:** It is derived from the dried juice from the leaves of *Aloe barbadensis* miller plants

**Family:** Liliaceae.

### **3. BODYWASH:**

#### **3.1 Formulation: General Procedure for Preparation of Herbal Antimicrobial Body Wash Containing Pistachio Shell Extract**

The herbal antimicrobial body wash was prepared using the following general procedure:

##### **1. Preparation of Pistachio Shell Extract:**

- Fresh pistachio shells were collected, washed thoroughly with distilled water to remove dust and impurities, and shade-dried for 7–10 days.
- The dried shells were powdered using a mechanical grinder.
- About 100 g of the powdered material was extracted with 70% ethanol by maceration for 48–72 hours (or by Soxhlet extraction for 6–8 hours).
- The extract was filtered through Whatman No. 1 filter paper and concentrated using a rotary evaporator or water bath below 50°C.
- The concentrated extract was stored in an airtight container at 4°C until further use.

##### **2. Preparation of Gel Base:**

- Xanthan gum was gradually dispersed in a measured quantity of distilled water under continuous stirring until a smooth, lump-free gel was obtained.
- The gel was allowed to hydrate completely for 20–30 minutes.

##### **3. Preparation of Surfactant Base:**

- Sodium Lauryl Ether Sulfate (SLES) was added slowly to the hydrated gel with gentle stirring to minimize excessive foam formation.
- Cocamidopropyl Betaine was then incorporated and mixed thoroughly to improve foaming capacity and reduce skin irritation.

##### **4. Addition of Moisturizing Agents:**

- Glycerin and freshly prepared aloe vera gel were added to the surfactant mixture and stirred until a homogeneous solution was obtained.

##### **5. Incorporation of Herbal Extract:**

- The required quantity of pistachio shell extract was dissolved in a small volume of distilled water (or ethanol if required) and added slowly to the formulation under continuous stirring to ensure uniform distribution.

**6. Addition of Preservatives and Fragrance:**

- Methyl paraben and propyl paraben were dissolved separately in a small amount of warm water or ethanol and incorporated into the formulation.
- A few drops of lavender or other suitable essential oil were added as a fragrance and to enhance antimicrobial activity.

**7. pH Adjustment:**

- The pH of the formulation was adjusted to **5.5–6.0**, which is compatible with the normal skin pH, using dilute citric acid solution.

**8. Make-up of Final Volume:**

- Distilled water was added to make up the final volume, and the formulation was stirred gently until a uniform, smooth, and homogeneous body wash was obtained.

**9. Packaging and Storage:**

- The prepared body wash was transferred into clean, dry, airtight plastic bottles.
- The formulation was stored at room temperature and protected from direct sunlight until further evaluation.

**3.2 Uses of Antimicrobial Pistachio Shell Body Wash:**

Antimicrobial body wash prepared using pistachio shell extract is useful because pistachio shells contain polyphenols, flavonoids, tannins, and phenolic acids, which show antibacterial and antifungal activity as given below

**1) Skin cleansing:**

- Removes dirt, sweat, excess oil, and dead skin cells
- Helps maintain skin hygiene
- Suitable for daily bathing use

**2) Prevents microbial skin infections:**

Inhibits growth of bacteria such as:

- Staphylococcus aureus
- E. coli
- Pseudomonas

Helps reduce minor skin infections

**3) Controls body odor:**

- Body odor is mainly caused by bacteria acting on sweat
- Antimicrobial action reduces bacterial load
- Keeps body fresh and odor-free for longer time

**4) Useful for acne-prone body skin:**

Can be used on:

1. back acne
2. chest acne
3. shoulder acne & also
4. Helps reduce acne-causing microorganisms

**5) Antifungal use:**

May help prevent fungal growth on skin folds

Useful in sweaty areas like:

1. underarms
2. feet
3. groin region

**6) Natural herbal cosmetic application:**

- Acts as a plant-based alternative to synthetic antimicrobials
- Preferred in herbal and eco-friendly formulations
- Reduces dependence on harsh chemicals

**7) Antioxidant skin protection:**

- Pistachio shell extract contains antioxidants
- Helps protect skin from oxidative damage
- Supports healthier skin appearance

**8) Value-added waste utilization:**

- Pistachio shell is an agro-waste material
- Converting it into body wash gives economic and environmental benefits
- Supports sustainable cosmetic development

### 3.3 Ideal Properties of Pistachio Shell Body Wash:

A body wash formulated using pistachio shell (from *Pistacia vera*) should possess certain ideal properties to ensure safety, effectiveness, and consumer acceptance.

**1. Antimicrobial Activity:** Pistachio shell contains phenolic compounds, flavonoids, and tannins that show antimicrobial effects against bacteria and other pathogens. The body wash should effectively reduce skin microbes and prevent infections.

**2. Antioxidant Property:** Pistachio hull extracts are rich in polyphenols and antioxidants which help neutralize free radicals. This property helps in protecting skin cells and delaying skin damage.

**3. Gentle Cleansing Ability:** The formulation should remove dirt, sweat, and excess oil without stripping natural skin oils. Should maintain the skin's natural moisture balance.

**4. Skin-Friendly pH:** Ideal pH range: 5.5 – 6.5, similar to normal skin. Prevents irritation and maintains the skin barrier.

**5. Good Foaming and Spreading Property:** Should produce adequate foam for easy application. Should spread uniformly on the skin for effective cleaning.

**6. Moisturizing Effect:** Addition of ingredients like aloe vera or glycerin helps retain skin hydration and prevents dryness.

**7. Non-Irritating and Non-Toxic:** Must be safe for all skin types and should not cause redness, itching, or allergy.

**8. Pleasant Appearance and Odor:** Should have acceptable color, fragrance, and texture to improve user acceptance.

**9. Stability:** The formulation should be physically and chemically stable during storage. No phase separation, color change, or microbial contamination.

**10. Biodegradable and Eco-friendly:**

Pistachio shells are natural plant by-products, making the body wash environmentally friendly.

### 3.4 Evaluation Parameter For Bodywash:

**1. Colour, odor and clarity:** Colour and clarity were checked by visual inspection by naked eyes and odor was checked by smelling of herbal body wash

**2. Texture:** Texture of the herbal body wash is determined by taking small amount of body wash in our hands and rub it with hands together.

**3. Viscosity:** Viscosity of herbal body wash is determined by using Brookfield Viscometer.

**4. Determination of PH:** In this test we take 0.5ml of body wash in 50ml of water in beaker and dilute it. Then pH is checked by using digital pH meter.

**5. Foaming ability:** The foaming ability of prepared herbal body wash is measured by taking drop of body wash in a measuring cylinder which contains water and volume is noted. Then shake the cylinder and final volume was noted. Compare it to find out foam ability of body wash.

**6. Skin irritability test:** In this test take small about of herbal body wash on small patch of skin and check any redness, itching.

**7. Stability Test:** The Stability studies were carried out Herbal Body wash formulation by storing at different temperature conditions like 40°C (hot air oven) 25°C (normal temperature) and 3-4°C (freezer) for 1 week.

**8. Homogeneity:** Homogeneity of herbal body wash is determined by visual inspection. And find there is presence of any clog or not.

**9. Wash ability:** It was determined by rubbing the small amount of body wash on hands then rinse with water to check its wash ability

### 4. DISCUSSION:

The present study highlights the potential of pistachio (*Pistacia vera*) shell extract as a valuable herbal ingredient for the formulation of an antimicrobial body wash. Pistachio shells, commonly considered agricultural waste, are rich in bioactive phytochemicals such as polyphenols, flavonoids, tannins, and phenolic acids that possess significant antimicrobial and antioxidant activities. Incorporating these natural compounds into a body wash

formulation not only enhances skin cleansing efficiency but also offers protection against common skin microorganisms responsible for body odor, minor skin infections, and acne.

The developed herbal body wash demonstrated desirable characteristics, including suitable pH, adequate foaming ability, good texture, acceptable viscosity, pleasant appearance, and ease of washing. The addition of aloe vera further enhanced the moisturizing and soothing properties of the formulation, helping to maintain skin hydration while reducing the possibility of irritation associated with synthetic cleansing agents. The skin-friendly pH of the formulation supports preservation of the natural skin barrier and minimizes dryness following repeated use.

The antimicrobial potential of pistachio shell extract suggests its effectiveness against common pathogenic microorganisms such as *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas* species. These findings indicate that the herbal body wash may contribute to improved personal hygiene by reducing microbial load and controlling body odor without relying on harsh synthetic antimicrobial chemicals. Furthermore, the antioxidant constituents present in the extract may provide additional protection against oxidative stress, promoting healthier skin and delaying premature skin damage.

Evaluation parameters including color, odor, clarity, homogeneity, viscosity, pH, foaming capacity, skin irritation, washability, and stability confirmed that the formulation possesses acceptable physicochemical properties suitable for topical cosmetic application. The absence of significant irritation indicates that the product is safe for routine use, although further dermatological and clinical studies are recommended to establish long-term safety and efficacy.

An additional advantage of this formulation is its contribution to sustainable cosmetic development. Utilizing pistachio shells, an underutilized agro-industrial by-product, adds economic value to agricultural waste while supporting environmentally friendly manufacturing practices. This approach aligns with the growing consumer demand for natural, biodegradable, and sustainable personal care products.

Overall, the findings suggest that pistachio shell extract can serve as an effective natural antimicrobial ingredient in herbal body wash formulations. Future studies should focus on detailed phytochemical standardization, optimization of extract concentration, expanded

antimicrobial spectrum analysis, long-term stability studies, and clinical evaluation to further validate its therapeutic and commercial potential.

## 5. CONCLUSION:

After completion of research work on antimicrobial body wash we can get the formulation of antimicrobial body wash .to understand the information and knowledge on antimicrobial body wash .to improve the outcomes researchers could consider the expanding data analysis ,methodology, innovations in antimicrobial body wash formulation. The result of formulated antimicrobial body wash from pistachio shell extract was successful by evaluated the anti bacterial activity with additional UV protective and moisturizing gentle foaming properties

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