



Review Article

Biodegradable Sanitary Napkins-An Innovative Approach Towards Menstrual Hygiene Using Bamboo Fiber And Lemon Grass

Mounika K.^{1*}, Dr. K. B. Ilango¹, Baranitharan A. K.², Dhivyatharshini S.³, Gowtham K.⁴, Swetha V.⁵, Vijaykumar S.⁶

^{1*}Associate professor, Department of Pharmaceutical Chemistry, College of Pharmacy, Shree Venkateshwara college of paramedical sciences, Gobi. Tamilnadu-638455.

¹Principal, Head of the Department of pharmaceuticals, College of Pharmacy, Shree Venkateshwara college of paramedical sciences, Gobi-Tamilnadu-638455.

^{2,3,4,5,6}B. Pharm final year students, College of Pharmacy, Shree Venkateshwara college of paramedical sciences, Gobi-Tamilnadu-638455

ARTICLE INFO

Received: 30 Oct 2023

Accepted: 01 Nov 2023

Published: 07 Nov 2023

Keywords:

Menstruation, Dioxins,
Biomaterial, Puberty,
Menopause, Vagina,
Tampon, Papyrus

DOI:

10.5281/zenodo.10078084

ABSTRACT

Sanitary napkin is worn in direct skin contact and is an essential product for most women. Bamboo fiber is a cellulosic fiber that is regenerated from bamboo plant. It is a great prospective green fiber with outstanding biodegradable textile material, having strength comparable to conventional glass fibers. Bamboo used for fiber preparation is usually 3-4 years old. Emphasis is given to use of naturally available absorbent fibers such as organic cotton, banana fiber, jute, bamboo etc, which are widely available and biodegradable in nature having low carbon footprint which not only makes it eco-friendly but also reduces the cost of sanitary pad. Bamboo fiber has various micro-gaps, which make it softer than cotton and increase its moisture absorption. They are elastic, environment-friendly, and biodegradable. The fiber is bacteriostatic, antifungal, antibacterial, hypoallergenic, hygroscopic, natural deodorizer and resistant against ultraviolet light. Furthermore, it is highly durable, stable and tough and has substantial tensile strength. Due to its versatile properties, bamboo fibers are used mainly in textile industry for making attires, towels, and bathrobes. Due to its antibacterial nature, it is used for making bandages, masks, nurse wears, and sanitary napkins. UV-proof, antibiotic and bacteriostatic curtains, television covers, and wallpapers and many other things are also prepared from bamboo fibers to lessen the effects of bacteria and harm of ultraviolet radiations on human skin. The use of natural and biodegradable polymers in sanitary napkins could help in cost reduction and make them easily affordable.

***Corresponding Author:** Mounika K.

Address: Department of Pharmaceutical Chemistry, College of Pharmacy, Shree Venkateshwara college of paramedical sciences, Gobi. Tamilnadu-638455

Email ✉: mounika.mythu@gmail.com

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



INTRODUCTION

Menstrual hygiene is an issue that every girl and women had to deal with in her life. The process of discharge of blood from the lining of the uterus of women in an interval of 28 to 35 days from the puberty until menopause is known as menstruation. Many women feel some pain and displeasure during menstruation which will impact on daily activities. Due to lack of hygiene, they are suffering from Reproductive Tract Infections. When menstruation starts, women need to use cotton clothes, pads or a tampon for soak up the menstrual fluid. Nowadays, the menstrual hygiene pads available are laced with dioxins, petrochemicals and artificial fragrances and when these chemicals react with sensitized skin tissue, it results in skin irritation. The ingredients present in the synthetic pads are problematic for female reproductive system as it is very sensitive and absorptive. To overcome these severities, we can use biomaterials like banana fiber, papyrus, cotton, water hyacinth, aloe vera, hemp with Anti-microbial activity for preparing sustainable sanitary pads. The aim of our project is to acknowledge the importance of menstrual hygiene to manage menstruation and to explore other alternative products using bamboo and lemon grass for its excellent Anti- fungal activity to reduce the risk of infections in women.

OBJECTIVES

- ❖ To produce 100 % environment friendly sanitary pads
- ❖ Chlorine-free biodegradable sanitary napkins
- ❖ Free from irritations, allergies, itchiness and infections
- ❖ Packaging with biodegradable materials
- ❖ pH compatible and free from plastics
- ❖ Providing natural fragrance
- ❖ To decrease severe complications in women

MATERIALS AND METHODS:

MATERIALS USED:

To produce the bio-degradable sanitary pads, bamboo fiber is collected and used as the main raw material. Bamboo fiber is used as the surface layer and its pulp is used as the absorbent material. The sources include fields of villages, by-product from fabric manufacture, and the post-industrial scrap textiles from other industries. Lemon grass is also used for its pleasant fragrance and also contains Anti-fungal activity.

❖ **BAMBOO FIBER:**

Bamboo belongs to a family Poaceae. Bamboo fiber is a natural fiber processed either as a naturally occurring best fiber (bamboo linen) or a regenerated manufactured fiber (bamboo rayon / viscose or lyocell) and starchy pulp is produced from bamboo stems and leaves by a process of alkaline hydrolysis and multi-phase bleaching. They are used for making sheets, blankets, towels, hand towels or a number of other household textiles and construction, furniture, food, biofuels, fabrics, cloth, paper, pulp, charcoal, etc. Bamboo clothing is luxuriously soft when compared to cotton and silk. It can able to absorb moisture 40 % better than cotton.

ADVANTAGES OF BAMBOO FIBER:

- ✓ Good Absorbent, soft, smooth and luxurious
- ✓ Cool and Breathable
- ✓ Anti-bacterial and Anti-fungal
- ✓ Hypoallergenic and strong
- ✓ Durable and Long-lasting
- ✓ Ecofriendly
- ✓ Anti-UV protection

❖ **LEMON GRASS:**

Lemon grass, also known as sweet rush, belongs to a family Poaceae (*Cymbopogon citratus*). It is a perennial grass grown for its fragrant leaves and stalks which are used for its flavor. It is used for treating stomach pain, dandruff, high cholesterol, gingivitis, gastrointestinal tract issues, including constipation, bloating, flatulence, nausea, stomach and intestinal cramps and gastric ulcers.



ADVANTAGES OF LEMONGRASS:

- ✓ Rich source of flavonoids and phenolic compounds having antioxidants
- ✓ Effective Anti-bacterial and Anti-fungal agent with Anti-inflammatory and Anti-oxidant properties
- ✓ Kills cancer cells
- ✓ Detoxifier and pain killer
- ✓ Clean the kidney, liver, pancreas, digestive tract and bladder
- ✓ Used in the treatment of fever, Diarrhea, stomach ache, flu and cold.
- ✓ Lowers blood sugar level in diabetes.
- ✓ Maintains healthy cholesterol levels and strengthens the immune system.
- ✓ Combats unpleasant body odor and removes harmful toxic wastes.

METHODS

1. GATHERING OF MATERIALS:

- ❖ Bamboo leaves or sheets (dried or fresh, depending on availability).
- ❖ Lemongrass stalks.
- ❖ Twine or string.
- ❖ Scissors or a knife

2. CLEANING AND PREPARING LEMONGRASS:

- ❖ Wash the lemongrass thoroughly to remove the presence of any dirt or impurities.
- ❖ Cut the lemongrass into smaller pieces.

3. PREPARATION OF BAMBOO LEAVES:

- ❖ If using fresh bamboo leaves, blanch them in boiling water for a few seconds to soften and clean.
- ❖ If using dried bamboo leaves, soak them in warm water until they become pliable.

4. ASSEMBLE THE PAD:

- ❖ Lay out bamboo leaf on a clean, flat surface.

- ❖ Place the prepared lemongrass pieces on the bamboo leaf, distributing them evenly.

5. FOLD AND SECURE:

- ❖ Fold the bamboo leaf over the lemongrass to create a pad.
- ❖ If needed, use twine or string to tie the pad together and secure it.

6. TRIM EXCESS:

Use scissors or a knife to trim any excess bamboo or lemongrass from the edges of the pad.

7. STEAM OR COOK:

Can choose to steam or cook the bamboo and lemongrass pad to infuse the flavors and aromas further. Steaming is a common method.

PHYTOCHEMICAL ANALYSIS:

Phytochemical constituents	Name of the test	Observation
Flavonoids	Alcohol-acid test	+
Tannins	Braymer's test	+
Phloba tannins	Precipitation test	-
Saponins	Emulsion formation	+
	Foam formation	+
Steroids	Salkowski test	+
Terpenoids	Salkowski test	+
Cardiac-glycosides	Keller-Killani test	-
Coumarins	Alkaline solution	+

Table 1: Phytochemical Screening of Lemongrass

CHEMICAL COMPONENTS	PERCENTAGE
Aqueous extract	3.16
Pectin	0.37
Hemicelluloses	12.49
Lignin	10.15
Cellulose	73.83

Table 2: Phytochemical screening of Bamboo fiber

RESULTS AND DISCUSSIONS



Bamboo fiber is more absorbent than cotton. However, this experiment revealed that bamboo fiber in a non-woven wadding form was 9-fold more absorbent than cotton, and almost twice as absorbent as a standard sanitary pad. A recent study found that bamboo fiber as an absorbent core in a traditional sanitary napkin format absorbs and wicks water 3-4-fold better than cotton and reduces odor as the fiber is filled with multiple micro-holes and micro-gaps. The presence of lemon grass masks the unpleasant odor and also contains Anti-fungal activity. Future investigations should include in-use testing to assess the safety of non-woven bamboo.

CONCLUSION

In the present study, the bamboo was found to be the most absorbent biodegradable material comparing with hemp, banana, papyrus, cotton etc. It is considered as the suitable raw material for making sanitary pads because it is extremely affordable, lightweight, absorbent and biodegradable. Lemon grass, an excellent Anti-fungal material which reduces the severe infections in women during menstruation. Further research could enable the girls with low and medium income to make their own sanitary pads. This research of a physical material from a technical aspect, if further investigated with a social science and policy perspective, it will definitely increase school attendance, improve the education levels attained by girls, explore the importance of using biodegradable sanitary pads and be a key step towards gender equality.

REFERENCES

1. Anuradha Barman, Pooja M Katkar, S.D. Asagekar. Development of Eco-friendly Herbal Finished Sanitary Napkin. *International Journal for Innovative Research in Science & Technology* | Volume 4 | Issue 1 | June 2017.
2. Shendurse AM, Sangwan RB, Amit Kumar, Ramesh V, Patel AC, Gopikrishna G and Roy SK. Phytochemical screening and antibacterial

activity of lemongrass (*Cymbopogon citratus*) leaves essential oil. *Journal of Pharmacognosy and Phytochemistry* 2021; 10(2): 445-449.

3. Mayowa Akeem Azeez and Joshwa Iseoluwa Orege. Bamboo, Its Chemical Modification and Products. *Current and Future Prospects*.2018;1-24.
4. Jamie Hand, Christina Hwang, Wren Vogel, Christina Lopez, Sangchul Hwang. An exploration of market organic sanitary products for improving menstrual health and environmental impact. *Journal of Water, Sanitation and Hygiene for Development* (2023) 13 (2): 63–77.
5. Subrata Das. Fibers and fabrics used in home textiles. *Performance of Home Textiles 2010*, Pages 22-41.
6. Dr. Subrata Das. Properties Of Bamboo Fiber. Available from www.fibre2fashion.com/industry-article. [Accessed on 15 November 2009].
7. Dr Siddharth Gupta. Lemongrass: Uses, Benefits, Side Effects and More. <https://pharomeasy.in/blog/ayurveda-uses-benefits-side-effects-of-lemongrass>.
8. Lemongrass - Uses, Side Effects, and More- Overview. Available from <https://www.webmd.com/vitamins/ai/ingredientmono-719/lemongrass>.
9. Jabeen Begum, MD. Lemongrass: Are There Health Benefits? Available from <https://www.webmd.com/diet/lemongrass-health-benefits>.
10. Malia Frey, M.A., ACE-CHC, CPT. The Health Benefits of Lemongrass. Available from <https://www.verywellfit.com/lemongrass-benefits-side-effects-and-preparations-4178847>.
11. Benefits of Bamboo Fabric - OETEO Singapore. Available from



<https://oeteo.co/blogs/news/bamboo-fabric-what-is-it-and-benefits-for-baby>.

HOW TO CITE: Mounika K.*, Dr. K. B. Ilango, Baranitharan A. K., Dhivyatharshini S., Gowtham K., Swetha V., Vijaykumar S, Biodegradable Sanitary Napkins-An Innovative Approach Towards Menstrual Hygiene Using Bamboo Fiber And Lemon Grass, *Int. J. in Pharm. Sci.*, 2023, Vol 1, Issue 11, 135-139. <https://doi.org/10.5281/zenodo.10078084>

