Development of Wetwipes Using Bamboo Fabric Infused with Chyrsopogan Zizanioides

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***Abstract*—The swift rise in the consumption of disposable wet wipes has raised considerable environmental issues, primarily due to the synthetic fibres present in traditional wipes, which contribute to non-biodegradable waste. This initiative seeks to create environmentally friendly wet wipes utilizing bamboo fabric infused with Chrysopogon zizanioides (Vetiver) extract. Bamboo fabric, recognized for its natural biodegradability and sustainability, provides excellent absorbency, antibacterial characteristics, and a soft feel, making it a superior alternative to synthetic materials. Vetiver is renowned for its antimicrobial, anti-inflammatory, and skin-nourishing attributes, which enhance the functional advantages of the wipes, promoting skin hydration and protection while reducing the reliance on synthetic preservatives and chemicals.**

The research examines various facets of product development, including the selection of materials, methods for extraction and infusion, stability, and performance testing. Critical evaluations encompass biodegradability assessments, microbial resistance, moisture retention, pH balance, and user safety analysis. Furthermore, the study explores the economic viability and potential market acceptance of these sustainable wipes in comparison to traditional alternatives.

By combining biodegradable materials with natural botanical extracts, this project aspires to provide a sustainable hygiene solution that mitigates environmental impact while delivering exceptional skin care benefits. The results may facilitate the creation of innovative, eco-friendly personal care products in the future

***Index Terms*—Chrysopogon zizanioides, Bamboo fabric, Skin hydration, Wet wipes, Biodegradable and Sustainable.**

I. INTRODUCTION

The rising consciousness regarding environmental sustainability has resulted in an increased demand for biodegradable and eco-friendly substitutes for traditional personal care items. Wet wipes, commonly utilized for personal hygiene, infant care, makeup removal, and surface cleaning, are frequently composed of synthetic fibres such as polyester and polypropylene. These materials contribute to environmental degradation due to their non-biodegradable characteristics. The improper disposal of these wipes has led to significant ecological issues, including blocked sewage systems and heightened landfill accumulation. To mitigate these challenges, the creation of biodegradable wet wipes utilizing sustainable materials and natural bioactive compounds presents a viable solution.

This initiative centres on the production of wet wipes crafted from bamboo fabric infused with Chrysopogon zizanioides (Vetiver) extract. Bamboo fabric serves as an excellent alternative to synthetic fibres, given its biodegradability, superior absorbency, softness, and natural antimicrobial properties. Furthermore, Vetiver, a medicinal plant recognized for its antimicrobial, anti-inflammatory, and skin-soothing attributes, enhances the wipes naturally, thereby minimizing the necessity for synthetic preservatives and chemical additives.

The research investigates the manufacturing process, encompassing the selection of bamboo fabric, extraction and infusion methods for Vetiver, and the formulation of the wetting solution. The resulting wipes will undergo evaluation for their physicochemical characteristics, microbial resistance, skin compatibility, biodegradability, and overall efficacy. By integrating sustainable materials with natural bioactive compounds, this study aspires to develop an eco-friendly and efficient hygiene product that aligns with global sustainability initiatives and consumer preferences for greener options.

The outcomes of this research could significantly contribute to the expanding domain of sustainable personal care products and offer valuable insights into the potential commercialization of biodegradable wet wipes with additional therapeutic advantages.

II. OBJECTIVES

- To Develop a Sustainable product.
- To Drive innovation in personal care products.
- To Enhance user experience with natural ingredients.
- To Ensure high product quality and safety.
- To Enhance moisture retention and longevity.

SELECTION OF FABRIC - Bamboo fabric

(Figure-01) Bamboo Non-woven fabric

Non-woven bamboo cloth is a biodegradable, environmentally friendly cloth made of bamboo fibre through a chemical or mechanical process. Unlike woven fabrics, it is manufactured by bonding fibre together using heat, pressure, or adhesive instead of weaving or weaving. It is a soft, breath and highly exploitative material for skincare, medical and hygiene applications. Bamboo fibre extraction - Bamboo pulp is processed to extract fibre. Fiber processing - fibre is treated mechanically or chemically to break them. Bonding process - Fiber is fused simultaneously using heat, pressure or adhesive. Finishing and Cutting - Fabric is finished and has been cut into various applications, such as sheets masks, wipes and filters.

III. SELECTION OF HERBS

Chrysopogon Zizanioides is the scientific name of Vetiver, which is a tall, perennial grass that thrives in the arid and periodically flooded regions of western and north-central India. This plant develops a spongy, extensively branched root system, which are characterized by fine rootlets that contain a fragrant oil, making them a natural perfume.

The dried aromatic roots are utilized in the production of curtains, mats, fans, and various decorative items, as they release a sweet, refreshing scent for an extended duration when dampened. Additionally, the oil serves as a valuable fixative in the formulation of perfumes, cosmetics, and the scenting of soaps.

The cultivation of vetiver is primarily found in small plots across Kerala, Karnataka, Tamil Nadu, and Andhra Pradesh, with a lesser presence in Uttar Pradesh. Given the superior quality of oil produced in India compared to that from Indonesia, Pakistan, Senegal, Sri Lanka, Brazil, and Haiti, the north Indian variety of vetiver oil holds significant export potential. Furthermore, it underscores the use of vetiver as a medicinal and aromatic plant in Thailand, where it is employed in traditional medicine, pest control, and as a fragrant material.

The essential oil is obtained from the roots through the process of steam distillation. Freshly harvested roots yield a greater quantity of oil compared to those that have been stored, with the yield diminishing progressively over time. Prior to distillation, the roots are soaked in water for 18 to 20 hours to soften the material, thereby enhancing the release of oil. Cutting fresh roots into lengths of 2.5 cm to 5 cm further improves oil recovery. Since the most valuable components are found in the high boiling fractions, the roots should be distilled for an extended duration of 20 to 24 hours.

Varieties from North India typically produce between 0.4 to 0.8 of oil. During the distillation process, two fractions are collected: lighter and heavier oils. Initially, the highly volatile lighter fraction is released, and a significant portion may escape before it cools and condenses into a liquid. To mitigate this loss, a piece of clean marking cloth is secured at the delivery outlet in a balloon shape, submerged in water. This setup captures the lighter fraction that might otherwise escape with the steam or distillate water. As distillation continues, the heavier fraction accumulates in the cloth while the lighter fraction passes through and is collected in the receiver. At the conclusion of the distillation, the cloth is squeezed to extract the oil. This cloth can be reused until it deteriorates. Before disposal, it may be washed with diethyl ether to recover any remaining oil, thereby enhancing overall oil yield. Traditionally, a copper vessel with a stainless-steel condenser is preferred for vetiver oil extraction, as the oil reacts with free copper, resulting

in a bluish hue that commands a higher price in the perfumery market. The oil produced through this traditional method is often referred to as "Ruhe khus," typically distilled using the Kannauj-style "Deg Vopka."

(FIGURE-2) CHYSOPOGON ZIZANIOIDES

The therapeutic advantages of Vetiver Essential Oil stem from its various properties, including anti-inflammatory, antiseptic, aphrodisiac, nervine, sedative, tonic, and vulnerary effects.

The calming and cooling properties of this essential oil effectively alleviate various types of inflammation. It is especially beneficial for providing relief from inflammation within the circulatory and nervous systems. This oil has proven to be a suitable remedy for inflammation resulting from sunstroke, dehydration, and loo, which refers to the extremely hot and dry winds common during the summer months in arid regions of India and some neighbouring countries. In tropical nations such as India and its surrounding areas, the warm and humid climate fosters rapid growth of microbes and bacteria. Consequently, the likelihood of wounds becoming infected is significantly heightened due to the abundance of bacteria in these environments. Fortunately, nature provides remedies in these regions, one of which is Vetiver and the essential oil derived from it. This oil effectively inhibits the growth of Staphylococcus Aureus, the bacteria responsible for septic infections, and aids in their elimination, thus facilitating the healing of septic conditions and offering protective benefits. Safe for use, this oil can be applied topically to wounds or ingested to safeguard both external injuries and internal organs from infection.

Vetiver essential oil promotes the development of new tissue, thereby facilitating the healing and recovery of skin wounds. It is also effective in diminishing stains, marks, and scars on the skin. Additionally, it aids in repairing cracks and grooves that may arise from various factors, including pregnancy, dieting, allergies, and burns.

Alongside a range of beverages intended for culinary use and aphrodisiacs, vetiver essential oil is utilized to create a calming infusion that aids in relaxation and recovery from intense stress. It is beneficial in addressing experiences of shock, fear, elevated stress levels, panic, and similar conditions.

The healing properties of Vetiver Essential Oil facilitate the regeneration of new tissue at the site of injury. Additionally, it protects the area from infections by suppressing microbial growth and encouraging the accumulation of leukocytes and platelets at the wound site.

The impact of a tonic on the body closely resembles the process of overhauling and servicing a vehicle. A tonic enhances the performance of all bodily systems, including the digestive, respiratory, circulatory, excretory, immune, endocrine, nervous, and neurotic systems. In summary, it maintains the metabolic system's efficiency, revitalizes the body, increases strength, and enhances immunity**.**

Vetiver Essential Oil is widely recognized for its sedative properties. It effectively calms nervous irritations, alleviates afflictions, and mitigates convulsions and emotional disturbances, including anger, anxiety, epileptic episodes, and hysterical attacks. Additionally, it provides relief for individuals suffering from insomnia, as well as addressing restlessness and nervousness.

A substance that serves as a tonic for the nervous system is referred to as a nervine, exemplified by our Essential Oil of Vetiver. This oil supports the health of the nerves and promotes their well-being. Additionally, it aids in the recovery from damage caused by trauma, anxiety, stress, and similar factors. Moreover, it assists in alleviating various nervous disorders, including epileptic and hysterical episodes, as well as conditions such as Parkinson’s Disease and issues related to loss of motor control**.**

Incorporated into sorbets and drinks as a flavouring agent, this oil possesses aphrodisiac properties. It boosts libido and promotes arousal. Given that sexual experiences are more influenced by psychological

factors than physiological ones, many sexual disorders, such as frigidity, low libido, and impotence, can often be traced back to the brain. Specific compounds in this oil activate certain areas of the brain, effectively addressing these issues.

Additional advantages associated with the use of vetiver essential oil include the fortification of bones and the alleviation of conditions such as rheumatism, gout, arthritis, muscle pain, dryness, cramps, and dry skin.

IV. PREPARATION PROCESS

STEP 1: PREPARE THE SOLUTION FOR INFUSING PROCESS

From vetiver prepare vetiver extract and mix the vetiver extract with glycerin, vitamin e , citronella oil, isopropyl alcohol and fragrance.

STEP 2: ALLOW THE SOLUTION TO SET FOR FEW HOURS AND PREPARE THE FABRIC

Cut the fabric accordingly and let the solution set for few hours before soaking process.

STEP 3: SOAK THE BAMBOO FABRIC IN THE SOLUTION

Soak the bamboo fabric in the vetiver solution and let it sit in the solution overnight.

TEST THE WETWIPES

Take the various test in the WETWIPES to know its properties and function.

- Skin Irritation Test
- Patch Testing
- Total viable Count (TVC)
- PH Testing
- Stability and Shelf-Life Testing

Skin Irritation Test: To ensure the wet wipes cause any skin irritation such as redness, itching and burning.

RESULT: The wet wipes do the cause any Itching and Irritation.

Patch testing: To ensure the wet wipes cause any skin allergens and irritation.

RESULT: The test prove that the wet wipes does not cause any skin inflammations.

Total viable Count (TVC): To analyze the total number of viable microorganism present.

RESULT: The test proves that there is no microorganism found in wet wipes.

PH Level Testing: The pH testing taken toa analyze the risk of skin irritation.

RESULT: The developed contain pH value of 7.1 which is safe to use.

Stability and Shelf-Life Testing: These tests are taken to analyze the shelf-life of the product.

RESULT: This test prove that the sample have a shelf-life for 2 years.

V. CONCLUSION

The project on developing wet wipes using Bamboo fabric infused with Chrysopogan zizanoides (vetiver) represents a significant advancement in sustainable and eco-friendly personal care products. By utilizing bamboo fibers, which are biodegradable and renewable, and infusing them with vetiver, known for its natural antimicrobial and aromatic properties, this project successfully combines functionality with environmental consciousness.

(FIGURE-3) WET WIPES

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