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FORMULATION AND DEVELOPMENT AND EVALUATION OF POLYHERBAL SHIELD

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ABSTRACT

The development of polyherbal bandages represents a promising advancement in wound care, integrating the therapeutic properties of multiple medicinal plants into a single dressing. These bandages are typically infused with bioactive compounds extracted from various herbs known for their antimicrobial, anti-inflammatory, and wound-healing properties. The synergistic action of these phytochemicals not only accelerates the healing process but also minimizes the risk of infection and scarring. In this study, a polyherbal bandage was formulated using extracts from Azadirachta indica, Curcuma longa, and Aloe vera, incorporated into a biocompatible base. The bandage was evaluated for its antimicrobial efficacy, biocompatibility, and wound-healing potential through in vitro and in vivo assessments. Results demonstrated significant antibacterial activity against common wound pathogens and enhanced epithelialization in treated wounds. These findings support the potential of polyherbal bandages as a natural, effective alternative to conventional wound dressings, with added benefits of reduced side effects and improved patient compliance.

KEYWORDS: *PineappleleaffiberSoilcover-Extraction-Biodegradability.Kappanumber*

INTRODUCTION

There great deal of potential for large-scale pineapple production in north eastern India. The extraction of pineapple leaf fibre is opening up a market for both commercial and small scale producers. Numerous other possibilities, such as different fibres that may come from the pineapple, are being researched. [1]The pineapple is an unidentified fruit that is native to tropical regions. An emerging industry that can be used for market opportunities is valuable dietary fibre. The fruit's fibre is a beneficial addition to a wide variety of foods. The fruit's microcrystalline cellulose, which is used in the other area, is visible.

author pharm fibre prosperity in addition to its strong foundation in the north eastern and Assamese regions. Thailand, the Philippines, Costa Rica, China, and India are the world's fastest growing nations, along with Brazil[2]. The largest region available for pineapple crop cultivation on a productivity scale is Assam. India leads the world in this crop's production, which leads to additional opportunities for fibre production. Nearly 90–95% of the product is organic, and the area generates over 40% of the nation's pineapple[3].

The creation of fibres and textiles with an emphasis on the green environment is a result of rising consumption and living standards .aceutical sectors. Gaining knowledge from creative projects that utilise leaves and stems Concerns about sustainable development have recently sparked initiatives to decrease waste output and increase the efficiency of raw resource use. The use of agricultural wasteasa substitutefibre source has been emphasised in this context. By reusing these wastes, the amount of garbage produced will be significantly reduced, which will lessen their impact on the environment[4]. In addition, the agricultural economy will become more diversified as a result of the repurposing of those byproducts for the production of value-added products. One of the most well-known tropical fruits that is grown Extensively world wide is the pineapple. For economic development, pineapple leaves—the plant's main under utilised portion—need international attention. Following the harvest of fruit, the leaves are burned or broken down for disposal. This occurred as a result of farmers' and local communities' misunderstanding of the existence of commercial uses of the antiquated technology used for this purpose. pineapple leaves. A thorough investigation is required to determine the potential of these useful agricultural wastes since plantation yield improvement will result from the in-situ decomposition and burrowing of the leaves [5]. Numerous researchers have conducted studies on different facets of pineapple leaf fibres (PALF). A number of writers have examined the physical, mechanical, and chemical characteristics of PALF from different pineapple species [6, 7]. Additionally, not much investigation has been done on the surface. effects of treatments on the tensile characteristics of PALF [8, 9]. Every study result indicated that surface

Drugs

Pineapple leaves themselves are not typically associated with any recreational or

Psycho active drug use. However, the rear some aspects of pineapple leaves and their potential uses in medicine or alternative health practices that are worth mentioning.

Medicinal Use of Pineapple Leaves

Pineapple leaves contain various bioactive compounds, including bromelain (a mixture of enzymes),antioxidants,andotherphytochemicals.Thesecompou

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ndshavebeenstudiedfor various potential health benefits, including:

Anti-Inflammatory Effects: Bromelain has been researched for its ability to reduce inflammation, which could help with conditions like arthritis or sports injuries.

Digestiveaid: Bromelainmayalsoassistindigestionbybreakingdownproteinsand improving the absorption of nutrients.

Antioxidantproperties:Pineappleleavescontainantioxidantsthatmayhelpcombat oxidative stress and support general health**.**

Advantages of Bandages

1. *Protection of Wounds:*
Bandageshelpprotectawoundorinjuryfromdirt,bacteria,andexternalcontaminants, reducing the risk of infection.
2. *Support and Immobilization:*
Forsprains,strains,orfractures,bandagescanhelpimmobilizetheinjuredarea, providing support and minimizing movement to allow proper healing.
3. *Control of Bleeding:*
Bandages, especially when used with pressure, can help control bleeding by applying gentle pressure to the wound, promoting clotting and reducing blood flow to the injured area.
4. *Pain Reduction:*
By stabilizing the injured part of the body, bandages can reduce the amount of movementandthereforehelpalleviatepain,especiallyincasesofsprainsorstrains.
5. *AbsorptionofExudate:*
Bandages,particularlythosewithabsorbentpads,canabsorbwoundexudates(fluids that leak from the wound), keeping the wound clean and preventing maceration of surrounding skin.
6. *Compression:*
Elasticbandages,suchasanACEbandage,arecommonlyusedtoapplycompressionto reduce swelling, promote circulation, and speed up the healing process in conditions like sprains, strains, or edema.
7. *AestheticCoverage:*
Bandageshelpcoverupvisiblewounds,burns,orabrasions,whichcanalsobeimportant for psychological reasons, especially in visible or socially sensitive areas like the face or hands.
8. *EasyApplication:*
Bandagesarerelativelysimpletouseandapply,makingthemapracticalandimmediate solution for basic wound care, especially in emergency situations.

Disadvantages of Bandages:

1. *Improper Application Can Cause Harm:*
- If a bandage is applied too tightly, it can restrict blood flow, leading to further tissue damage, swelling, or even the development of more serious complications like ischemia. Conversely,ifappliedtooloosely,itmayfailtoprovidethenecessary support,causingthe injury to worsen.
2. *SkinIrritation:*
- Prolonged use of bandages, especially those with adhesive, can lead to skin irritation, allergicreactions,orrashes.Peoplewithsensitiveskinarepparticularlyvulnerabletosuch issues.
3. *InfectionRisk(IfNotChangedProperly):*
Ifbandagesarenotchangedregularly,theycanbecomeabreedinggroundforbacteria, leading to infection. It is essential to change bandages according to the wound's condition and the advice of healthcare professionals.
4. *Discomfortor Restriction:*
Some bandages, especially thick ones or those used for immobilization, can cause discomfortorrestricttherangeofmotion,makingitdifficultforthepersontomovefreely.
5. *FalseSenseof Security:*
Abandagecansometimesgivethefalseimpressionthatawoundorinjuryisfullyhealed or protected, leading individuals to neglect proper medical care or rehabilitation. Over reliance on bandagescandelayproper healing.
6. *DifficultyinMonitoringWoundHealing:*
While bandages provide protection, they can sometimes obscure the wound, making it harderforboththepatientandhealthcareprovidertomonitorforsignsofinfectionorother complications.
7. *ExpensiveorSpecializedTypes:*
Some bandages, especially advanced ones like hydrocolloid or antimicrobial dressings, canbecostly.Additionally,specialtybandagesmaynotbereadilyavailableinallsituations or may require medical supervision to apply correctly.
8. *PotentialforCompressionInjury:*
Forinjuriesrequiringcompression(suchasusinganelasticbandageforasprainedankle), if the compression is too tight or not applied correctly, it can cause further injury, such as nerve damage or blood circulation problems.

Chemicals

Ingridient	Quantity
Ricewater[slurry]	Quantity suffecient
Honey	20ml
Alovera	20gm
Glycerine	12-14ml
Pineapple fiberes	1gm[approx]

Methode of preparation

1. 1gmofpineapplefibersandslurryofricewateristriturateinmorterpestle
2. then20gmof aloverais addedandthen20mlhoney and12-14mlglycerineare added
3. Thenthispasteispouredonpeteridishandkeptitinhotairovenfor5-6minathigh temperature
4. thencutitaccordinglytotheshapeofthebandage
5. thenputlittleamountofturmericandaloveraonthecuttedstripforantibacterialeffect and anitiinflameteroy effect
6. thenputthisstripinbetweenthelabellingpaper 7] and the bandage is ready

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FIG.1

Extraction

There has been some interest in using certain compounds from pineapple, including bromelain, for therapeutic purposes. Bromelain, for instance, has been used as a dietary supplement for its anti-inflammatory properties, but it is not classified as a recreational drug.Thereisnoevidencetosuggestthatpineappleleavesthemselvesarepsychoactiveor used as a recreational drug.
chemical method: Involved the extraction with 6% NaOH, 20% aqueous acetone, and pineapplejuicesolution.Thesemi-mechanicalmethodwasacombinationof"rollerand bladder" system and a chemical retting pro- cess using 6% NaOH alkaline solutions.

Key Components for Extraction:

Bromelain
Bromelainisamixtureofenzymesfoundinpineapple,particularlyinthestemandleaves.It hasvarioushealthbenefits,including anti-inflammatory,digestive,andpotentialanticancer properties.

Fibers:
Theleavesarerichincelluloseandlignin,makingthemsuitableforextractionintofibers that can be used in textiles, including Piñatex, a sustainable alternative to leather.

Flavonoids and Antioxidants:
Pineappleleavescontainvariousantioxidantslikeflavonoids,whichhaveanti-inflammatory and disease-fighting properties. These antioxidants can be extracted for use in dietary supplements or cosmetics.

Phenolic Compounds:
Thesecompounds,whichhaveantimicrobialandanti-inflammatoryproperties,arepresent in pineapple leaves and are of interest for various health and industrial uses.

PROCEDURE AND EVALUTION

Retting

Immersedinarettingtank.Ureaof ammoniumphosphatewasusedforquietretting.Atthe end of retting, the leaves are removed and washed mechanically with pond water.

UsingaCeramic Plate

Pineappleleafwithpreisteovermovementwillprovideturnandfiberbeneaththeleaf.How to pull the fiber off a lengthy leaf using an easy procedure.

Preandpost-Harvest Metabolism

As part of the grading criteria, pineapple fruit and crown quality are important economic considerations. As a result, leaf damage, which appears as dark blotches on the crown leaves, is incurring significant economic losses. During the day, CO will be discharged and treated using Rubiscobehind closed stomata. The pineapple crown is a continuation of the vegetativestem,andthespirallyarrangedleafletshaveasimilarshape.Thephotosynthetic activity of crown leaves remained unknown.

.Pineapplefiberisaswhite,creamy,andlustrousassilkfiber,butmorecoarsethancotton fiber, and it is easily dyed. India is the sixth-largest pineapple producer in the world. The biggest pineapple producing states in India are West Bengal, Assam, and Karnataka Bihar, Tripura, and Kerala. In India, the physical method for collecting fibre is quite stressful.

Furthermore,thereisahighdemandformarketingoperationstopromotepineapplefabric.

Pineapple plants are widely produced in tropical America, Far East Asian countries, and Africa. In the Philippines andGrown in Taiwan, the pineapple plant is mostly used as a resource. In India, the pineapple plant is also a well-known source of fiber. PALFextractionreliesheavilyonpre-and post-harvestingprocedures.Asthetimespent,thecropshouldbe used within the required time frame.

PHYSICALANDCHEMICALTEST
PHYSICALTEST

Peeltest

Thistestmeasurestheadhesivestrengthofabandagebypeelingbacktheadhesivefroma material. The test can help determine if the adhesive is strong enough or too strong for its intended use.

Microbialingrees test

Thistestmeasuresabandage'sabilitytopreventthetransmissionofmicroorganisms.The test involves using two gram negative and two gram positive organisms**.**

Usabilitytest

Thistestassessesabandage'susability,handling,easeofuse,size,easeofopening,and ease of application

Hydrostatichead test

Thehydrostaticheadtestdenotesthewaterprooflevelofafabriccoating.Inthistest,asectionoffabricispulledtightand sealedinthechamber.Wateristhenadded,andthe fabric is observed to see how much it can withstand before droplets seep through.

Chemical test

1] **SterilityTesting**

Purpose:Toensurethatthebandageisfreefromharmfulmicroorganismsbeforeitisused in wound care.
Method: A sample of bandages is incubated in a controlled environment to check for microbialgrowth.Thebandagesmaybeexposedtoasterilizationpr

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ocess(e.g.,gamma radiation, ethylene oxide gas) before testing.
Importance:Ensuresthatthebandagewillnotintroduceinfectionin tothewound.

pHTesting
Purpose:Todeterminewhetherthebandagematerialoranyincorpo ratedgeloradhesive has an appropriate pH level, as some materials could cause skin irritation or affect the wound healing process.

Method:Asmallsampleofthebandagematerial(oritsgel,adhesive, orothercomponents) is dissolved in water and its pH is measured using apH meter.
Importance:Ensuresthatthebandagedoesnotcreateanenvironme ntthatcoulddamage the skin or hinder wound healing.

ChemicalResidueTesting
Purpose:Toensuretherearenoharmfulchemicalsortoxicresiduesl eftfromthe manufacturing process (such as residual solvents or adhesives).

Method:High-
performanceliquidchromatography(HPLC)orotherchemicalana lysis methods may be used to detect any potentially harmful residues on the bandage.

Importance:Ensuresthatthebandageissafeforuse,especiallyforth osewithsensitivities to certain chemicals or materials.
AdhesiveCompositionandStability

Purpose:Toevaluatethecompositionandstability oftheadhesiveusedinadhesive bandages (such as medical tapes or dressings).

Method:Chemicalanalysisoftheadhesivematerialtoassessitsche micalstructure,stability over time, and resistance to environmental factors like heat or humidity.
Importance:Ensuresthattheadhesivewillnotdegradeorloseitspro pertiesovertime, especially when exposed to moisture or varying temperatures

Mechanism
The mechanism of a bandage can be understood in terms of its roles in wound care and injurymanagement.Whenappliedproperly,abandageservessever alkeyfunctionsthat support healing and protect the injured area. Here's a breakdown of how a bandage works:
Mechanism:Thepressurefromthebandagehelpsformaclotatthesi teofinjurybypromotingthecoagulationofblood.This assistsinstoppingorslowingthe bleeding, allowing the body's natural healing mechanisms to begin.
1. *ProtectionfromExternalContaminants*
   - *Function*: A bandage provides a barrier that protects the wound from dirt, bacteria,andotherpathogensthatcouldcauseinfection.Itkeeps thewoundcleanand minimizes the risk of infection.
   - *Mechanism*: Most bandages are madefrommaterials that are non-adherent (such assterilegauzeorfoam)andhaveantimicrobialproperties.This helpscreatea clean, sterile environment for the wound, promoting faster healing.
2. *MaintainingMoistureBalance*
   - *Function*: Some modern bandages (such as hydrocolloid or hydrogel bandages)helpmaintainanoptimalmoisturelevelinthewound. Thiscreatesa "moist wound environment" that can speed up the healing process.
   - *Mechanism*: Keeping the wound moist helps prevent the formation of scabs,whichcanbepainfulandslowdownhealing.Moistureals oencouragescell migration and growth,which aidstissueregeneration and reduces thelikelihood of scarring.

3. *ImmobilizationandSupport*
   - *Function*:Abandagecanhelpsupportandstabilizeanin jury,particularlywith sprains, strains, or fractures. By providing some level of compression and restricting movement, a bandage can reduce pain and prevent further damage.
   - *Mechanism*: When applied properly, a bandage can limit movement of the affectedarea,whichisessentialforreducingstrainontheinjured tissueandpreventing aggravation of the injury.
4. *AbsorptionofExudate*

- *Function*: A bandage, especially one with absorbent material like gauze, can absorbfluids (exudate)thatleakfromthewound.This helpspreventthewoundfrom becoming soggy and overexposed to bacteria.

Mechanism: The absorbent material draws fluid away from the wound, preventingmaceration(softeningandbreakingdownofskin)an dreducingtheriskof infection. Some bandages have layers designed specifically to manage this exudate, providing better protection and comfort.

5. *ComfortandPain Relief*
   - *Function*:Bandagescanalsoserveto reducepainanddiscomfortbycushioningthe wound and limiting exposure to irritating elements (like air or clothing).
   - *Mechanism*: Thepressureandsupport provided byabandagecan reducemovement in the area, which can help alleviate pain associated with a wound. Additionally, many modern bandages aredesigned tobesoftandnon-irritating,improvingcomfortforthe patient.

Summary of Key Mechanisms:
- *Hemostasis(controllingbleeding)*throughpressure.
- *Protection*frominfectionbycreatingasterilebarrier.
- *Moistwoundhealing*bymaintainingabalancedmoisturele vel.
- *Immobilization*tostabilizeinjuredareasandreducefurther damage.
- *Absorption*of exudatetopreventexcess fluidbuild-up.

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- *Comfortandpainreduction*throughcushioningandreducingexposuretoirritants.

Discussion on over coming defects

To address and overcome the potential defects or limitations of a bandage, it's important to understand the types of issues that can arise when using a bandage for woundcareorinjurymanagement.Belowaresomecommondefectsandstrategiesfor overcoming them:

1. *PoorAdhesion*
- *Problem*:Sometimesbandagesfailtostickproperlyto theskin,especiallyiftheskin is oily, wet, or if the bandage is old.
- *Solution*:
Chooseahigh-qualitybandage designedforskintypesorconditionswhereadhesion is challenging (e.g., waterproof or silicone-based bandages).
Cleanthearea wherethebandagewillbeapplied,ensuring it'sdryandfreeofoilsor creams that can interfere with adhesion.
- *Useadhesivetape* oradditionalstripsifnecessaryto securethebandageinplace.

2. *InadequateCoverage*
- *Problem*:Thebandagemaynotbelargeenoughtofullycover thewoundorinjury, or it may leave the edges exposed, leading to infection or discomfort.
- *Solution*:
- *Choosetherightsize*ofbandagethatadequatelycovers thewound,ensuringit extends beyond the edges of the injury.
- Forlargerwounds,useagauzepadcombinedwith alargeradhesivedressingortape to secure it in place.
- Ifthebandageistoo small,considerusingmultiplesmallerbandagesoroptingfora different type of dressing (e.g., a larger adhesive bandage, sterile wrap, or medical gauze).

3. *IrritationorAllergicReactions*
- *Problem*:Somepeopleexperienceirritationorallergicreactionsdueto theadhesive material, especially for sensitive skin.
- *Solution*:
- *Usehypoallergenicbandages* thataredesignedforsensitiveskin.Theseoftenhave milder adhesives or use non-adhesive wraps.
- *Considerusinggauzewithtape*ratherthanapre-madeadhesivebandage,asthiscan reduce direct contact with the adhesive.
- If irritationoccurs,removethebandageandreplaceitwith onethatisdesigned for sensitive skin.

4. *MoistureBuildup*
Problem:Bandages,especiallywhenusedforlongerperiods, cantrapmoisturearoundthe wound, which may encourage bacterial growth or slow healing.*Solution*:
- *Optforbreathablebandages*thatallowairtocirculatewhile stillprovidingabarrier against contaminants.
- *Usespecializedwaterproofbandages* thatallowyouto keepthewounddrywhile preventing external moisture from entering.
- Changethebandageregularlytokeepthewoundcleananddry. Thisisparticularlyimportant for bandages covering open or draining wounds.

5. *BandageNotProvidingAdequatePressure*
- *Problem*:Somebandages,particularlyelasticones,maynotprovidesufficientcompression for injuries like sprains or strains.
- *Solution*:
- *Usecompressionbandages*(suchasanACEbandage)thatprovidebothsupportand consistent pressure to reduce swelling or support injuries.
- Ensurethebandageis applied withtherighttension—toolooseand itwon't beeffective; too tightanditcancutoffcirculation.

6. *DifficultyRemovingtheBandage*
- *Problem*:Removingbandagescanbepainful,especiallyifth eadhesivesticksto thewoundor the skin.
- *Solution*:
- *Useagentleadhesiveremover*toeasetheremovalof thebandage.
- Alternatively,*usebandageswith aneasy-peeldesign*orthosethathaveanonstickpadto minimize the risk of pain during removal.

7. *InfectionfromBandageContamination*
- *Problem*:Ifabandageisnotsterile,itcanintroducebacteriainto thewound,leadingto infection.
- *Solution*:
Alwaysuse*sterilebandages* anddressingsforopen wounds.
*Changethebandageregularly*toavoidbacteriabuildupand contamination.Clean the wound properly before applying a fresh bandage.

8. *BandageSlippage*
- *Problem*:Bandages cansliporshift,especiallyif theinjuredareais mobile(suchas around joints).
- *Solution*:
- Use*bandageswithbetteradherenceproperties*oradditionalsecuringdeviceslikeclips, tape, or a secondary dressing to prevent slippage.
- Forjointsorflexibleareas,considerusing*elastic orself-adhesivebandages* thatconform to the body and remain in place better.

9. *NotSuitableforCertainTypesofWounds*
- *Problem*:Somebandages maynotbeappropriateforspecifictypes of wounds,such asburns, deep cuts, or surgical incisions.
- *Solution*:

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- For*burns,use**burn-specificdressings* (suchashydrocolloidorsilversulfadiazine bandages) that provide pain relief and promote healing.
- For*surgicalwounds*ordeep cuts,use*sterilegauzepads*and*advanced dressings*designed to absorb fluids and prevent inflamation

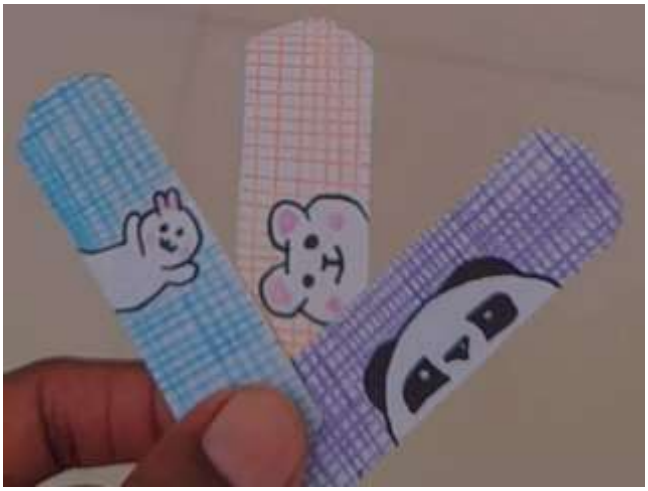


Fig.No:2



CONCLUSION

In conclusion, The future of bandages lies in a perfect fusion of material innovation, smart technology, and personalized healthcare. As these developments unfold, bandages will not just be passive wound coverings but active, dynamic agents in promotinghealing,preventinginfection,andmonitoringhealth.T hisprogressionwillnotonlyimprovethequalityofwound carebutcould alsohavesignificantimpacts on healthcare efficiency, environmental sustainability, and patient outcomes. The next generation of bandages will undoubtedly play a crucial role in the transformation of modern medicine and wound car

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