

## Preparation and Evaluation of Herbal Sanitary Napkin for Menstrual Health

Manisha U. Mishra<sup>1</sup>, Aastha D. Tembhare<sup>2</sup>, Nidhi S. Baghele<sup>3</sup>, Tanvi S. Murjani<sup>4</sup> and Vina J. Katre<sup>5</sup>  
<sup>1,2,3,4,5</sup>Manoharbhairam Institute of Bachelor of Pharmacy, Kudwa, Gondia, Maharashtra, INDIA.

<sup>1</sup>Corresponding Author: manishaumishra@yahoo.in



www.jrasb.com || Vol. 4 No. 1 (2025): February Issue

Received: 12-02-2025

Revised: 23-02-2025

Accepted: 28-02-2025

### ABSTRACT

The research work highlights the preparation of herbal sanitary napkins with natural and chemical-free materials showing eco-friendly and biodegradable properties. To protect women's reproductive health and promote awareness for environmental sustainability. This alternative approach is designed to improve menstrual health and hygiene. The purpose of the research work focuses on the preparation of three generations of herbal sanitary napkins (F1, F2, and F3) by showing variation in lay arrangement, i.e., hydrophilic nonwoven fabric as the top layer, airlaid tissue, SAP sheet, gelling sheet as the absorbent core, hydrophobic nonwoven fabric and polyethylene sheet as the barrier layer, and application of lemongrass essential oil, mainly used as an herbal ingredient, to give both antimicrobial activity and fragrance. Performance of napkins assessed by absorbency percentage, leak proof test, liquid strike through test, wet back strike through test, fluid retention test, and antimicrobial test. It was revealed from the results that herbal sanitary napkins of the F2 generation showed the best performance.

**Keywords-** Herbal Sanitary Napkins, Biodegradable, Chemical free, Absorbent.

## I. INTRODUCTION

A sanitary napkin is also known as a pad, sanitary pad, menstrual pad, or sanitary towel. A sanitary napkin is a type of medical textile that is used as an adsorbent material designed to be worn externally in direct contact with skin during menstruation. Menstruation is a physiological phenomenon of regular discharge of blood and mucosal tissue (menses) from the lining of the uterus through the vagina at an interval of 28 to 35 days from puberty until menopause [1]. These sanitary napkins are a crucial part of women's health and hygiene during menstruation. At the beginning of time, women used sea sponges, sandbags, homemade rags from woven cotton or sheep wool, and grass mats. In the 19th century, the first sanitary pads were made from wood pulp bandages (known as cellulose) that French nurses found in hospitals. In 1896, Johnson & Johnson jumped on this and created their own version called Lister's Towel: Sanitary Towel's for Ladies [2], and the evolution

of menstrual products continues. A sanitary napkin is a multilayered structure mainly consisting of a top sheet, an absorbent core, and a backing sheet.

a) Top sheet<sup>[3]</sup>: It is designed to transfer fluid quickly from the top sheet to secondary layers. The top sheet contains thermoplastic fibers to prevent capillary collapse of this layer and a small amount of hydrophilic absorbent fiber to allow fluid to absorb.

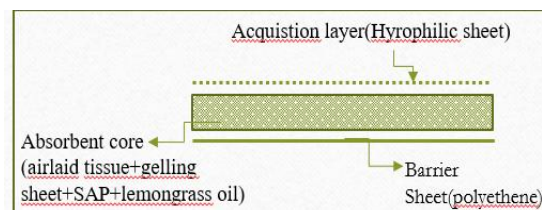


Fig no.1 Conventional structure and material used in herbal sanitary napkins

b) Absorbent core<sup>[3]</sup>: It is interposed between the top sheet and barrier layer; its main function is to absorb and

retain the fluid. Moreover, to have comfort, absorbent cores need to be thin, soft, and pliable. The core was made up of wood pulp traditionally.

c) Barrier sheet<sup>[3]</sup> : It seals the fluid from staining or leakages. It is a breathable but fluid-impermeable film.

**Herbal Sanitary Napkins:** Herbal sanitary napkins are a type of sanitary napkin made of natural fibers infused with herbs, natural ingredients, and essential oils. These napkins help to protect women's reproductive system from infection and ailments and promote women's health, social awareness, and environmental sustainability.

**Objective:**

- To develop formulation and evaluation of herbal sanitary napkins that consist of lemongrass essential oil.
- To provide a natural, chemical-free, and eco-friendly alternative to traditional sanitary napkins.
- To understand the physical and chemical properties of herbal sanitary napkins.
- To reduce the risk of toxic shock syndrome, allergies, and skin irritation.
- To investigate the impact of herbal sanitary napkins on menstrual health and the female reproductive system.

**Ideal Characteristics:-**

- Absorption and retention of menstrual fluid.
- Prevention of bacterial growth and infection.
- Reduction of odor and discomfort.
- Minimization of skin irritation and rashes.
- Protection against toxic shock syndrome (TSS).

**II. MATERIALS AND METHODS**

**Hydrophilic Non-woven Sheets :** These sheets are a type of non-woven fabric used as top sheets in sanitary napkin .This means that the sheet can easily absorb and retain blood.

**Wood Pulp Sheets:** These are also known as airlaid tissues, it is the absorbent core made up of cellulosic pulp and generally made up of different plant fibres used to absorb and retain fluid.

**SAP Sheet:** It is also known a superabsorbent layer, Polymers present in it clog the pores of structure and restrict absorption of fluid so the SAP polymer is affixed to a tissue and placed between a pulp and backsheet.

**Hydrophobic Non-woven Sheet:** It is also known as barrier sheet, it is used as a fluid impermeable sheet which prevent leakage, generally made up of polyethene.

**Release Paper:** It is also known as peel off strip or release liner used as a adhesive strip on the back of the napkin to ensure that it remains sticky and effective.

**Lemongrass Oil:** These oils comprise different molecules, such as monoterpenes, sesquiterpenes, and phenols<sup>[6]</sup> which possess antimicrobial effects, enhance the immune system, and provide stress relief. In particular, essential oils such as lemongrass oil are Essential oils which are effective against Staphylococcus aureus and Escherichia coli causing toxic shock. These essential oils possess deodorizing effects on various substances, including ammonia gas. It would be beneficial to investigate essential oil sanitary napkins with antimicrobial and deodorizing effects.

**Table no.1: Raw Materials**

Sr No.	Raw Material	Uses	Sources
1	Hydrophilic Non Woven Sheet	As Top layer	Rk Enterprises, Mumbai
2	Wood Pulp Sheet	As Absorbent core	Rk Enterprises, Mumbai
3	SAP Sheet	As Super Absorbent core	Rk Enterprises, Mumbai
4	Hydrophobic Non Woven Sheet	As Barrier Layer	Rk Enterprises, Mumbai
5	Release Paper	As Adhesive	Rk Enterprises, Mumbai
6	Lemongrass oil.	For Antimicrobial Activity and Fragrance	Market RV essentials-Flipkart



**Fig. No 2: Top sheet**



**Fig. No 3: Absorbent core**



**Fig. No 4: Release paper**



**Fig. No 5: Lemongrass oil**

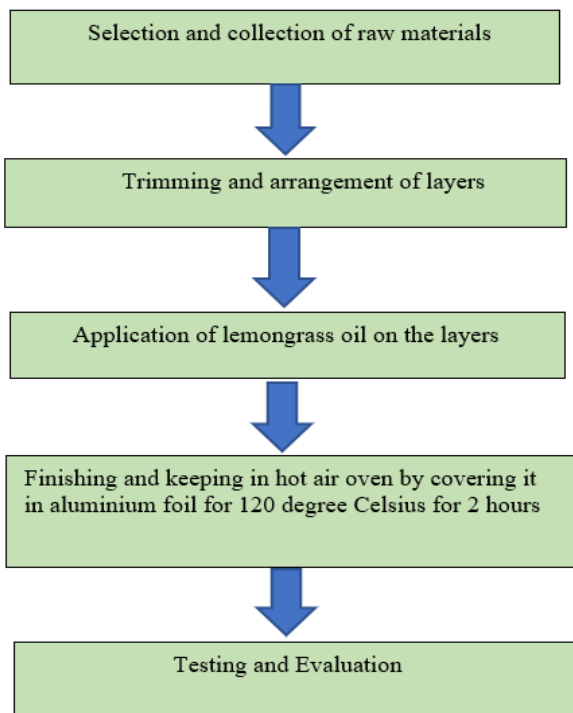
### III. METHOD OF PREPERATION

#### Preparation of Herbal Sanitary Napkins:-

- Selection and collection of Raw material.
- Gift Sample of raw material is receive from RK Enterprises Innovative Paper Creation, Mumbai.
- Trimming and arrangement of layers.
- Application of lemongrass oil on the layers.
- Finishing
- Herbal sanitary napkins are kept in Hot air oven by fully covering it in aluminium foil for 120 degree Celsius for 2 hours.
- Testing and Evaluation



Fig. No 6: Trimming



Flow chart for Herbal Sanitary Napkin Preparation

#### Preparation of Artificial Blood:

The artificial blood used for testing of sanitary napkins was prepared using 1.0% w/v of sodium chloride, 0.4% w/v of sodium carbonate, 10% w/v glycerol, 0.5% w/v of

carboxymethyl cellulose, and 90% w/v of deionized water, congo red 0.001 gram.<sup>[10]</sup>



Fig. No 7: Artificial Blood

Table No. 2 Composition of Herbal Sanitary Napkin

Sr no	Materials	F1	F2	F3
1	Dimension (cms)	15*8	15*8.3	15*7.8
2	Hydrophilic Non Woven Sheet(gms)	0.96	1.03	0.96
3	Wood Pulp(gms)	3.4	3.2	3.13
4	SAP Sheet(gms)	-	2	2
5	Hydophobic Layer(gms)	0.41	0.43	0.40
6	Lemongrass oil	4 Drop	6 Drop	8 Drop
7	Total Weight(gms)	4.77	6.66	6.49



Fig.no 8 Prepared Herbal Sanitary Napkins

### IV. EVALUATION<sup>[6]</sup>

**1. Absorbency Test:** The weight of the dry sample was recorded, then blood substitute was added slowly, drop by drop, till the point of leakage by using a burette. After this process, the final weight of the sample was measured with a weighing scale.

Formula: (final weight-initial weight)/initial weight \*100

**2. Leakage Test:** This test was conducted to measure the amount of blood substitute that leaked out of the sanitary pad after placing 1 kg of weight.

Formula: (final weight of blotting paper-initial weight of blotting paper)

**3. Retention Test:** This test is used to calculate the ability of a sanitary napkin to hold the maximum amount

of absorbed blood after the removal of 1 kg of weight for 1 min.

Formula: (final weight-initial weight)/initial weight\*100

**4. Liquid Strike Through Test:** This test was conducted to measure the time taken by the blood substitute to penetrate inside the dry sanitary pad. The sample was placed on the glass plate to note the change easily. One drop of blood substitute was poured on the sample.

**5. Wet back strike through test:** The test was conducted to measure time taken by the blood substitute to penetrate inside the wet sanitary pad. 10 ml of blood substitute is poured at the center of the sanitary pad to wet the sample there after one drop of blood substitute was dropped on the wet sample. The time was noted in seconds before and after the penetration of the blood substitute in the wet sample.

**6. Antimicrobial Screening:** Antimicrobial test is carried out using Agar Diffusion test against gram positive bacteria(*Staphylococcus aureus*)and gram negative bacteria (*Escherichia coli*). The treated samples are to be placed on the incubated agar plate Development of Herbal finished Sanitary Napkin with test bacteria for 24 hours at 37degree celsius. After incubation the samples assessed visually the area of inhibition measured for antimicrobial efficiency.

## V. RESULT AND DISCUSSION

Table No. 3: Result of Evaluation Test

Sr. no	Test	F1	F2	F3
1	Absorbency Test (%)	51.00	52.40	49.00
2	Leakage Test (%)	2.36	0.55	1.56
3	Liquid Strike through test (sec)	3	5	6
4	Retention Test %	25.00	26.70	19.80
5	Wet back (sec)	7	9	4

**Absorbency Test:** Evaluation of herbal sanitary napkins was done for absorbency percentage. The weight of herbal sanitary napkins for all three generations are calculated respectively are 7.15 gm,6.66gm,8.9gm and the odour is pleasant. By using a formula absorbency % is calculated and F1 is 51.00%,F2 is 52.40%,F3 is 49.00%.F2 batch shows good absorbency% comparison

to others. It can hold a maximum 30 ml of blood substitute.

**Leakage Test:** Amount of blood substitute that leaked out of the sanitary pad after placing 1 kg of weight on F1,F2,F3 generations are 2.36%,0.55%,1.56% out of all the least leakage occurs in F2 generation as well as it shows good holding capacity of blood substitute.

**Retention Test:** The ability of a sanitary napkin to hold the maximum amount of absorbed blood after the removal of 1 kg of weight for 1 min. In F1 25.00%,F2 26.70%,F3 19.80% blood substitute retains and the most retained percentage is shown by F2 generation i.e 26.70%.

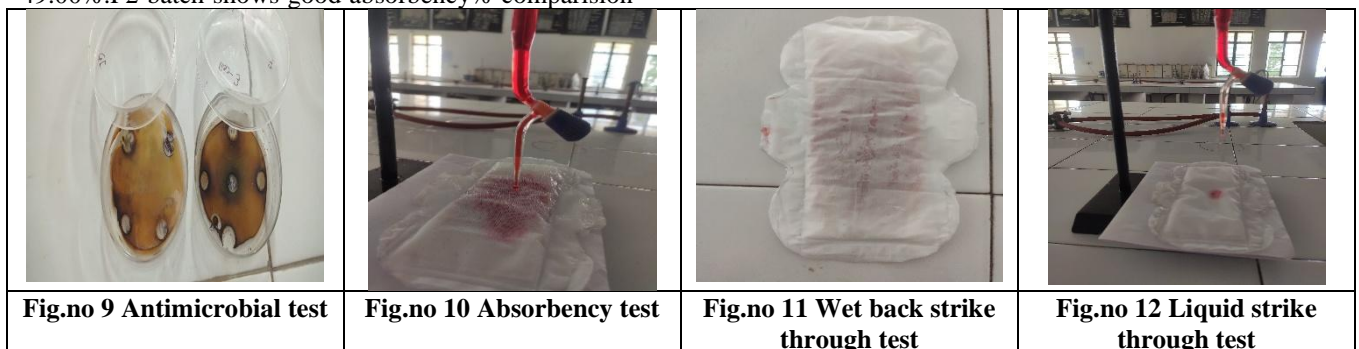
**Liquid Strike Through Test:** Time taken by the blood substitute to penetrate inside the dry sanitary pad. The F1,F2,F3 sample was placed on the glass plate to note the change easily. One drop of blood substitute was poured on the sample, time required by single drop of blood substitute to touch the top layer are 3 sec,5 sec.6 sec, The effective time required is by F2 generation.

**Wet back strike through test:** The test was conducted to measure time taken by the blood substitute to penetrate inside the wet sanitary pad of F1,F2,F3 generation 10 ml of blood substitute is poured at the center of the sanitary pad to wet the sample there after one drop of blood substitute was dropped on the wet sample. The time was noted in seconds before and after the penetration of the blood substitute in the wet sample are 7 sec, 9 sec,4 sec where F2 shows best result.

**Antimicrobial tests:** The zone of inhibition for F1,F2,F3 evaluation F2 formulation showed maximum zone of inhibition than other F2.Significant result was obtained for F2 formulation against *Staphylococcus aureus*, *Escherichia coli*, which was found to be 18 mm and 16 mm respectively due to the lemongrass oil incorporated which shows zone of inhibition and acts against bacteria.

Table No 4: Zone of inhibition

Sr.no	Formulation code	Zone of inhibition(mm)	
		<i>Staphylococcus aureus</i>	<i>Escherichia coli</i>
1	F1	14 mm	13 mm
2	F2	18mm	16mm
3	F3	15mm	14mm





## VI. CONCLUSION

The usability of sanitary napkins is increasing day by day, so the nature and quality of sanitary napkins should not be compromised because they directly affect the woman's health. The herbal biodegradable sanitary napkins are good for women's health and environmental sustainability. In this research, the herbal biodegradable sanitary napkins are prepared and evaluated. These biodegradable sanitary napkins are good in absorbency test, leakage test, retention test, wet back test. The three generations of sanitary napkins were prepared, i.e., F1, F2, and F3, and after the evaluation test, it was observed that the F2 showed the best results regarding absorbency, retention, leakage.

## REFERENCES

- [1] Anuradha Barman, M. Pooja Katkar, S.D. Asagekar, "Development of Eco-friendly Herbal Finished Sanitary Napkin", International Journal for Innovative Research in Science & Technology., vol.4, no.1, (2017), pp.183-189.
- [2] Jeyakanthan, D.M., Schuster, J. and Shaik, Y.P. (2023) Development of Ecological Absorbent Core Sanitary Pads in Combination of Kenaf and Chitosan Fibers. Materials Sciences and Applications, 14, 363-381.
- [3] Anbalagan, S. and Mekala, M. (2021) An Overview of the Plant Fibers in the Development of Ecologically Sustainable Sanitary Napkins for the Green Economy. Journal of University of Shanghai for Science and Technology, 23, 161-172. <https://doi.org/10.51201/JUSST/21/08362>.
- [4] <https://www.mymed.com/health-wellness/interesting-health-info/the-evolution-of-menstrual-product>.
- [5] [journals.sagepub.com/home/jit](https://journals.sagepub.com/home/jit)
- [6] Arun Nivas V et al / Int. J. of Pharmacy and Analytical Research Vol-8(3) 2019 [358-361].
- [7] Barman, A., Katkar, P.M. and Asagekar, S.D. (2017) Natural and Sustainable Raw Materials for Sanitary Napkin. Journal of Textile Science & Engineering, 7, Article ID: 1000308. <https://doi.org/10.4172/2165-8064.1000308>
- [8] Samanta, K.K., Chattopadhyay, S.N., Shakyawar, D.B., Debnath, T.B., Bhowmick, S. and Bhattacharya, S. (2023). Potential of Natural Fibres in Sanitary Napkin. Int. J. Bioresource Sci., 10(01): 89-98. Source.
- [9] 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>
- [10] Kavitha.V et al. Ijppr.Human, 2023; Vol. 27 (2): 144-159.
- [11] [www.jetir.org](http://www.jetir.org) (ISSN-2349-5162).
- [12] Mahalakshmi/Afr.J.Bio.Sc. 6(6) (2024) 8104-8110 ISSN: 2663-2187 <https://doi.org/10.33472/AFJBS.6.6.2024.8104-8110>
- [13] Asian J. Biol. Sci., 16 (3): 218-228, 2023.
- [14] Ganguly L, Satpati L, Nath S. Papyrus to Pad: An Evolution of Menstrual Products. Asian Pac. J. Health Sci., 2022;9(4):72-76.
- [15] [www.rspsciencehub.com](http://www.rspsciencehub.com) Volume 03 Issue 02S February 2021.
- [16] [www.jchr.org](http://www.jchr.org)JCHR (2024) 14(3), 839-844 | ISSN:2251-6727.
- [17] <https://www.kviconline.gov.in>
- [18] Tharakeswari, S., Barshana, S., Indhu, R., Vinu Arthi, M. and Yuva Bharathi, B. (2021) Development of Eco-Friendly Herbal Sanitary Napkins Using Cotton and Kenaf Fibers. International Journal of Mechanical Engineering, 6, 224-229.
- [19] [www.ijppr.humanjournals.com](http://www.ijppr.humanjournals.com).