



EXTRACTION OF PAPAIN FROM PAPAYA FRUIT AND ITS USE AS DETERGENT FOR REMOVAL OF STAIN

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Abstract—Papain is a proteolytic enzyme present in white fluid of raw papaya. Papain is extracted from papaya fruit from a locally grown plant. The crude papain is used to remove protein stains such as blood stains from cloth. Different concentrations of crude papain such as 20%, 40%, 60%, 80% and 100% were prepared and were used for removal of blood stains from the cloth. The blood stain was prepared on white clothes and washed with extracted papain. It was found that 60% papain solution cleans the blood stain perfectly. It is also found that there is no hostile impact on washed clothes. Therefore, it may be concluded that crude papain may be used for removal of blood stain from the cloth.

Keywords—Papain, proteolytic Enzymes, detergent industry, dirt

I. INTRODUCTION

Papain (E.C. 3.4.22.2), also known as papaya proteinase, is an enzyme present in papaya. It is a protease enzyme, thus it breaks down proteins into smaller fragments or up to the amino acid level of a protein [1]. Papaya (*Carica papaya*) is a succulent fruit of a large plant included under the family caricaceae [2]. Papain enzyme is usually extracted from the raw fruit of the papaya. Papain is a relatively heat-resistant enzyme, with an optimal temperature range of 60°C and 70 °C. Papain has wide use in the society. It is taken through the mouth to improve digestion. Pharmaceutically, papain is used to treat parasitic worms, inflammation at the throat and pharynx, shingles symptoms, sore muscles, diarrhea, hay fever and psoriasis [3-5]. Papain is also taken by mouth to treat the side effects of radiation therapy, or it may be used in combination with other therapies to treat tumors [6]. Some people apply

papain directly onto the skin to treat insect or animal bites, infected wounds, sores, and ulcers. Papain is popularly used in cosmetics, toothpaste, contact lens cleaners, meat tenderizers, and meat products [7]. Meat tenderizer powder prepared from papain as an active component is available in the market [8].

Gunupur, Rayagada dist. is famous for papaya cultivation. The papaya fruits are easily available at the local market at a cheaper cost. Though several reports are available with respect to use of papain in industry and health sciences, its use in detergent industry is scanty. A blood stain is an organic stain, which means it's full of proteins, and proteins are programmed to bind together when heated, making them set fast into our clothes [9]. Huge quantities of blood stain clothes are generated from the operation theater. Thus, an investigation is made for use of crude papaya extract to remove the blood stain from the clothes

II. MATERIALS AND METHODS

a) *Identification of Plant*: A papaya plant growing at the botanical garden of M.Sc. Life Sciences department was selected for the extraction of papain. The healthy raw fruits of the plant are selected for the study.

b) *Extraction of papain*: The raw fruits appeared in the papaya plant were used for extraction of papain. The fruits were made scar with the help of a sterilized blade. The white latex oozing out from the scar of the fruit were collected by glass test tubes and immediately brought to the laboratory. The crude extract was kept at 4°C. The crude latex extract of papaya was dissolved in alkali solution. 5ml of crude milk latex was mixed with 50 ml

of 1N NaOH solution. This is considered as 100% of the washable solutions. Different concentrations of latex solutions were prepared and then used to remove dirt from the cloth.

c) *Removal of dirt/stain from the cloth:* To investigate the efficacy of the papain solution to remove the blood stains from the cloth an artificially blood stains were prepared on the cloth. White cotton cloth pieces (5 cm X 5 cm) are taken and dipped into the human blood taken in a beaker. Then the clothes are dried sometimes to fix blood stains. Different concentration papain solutions such as 20%, 40%, 60%, 80% and 100% were prepared from the stock solution using the same alkali solvent. 5 ml of papain solution of each concentration were added to the 100 ml distilled water taken in separate five beakers. The blood soaked clothes were dipped into the beaker and washed out. The removal of blood stains from the cloth are visually observed.

III. RESULTS AND DISCUSSION

Papain is a cysteine protease enzyme present in papaya. It has wide application in different industries particularly in pharmaceutical and meat industries. Papain enzyme present in leaves, latex, roots and fruit of papaya plants [10-12]. In this experiment different concentrations of papain were added to the water for removal of the blood strain. It was found that 60% of the papain solution suitably removes the blood stains from the experimental clothes. Papain catalyzes the breakdown of protein by hydrolysis reaction. Papain shows extensive proteolytic activity towards proteins, short chain peptides, amino acid esters and amide links and is applied extensively in the fields of food and medicine [13]. It specially chops peptide bonds connecting basic amino acids, particularly arginine, lysine and residues following phenylalanine [14]. The unique structure of papain gives its functionality that helps to understand how this proteolytic enzyme works and it's useful for a variety of purposes. Therefore, blood strain was degraded by the action of papain as a result the dirt was removed.

IV. CONCLUSION

In this investigation, papain extracted from papaya latex was used as detergent to remove the blood stain from cloth. The white latex was collected from papaya fruit and brought to the laboratory for experimental purposes. The latex is dissolved as an alkali solution to prepare the washable solution. The solution

was added to the distilled water and was used for washing the blood stained cloth. It was found that 60% of washable solutions removed the blood stain completely from cloth. It doesn't have any adverse effect on cloth. Therefore it may be suggested that papaya latex in a dilute manner can be used to remove the blood stains from the cloth.

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