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Exploring Eco-Friendly Alternative: A Review of Natural Fibre Applications in Sanitary Napkins

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Abstract

The menstrual cycle is an integral part of a woman's life, often accompanied by discomfort and annoyance. Traditional synthetic sanitary napkins pose health and environmental risks, leading to various diseases and skin issues. This study proposes using natural fibres like banana, bamboo, cotton, flax, jute, and hemp, supplemented with herbal finishes, as alternatives to synthetic materials in sanitary napkins. Current review concerns the all problems and disadvantages of materials that are used to make sanitary napkins for commercial purpose. So here is the summarization of all the data that mainly focused on natural sources of fibre and its application in sanitary napkins. Natural fibre is more advantageous than synthetic and easy to commercialise.

Keywords: Biodegradable; Sanitary Pad; Natural Fibre

Introduction

Sanitary napkins, essential for managing menstrual secretions, utilize absorbent materials [1]. Natural fibres like banana, bamboo, cotton, flax, jute, and hemp are cost-effective due to their low density and high specific characteristics. Their unique biodegradability distinguishes them from synthetic alternatives, aligning with consumer preferences for environmentally friendly products [2]. These napkins typically consist of leak-proof material, super absorbent polymers, and an absorbent core encased in cover stock [3]. Given the growing importance of eco-friendly solutions, terms like biodegradable materials, natural products, and sustainable resources are vital, especially concerning menstrual waste disposal [4]. The degradability of these napkins, potentially facilitated by biodegradable polymers, is equally significant alongside their ease of disposal [5].

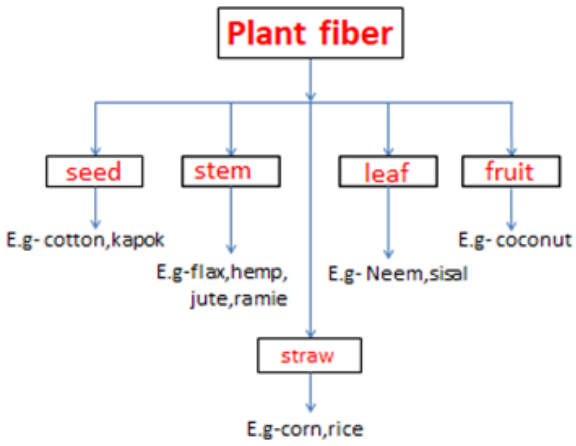

Figure 1: Classification of Natural Fibre.

Objectives

- To elect natural fibre and natural sauces for the aseptic pad.
- To produce 100 eco-friendly aseptic pads.
- To estimate the Disposable Test, pH value test, and Wear study.
- To enhance the antimicrobial protection of stoners.
- To develop biodegradable aseptic hankie grounded on natural coffers.

Selection of Fibres

Bamboo Fibres: Bamboo is one of the tone-growing shops as it requires no chemicals, diseases, or water to grow. Generally, bamboo is largely used in construction, creating musical instruments and implements. It's more permeable than cotton and it also helps the skin to feel comfortable by absorbing humidity snappily, sinking sweat from the mortal body briskly like breathing. Besides that, it contains a unique anti-microbial agent called "bamboo kun" which takes part in arresting odour and fungus. The hypoallergenic property presented in bamboo won't get any antipathetic responses. As bamboo filaments are 100 cellulosic and can be reused through a regenerated or natural process, its biodegradable [6].

Comparing bamboo clothes to silk and cotton reveals how incredibly soft it is. It is 40% more capable of absorbing moisture than cotton [7]. Bamboo fibre has certain special qualities that make it simple to weave into a cloth. The 100% cellulose content of regenerated bamboo fibre makes it biodegradable and fully environmentally benign. It is safer to use and has a higher absorbency limit. Bamboo pads are incredibly soft and have antibacterial qualities. Bamboo fibre has a higher absorption capability than cotton fibre. This results in a menstrual cycle free from inflammation and pollution [8].

- **Properties:**
- Bamboo is antibacterial.
- It absorbs moisture.
- It is hypoallergenic.

Figure 2: Extraction of Bamboo Fibre.

Cotton: The cotton is naturally soft and spongy. It resists bacterial and fungal growth which is formed due to inordinate humidity in aseptic pads. Cotton has good immersion parcels and will retain the fluid and separate it from the body. The porosity property of cotton provides a hedge against heat and humidity. So, it's permeable in contact with the body [6]. Among all the available natural fibres, cotton fibre is the most abundant, cellulosic, plant-based fibre. Among its many special qualities are its softness, breathability, outstanding absorbency, staticliberty, mixing simplicity, organic feel, and appropriate strength [9].

Among all the available natural fibres, cotton fibre is the most abundant, cellulosic, plant-based fibre. Among its many special qualities are its softness, breathability, outstanding absorbency, static liberty, mixing simplicity, organic feel, and appropriate strength [10]. One often recommended raw material for sanitary napkins is organic cotton for the top sheet due to its non-irritating, skin-friendly, and great qualities for holding fluids. It provides comfort and dryness because it is pliable and flexible. Cotton dries out skin by wicking away moisture [11].

Properties:
- Cotton is sustainable, renewable and biodegradable.
- It is eco-friendly and natural fibre.
- It is a spongy and permeable material.
- It is soft and lightweight.

Banana Fibre: A lignocellulosic fibre derived from the pseudostem of the banana plant is called banana fibre [11]. The banana plant does not only produce succulent fruit but also provides cloth fibre known as banana fibre. Banana fibre is a natural fibre having low viscosity, applicable inflexibility and mechanical parcels, and high disposability and renewability. It's also recyclable and biodegradable. Banana fibre is a fibre obtained from pseudo- the stem of a banana plant. The banana plant is imperishable and available throughout India, Southeast Asia, Thailand, Bangladesh, Indonesia, Malaysia, Philippines, Hawaii, and some Pacific islands [12].

In underdeveloped nations, girls and women can now purchase affordable, high-quality, environmentally friendly sanitary napkins made from banana (*Musa paradisiaca*) fibre, which has been used to create sanitary pads in recent years. The main factor causing bananas to naturally absorb fibre is their inherent porosity. Similar to jute fibre, banana fibre is environmentally benign (*Corchorusolitorius*) [13]. The banana fibres have a higher tensile strength (458 Mpa) and a 17.14 gigapascal modulus when compared to other natural fibres like jute, coir, palm, etc. The biodegradable banana fibres consist of characteristics such as being recyclable, fireproof, and rip-resistant [14].

- **Properties:**
  - It has an analogous look to bamboo fibre, yet its fineness and spin ability are superior to bamboo fibre.
  - Cellulose, hemicelluloses, and lignin make up the chemical makeup of banana fibre.
  - It's a robust but lightweight fibre.
  - It has excellent humidity immersion parcels. It absorbs and releases humidity at a rapid-fire rate.
  - It's biodegradable and has no negative impact on the terrain; therefore it falls into the eco-friendly order.

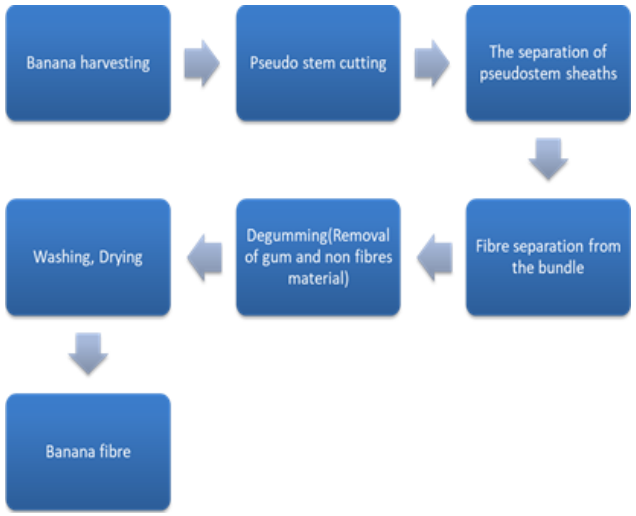

Figure 3: Extraction of Banana Fibre.

Kneaf Fibre: Kneaf filaments are attained from the stems of *Hibiscus cannabinus* [11]. Like bamboo, kena also can grow with no fungicides or chemical diseases. It has an antimicrobial property which can help the spread of microorganisms during the menstrual cycle. In addition, antioxidants, and anti-cancer agents help women to escape from conditions and uterus cancer. The external bast fibre and whole stalk of kneaf can be used in fabrics, absorbents, and mixes. The filaments also share in perfecting the soil structure by fixing soil nutrients in the correct proportion [6]. Kneaf is one such resource that helps menstruation women ease discomfort and infection because of its higher absorbency, affordability, soft feel, and antimicrobial qualities [15]. Experimental studies revealed that the kneaf core of 106- 425 microns absorbs water 12 times its weight, while that of a core ranging from 425- 840 microns absorbs water 10 times its weight. The humidity content is at 75 and the pH of the kneaf fibre is 5.5, which is optimum for womanlike hygiene products. Kneaf-grounded aseptic pads are a biodegradable, cost-effective, and environmentally friendly volition to marketable padsaon the request %(5) [16].

- **Property:**
  - It can be fluently biodegradable.

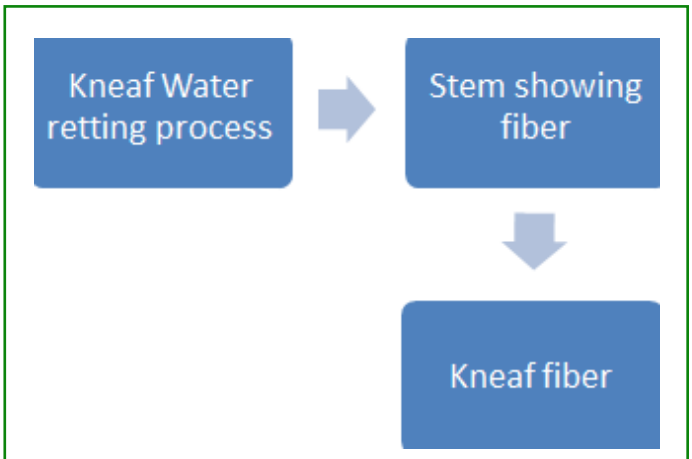

Figure 4: Extraction of kneaf fibre.

Jute: Jute is a long, candescent factory belonging to the Liliaceae family. Jute is one of the most protean, natural, durable, and cheapest filaments that can be spun into long, strong, and coarse vestments because of its soft and candescent texture Jute filaments are recyclable, 100 biodegradable, and environmentally friendly Jute is the cheapest, smallest cost, permeable and environmentally friendly fibre like cotton and causes no skin vexation The jute fibre uprooted from the factory is used to make hessian or gunny cloth jute fibre, also called golden fibre, is the alternate most extensively used fibre after cotton. Jute fabrics are biodegradable, putrefy in nature, and neutralize carbon dioxide. Jute has a high cellulose content of 65- 70 and has a high water immersion capacity [16].

- **Property:**
  - It is biodegradable.

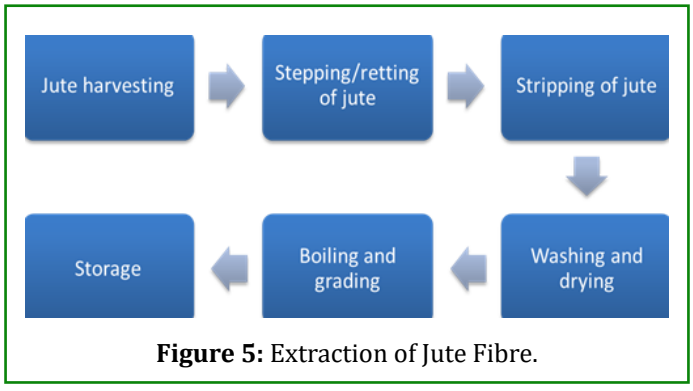

Figure 5: Extraction of Jute Fibre.

Chitosan Fibre: The chitosan filaments are prominent and famed accoutrements in a plethora of fields such as biotechnology, bio-nanotechnology, food technology, and

industries. Above all, it's one of the promising agents in curing cancers and it is called a stylish cancer remedy agent. It has a memoir-compatible property which causes no detriment to any living towel. So, it's irreplaceable in crack dressing, towel engineering, and sutures. Likewise, filaments are used to produce clothes for babies and the elderly who have weak and sensitive skin because they can keep the skin from drying without any vexation or mislike [6].

- **Properties:**
  - It has antimicrobial, antioxidant, and anti-inflammatory parcels.
  - It's also totally biodegradable.

Neem: One of the relatively few known plants in the Indian subcontinent is neem (*Azadirachta indica A. Juss*). This tree is a member of the Meliceae family [17]. The neem tree produces neem, which is a natural condiment. It's an imperishable factory. India, Nepal, Pakistan, Bangladesh, Sri Lanka, and the Maldives are the most common locales. The remedial merits of neem have been used in India for over two glories. Siddha and Ayurvedic interpreters suppose that neem products are anti-diabetic, antibacterial, antiviral, contraceptive, and opiate [18].

- **Properties:**
  - Neem is antibacterial, antiviral, and anti-parasitic.
  - Neem splint has antibacterial parcels.
  - It's also antifungal.
  - Neem splint is also antioxidant, ant mutagenic and ant carcinogenic.

Flax Fibre: Flax is generally known as linseed or common flax. Flax fibre is substantially used in cloth assiduity for the manufacture of linen and is soft, crisper, stiffer, lustrous, flexible, and stronger to handle in comparison to cotton. The humidity immersion is high and releases water snappily, making linen fabric more comfortable in hot rainfall. Linen fabric has the advantage of excellent strength, cool in warm rainfall, and is hydrophilic, which absorbs water and dries veritably snappily. Since flax filaments are more renewable, biodegradable, and eco-friendly filaments than synthetic filaments, exploration is being carried out into exercising these factory filaments for colourful operations. Hence, these filaments could be consecutively employed as a raw material in an aseptic pad making for a sustainable green frugality [16].

Hemp: Indian hemp, generally known as Himalayan hemp. Hemp is one of the oldest shops and its fibre is considered to be environmentally friendly. Hemp fibre is biodegradable, eco-friendly, humidity passable, anti-static, sequestration, warmth retention, and anti-UV, anti-mildew and antibacterial. It absorbs further humidity and has good permeable performance. Hemp is an excellent choice to consider for a menstrual product due to its antibacterial parcels, high tensile strength, mildew resistance, and biodegradable attributes [16]. A natural fibre derived from a type of the *Cannabis sativa* plant is called hemp, or industrial hemp. Hemp has high absorbency and antimicrobial qualities. Compared to cotton, hemp absorbs more water [18].

Indian Fragment Rose: The Anti-inflammatory parcels of rose water can help reduce skin greenish ness, help fresh lumps, and soothe the discomfort of acne. Rose water is rich in vitamin C and phenolic, making it a natural, anti-inflammatory option for inflamed acne. Antioxidants in Rose help with cell damage and help in regenerating skin napkins. They also neutralize free revolutionaries, furnishing anti-aging benefits to the skin as well. While the rose is excellent for all skin types, it's incredibly effective for dry skin. It contains moisturizing [18].

Conclusion

Biodegradable sanitary pads are an excellent solution to the issue of commercially available non-biodegradable sanitary napkins. This article examines various plant fibres that could be used in sanitary napkins. Lignocellulosic plant fibres are considered renewable, biodegradable, and environmentally friendly, making them potential replacements for synthetic and man-made fibres. The use of plant fibres in feminine hygiene products will not only help to clean our environment but also improve the health and lifestyle of women. Thus, plant fibres are a viable raw material for the production of sanitary napkins.

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