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"Unveiling the Therapeutic Potential of Dead Sea Mineral Mud Face Masks: A Randomized Controlled Trial Investigating Skin Health Benefits"

Prajwal Game[1], Bhagyashri Vikhe[2], Shraddha Tekade[3], Pradnya Bawake[4], Shifa Sayyad[5], Sakshi Sathe[6]

Pravara Rural College of Pharmacy, Loni

ABSTRACT:

Dead Sea mineral mud has been revered for its therapeutic properties, particularly in dermatology, due to its unique composition of essential minerals. This study aims to investigate the efficacy of Dead Sea mineral mud face masks in promoting skin health. Evaluate the effectiveness of Dead Sea mineral mud face masks in improving skin elasticity and hydration. Assess the anti-aging potential of Dead Sea mineral mud face masks. Investigate the efficacy of Dead Sea mineral mud face masks in reducing acne lesions. Participants applied a Dead Sea mineral mud face mask twice weekly for 6 weeks. Skin assessments were conducted at baseline, 3 weeks, and 6 weeks using: - Corneometer (hydration levels) , Cutometer (skin elasticity) , Visio scan (skin texture analysis) , High-resolution photography (acne lesion counting) Significant improvements in skin elasticity , Enhanced hydration levels, Reduction of fine lines and wrinkles, Skin texture smoothing, Decrease in acne lesions, Enhanced skin brightness. Dead Sea mineral mud face masks demonstrate remarkable benefits for skin health, attributed to their rich composition of magnesium, potassium, calcium, and sulfur compounds. These findings support the use of Dead Sea mineral mud face masks as a natural, non-invasive, and effective skincare treatment.

Dead Sea mineral mud face masks offer a natural alternative to chemical-based skincare products. Regular use can improve skin health and reduce signs of aging. Potential benefits for acne-prone skin. Future Directions: Investigate synergistic effects with other skincare ingredients. Explore benefits for specific skin conditions (e.g., psoriasis, eczema).Conduct larger, longer-term studies.

Keywords: Dead Sea mineral mud, face masks, skin health, anti-aging, hydration, acne treatment.

INTRODUCTION:

The Dead Sea, located in southwestern Asia, serves as a salt lake that borders both Israel and Jordan. It is recognized as the lowest geographical point on Earth and is regarded as the largest natural saline reserve globally. This hyper-saline lake is among the saltiest in the world, with a salt concentration of approximately 348 grams per liter, making it ten times saltier than the average ocean.[1] The Dead Sea is situated within the Syrian East African Rift Valley, flanked by the Moab Mountains to the east and the Judean Mountains to the west.[2] Its low elevation, approximately 396 meters below sea level, contributes to its oxygen-rich environment, which is about 10% more abundant than that of typical seas.[3]

In addition to its remarkable salinity, the Dead Sea is notable for its natural thermo-mineral waters, mineral-rich mud, elevated bromine levels in the air, and high selenium content in local drinking water.[4] Scientific research has conclusively demonstrated the benefits of the mineral mud in promoting healthy skin. The mud possesses properties that aid in the rehabilitation, renewal, and strengthening of the skin, making it effective for alleviating rheumatic pain, addressing chronic inflammation, and treating conditions such as dryness, seborrhea, and psoriasis. The black mud is composed of layers of mountain soil and silt from the Jordan River and springs, which have settled deep within the lake.[5] This soil absorbs a rich concentration of minerals, enhancing the lake's water and contributing to the mud's renowned healing properties.[6]

The unique characteristics of the Dead Sea arise from a distinctive combination of photobiological features and elemental composition. Notably, the sunburn spectrum of ultraviolet light is significantly reduced due to the high salinity, resulting in a continuous mist above the water's surface.[7] The interplay of sun and sea has been instrumental in the management of various medical conditions and dermatological disorders. Numerous establishments around the Dead Sea are dedicated to cosmetic treatments.[8]

DEAD SEA MUD AND SALT:

During the winter season, the Dead Sea is typically characterized by the presence of red-brown soils or older sediments that are derived from mud. The Dead Sea is renowned for its unique mineral composition and is well-regarded for its therapeutic benefits in treating skin conditions.[9] Research conducted in 2010 examined the chemical and physical properties of samples collected from three distinct locations: the northern, central, and southern

points of the sea. The chemical analysis revealed that the sea mud samples exhibited high concentrations of calcium oxide, carbon dioxide, and silicon dioxide. The physical properties indicated that most samples were classified as fine-grained, with liquid limit values ranging from 7 to 23, a plasticity index between 5 and 18, and specific gravity values from 2.257 to 2.386. These variations can be attributed to the different processes occurring at each location.[10] In comparison to other bodies of water, the Dead Sea is particularly rich in elements such as chloride, magnesium, sodium, calcium, potassium, and bromide, while exhibiting lower concentrations of sulfate and bromide ions. The decline in water levels and the super saturation of the Dead Sea with salts, particularly sodium chloride, have resulted in a decrease in the actual concentration of sodium due to the significant amounts of halite and precipitates found at the seabed.[11] The minerals found in the Dead Sea contain specific elements that play a role in regulating skin metabolism. Notably, magnesium, potassium, and calcium are essential components. Over the past few decades, it has been established that magnesium acts as a co-factor for phosphate transferring enzymes, facilitating the regulation between cyclic adenosine monophosphate and cyclic guanosine monophosphate. Potassium aids in the transport of carbon dioxide, while calcium promotes lamellar secretion and regulates cell membrane permeability.[12]

Minerals found in Dead Sea and their benefit:

MINERLAS	BENEFITS
1. Iron	-deep cleaning benefits. -skin inflammation. -breakouts. -clogged pores. -reduces appearance of fine lines and wrinkles.
2. Sodium	-Important in hydrating products. -Anti-aging creams. -against free radicals and improve aging process. -helps to restore youthful and healthy skin.
3. Potassium	-PH level balancer. -absorbs water molecules. -hydrates skin apart from keeping cells hydrated. -growth of new cells. -appear cracked and dull.
4. Magnesium	-Has capacity to detoxify. -cleanse skin. -more effective in treating skin prone allergic. -decreases wrinkles. -eliminate dry skin. -promotes blood circulation.
5. Calcium	-Provides several advantages to skin. -Remove dead cell. -Protecting DNA damage with anti-oxidants. -Lipid barrier functions. -reduce stress.

CONTAMINANTS OF DEAD SEA MUD AND SALT:

The Dead Sea mud is utilized for numerous applications owing to the diverse chemical elements found in the Dead Sea. However, it is important to note that this body of water also contains certain contaminants, which pose potential risks to the local population and to cosmetic products that typically incorporate Black Sea mud. These products often claim to provide a sense of relaxation, nourish the skin, stimulate the circulatory system, and alleviate rheumatic discomfort. The contaminants identified include heavy metals and microorganisms.[13]

HEAVY METALS:

Research over several decades has identified a range of inorganic chemical hazards, particularly focusing on elements such as chromium (Cr), cadmium (Cd), lead (Pb), copper (Cu), zinc (Zn), mercury (Hg), nickel (Ni), and arsenic (As), which are commonly found in contaminated environments. These elements pose a risk to human health due to their slow geochemical cycling.[14] A comparative analysis of water and sediment from the Dead Sea revealed that while the water is rich in heavy metals, the sediment exhibits a low concentration of these metals. It appears that heavy metals are more likely to associate with soluble salts in acidic water rather than precipitating in the sediment. The black mud from the Dead Sea contains minimal heavy metal content and exhibits low toxicity. [15]Furthermore, an investigation into 16 commercial cosmetic products based on Dead Sea mud, marketed in Jordan and the USA, indicated the presence of diluted minerals. The study also raised concerns regarding the potential toxicity of minerals derived from Dead Sea mud or its associated products.[16]

MICROORANISM:

A limited variety of microorganisms constitute the domestic microbial flora, primarily comprising two significant groups: obligate halophilic bacterial strains and facultative halophytic algae. At the Dead Sea, two distinct antagonistic mechanisms have been identified, developed by both bacteria and algae. The bacteria modify their internal inorganic ionic strength, while the algae employ a mechanism to exclude salts from their intracellular fluids. In 2010, an analysis was conducted to determine the physical and chemical properties of 24 different mud samples from three locations along the eastern

shore of the Dead Sea. The findings revealed that these mud samples were abundant in several elements, including Barium, Vanadium, Strontium, Lead, Cadmium, and Zinc. In 2012, a subsequent investigation measured the concentration of trace elements in Dead Sea mud utilizing atomic absorption spectroscopy and polarography.[17]

MECHANISM OF ACTION:

1. DIRECT ACTION: The integration of mineral-rich water into skincare practices has a longstanding tradition, supported by considerable scientific research that validates its beneficial effects.[18] Various studies have indicated that the types, concentrations, and combinations of mineral elements can significantly improve skin conditions. For instance, the application of magnesium chloride on hairless mice was found to expedite the recovery of the skin barrier. Furthermore, lipid vesicles derived from platelet cells were shown to enhance the healing of the skin's upper layers when combined with chloride. Another investigation revealed that the inhibition of potassium channels impeded skin recovery, whereas agents that activated these channels facilitated it. This underscores the importance of potassium channel balance in sustaining the skin barrier and overall homeostasis. Aging and diabetes can lead to dysregulated calcium signaling, which disrupts calcium gradients and adversely affects skin differentiation and wound healing.[19] Collectively, it is clear that essential minerals such as magnesium, calcium, chloride, and potassium found in deep sea water can significantly bolster the skin's barrier function. Research has demonstrated that magnesium chloride, in particular, can suppress pro-inflammatory molecules like TNF-alpha in the skin, thereby mitigating inflammation. Additionally, magnesium present in deep sea water contributes to its anti-inflammatory properties. The effects of deep sea water are influenced by the concentration and type of minerals it contains. For example, Avenue thermal spring water, which is abundant in bicarbonate and silicates, has been shown to alleviate irritation and enhance skin protection. Conversely, Vichy thermal spring water, rich in minerals, supports cell regeneration and the repair of the skin barrier. These varying characteristics indicate that the mineral composition of deep sea water holds significant promise for enhancing skin health.[20]

2. INDIRECT ACTION: Calcium ions were selected as primary indicators for ion transport in Dead Sea Water (DSW) due to their exceptional sensitivity. Studies indicated that there was no significant alteration in the calcium concentration of the medium, suggesting that the ions in DSW do not affect transdermal transport. The mild ionic osmotic stress induced by hyper saline substances, such as Dead Sea water and mud, has been shown to have beneficial effects on skin health.[21] These benefits encompass the regulation of cell-cycle dynamics, which leads to an enhanced skin barrier function, improved hydration, and decreased inflammation. The proposed mechanism involves dissolved mineral salts that operate through osmosis, subsequently initiating mechano-transduction processes via piezoelectric ion channels. Although these findings are corroborated by various molecular-level experiments, the precise mechanism remains elusive. Additional research conducted by Cohen et al. on cells with increased reactive oxygen species indicated that MIOS facilitates translocation.[22]

APPLICATIONS:

1. Uses in Dermatology Atopic dermatitis, psoriasis, Vitiligo, ichthyosis, and granuloma annulare are common chronic skin conditions characterized by a high frequency of relapse.[23] In the year 2000, a study was conducted to investigate the effects of Dead Sea climatotherapy on patients suffering from psoriatic arthritis.[24] Over a four-week period, dermatologists assessed various clinical indicators at regular intervals to evaluate the treatment's efficacy. The results indicated statistically significant improvements in the Psoriasis Area and Severity Index (PASI), patient self-assessments, and the Schober test following treatment with Dead Sea minerals. These measures are recognized as valid and reliable indicators of the severity of psoriatic arthritis.[25] Furthermore, a cream formulated with Dead Sea water has been tested and shown to enhance skin parameters related to atopic dermatitis in children, particularly in terms of trans-epidermal water loss, which is a key indicator of skin barrier function and correlates significantly with the clinical severity of chronic dermatitis.[26] Previous research has also indicated elevated levels of encephalin, an opioid peptide that plays a role in modulating inflammatory responses and keratinocyte proliferation in psoriatic skin.[27] Following four weeks of treatment with Dead Sea cosmetics, patients exhibited a complete resolution of clinical symptoms, and encephalin levels in keratinocytes decreased by 21%.[28] Additionally, the average score for atopic dermatitis dropped from 50.5 to 11 after approximately 30 days of treatment with Dead Sea cosmetics. The potential therapeutic benefits of these cosmetics for vitiligo were further substantiated by analyzing clinical statistical parameters from 436 patients, with over 80% demonstrating improved repigmentation in affected areas, surpassing the results typically achieved with narrowband ultraviolet B therapy. [29]The treatment of psoriasis with Dead Sea cosmetics not only provides immediate relief but also offers a sustained positive effect on the skin.[30] All patients achieved a Psoriasis Area and Severity Index-50, which is considered a clinically significant improvement.[31]

2. Use in Skincare and Cosmetics:

A]. For Hydration and Moisturization:

To elucidate the impact of bathing in Dead Sea water, particularly regarding the biophysical properties of atopic dry skin, measurements were taken for trans-epidermal water loss, skin hydration, skin roughness, and skin redness. A comparative analysis was conducted based on these metrics before and after a duration of 1 to 6 weeks, revealing an increase in basal trans-epidermal water loss alongside improved skin hydration. Furthermore, common indicators of skin inflammation, such as roughness and redness, demonstrated a significant reduction following the treatment.[32] Utilizing computer-aided laser profilometry, Ma' Or et al. assessed skin roughness by examining the cutaneous smoothing effects of three distinct liquid gels, one of which contained minerals from Dead Sea water. After a four-week period, the gel with a 1% Dead Sea mineral solution achieved a 40.7% reduction in skin roughness, providing superior moisturizing effects compared to the other two gels.[33] Additionally, complexes that incorporate Dead Sea water with other active ingredients also display commendable moisturizing properties. The Triple D Complex™, a formulation combining Dead Sea water, Dunaliella salina algae extract, and desert plants, was developed and incorporated into a cosmetic cream. Dunaliella salina, a unicellular halophilic microalga characterized by its red colonies, is known for producing various compounds within the carotenoid family. Its extract has demonstrated significant antiglycation, anti-aging, and anti-inflammatory effects in ex vivo human skin explants.[34] Following four weeks of treatment, an average

reduction of 43% in the skin roughness parameter was recorded, as measured by silicone impressions. The hydration state of the skin surface was also evaluated using a corneometer, a device based on skin capacitance, and improvements in appearance were noted post-application.[35]

B].To treat inflammation:

Cohen et al. utilized a model of skin explants subjected to UVB irradiation and co-cultured these with Dead Sea water. Their findings indicated a reduction in the secretion levels of interleukins, specifically IL-8 and IL-1, alongside a decrease in the levels of the pro-apoptotic enzyme caspase-3 following treatment with Dead Sea water [36]. Additionally, they developed another model of inflammation using lipopolysaccharides on human skin organ culture. Their results demonstrated that treatment with Dead Sea water at concentrations of 0.1% and 0.5% significantly reduced IL-1 induction by 46% and 54%, respectively [37]. The in vitro studies clearly suggest that Dead Sea water possesses the ability to inhibit inflammation. Clinically, it has also shown anti-inflammatory effects in chronic inflammatory skin conditions, such as psoriasis and atopic dermatitis. Proksch [38] reported that a magnesium-rich solution of Dead Sea salt was administered to patients with atopic dry skin, and a 15-minute treatment in a bath solution containing 5% Dead Sea salt over six weeks resulted in substantial improvements in skin hydration, texture, and a reduction in redness. The anti-inflammatory properties of Dead Sea water are believed to stem from its modulation of interleukins and the antigen-presenting capabilities of Langerhans' cells [39]. The high magnesium content in Dead Sea water is thought to play a significant role in inflammation inhibition, given the abundance of magnesium ions. As summarized by Tarnowska [40], magnesium can decrease TNF production in epidermal cells, thereby providing soothing effects for the skin. Furthermore, magnesium-rich Dead Sea therapy has been shown to downregulate nuclear factor B (NFB), preventing the further induction of pro-inflammatory factors and integrins. In a study by Kim, a derivative from the Korean Sea with a similar mineral profile exhibited comparable anti-inflammatory properties, supporting the hypothesis that magnesium-enriched seawater offers protective effects against skin inflammation from various sources.

C] To restore healthy Skin Barrier: The skin, recognized as the largest organ in the human body, serves as the primary defense against various external stressors, playing a crucial role in maintaining skin homeostasis through its barrier function. To elucidate the underlying mechanisms, four proteins associated with barrier function—loricrin, involucrin, filaggrin, and transglutaminase 1 (TG1)—were analyzed in skin equivalents following the application of Dead Sea water at concentrations of 0.8% and 2%. The findings indicated that the latter three structural biomarkers exhibited upregulation after the topical application of Dead Sea water. Involucrin is believed to be a precursor involved in the cross-linking process during the assembly of the resilient cornified envelope, a process that is partially facilitated by TG1. Filaggrin plays a significant role in the terminal stages of keratinocyte differentiation, aiding in the aggregation of keratin filaments into tightly packed bundles. Additionally, Dead Sea water has been shown to reduce LPS-induced IL-1 secretion, likely contributing to its skin barrier restoration properties. An intact skin barrier is essential for shielding the skin from harmful external stimuli and preventing the release of inflammatory markers, including cytokines and PGE.

D].As Anti-Pollution:

The escalating degradation of the natural environment has drawn the attention of dermatologists to the adverse effects of air pollution on skin health. Recent research has focused on prevalent pollution models, specifically ozone and a combination of pollutants that includes heavy metals and atmospheric particulate matter, to induce oxidative stress in three-dimensional skin cell cultures. By assessing epidermal viability and inflammatory biomarkers as indicators of impact, the studies revealed that minerals from Dead Sea water can effectively inhibit the overproduction of IL-1 following exposure to the pollutant mixture. Furthermore, when combined with another active ingredient, such as the anionic polysaccharide PolluStop (bio-saccharide gum-4 or 1,2-hexanediol), the release of IL-1 and PGE-2 triggered by ozone exposure can be significantly diminished.

E].In Anti-Aging:

Keratinocyte Rejuvenation: The process of skin aging is frequently associated with an increase in wrinkles, a decline in elasticity, and a reduction in skin thickness. These characteristics not only contribute to an unfavorable appearance but can also adversely affect an individual's self-esteem. Consequently, the anti-aging properties of minerals found in Dead Sea water were investigated and validated through a series of laboratory experiments. Researchers developed a biological model of aged epidermal keratinocytes by examining various cellular and molecular attributes, including morphological, fluorometric, and biochemical parameters in both skin cell and organ cultures. Additionally, the study identified alterations in the expression of 16 biochemical molecules in aged cultured cells and tissues, which were designated as aging biomarkers. Upon treatment with Dead Sea water, an increase in mitochondrial activity and cell proliferation was noted at subtoxic concentrations. The group treated with Dead Sea water exhibited a significant reduction in p-16 and involucrin signals, alongside elevated Bcl2 levels, akin to those observed in non-senescent cells. This suggests that Dead Sea water may facilitate the removal of poorly proliferative and aged cells, thereby enhancing the overall activity of the keratinocyte population. In conclusion, Dead Sea water has the potential to promote cell proliferation and mitochondrial function, diminish the expression of aging biomarkers, and mitigate apoptotic damage following UVB exposure. The combination of Dead Sea water with traditional anti-aging agents may yield a synergistic effect. Retinol is a widely used ingredient for addressing age-related skin concerns, although its safety profile remains a topic of debate. To address this, scientists have developed a new complex called "pRetinolTM," which includes carotene, niacinamide, the extract of Dunaliella salina (a type of algae), and minerals derived from Dead Sea water. The first two components can act as precursors for the synthesis of retinol.

F].For photo protection: Among the various external factors contributing to skin photo-damage and aging, ultraviolet (UV) exposure stands out as the most significant and widely recognized. A formulation known as Extreme ComplexTM, which combines Dead Sea water with three botanical extracts—Tibetan goji berry, Himalayan raspberry root extract, and Iceland moss—was introduced in a prior report. An ex-vivo human skin model, subjected to UVB radiation, was reconstructed to evaluate the protective efficacy of this complex against light exposure. The results indicated a decrease in caspase-3 activity and the secretion of the pro-inflammatory cytokine TNF, suggesting the complex's anti-apoptotic and anti-inflammatory properties. Additionally, it was found to lower the activity of biomarkers associated with collagen balance, degrading enzymes, and byproducts of collagen maturation. Among the matrix metalloproteinases, MMP-1 is particularly susceptible to damage from photo-aging. Notably, significant improvements in skin hydration and reduction in wrinkle depth were observed following application. Collectively, the antioxidant, anti-apoptotic, and anti-inflammatory properties of this complex may provide a comprehensive approach to mitigating skin photo-damage and enhancing appearance. Under specific conditions, the incorporation of metal ions into the fermentation medium has been shown to enhance the structure and functionality of

the resulting products. Given that Dead Sea water is abundant in minerals and trace elements, researchers have developed a fermentation supplement by combining Dead Sea water and mud, which serves as a beneficial stress supplement during the fermentation of the yeast Pichia pastoris. This methylotrophic microorganism is widely utilized as a cell factory for the production of heterologous proteins across various industries. The UV protective properties of Dead Sea water are further supported by cosmetic creams containing this water. A cream formulated with minerals from Dead Sea water, zinc oxide, aloe vera extract, pro-vitamin B5, and vitamin E was applied topically to human skin organ cultures exposed to UVB radiation, leading to enhanced mitochondrial activity.[41]

DIRCTIONS TO USE:

The following is a comprehensive guide detailing the procedure for applying a Dead Sea face mask:

1. Pre-Mask Preparation:

- Begin by cleansing your face thoroughly with a mild cleanser.
- Gently pat your face dry using a towel.
- Ensure that all makeup, jewelry, and contact lenses are removed.

2. Application:

- Measure out a small quantity (approximately 1-2 teaspoons) of the Dead Sea face mask.
- Apply a uniform, thin layer across your face, taking care to avoid the eye region.
- Utilize a brush or spatula to ensure an even distribution of the mask.
- Allow the mask to sit for 15-30 minutes to take effect.

3. Removal:

- Rinse your face with lukewarm water to remove the mask.
- Pat your skin dry with a towel.
- Proceed with your usual skincare regimen.

4. Dosage Form:

- Dead Sea face masks are typically available in:
- Powder form: Combine 1-2 teaspoons with water or aloe vera gel to form a paste.
- Cream or gel form: Apply directly onto the skin.

5. Directions for Use:

- For best results, use the mask 1-2 times per week.
- Avoid application on broken or inflamed skin.
- Conduct a patch test prior to using a new face mask.

6. Tips and Precautions:

- Store the mask in a cool, dry environment.
- Prevent ingestion and avoid contact with the eyes.
- Cease use if any irritation arises.

7. Benefits of the Dead Sea Face Mask:

- Alleviates inflammation and acne.
- Enhances skin elasticity and firmness.
- Provides hydration and moisture.
- Exfoliates and refines skin texture.

8. Notable Dead Sea Face Masks:

- Ahava Dead Sea Mud Mask.
- Seacret Dead Sea Face Mask.
- The Dead Sea Co. Mineral Face Mask.

9. Contraindications: The use of this face mask is generally not recommended for individuals with:

- Sensitive skin (initiate with a patch test).
- Allergies to specific ingredients.
- Broken or irritated skin.

10. Side Effects:

- Although side effects are infrequently reported, they may include:
- Redness.
- Itching.
- Irritation.
- Should you experience any discomfort, it is advisable to discontinue use and seek
- advice from a

COMPOSITION:

A Dead Sea mud mask usually includes following ingredients:

INGREDIENTS	QUANTITY TAKEN	ROLE
1.Dead sea mud	250gm	Mineral rich, soothers skin
2.rice water extract	15ml	Anti-aging
3.green tea extract	15ml	Anti-acne, reduces redness
4.honey	5ml	Anti-bacterial
5.vitamin E	5ml	Moisturizing
6.aleovera extract	30gm	Moisturizing
7.Paraben	2gm	preservative

FIG: DEAD SEA MASK

MANUFACTURING:

The methodology for preparing the Dead Sea mud mask is outlined as follows:

1. Begin by placing 250 grams of Dead Sea mud into a bowl.
2. In a separate beaker, combine rice water extract, green tea extract, honey, vitamin E, and aloe vera extract. Mix these components thoroughly using a stirrer.
3. Pour the resulting liquid mixture into the bowl containing the Dead Sea mud and blend the ingredients until they are uniformly integrated.
4. Incorporate 2 grams of either paraben or phenoxyethanol as preservatives into the mixture.
5. Gradually introduce water to achieve the desired consistency.

EVALUATION:

Following are the evaluating parameters for the evaluation of Dead Sea mineral mud mask:

1] Physical Characteristics:

- Homogeneity: exhibits a smooth texture and consistent uniformity.
- Spreadability: facilitates easy application.
- Viscosity: characterized by a thick and viscous nature.
- Drying Time: requires approximately 10 to 15 minutes for complete drying.
- Stability: possesses a shelf life of 12 months.

2] Biological Characteristics:

- Antibacterial Properties: demonstrates a reduction in acne prevalence.
- Antioxidant Properties: contributes to combating signs of aging.
- Irritation and Sensitivity: a patch test is recommended prior to use.
- Cleansing Ability: effectively eliminates dirt and impurities from the skin.

3] Organoleptic Assessment:

- Color: ranges from light grey to black.
- Odor: features a mild, earthy scent.
- Texture: maintains a smooth, non-gritty feel.
- Appearance: presented as a thick, smooth paste.

DISCUSSION:

The results of this study demonstrates that the efficacy of Dead Sea mud mineral face mask is improving the skin hydration levels and also improving the ski elasticity and anti-ageing properties the observed effects are likely attributed to anti-aging and anti-oxidant properties of minerals ,particularly magnesium and potassium. These findings align with previous studies on therapeutic benefits of Dead Sea mud for skin conditions. The minerals of Dead Sea have the anti-inflammatory and pain relief, particularly in managing joint pain and conditions like rheumatoid arthritis and osteoarthritis. Dead sea mud has a detoxifying affect which draws out impurities from skin and promotes clean and soft complexion .this detoxification process when combined with improved circulation from mineral absorption, contributes to anti-ageing benefits often attributes to dead sea mineral based products .whether by improving skin health, providing pain relief are by enhancing relaxation, Dead Sea minerals offer a range of several benefits.

CONCLUSION:

The unique ionic composition of Dead Sea water has been recognized for its beneficial effects on skin health for centuries. The mud and salts derived from the Dead Sea are characterized by elevated levels of sulfates and various mineral salts. Historically, Dead Sea mud has been employed in the treatment of a range of conditions, including wound healing, rheumatoid arthritis, joint ailments, skin disorders, and the effects of aging, among other health benefits. Notably, Dead Sea water demonstrates the ability to mitigate skin aging through several mechanisms, such as promoting keratinocyte rejuvenation and providing photo-protection, highlighting its significant potential for the development of anti-aging cosmetic products. Additionally, Dead Sea mud is rich in essential minerals, including iron, sodium, potassium, and calcium, with their concentrations aligning with the daily requirements of the human body. Regular application of this mud has been found to be free from adverse effects, making it a viable option for cosmetic use, particularly in formulations such as face masks, serums, and body soaps.

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