DEVELOPMENT ON REUSABLE DIAPER INSERT PAD WITH BANANA FIBER AND HERBAL FINISH

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ABSTRACT

Hygiene and cleanliness are a priority when it comes to baby care and changing diapers in order to keep all bacteria and germs away. Babies are more prone to infections because of their delicate thin skin which comes in direct contact with faecal matter when they are using disposable diapers. Disposable diapers are not only hazardous to babies but they are also a threat to our environment. To prevent from various infection caused by bacteria and to keep them comfortable and chemical free product with anti-bacterial and anti- inflammatory protection. Cloth diapers may be more breathable with high absorbent quality, which can help to reduce skin irritation. Cloth napkin has the advantage of being semi-sustainable with merits like ventilation, comfort, skin-friendly, long-lasting, and economically good. Infants with allergies by using disposable diapers with chemical substance and the bacterial infection due to the disposable diaper can use the reusable cloth diaper with anti-bacterial finish can help to control the infection caused by bacteria that are assist with the wearer from the risk of infection. Anti-inflammatory properties are provided in reusable diapers to any inflammations caused due to infection. The uses of hygienic and eco- friendly products are increasing in developing and developed countries. Therefore, this area of market is increasingly expanding and competitive reusable product for baby. This study deals with development of reusable diaper insert pad with banana fiber and herbal finish to protect the interests of infants and to maintain their hygiene. The tests were conducted as per AATCC standards.

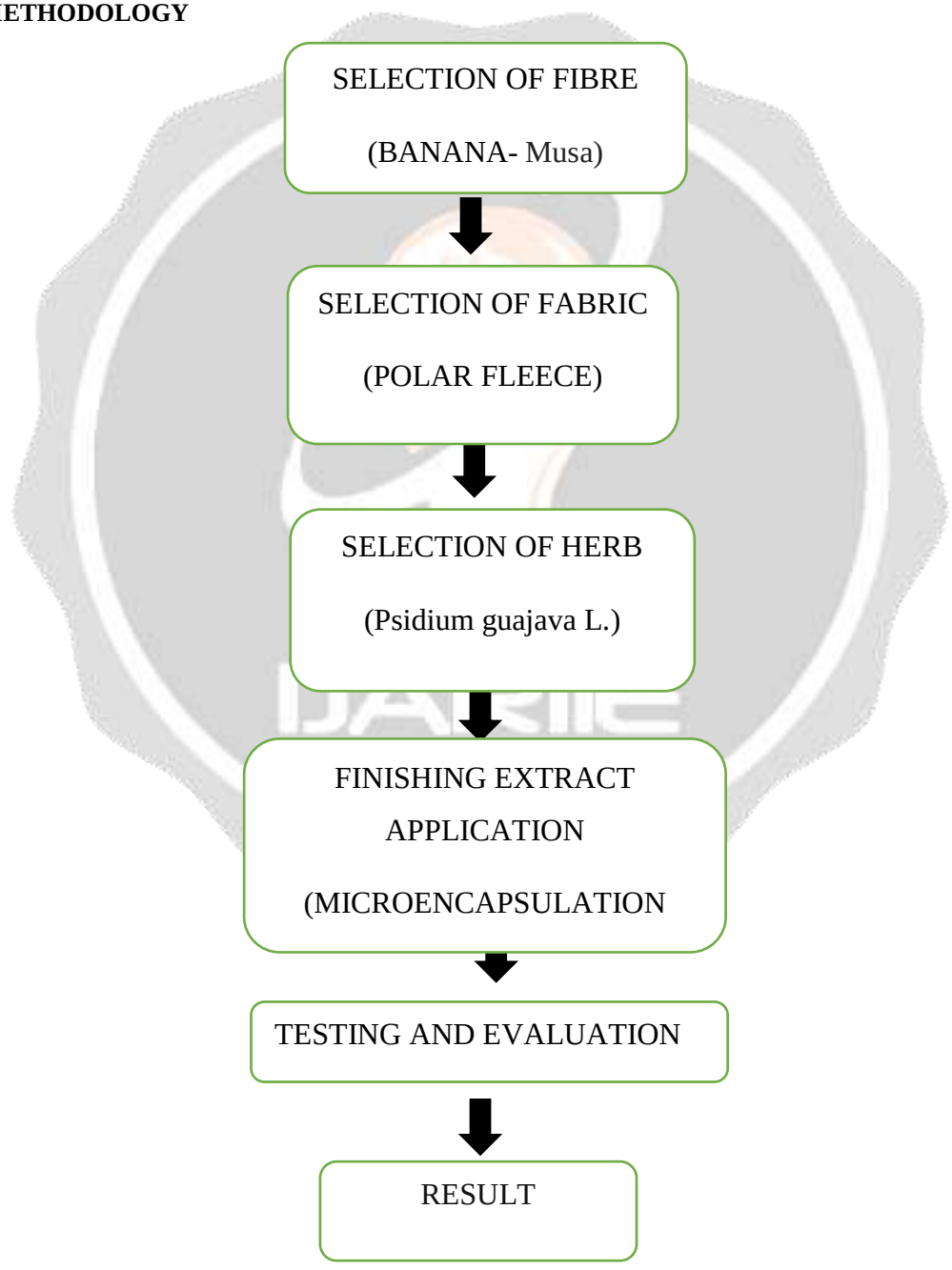
KEYWORDS: Reusable diapers, Anti-bacterial, Anti- inflammatory protection, Natural fiber, Eco -friendly, Microencapsulation.

INTRODUCTION

Reusable diapers are a good choice for those who want to safeguard a baby's delicate epidermis while being environmentally conscious. There are many different types of reusable diapers, and there may be some health advantages, particularly for babies with skin conditions like eczema. Using cloth diapers could lessen your risk of developing sensitivities and bacterial infections. Polyester fabrics microfleece or suede cloth are often used inside cloth diapers as a "stay-dry" wicking liner because of the non-absorbent properties of those synthetic fibers. Modern cloth diapers come in a host of shapes, including preformed cloth diapers, all-in-one diapers with waterproof exteriors, fitted diaper with covers and pocket or "stuff able" diapers, which consist of a water-resistant outer shell sewn with an opening for insertion of absorbent material inserts. Wool, bamboo, and unprocessed hemp are examples of other natural fiber fabrics. It is possible to use artificial materials like an external waterproof layer of polyurethane laminate (PUL) or an interior absorbent layer of microfiber toweling. Other types of fleece are manufactured from cotton, bamboo, hemp, or a combination of these materials, and microfleece is a lining material for diapers. Diaper inners, soakers, and exterior layers can all be made of natural fiber fleece. Banana fiber has a wide range of qualities, including biodegradability, resilience, breathability, and absorbency. Since banana fiber is highly effective at absorbing moisture, it is frequently used in high-end

sanitary goods like baby diapers, textiles, napkins, and eye pads. The most effective antimicrobial agent against M. catarrhalis and S. aureus is banana fiber. The guava plant's Psidium guajava (L.) leaves have biological effects, including anti-inflammatory, antimicrobial, antibacterial, and antioxidant properties that serve to ward off infections and lessen inflammation. For personal health care products like diapers, protective clothing, cleaning cloth, and sanitary napkin raw materials, hydrophobic fabrics have excellent hydrostatic pressure. When in touch with water, hydrophobic surfaces have the ability to repel moisture and resist getting wet. Surface tension, a result of imbalanced molecular forces at the water/solids interface, is what causes the occurrence. When obtaining specialized hydrophobic finishing treatments, water-repellent fabric is used to create the leak-proof diaper material. Reusable insert pads are a comfort for infants to safeguard against different infections, and using environmentally friendly products won't harm the environment.

METHODOLOGY



SELECTION OF FIBRE:

Fig 3.1(Banana fibre)

Banana is one of the most well-known and useful plants in the world. Almost all the parts of this plant, that are, fruit, leaves, flower bud, trunk, and pseudo-stem, can be utilized. It discusses the production of banana pseudo-stem fiber, which includes plantation and harvesting; extraction of banana pseudo-stem fiber; retting; and degumming of the fiber. It also deals with the characteristics of the banana pseudo-stem fiber, such as morphological, physical and mechanical, durability, degradability, thermal, chemical, and antibacterial properties. Several potential applications of this fiber are also mentioned, such as the use of this fiber to fabricate rope, place mats, paper cardboard, string thread, tea bags, high-quality textile materials, absorbent, polymer/fiber composites, etc. The use of cellulose fiber from the forest and agricultural residues has many advantages, such as environmental friendliness, recyclability, and low cost or even free raw material. Banana plants, which belong to the family of Musaceae, are native to the Malaysia-Indonesian region of South-East Asia.

SELECTION OF FABRIC:

Fig3.2. Polar fleece fabric

Polar fleece is a soft napped insulating fabric made from polyester. Polar fleece is much thicker and warmer than microfleece. Polyester fleece comes in many weights and varieties and can perform several different functions. The thinnest fleece is often used on the interior of a diaper as a stay dry layer. Thicker fleeces can be used in making a breathable cover for diapers. If there is a very absorbent diaper underneath, fleece can be an incredibly successful fabric as a cover for diapers since it is so water resistant, yet porous for breathability. Anti-Pill Fleece A lower-quality polar fleece commonly available at fabric stores. Some kinds of anti-pill fleece are thick enough to use for Cloth Diaper Covers. Some types are thin enough to use for an inner wicking layer. Microfiber A super absorbent fabric used for an absorbent Soaker layer and also used for making Inserts pads for diapers. Microfiber can be very drying so most people recommend against using it directly against baby skin. Microfiber can be prone to compression leaks when it is wet and squished. One is made from synthetic fibers and is known as polar fleece (water resistant) or Microfleece (thin enough to be used as a diaper lining). The other kind of fleece is made from cotton, bamboo, hemp or a combination of these. Natural fiber fleece can be used for a diaper inner, soaker or outer layer.

SELECTION OF HERB:

Psidium guajava (Guava leaf extract)

Fig3.3. **Psidium guajava (Guava leaf extract)**

Psidium guajava is a common plant, called guava, and is available worldwide. Guava has been shown to have many biological activities as a medicinal plant, including anti-cough, anti-diabetes, antibacterial and antioxidant properties. Pharmacological and chemical research work has been carried out on the leaf as it is enriched with phytoconstituents, including flavonoids and phenols, including terpenoids, chlorophyll, tannins, saponins, and essential oils Psidium Guajava leaf extract containing phenolic compounds are known for antimicrobial activity. Psidium guajava leave extract was therefore used to impart multi-functional properties to fabrics, such as antibacterial and antioxidant properties, in addition to ultraviolet protection. Two solvents have been used for the preparation of the extract, namely water, and ethanol. Both prepared extracts were used as a reducing and stabilizing agent in the synthesis of silver nanoparticles.

MICROENCAPSULATION:

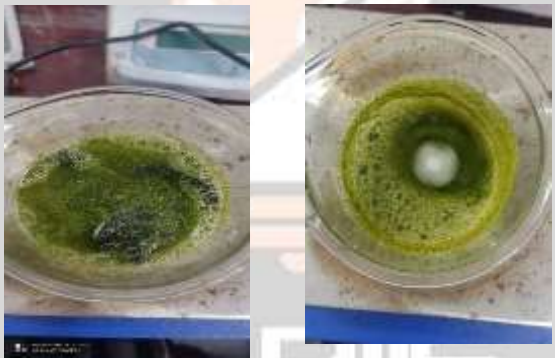


Fig3.4.Microencapulastion process

Microencapsulation is a natural phenomenon and the examples of ideal microcapsules are found in the nature i.e., spores, seeds, eggs and pollen etc only a few to mention. Due to numerous applications of microencapsulation and as a result there are a number of processes developed to encapsulate a galaxy of materials to suit the individual applicability. In the broadest sense, microencapsulation provides a means of packaging, separating and storing solid and liquid materials in a microscopic scale for a later release on your own desire under controlled conditions.Microcapsules are minute containers that are normally spherical if they enclose a liquid or gas, and roughly of the shape of the enclosed particle if they contain a solid. It can be considered as a special form of packaging, in that particulate matter can be individually coated for protection against environment and release the volatile substance from the enclosed capsule as required. This property has enabled microcapsules to serve many useful functions and find applications in different fields of technology.

TESTING AND EVALUATION

ANTIBACTERIAL ACTIVITY:

The antibacterial activity and antifungal activity of crude extract extracts was determined by Well Diffusion method (Bauer *et al*., 1996). MHA plates were prepared by pouring 20ml of molten media into sterile petriplates.. The sterile paper discs were dipped into required solvents then placed in agar plates. Then 10-50 µl of plant extract was poured into the wells. After that, the plates were incubated at 37°C for 24 hours. Assay was

carried into triplicates and control plates were also maintained. Zone of inhibition was measured from the edge of the well to the zone in mm. The tested cell suspension was spread on mullerhintonagar plate and potato dextrose agar. well, were put into the agar medium using sterile forceps. plant extract was poured on to wells. Then plates were incubated at 37°c for about 24 hours and control was also maintained. Zone of inhibition was measured from the clear zone in mm.Antibacterial activity was performed by agar diffusion method. Van der Watt *et al.*, 2001. The stock culture of bacteria *(E. coli* and *S. aureus)* was received by inoculating in nutrient broth media and grown at 37 % for 18 hours. The agar plates of the above media were prepared. Each plate was inoculated with 18 hours old cultures the bacteria were swab in the sterile plates. Cut the 5 wells Pour the extract in ratio 25 µl, 50 µl, 75 µl, 100 µl. All the plates were incubated at 37^{o}C for 24 hours and the diameter of inhibition zone was noted in Cm. Agar well diffusion method has been used to determine the antimicrobial activities and minimum inhibitory concentrations or plant extracts against gram-positive, gram-negative bacteria. The extracts exhibited antibacterial activities against tested microorganisms.

ABSORBANCY TEST:

To test the absorbencies of different fabrics, I took 10 cm (4″) square pieces of the fabrics compared the weight of the samples when dry, and then let them absorb as much hot water as they can to make sure all the fibres were saturated (left them soaking in a bowl of water for a minute, squeezed the water out then put it back in to absorb more, repeated then left that to soak for a few more minutes). I then lifted them out of the bowl by one corner and waited until they stopped dripping and then weighed them to see how much liquid they had absorbed. Comparing the wet weight to the dry weight

RESULTS AND DISCUSSION

ANTI-BACTERIAL ACTIVITY

Organisms(*S.Mutans)*	***E.Coli***	***staphylococcus aureus***
Turmeric treated cloth	0.7 cm	0.9 cm
Standard (Chloramphenicol)	1.0 cm	1.0 cm

Fig 4.1.1 E.coli

Fig4.1.2 staphylococcus aureus

REPORT:

Thus, the result is find in the guava treated cloth having antibacterial activity against the E.Coli and staphylococcus aureus.

ABSORPTION TEST:

To test the absorbencies of different fabrics, I took 10 cm (4″) square pieces of the fabrics compared the weight of the samples when dry, and then let them absorb as much hot water as they can to make sure all the fibres were saturated (left them soaking in a bowl of water for a minute, squeezed the water out then put it back in to absorb more, repeated then left that to soak for a few more minutes). I then lifted them out of the bowl by one corner and waited until they stopped dripping – and then weighed them to see how much liquid they had absorbed. Comparing the wet weight to the dry weight

Test	**Weight of the dry fabric**	**Weight of the wed fabric**	**% of the absorbance**
Testing of polar fleece	**0.8g**	**0.38 g**	**70 %**

SUMMARY&CONCLUSION:

Thus, the insert pads for diapers have been developed and tested according to AATCC Standards. This pad possesses anti-bacterial and anti-inflammatory properties. These are cheaper and eco-friendly product that are sustainable as well as hygienic. Developed insert pad with the uses of banana fiber and polar fleece in the ratio of 1:1 hence it is very cost effective. No chemicals are used in this insert pad and the development process also. Hence it is the healthier and cheaper option for infants to prevent from bacterial infection and rashes free product, which will reduce the environmental hazards.

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