

DEVELOPMENT OF HERBAL FINISHED BABY DIAPERS WITH BAMBOO FIBER

G. MALARVIZHI

Research Scholar, Research and Development Center, Bharathiar University, Coimbatore, Tamil Nadu, India

ABSTRACT

Textiles are an integral part of everyone's life associated with him from cradle to grave. It is used to cover human body, thus encompassing and protecting it from dust, sunlight, wind and other foreign matter present in the external environment that may be harmful to him. Textiles in apparel have retained an important place in human life, starting now into developing of newer high technology and interdisciplinary products. Among technical textiles, medical textiles are a very promising sector which plays a vital role in health of mankind. It consists of textiles used in operative and post-operative tasks in and around the patient and the medical practitioners. These products are produced either by weaving, knitting, braiding or other nonwoven techniques. Medical textiles are broadly classified as non-implantable materials, implantable materials, extra corporeal devices, and hygiene products, protective and health care textiles. Health care and hygiene products include both disposable and non-disposable products mainly used in hospitals such as surgical gowns, surgical masks and gloves, diapers, sanitary napkins, wipes and incontinence products. The use of such products helps to reduce the opportunity for contamination by biological toxins and infectious pathogens. Hygiene and health care textiles consists of absorbent disposable products, such as baby diaper, sanitary napkins, tampons, panty shields, etc. which are mostly single use items.

Baby diaper are made up of different kinds of fibers such as bamboo, cotton, rayon, wood pulp and or cotton linters which are usually cellulose fluffs combined with super absorbent polymers to create the absorbent core that acts as a storage structure in the product. When baby passes urine onto the baby diaper it creates the favorable conditions for the growth of microbes which will result in the occurrence of nappy rashes. Also the cellulosic materials used in baby diaper are easily degraded by microorganisms which in turn affects to the sensitive skin of babies. Bacterial growth is one of the biggest fallout of non-hygienic atmosphere. Further microorganisms such as bacteria, mould and fungi also cause deterioration of textiles. Hence there has been greater interest in textiles and garments that offer enhanced comfort as well as protection to the wearer.

Hence to prevent such nappy rashes some kind of an antibacterial finishes is essential. Plants and plant product are traditionally used for healing of wounds, burn injuries, anti fungal, anti viral, anti bacterial and anti microbial activity against skin infections. Herbal plant extract for antimicrobial finishing in textiles because of the excellent antimicrobial and eco friendly properties exhibited by them. The population explosion and the environmental pollution in the recent years forced the researchers to find new health and hygiene products for the well being of the mankind. Nowadays the consumers are demanding eco-friendly products. Hence the research has been carried out to use natural herbal plant extracts for antibacterial finishing in textiles because of the excellent antibacterial properties exhibited by them. Since these natural antibacterial agents are less toxic, less irritant and biodegradable they can be used as an antibacterial finish for baby diaper.

KEYWORDS: Health Care Textiles, Baby Diaper, Antimicrobial Finish

INTRODUCTION

Textiles are an integral part of everyone's life associated with him from cradle to grave. According to American Textile Manufacturers Institute, "Textiles go to war, it reaches space, can become a roof, choke an oil spill, imitate an artery, hold you safely in your car seat, form tea bags, support tyres, baby's diaper, line roads, wrap wounds and so on. Present day consumers are demanding much more on value addition in the product. Hence technical textiles have established to offer a strong potential to the revival of the industry. The fields of application of technical textiles are unlimited and the ideas are often revolutionary.

Among technical textiles, medical textiles are a very promising sector which plays a vital role in health of mankind. It consists of textiles used in operative and post-operative tasks in and around the patient and the medical practitioners. These products are produced either by weaving, knitting, braiding or other nonwoven techniques. Medical textiles are broadly classified as non-implantable materials, implantable materials, extra-corporeal devices, and hygiene products, protective and health care textiles.

Evolution is a constant and human race is constantly trying to upgrade to better quality of life. One of the outcomes of this "growth" is the need for healthier living through better hygiene. Health care and hygiene products include both disposable and non-disposable products mainly used in hospitals such as surgical gowns, surgical masks and gloves, surgical drapes, surgical foot wear and head wear, staff apparel, towels, bedding, diapers, sanitary napkins, tampons, panty shield, wipes, incontinence products,

Hygiene and health care textiles consist of absorbent disposable products, such as baby diaper, sanitary napkins, tampons, incontinence products, panty shields and wipes which are mostly single use items designed to receive, absorb and retain body fluids and solid wastages. As it is a commonly accepted principle, prevention is better than cure and hence maintaining a better hygienic environment will obviate the need for curative measures.

REVIEW

Technical Textiles

Technical textiles are one of the fastest growing sectors of the global textile industry, reveals Gulrajani (2008). The term technical textiles was coined in the 1980s to describe the growing variety of product and manufacturing techniques being developed primarily for their technical properties and performance rather their appearance or other as aesthetic characteristics, remark Nadiger et al. (2008). The promise of technical and performance textiles is an emerging generation of products combining the latest development in advanced flexible materials with advances in computing and compensations technology, bio materials, nanotechnology and novel process technologies such as plasma treatment, says Venkatachalam (2007).

Health care and hygiene products include bedding, clothing, surgical clothes products for famine hygiene like sanitary napkins, baby and adult diapers, briefs Gulrajani (2008). The product is in direct contact with skin; hence it has to be of very high sensitivity. Besides being particularly soft and gentle to the skin, the product feature excellent workability, high strength and good strike through wet back characteristic, reveals Vishnu (2006). Baby diaper fall under the class of nonwoven product. Nonwoven fabrics are flat, flexible, porous sheet-like structures that are produced by interlocking of layers or networks of fibres, filament or filamentary structures. They generally fall in two category i.e. disposables or durables and provide the basis for a wide variety of consumer, industrial and health care products used around the world, describe Advarekar et al. (2007).

Bamboo fabrics are made by pure bamboo fibre yarns, which have excellent wet permeability, moisture vapor transmission properties, soft hand, better drapery easy dyeing and splendor colors. It is a newly founded, great prospective green fabric.

Bamboo decorating series has the function of antibiosis, bacteriostasis and ultraviolet-proof. It is very advantageous for utilization in the decorating industry. Curtain television cover, wallpaper and sofa slipcover can all be made by bamboo fibre.

Nappy Rash (Napkin Dermatitis)

Nappy rash is the most common infant skin complaint which causes discomfort. Diaper rash (US) or nappy rash (UK), is a generic term applied to skin rashes in the diaper area that are caused by various skin disorders and or irritants. Napkin dermatitis with secondary bacterial or fungal involvement tends to spread to concave surfaces (i.e. skin folds), as well as convex surfaces, and often exhibits a central red, beefy erythematous with satellite pustules around the border. It also spreads between the legs to the anal region behind shown in (plate I). Nappy rash may also be caused by chafing of soiled nappy against the skin, note Benjamin et al. (1966). Irritant diaper dermatitis develops when skin is exposed to prolonged wetness, increased skin pH caused by urine and feces and resulting breakdown of the stratum corneum, or outermost layer of the skin.

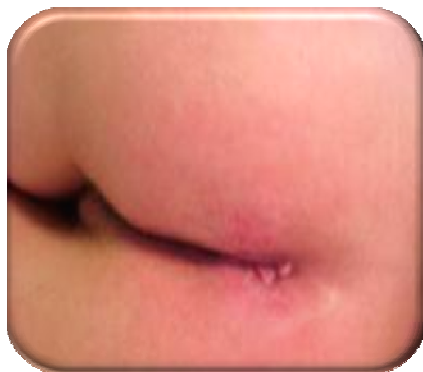


Figure 1: Nappy Rash

In infants this layer of the skin is much thinner and more easily. This infection also results in peeling of the skin. Nappy rashes create irritation on the baby's skin especially in the region of the diaper that is the crotch, buttocks and stomach.

Finishes

The rapid growth in technical textiles and in their end uses has generated many opportunities for the application of innovative finishes. Novel finishes of high added value for apparel fabrics, home textiles are also greatly appreciated by a more, discerning and demanding consumer market, indicates Holmes (2007). The modern trend is towards the production of durable and lasting finishes

Antibacterial Finish

The term antibacterial finishes indicates controlling or limiting the growth of bacterial colonies and their extinction, defines Achwal (2003). The antibacterial finish protects wearers of the textile product for against bacterial, dermatophytic fungi, yeasts, viruses and other deleterious microorganisms, states Jasuja (2004). Antibacterial control, destroy or suppress the growth of microorganisms and their negative effects of odour, staining and deterioration.

Aloe Vera

According to Rawar (2005), Aloe vera gel is an extraordinary demulcent compound, composed of mannuronic and glucuronic units combined to form a polymer of high molecular weight. Gastric mucin contains only glucuronic units in its carbohydrate moiety. The uronic acids are natural detoxicants, and as they are released by the hydrolytic cleavage of Aloe vera gel, they may take part in the healing process by stripping toxic materials of their harmful irritation.

METHODOLOGY

- **Selection of Sample and Collection of Data**

Hundred lactating mothers of age group 3-18 months were selected as the samples for the study. Information's regarding the usage of baby diaper, problems commonly faced, need and awareness of any special features was collected and consolidated using an Interview schedule method.

- **Designing Baby Diaper**

Table 1

Components of Baby Diaper	Selection of Material
Antimicrobial treated skin touching layer	19 GSM of nonwoven polypropylene sheet was selected for the top layer of the baby diaper shown in plate II
Absorbent core	30:70 ratios of bamboo and wood pulp fibre were used to form an absorbent core layer shown in plate III and IV
Back sheet	Polypropylene nonwoven fabric (Hydrophobic) shown in plate V

RAW MATERIALS USED TO DESIGN BABY DIAPERS

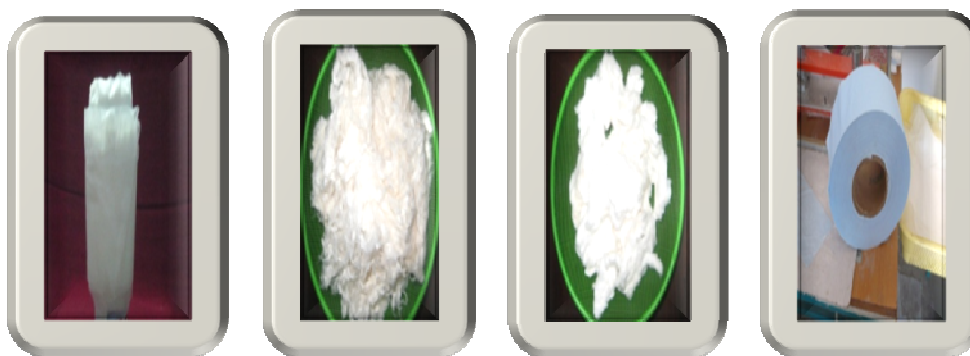


Figure 2

- **Preparation of Antimicrobial Finish for Inner Layer**

The aloe vera extracted herbal solution was taken in three different proportion such as 25, 50, 100 percentage. This was mixed in the ratio of 1: 5, 1: 10, and 1: 15 with water. The mixture was then centrifuged at 1500 rpm speed for 15 min as recommended by Kokilavani (2007) to get clear extract. The clear extract is filtered using watt man filter paper. The filtered solution was preserved in conical flask and used at different percentage namely 25, 50 and 100 per cent.

Based on the antibacterial test 100 per cent concentration was opted as the best. Thus this concentration level was taken into account for the study respectively.

- **Assembling the Components:** The selected components namely back sheet, Absorbent core layer, Antimicrobial finished top layer (Table1) were spread and packed neatly with a strip of adhesive tape fixed at the back for closure.

RESULTS AND DISCUSSIONS

- **Mother's Opinion about Baby Diaper:** Forty percent of mother of infants age group 3-12 months use baby diaper regularly. More than 64 percent of mothers of 3-18 months of infants use baby diaper occasionally in that 12-18 months use baby diaper occasionally due to the fact that these age children move around frequently and to be part in social gatherings along with their parents. Hygiene and travel were the major reasons quoted by 100 and 84 per cent of mothers for using baby diaper. Fifty percent of mothers preferred A2 followed by 44 per cent for A1 brand. The reason for preferring a specific brand was cost and comfort. Maximum of 76 percent mothers were not aware about the raw materials used in baby diaper. Only 24 percent were known about bamboo fibre. Among them 64 were known bamboo fibre for its absorbency, 36 were known for antibacterial, 60 for softness and remaining had no idea about it. Rashes and itching sensation was the maximum problem faced by children using baby diapers as 68 and 44 percent respectively. Only forty mothers were interested to accept the value specially finished baby diaper for their infants. Types of finish required were off with antibacterial and cool finish. Maximum of 61.5 percent required for antibacterial, 38.5 for cool finish and 28.5 for perfumized finish were the type of finish required by the mothers. Use wrap and throw was the only method followed by all the mothers to dispose the baby diaper.
- **Evaluation of the Designed Baby Diaper:** The designed baby diaper possess good absorption capacity which is well supported by the wicking values, both in longitudinal and transverse. The wetness value proves that the designed baby diapers were able to float for several minutes before it became completely wet and cannot prevent the rewetting of the liquid when subjected to pressure. The fluid run off value proves the designed baby diaper have a tendency to bleed, after attaining saturation point.
- **Performance of Designed Baby Diaper:** Based upon the usage of the mother for their infants it is clear that baby diaper were comfortable and good on usage. They were satisfied with the physical properties like size, weight and thickness. But the properties like colour were express as not satisfactory 52.5 per cent of mothers. The mothers also expressed curling and leakage of the designed baby diaper on over wetting. In a nut shell the designed baby diaper were good but need light modification to be commercialized.

SUMMARY AND CONCLUSIONS

Newborn babies, the most wonderful creator on the earth, rather the ultimate wonder of the Almighty is a dream of every married man and women. Each individual take care of their tiny ones and tries to give the best to bring them up the most effective manner. The young mother always wants her baby to be healthy in soft and warm hands. The results of this research can be a right solution for this inner feeling and production of modern health and hygiene care products.

The antibacterial skin touching layer Diaper prove to be safe, laying a foundation to reduce health problems like nappy rashes, red patches, itching sensation on the baby's skin. The bamboo fibre incorporated with wood pulp at the ratio 30:70 showed good absorbency property. The other physical such as thickness, size, shape, and odour were partially satisfied by the mothers. The results of the research study proved that the antibacterial finished baby diaper were to reduce health problem and to produce eco friendly products. In a nut shell the study has laid a foundation in production of healthy and safe baby diaper.

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