

## FORMULATION AND EVALUATION OF HERBAL ADHESIVE BANDAGE – ZENDUPLAST

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### ABSTRACT

Herbal Adhesive Bandages present in market were having Antiseptic property only and The present study aimed to design, develop, and evaluate the antiseptic as well as hemostatic (astringent) activity of herbal wound pad containing powdered herbal drug's i.e. *Tagetes erecta* (marigold), *Curcuma longa* (Turmeric) and *Acacia catechu* (Kattha) The plants have been reported in the literature as having good antimicrobial, anti-inflammatory and Hemostatics (Astringent) Activity. Various formulation batches of herbal ointment were prepared and evaluated for various parameters like colour, appearance, pH, Consistency, Spreadability, Grittiness and antimicrobial activity. Prepared ointment was used for the preparation of zenduplast. The formulation of Batch# F4 was compared with the marketed preparation Clindamycin ointment. It is a very good attempt to establish the herbal antiseptic wound pad containing powders of *Tagetes erecta*, *Curcuma longa* and *Acacia catechu*. Zenduplast wound pad was successfully designed and developed after extensive manufacturing and evaluation process by specialized techniques for evaluation of antiseptic activity *in vitro*.

**Keywords:** *Tagetes erecta*, *Curcuma longa*, *Acacia catechu*, Zenduplast, Antiseptic, Hemostatic.

### INTRODUCTION

Zenduplast wound pad consist of sterilized woven fabric .this antiseptic pad impregnated with *Tagetes erecta* (marigold), *Curcuma longa* (Turmeric) and *Acacia catechu* (Kattha) containing herbal ointment. We were prepared simple ointment and used as base for our herbal ointment preparation by trituration method [1]. The antimicrobial activity of herbal drugs was tested individually by checking the zone of inhibition and the Aseptic conditions was maintained during the practicals [2-5]. It is used to protect and heal cuts, scratches, blisters, insect bites, minor wounds and to stop bleeding. It is new antiseptic woven fabric adhesive bandage as the elementary material is more suitable to be used for children as well as for adults. For its more advantages, each bandage is wrapped individually in a waterproof bag. The outer package is strong cardboard carton to keep best storing condition. *Tagetes erecta* (marigold), *Curcuma longa* (Turmeric) show pharmacological actions as antibacterial, antifungal, and anti-inflammatory. *Acacia catechu* possesses Hemostatic

(Astringent) activity. Because of this additional property zenduplast is better than other marketed preparation. Coated paper and plastic were used as Backing. The woven fabric was used as Adhesive sheet [6-10]. The Acrylate adhesives were used on woven fabric sheet. The cotton absorbent pad was used and the pad was medicated with prepared herbal ointment [11-14].

### MATERIAL AND METHODS

#### FORMULATION OF HERBAL BANDAGE

##### Preparation of Ointments by Trituration method

##### Preparation of simple ointment (base) (Simple ointment I.P, 1966)

- 1) Wool fat.....5.0 g
- 2) Hard paraffin.....5.0 g
- 3) Cetostearyl Alcohol.....5.0 g
- 4) White soft paraffin or yellow soft paraffin.....85.0 g

**Procedure**

- All ingredients was accurately weighed.
- Hard paraffin and cetostearyl alcohol were melted on water bath.
- To this wool fat and white soft paraffin was incorporated.
- All ingredient was Stirred until get melted .
- Contents were examined for foreign particles and fibers .
- The mixture was stirred until attained room temperature .

**Incorporation of powdered active ingredients**

- The Concentration of herbal active ingredients was optimized by using  $2^3$  factorial design.
  - The required amount of herbal powders was weighed and mixed homogeneously.
- Mixed powder was triturated with prepared base until homogeneous ointment formed.
- The levels of ingredients was selected on the basis of preformulation study's observation (individual study of antimicrobial activity of different concentration batches by comparing the zone of inhibition of individual ingredient with marketed clindamycin ointment )

**Preparation of herbal adhesive bandage**

- The woven fabric was cutted into suitable dimension  $7 \times 2$  cm(length  $\times$  width )
  - Wound pad of  $2.5 \times 1.2$  cm size was prepared and fixed on adhesive woven fabric.
  - Then prepared herbal ointment was spread over wound pad.
- The backing plastic material having same size was fixed over the adhesive woven fabric [15].

**EVALUATION OF HERBA BANDAGE****Evaluation of raw material****Evaluation of antimicrobial activity**

*Tagetes erecta* ,*curcuma longa* , *acacia catechu* were powdered . The antimicrobial activity of herbal drugs was tested individually by checking the zone of inhibition ant the Aseptic conditions was maintained during the practicals.

Then nutrient agar medium was prepared according to given formula in literature [16-18]. And  $p^H$  7.0 was maintained . the bores was prepared by borer at center of plate .then *staphylococcus aureus* was used as microorganism and spread over the plate, then the bores of plate filled with individual herbal drugs and incubated at  $37^\circ C$  in incubator for 24 hrs. the zone of inhibition was observed and found that drugs having good antimicrobial property [19-22].

**Nutrient Agar Medium**

- a)beef extract .....10 gm.
- b)peptone.....10gm
- c)sodium chloride.....5.0gm
- d)Agar.....20gm
- e)distilled water .....1000ml

**EVALUATION OF SEMI FINISHED PRODUCT OF BANDAGE (OINTMENTS)**

The different methods of evaluation of ointments are:-

**Physical Property Testing**

- Colour
- odour
- Smooth texture
- Elegant in appearance
- Non dehydrating
- Non gritty
- Non greasy and non-staining
- Non hygroscopic

**Physiological Properties Testing**

- Non irritating
- Do not alter membrane / skin functioning
- Miscible with skin secretion
- Have low sensitization index

**Application Properties**

- Easily applicable with efficient drug release.
- Washability.
- Test of rheological properties
- Test of content uniformity
- Test of microbial content
- Antimicrobial testing

**Test of rate of absorption**

Diadermic ointments are those from which the drug moves into deeper skin tissues and finally into the

systemic circulation. Such ointments should be evaluated for the rate of absorption of drugs. The ointment should be applied over a definite area of the skin by rubbing. At regular intervals of time, serum and urine samples should be analysed for the quantity of drug absorbed. The rate of absorption i.e., the amount of drug absorbed per unit time should be more.

#### Test of rheological properties

The viscosity of the preparation should be such that the product can be easily removed from the container and easily applied to the skin. Using cone and plate viscometer the viscosity of the preparation was determined.

#### Test of content uniformity

The net weight of contents of ten filled ointment containers was determined. The results should match each other and with the labeled quantity. This test was also called minimum fill test.

#### Test of microbial content

Micro-organisms like *Pseudomonas aeruginosa* and *Staphylococcus aureus* may contaminate the preparation and finally infect the skin. So ointments should be tested for the absence of such micro-organisms. Solutions of different samples of the preparation was made. Each sample was inoculated into separate volumes of 0.5 ml of rabbit's plasma under aseptic conditions and incubated at 37°C for 1-4 hours. No formation of the clot in the incubated mass indicates the absence of the micro-organisms.

#### Microbial limits

On 14th day, the number of vegetative cells should not be more than 0.1% of initial concentration. On 28th day, the number of Microorganisms should be below or equal to initial concentration.

#### Specified tests for evaluation of ointments

The evaluation of a drug means to perform the tests for the maintenance of quality and quantity according to the specifications. After the manufacturing of drug or during the production, the specific tests are done for that particular product to evaluate it.

**Table 1. List of Chemicals**

Sr .no.	Name of chemicals	Category
1	Wool fat	Base
2	Hard paraffin	Base
3	Cetostearyl Alcohol	Solidifying agent
4	White soft paraffin	Base
5	Curcuma longa	Antimicrobial
6	Acacia catechu	Astringent
7	<i>Tagetes erecta</i>	Antimicrobial

#### Consistency

- Should be smooth, no solid particles.

#### Melting point

Not less than 11°C.

#### Solubility

Should be soluble in 9 parts of water and 17 parts of boiling water, miscible with alcohol, with solvent such as ether, chloroform or with volatile oils.

#### In Vitro Skin Penetration

Flow through cell of Franz diffusion cell They mainly have two compartments 1) Donor 2) Receptor Method: →mouse skin or human cadaver skin. →Placed in between the two compartments. →The passage of semisolid preparation through the epidermal surface to receptor compartment is measured by, ♣Detector (Flow through type) ♣Sampling (Franz diffusion cell)

#### Rate of Release of Medicament

To assess rate of release of medicament, small amount of the ointment can be placed on the surface of nutrient agar contained in a Petri dish or alternately in a small cup cut in the agar surface.

If the medicament is bactericidal the agar plate is previously seeded with a suitable organism like *S. aureus*. After a suitable period of incubation, the zone of inhibition is measured and correlated with the rate of release.

Another method for finding out release rate is to smear internal surface of test tubes with thin layers of ointment, fill the tubes with saline/serum and after a gap of time estimating the amount of drug present in the serum/saline.

**p<sup>H</sup>**: The p<sup>H</sup> of dermatological ideally should be 6 to 8 in range and important to measure.

#### ANTIMICROBIAL PROPERTY TESTING

Antimicrobial property of semifinished product (ointment) was tested by the same procedure as tested for individual drugs above:

**Table 2. List of Instruments**

Sr .no.	Name of instrument	Use
1	Autoclave	Sterilisation
2	Weighing balance	Weighing
3	Incubator	Incubate
4	Brookfield viscometer	Viscosity

**Table 3. Factorial design of batches for Optimization**

Formulation code	Combination	Curcuma longa(A)	<i>Tagetes erecta</i> (B)	Acacia Catechu(C)
F1	(1)	-	-	-
F2	A	+	-	-
F3	B	-	+	-
F4	AB	+	+	-
F5	C	-	-	+
F6	AC	+	-	+
F7	BC	-	+	+
F8	ABC	+	+	+

+ = At high level

- = At low level

**Table 4. Levels of Ingredients**

Sr .no.	Name of ingredient	High level	Low level
1	Curcuma longa	10%	5%
2	<i>Tagetes erecta</i>	10%	5%
3	Acacia catechu	10%	5%

**Table 5. Observation Table**

Sr.no.	Name of Sample	Zone of Inhibition (mm)	Name of medium used	Name of culture used	Inference
1	<i>Tagetes erecta</i>	30	Nutrient agar medium	Staphylococcus Aureus	Antimicrobial property present
2	Curcuma longa	08			
3	Acacia catechu	07			
4	Marketed standard	15			
5	Control plate	-		-	-

**Table 6. Evaluation Table**

Sr.no.	Test	Observation
1	Colour	Brown
2	Odour	Characteristic
3	Consistency	Semi solid
4	p <sup>H</sup>	6-8
5	Spreadability	Good
6	Washability	Easily washed with water

**Table 7. Observation (Sample of different batches)**






Batch no.	Batch code.	Zone of inhibition in mm	Medium used	Culture used	Inference
F1	(1)	08	Nutrient agar medium	<i>Staphylococcus aureus</i>	F4 batch shows the maximum zone of inhibition
F4	AB	28			
F7	BC	10			
F8	ABC	19			
-	Standard	30			
-	Control	-	-	-	-

**FINISHED PRODUCT EVALUATION**

**Skin Irritation test**

**Table 8. Skin Irritation scores following zenduplast application:**

Sr. no.	Zenduplast Batch F4	Zenduplast Batch F4	Formalin 0.8%	Formalin 0.8%	Control group	Control group
Time (hr).	Erythema	Edema	Erythema	Edema	Erythema	Edema
1	0	0	2	2	0	0
2	0	0	1	1	0	0
3	0	0	1	0	0	0
4	0	0	2	2	0	0
5	0	0	2	1	0	0
6	1	0	2	1	0	0
7	0	0	1	2	0	0

Working Procedure	Observations
 <p>plate – 01: Curcuma longa</p>	 <p>Plate – 02: Control plate</p>
 <p>Plate – 03: marketed standard</p>	 <p>Plate – 04: Tagetes erecta</p>
	

**Fig 2. Images of (zone of inhibition) selective batches**

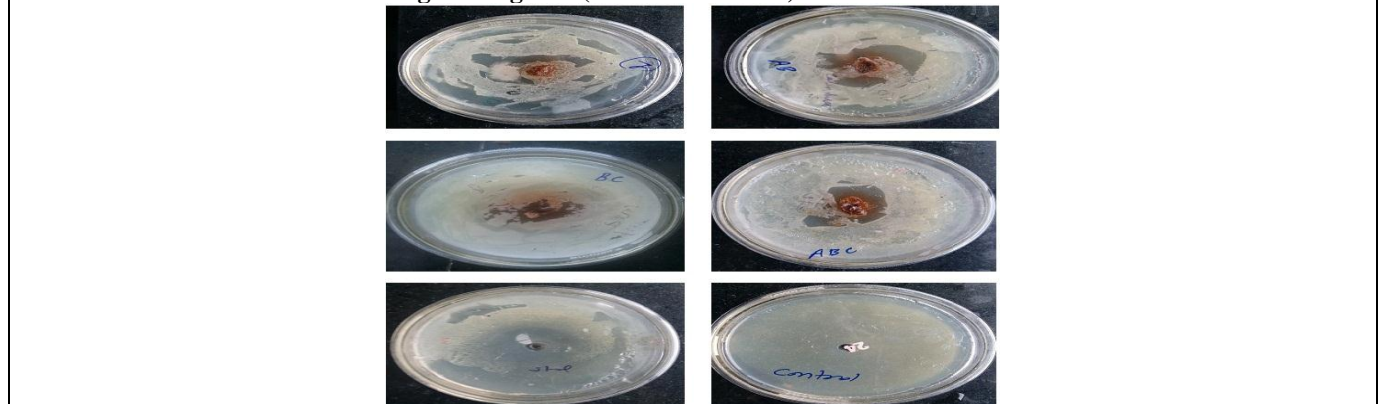


Fig 3. Zenduplast Applied for skin irritation Study.

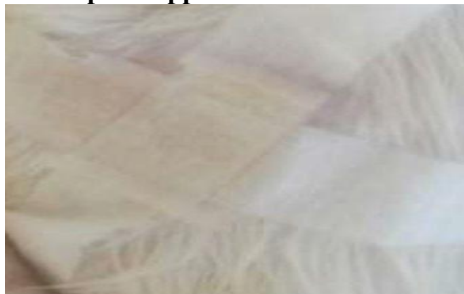


Fig 4. Before Bandage

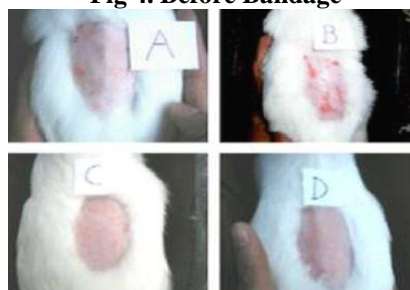
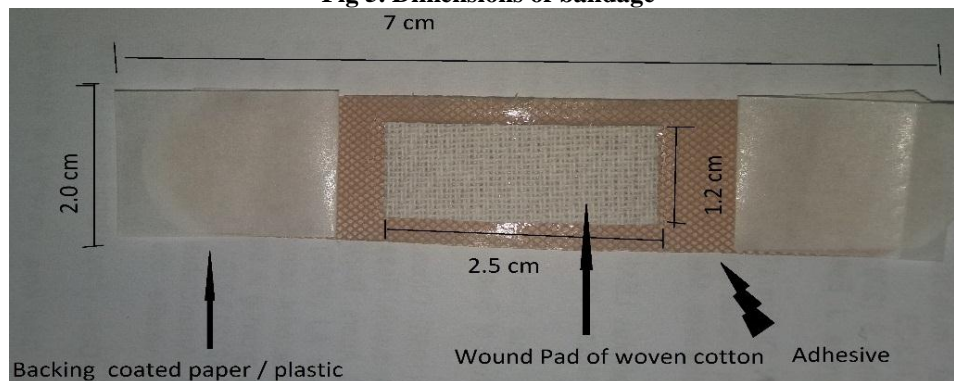


Fig 5. Dimensions of bandage



## RESULT AND DISCUSSION

Formulation and evaluation of herbal antiseptic bandage was performed. Zenduplast was evaluated in terms of appearance, and found dark brown with characteristic odour were checked visually. pH of ointment were checked pH analyzing antimicrobial activity it was found that newly developed herbal antiseptic wound pad Zenduplast had an inhibitory effect on the *S.aureus*. It also showed satisfactory zone of inhibition compared with control sample. Zenduplast is based on natural source and showed zone of inhibition very close to clindamycin so we can conclude that Zenduplast has similar efficacy and safe to use as compared to synthetic (clindamycin). In this way zenduplast ointment showed comparatively satisfactory antimicrobial activity than control sample.

The present study shows that newly developed polyherbal antiseptic wound pad was successfully designed, developed and assessed its antimicrobial activity against control clindamycin. Hence herbal wound pad could be used as better and safe substitution of synthetic wound pad Hansaplast. In previous studies it is described that when powder of *Tagetes erecta*, *Curcuma longa*, applied on open wound it serves as an excellent antiseptic property. It is reported that *Tagetes erecta*, *curcuma longa* has the antimicrobial activity against a variety of pathogens like *Vibrio cholerae*, *Klebsiella pneumoniae*, *M. tuberculosis* and *M. pyrogenesis* in vitro study. The extract of Turmeric has shown antibacterial activity against *S. aureus*, *Escherichiacoli*, *Klebsiella pneumonia* and *B.*

*subtilis*. Traditionally it is said that turmeric when applied to face it improves the beauty and safe guard against number of skin diseases hence traditionally it is used in herbal cosmetics.

The number of batches having different concentrations of herbal drugs was prepared and evaluated. We found that the F4 batch shows the excellent antimicrobial activity by testing all batches for zone of inhibition test.

## CONCLUSION

Herbal dosage forms of *zenduplast* showed good elegance and appearance. It is an excellent effort to design and develop the herbal antiseptic wound pad having satisfactory zone of inhibition and antimicrobial activity comparable with control sample Hansa-plast. the designed zenduplast have a excellent antiseptic as well as hemostatic property. This study revealed that the developed herbal wound pad was suitable dosage form for antiseptic bandages.

## ACKNOWLEDGEMENT

The author's thanks to Dr. Anil Jadhav principal of SIPS college Nashik, and Dr. G. Chhabra, Sayali Daware and Deepali Shewale for providing all the support and encouragements to do this work. The author's also thanks to Ramhari Sagar, Prashant Salunke and Vishal mardhekar for Inspiring me all the times etc.

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