iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** XI **Month of publication:** November 2024

DOI: https://doi.org/10.22214/ijraset.2024.64938

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue XI Nov 2024- Available at www.ijraset.com

Review about Application of *Nelumbo Nucifera*

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Abstract: ***Natural Fibers are obtained from nature. The natural sources of these fibres can be plants, animals or minerals. We selected the plant sources as Lotus (Nelumbo nucifera). Lotus(Nelumbo nucifera) an aquatic perennial plant cultivated widely from Pallapalayam pond, Pollachi. Natural fibers have the advantages of low density, low cost, and biodegradability. Lotus fabric has the same significance but is less popular compared to other natural fibers. This fiber is a unique and luxurious natural fiber and its properties are Softness due to the fine and delicate fibers, breathability, antibacterial, moisture-wicking, UV-resistant, sustainable alternative to synthetic fibers. It is used for Textiles like scarves, shawls and clothing, fishing nets and ropes because it has water resistant properties and other marine equipment, handicrafts such as baskets, bags and other woven goods, paper, medical purposes like napkins, wet wipes, sutures, absorbent core sheet, diapers etc. The industry is embracing non-wovens (pads, wipes, napkins) and single-use materials to cater to the huge demand from the consumer community. Nelumbo nucifera (Lotus) was used in their study to enhance the good medicinal property and eco- friendly in nature. Sustainability issues in textiles have an exploration of many new fibers from renewable sources. Lotus plants require minimal water and no chemicals or pesticides, making the fiber environmentally friendly. It is also naturally resistant to water and stains, making it's a range of products.***

Keyword: Natural fiber, cellulose, lotus fiber, sustainable, future development.

I. INTRODUCTION

The word 'textile' is from Latin, from textile, meaning 'woven', and textiles is from textus, the past participle of texere, or 'to weave' (Kaur et.al., 2009)[6] The world production of natural fibers is increasing since the product base is growing each year; more synthetic fibers and high energy consuming products are being replaced by natural- fiber based products because of its exceptional properties.(R. Dunne et.al., 2016)[8] Medical textile constitutes one of the most dynamic research fields characteristics of technical textile and its range of applications.(Dr Praveen Banu, 2014)[4] This new field is a combination of textile technology and medical sciences with several functional applications. Nowadays, due to the increase of aging populations and the hazards of human activities, including transport accidents, chemical injuries, diseases, sports, etc., the demand for textile-based medical devices have been rapidly growing.(Anahita Rohani Shirvan, 2020)[1] Lotus fiber is extracted from lotus stems since 1910. (Dr(Mrs.) Kavita Patil 2018)[5] and cotton is the mostly widely produced textile fabric today. (Corbalman,2007)[2] The application of lotus fiber can not only avoid resources waste but also diversify the raw materials of textile products and promote sustainable development of textile industry**.**

II. LOTUS

Natural cellulose fibers produce from renewable plant resources, especially from crop residues can help to mitigate energy and environmental issues. There are a lot of fibers between lotus leaves and stalks, be easily to be obtained. And it is renewable, biodegradable, abundant in resources, more comfortable and skin-friendly than synthetic fiber (J G Wang et al., 2009)[3]. The application of lotus fiber can not only avoid resources waste but also diversify the raw materials of textile products and promote sustainable development of textile industry. (J G Wang et al., 2009)[3].



Fig1 Lotus Plant

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A. Fiber Extraction

The *Nelumbo nucifera* (lotus) stem were collected from Pallapalayam Pond, Pollachi. Stems of lotus plant were collected when the flower of the lotus is in full bloom. The deep pink flower consists of best quality fibers. The stems of lotus were cut with knife. Stems were washed with clean water to remove the dirt. Bunch of 3 – 5 petioles were taken together and snapped at a time. After snapped it reveals 20 – 30 fine filaments of fiber, Slight twist was given to the filament and then hang to dry.

B. Properties of Lotus Fiber

1) It is a cellulosic fiber and finest aquatic fiber (Waterproof fiber).
2) It is cool, stiff, breathable and comfortable fiber.
3) It has good elasticity.
4) It is Crease resistant fiber.
5) It absorbs moisture but dries fast.
6) Fabric produced with this fiber has outstanding properties.
7) It doesn't contain any chemical or toxic products so it produces ecological fabric

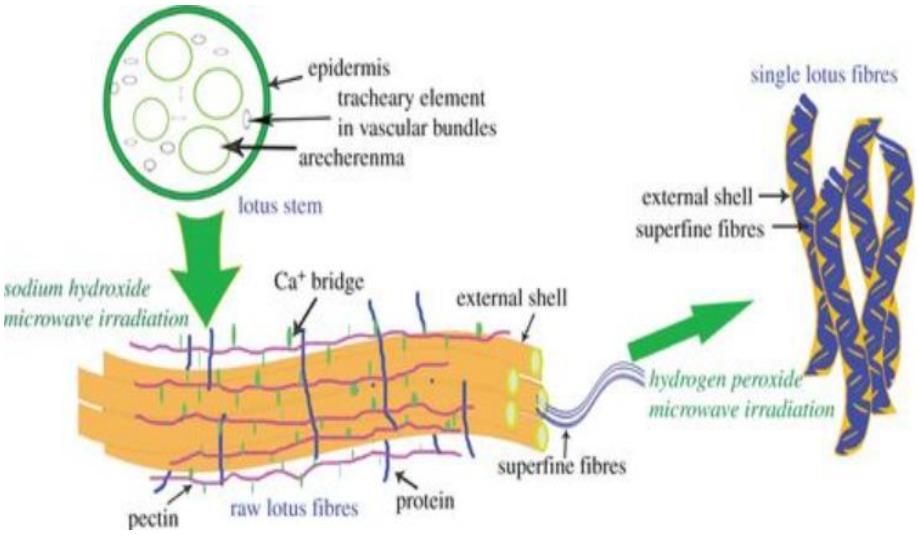


Fig 2.1 Extraction of lotus fiber
Fig 2.2 Extraction of LOTUS FIBER (*Nelumbo nucifera*) from LOTUS STEM under microwave irradiation.

The manufacturing process doesn't require any gas, petrol, electricity or additional water. The lotus flower is a photo sanitary plant that cleans the water in which it grows and preserves the ecosystem while protecting fish and insects. The whole process takes place within the framework of sustainable development. (Dr. Kavita Patil 2018)[5]

C. Medicinal Uses of the Lotus Fiber

1) For centuries, lotus flowers, seed, leaves, and parts of the underground stem (rhizhome) have been used to make medicine.
2) Lotus flowers are used to stop bleeding
3) Lotus seeds are used for disorders of the digestive tract, including diarrhea. Lotus flowers have been used in Ayurvedic medicine to treat diarrhea.
4) The seeds are used to treat inflammation and skin problems, including acne. When combined with green tea, an emulsion of lotus flower applied to the skin significantly reduced acne.
5) In traditional Chinese medicine, the embryo of lotus seeds is known as Lian Zi Xin. They are used to treat nervous disorder, insomnia, and cardiovascular diseases (hypertension and arrhythmia).
6) Mixed with honey, a powder of lotus seeds is useful in treating cough. (Dr. Kavita Patil 2018)[5].

D. Applications of Lotus Fiber

Lotus fiber is primarily used for high-end fashion garments, such as scarves, shawls, sarees, etc. In addition to fashion, lotus silk is also used in home décor such as cushion covers and wall hangings. The innovation of lotus production is being conducted into ways to increase efficiency without compromising the quality and sustainability of fabric. They developed more in medical related products like wet wipes, sutures, napkins, diapers. Lotus fiber, derived from the steam of the lotus plant, is gaining attention in the textile industry for its unique properties, here are some applications along with detailed explanation:

1) Surgical Sutures

Lotus sutures lies in their enhanced biocompatibility. The materials used in their production to minimize the adverse reactions in patients.

Reduced Inflammation: Lotus sutures are designed to cause minimal inflammation, which can lead to quicker wound healing.

Improved Tissue Integration: These sutures promote better integration with the surrounding tissues, leading to more natural healing processes.

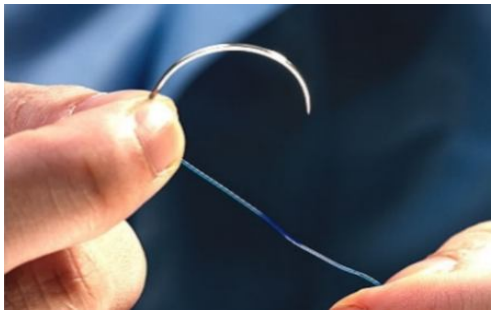


Fig 2.3 surgical sutures application used in med-tech

2) Sustainable Fashion

Their Commitment to environmentally friendly production, devoid of pollutants or chemicals, ensures high-quality textiles.



Fig 2.4 lotus fiber infused in yarn stage to make them sustain

3) Luxury fabrics

Lotus silk one of the rarest and most luxurious fabrics in the world. Boasts exceptional strength, breathability, and moisture-wicking capabilities. All thanks to the long, lustrous fibers surrounding the seeds of the lotus plant.



Fig 2.5 luxury fabric blends with lotus fiber to look more lusture and smooth

4) Accessories and Lifestyle Products

Lotus fiber is gradually finding its place in the accessories like bags, wallets and jewelleries, owing to the rising awareness about environment friendly products.

Due to its appearance, the fiber is ideal for the production of artisanal and hand-made goods, which stimulates the growth of rural crafts and supports the old techniques of weaving.

5) Technical Textiles

Due to its high tensile and thermal resistive attributes, lotus fiber is applied to manufacture technical fabrics like fire fighter, military and industrial safety apparels.

There are also investigations into the use of Lotus fiber-based composites in the automotive and aerospace sectors due to their lightweight and durability.

6) Wet wipes

Wet wipes are developed as personal care products, yet they become an increasingly popular item for everyday use in homies.Generally,wet wipes consist of two main parts: a non-woven fabric carrier(wipe)and liquid.

The wipes hold and spread the liquid or collect and hold dirt or other matters to be removed.



Fig 2.6 wet wipe layer with lotus fiber

7) Napkins

These napkins typically consist of leak-proof material, super absorbent polymers, and an absorbent core encased in cover stock.(Mahalakshmi M, et al 2024)[7] Their biodegradability distinguishes them from synthetic alternatives, aligning with consumer preferences for environmentally friendly products. (Saheb DN, eta al 1999)[9].

8) Diapers

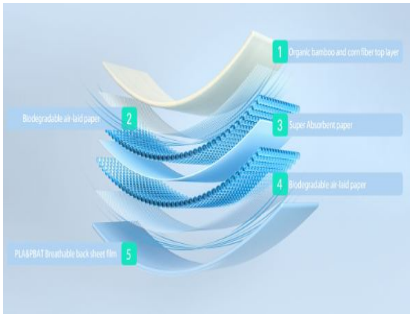


Fig 2.7 Sanitary napkin using lotus fiber

Disposable diapers produce 20 times more solid waste than reusable diapers, and disposable diapers have the highest impact of home-washed reusable cloth diapers; recycling water and using renewable electricity will reduce the impact of home -washed reusable cloth diapers. Also, commercially washed reusable cloth diapers are another option



Fig 2.8 baby diaper using lotus fiber which is biodegradable

9) Textile blends (Lotus cotton blend fabric)

Lotus fiber has a silk like luster and fine texture and is suitable for using in various up market products like dress materials, blouses and scarves. The fiber has good hygroscopicity and ventilation, which makes it suitable for different types of garments, especially in tropical regions.

Lotus fiber based textiles are sometimes mixed with other natural fibers such as silk or cotton to improve on the properties of the fabrics and to come up with new fabrics


Fig 2.9 Fabric is blended with cotton with lotus

10) Home Textiles

Lotus fiber is very durable and is also water-resistant and thus, it is used for home textiles like bedsheets, curtains, and upholstery. Fabrics of lotus fiber are used in making home décor products mostly in the higher end as they give a natural and rich feel to the living space.



Fig 2.10 Bed sheet made of lotus fibre

These applications highlight the versatility of lotus fiber in creating innovative, sustainable and high- quality textile product.

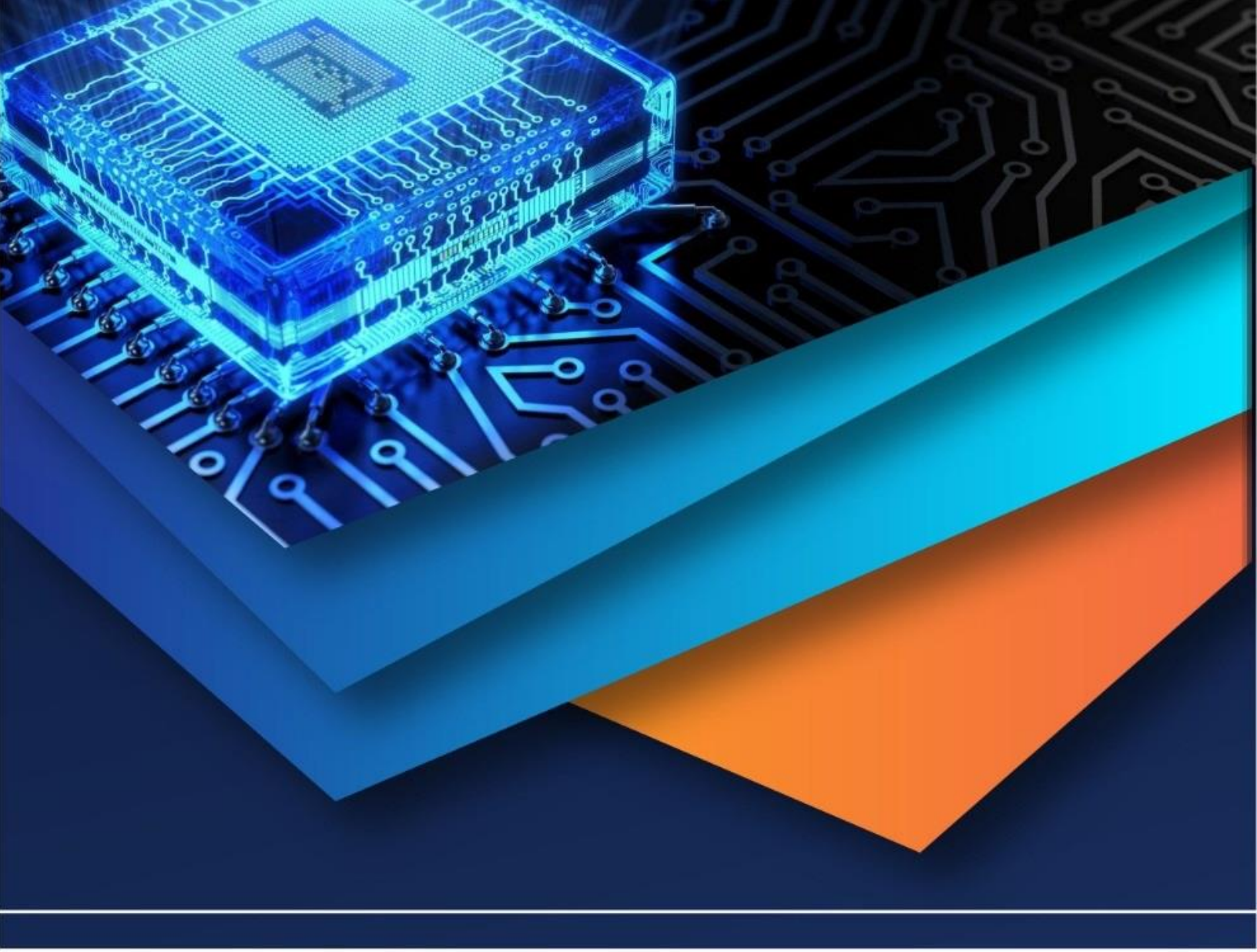
III. CONCLUSION

Lotus fiber is versatile, and its eco-friendly nature, biodegradability, antibacterial properties, and luster have made it popular among textile producers and fashion creators. The use of lotus fiber has been shown to be a promising natural fiber in the textile industry, and as the market expands to look for other green and natural materials, the development of lotus fiber and its uses in textile is expected to improve in the future. Thus, the further development of the textile industry in terms of sustainability and environmental responsibility will lead to the expansion of the range of applications of lotus fiber, as well as the growth in popularity of the fiber in the global market. The characteristics of lotus fiber and its environmental benefits make it a promising natural fiber for textile applications, which is promising and can expand the range of sustainable fibers for the industry.

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