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Formulation of a Papain-Based Topical Medicine for Regimen of Summer Boil, Carbuncles and Wounds

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ABSTRACT: Use of fresh latex of *Carica papaya* of summer boils, warts and freckles in smear form is a common practice in tropical folk treatment. This latex is full of enzymes; among which papain is the most stable one. Papain is mostly used in different industrial purposes and there are immense literatures to support the useful performance of papain in treating edema, inflammation and wound healing. But there is need of such proper medicinal preparation in market for treating summer boils, carbuncles, acne, burns, pilonidal cyst wounds, miscellaneous traumatic or infected or postoperative wounds, eczema, and keratosis. Liquid based: Papain, Cysteine, Glycerol, Potassium Phosphate Monobasic, Benzyl Alcohol, Microfiltered Water. Ointment based: Papain, Cysteine, Glycerol, Potassium Phosphate Monobasic, Emulsifying wax, Isopropyl Palmitate, Fragrance, Methylparaben and Propylparaben. Method used: Emulsification by High Frequency Ultra Sound using Piezoelectric Transducer. A decline tendency comes in inflammatory symptoms and abscess size of summer boil within 12 hrs. Normal complexion appears following black spots. On dry eczema, at first spreading is checked and then complete recovery comes after 15 days. Use on wound causes exfoliation of dead and damaged skin cells. This papain, having antibacterial properties, makes the formulation a complete package. Hence, it is a pilot study, testing of statistical significance is not applied. Pappya latex is easily available in our country and papain isolation is not much costly. So it can be anticipated that this enzyme based drug for treatment of such skin problems, could be prepared with a high efficacy and low cost effectiveness.

KEYWORDS: Papain, Summer boil, Carbuncles, Emulsification, Ultrasound.

I. INTRODUCTION

Genesis of this idea begins from an observation that painful scar and skin staining occurs while peeling vegetables vanishes after peeling of pappya. In tropical folk medicine, the fresh latex of *Carica papaya* is smeared on boils, warts and freckles and given as a vermifuge. The latex is a source of varieties of enzymes (cysteine endopeptidase, lipase, glycosidase) and papain, the proteolytic enzyme, is cultured most. It is the most stable one in protein denaturing agent e.g. 8M urea, 0.1% SDS and confirms efficiency in a broad range of pH value (4.0—8.0) with an optimum efficiency between pH 6.0—pH 7.0 and optimum temperature of 65°C. To destroy fresh tissues commonly used proteolytic enzymes are Serratiopeptidase, Hyaluronidase, Chymotrypsin, Streptokinase etc. The present scenario of use of papain is for meat tenderization, clearing of haze in bear industry, digestive aid in medicine, shrink proofing of wool. There is immense literature to support the application of papain in treating oedema, inflammation. Due to its better collagen deposition ability in presence of skin organelles, papain accelerates wound healing. In addition, papain is also integrated with bactericidal properties which make it a complete package for wound management. Raw latex contains complex mixture of proteolytic enzymes and peroxidases and alkaloids having versatile effects; so it should be applied directly on skin and need to be processed by specific molecule isolation.

There is lack of proper topical medicinal preparation based on papain for treating summer boils, carbuncles, acne, burns and pilonidal cyst wounds, miscellaneous traumatic or infected wounds, postoperative scars, diabetic ulcers, dermatitis(eczema), keratosis etc. The high cost of some healing modalities limits access for most of the population. The source of papain, pappya latex is easily available in our country and the enzyme papain is not very much costly. So, it may be anticipated that this specific enzyme based drug for the treatment of summer boil, carbuncle, scars of wounds, skin cleaning product could be prepared, with cost effectiveness. There are several types of coverage (alginate, hydro gel, growth factors), for the treatment of injuries, but selection depends on the intrinsic and extrinsic factors related to the injury.



Papain reduces pH of the wound bed, which stimulates the production of cytokines that promote cellular reproduction and turns the area hostile for the emanation of pathogenic microorganisms. In addition to its ridiculous action and accelerating the tissue repair process nature, wound healing is dependent on its stage.

II. CONVENTIONAL USE IN FOOD INDUSTRY

Meat tenderization, Brewery Industry, Leather Industry (tanning), Food Processing industry (clarifying agent); Combating- dyspepsia, digestive disorders, disturbances of GI tract; Production of- kunafa, pizza, pastries, etc.

So it can be safely used on human being.

No such medicinal preparation is commercially available based on papain with better efficacy for treating Summer Boils, Carbuncles, Pilonidal cyst/ wound acne, Burns, Miscellaneous traumatic or infected wounds, Post operative wounds, Diabetic ulcers, Dermatitis, Keratosis.

III. STRIKING FEATURES OF PAPAIN

Used as folk medicine with versatile activity. Easy availability by cutting the skin of green pappya fruit. Long history of being used to treat injury, traumatic wound healing and allergy. Potential biochemical excavator of dental carries. Enzyme with high specificity - strong debris removing agent, without disturbing sound tissue. Have Antifungal, Antibacterial and Anti- inflammatory property against allergic sinusitis without side effect. More stability even at elevated temperature and hydrophobic solvent, Defiant Attitude: to- high concentration of denaturing agents, Broad range: of – Optimum pH (4.0-8.0). Inhibitors, low pH, metal ions, and fluorinated alcohols may alter negligible structural change, but can't alter the Hydrolysis of: working efficiency.

IV. MODUS OPERANDI

Using a single formulation. This study describes the preparation and preclinical study of papain based topical formulation in accelerating wound healing. Papain – based preparation and distilled water with Betadine were used as negative and positive control. Twenty - seven clinically patients treated accordingly until healing. Papain – based preparation showed a progressive wound healing based on the wound reduction rates when compared with patients treated with distilled water and Betadine. In addition to its wound healing effect, papain - based product is also having antibacterial properties which make it a complete package.

Catalytic Activity: hydrolysis of peptide bonds with broad specificity.

Cysteine-25 of active site: attacks carbonyl carbon of peptide chain at NH₂-terminal. Stability creating cross linkages of collagen fibrils. Linkages become weaker and Collagen fibrils become more prone to be removed.

V. MAJOR COMPONENTS

A. Aqueous solution: papain, cysteine, glycerol, potassium phosphate monobasic, benzyl-alcohol, micro filtered water.

B. Ointment form: papain, cysteine, glycerol, potassium phosphate monobasic, micro filtered water, emulsifying wax, isopropyl palmitate, fragrance, methyl paraben, propyl paraben.

Stability : up to 12 months.

VI. PREPARATION METHOD:

Emulsification by Ultrasound: Equipments: a. Ultrasonic Horn : as a source of ultrasonic energy (BRANSON 2000). b. Image analyser: for analysis of droplet size (IPPLUS : LUKAS Microscope Service) c. Fluorescence Microscope: for observation of slides (Thermo Fisher Scientific).

VII. PROCEDURE

All components are taken in proper volume in a beaker. Sonication for 15 mints. [horn position 3mm deep for first 10mints. Then 5mm deep for rest 5 mints.] Temperature measurement, Density measurement [DUO SERIES LB474]. Droplet size analysis by Image Analyser attached to fluorescence microscope.

VIII. INTERPRETATION OF RESULTS

Multi sited, External application in

- Age group- 2.5yrs.-60yrs and
- Applied on summer boils, carbuncles, dry eczema, wounds.

A. Summer boils and carbuncles:

The severe pain of summer boils and carbuncle declines within 12 hrs, size of the abscess and reddish colour decreases black spot appears and finally normal skin colour regained consecutively. (n=150)



Fig:- 1.



Fig.:- 2.

Treatment of Summer Boil



Fig.:- 3



Fig.:-4



Fig.- 5

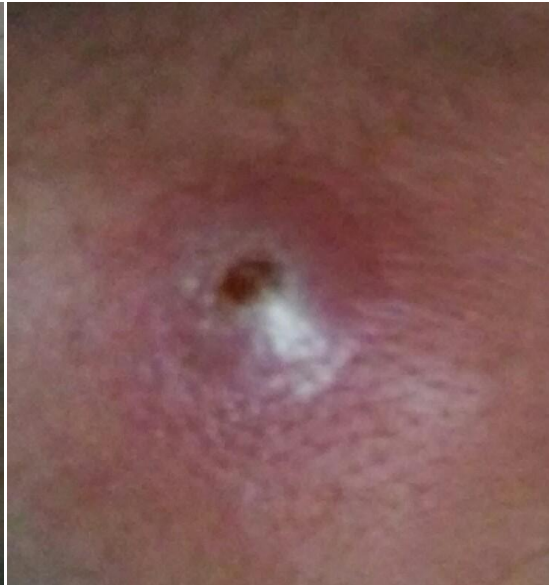


Fig.- 6

Treatment of carbuncle.

B. Dry eczema:

After 16 days of application, at first spreading was checked and then complete recovery comes with normal skin colour. (n=40)



Fig.- 7



Fig.- 8



Fig.:- 9

Treatment of Dry Eczema

D.Wounds :Cause exfoliation of dead and damaged skin cells, size and inflammatory symptoms decreases within 12 days. Normal skin colour come back after black spot. (n=30)

IX. INTERPRETATION

- Hence, it is a pilot study and number of patients is not same and sufficient, testing of statistical significance is not applied.
- Negligible changes may be possible by some agents, but those are not strong enough to modify the catalytic efficiency of papain.
- Papain acts with no harmful effect on sound tissues due to unique specificity.
- This enzyme efficiency is better as ointment form, because its substrate specificity is changed more in aqueous media.
- Common symptoms of papain intolerance: Throat irritation or damage. Oesophageal perforation. Stomach irritation.
- People who are allergic to latex or papaya should not use papain. Topical papain may cause allergic reaction, blisters, and skin irritation.

X. CONCLUSION

Papain enhances healing and diminishes denuded area and is inactivated by the salts of heavy metals of Pb , Ag & Hg. – avoid contact.

As it is a pilot study, it can't be claimed either as a substitute to antimicrobial agent or a complete solution of wound treatment, but can be taken as a supplementary agent. Further research outcomes can establish it as a new weapon in the armamentarium in the war of wound management.

Being the financier and responder of this study Wykay Pharma, reserves all specific and detailed data.



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