Manufacture of solid soap based on crude papainenzyme and antioxidant from papaya

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[1]. ABSTRACT

Papain and bromelain, protease enzymes from papaya latex (Carica papaya) and pineapple fruit (Ananas comosus) were extracted and purified by simple precipitation method, with percentage yields of 16.76 and 0.97 % w/w and molecular weight of 23 and 25 kDa respectively according to their standards. Standard papain exhibits times greater free radical scavenging activity than standard bromelain, which is 400 times higher. Extracted papain has

560 times lower free radical scavenging activity than standard papain. Standard papain and extract inhibited lipid peroxidation similarly to standard vitamins C and E, whereas standard bromelain and extract did not show this activity. All protease enzymes at a concentration of 25 µg/ml not only showed any cytotoxicity by the sulforhodamine B assay but also showed a relatively interesting stimulation of MMP-2 by zymography on human skin fibroblasts.

Papaya (Carica papaya L.) is a popular and important fruit crop in tropical and subtropical regions of the world. Fruits are consumed worldwide as fresh fruits and vegetables or usedas a processed product.The fruit is healthy and delicious and the entire parts of the plant including the fruit, roots, peel, bark, seeds and pulp are also known for their medicinal properties.The many benefits of papaya are due to its high content of vitamins A, B and C, proteolytic enzymes such as papain and chymopapain has antiviral, antifungal and antibacterial properties. Over the past years, profound insights have been made regardingthe biological activities and medical applications of papaya and it is now considered a fruitcrop with high nutritional value. In this review, the nutritional value of the fruit and the medicinal properties of its various parts have been discussed to provide comprehensive information about this versatile commercial fruit crop.

[2].INTRODUCATION

Papaya is a rich source of nutrients and is available all year round. It is a rich source of three powerful antioxidants, vitamin C, vitamin A and vitamin E. minerals, magnesium and potassium, B vitamins, pantothenic acid, folate and fiber. Apart from all this, it also contains a digestive enzyme-papain that effectively treats causes of injuries, allergies and sports injuries. All the nutrients in papaya generally improve the cardiovascular system, protect against heart disease, heart attack, stroke and prevent colon cancer. This fruit is an excellent source of beta-carotene which helps prevent free radical damage that can cause some forms of cancer. It reportedly helped 4,444 people prevent diabetic heart disease.Papaya reduces high cholesterol levels as it is a good source of fiber. Papaya Carica L. variety Pusa Dwarf belongs to the Caricaceae family and is widely grown in tropical and subtropical countries. Various parts of papaya, including leaves, peel, roots, latex, fruit, flowers and seeds, have many uses in traditional medicin Carica papaya is a plant in the Caricaceae family and is commonly known as "pawpaw". Carica Linn papaya is the most widely grown plant on a commercial scale, each part of thepapaya plant has economic value and is available all year round. Since ancient times, the whole papaya fruit, including leaves, seeds, ripe fruit, unripe fruit and their juice, has been used in traditiona medicine as an anti-inflammatory, antioxidant, beneficial diuretic, antibacterial, antiviral, abortifacient, dewormer, hypoglycemic. activity, anthelmintic and immunomodulatory, etc. Scientific evidence demonstrating their versatile biologicalfunctions supports the traditional use of in various diseases. It produces papain, an enzyme Proteolytic is valuable and has various medical applications. Experiments have shown that C. Papaya has anthelmintic, biological antigen, antibacterial, antifungal, antiviral, anti-inflammatory, antihypertensive, hypoglycemic, hypoglycemic, medicinal, anti-cancer, anti-radical properties. free, anti-sickling, neuroprotective, diuretic, abortifacient and anti-infertility 444 4 [3 -5]. Due to its significant biological activity and medicinal applications, papaya is now considered a fruit crop with high nutritional value. It is low in calories and rich in natural minerals and vitamins. It contains vitamins A, C and calcium. In recent years, attention has been drawn to papaya due to the nutritional and medical problems of papaya, as its fruit is a source of provides good carbohydrates, as wellas hig levels of vitamins (vitamin C and vitamin A) and minerals (copper and magnesium) [7] Naturally, there is a dynamic balance between free radicals and antioxidant components in vivo [8]. Antioxidant enzymes (i.e.superoxide dismutase and catalase) and antioxidant (i.e.glutathione, vitamin C and vitamin E) can protect biological molecules against free radicals. If free radicals cannot be rapidly eliminated, the balance between oxidative damage and antioxidant defenses can be disrupted [9] Oxidative stress refers to a state with an imbalance between ROS and endogenous antioxidant capacity.It is considered an important factor causing cancer, diabetes, neurological dysfunction and weakening of the immune system, manifested by lipid peroxidation, free radical formation, protein oxidation,nitrotyroin or DNA/RNA oxidation [10-11].On the other hand, because free radicals can lead to the development of off-flavor and potentially toxic products, lipid oxidation is also a major concern for the foodindustry and consumers [12]

Taxonomic classification, common names and used parts

Papaya belongs to the small family Caricaceae, has 4 genera worldwide. Categories Carica Linn.is represented by 4 species in India, including C. papaya Linna. is the most cultivated and bestknown species.

Taxonomic classification includes kingdom (Plantea), order (Brassicales), family (Caricaceae), genus (Carica), species (C. papaya). Common names include papaya, papaya, papaya, papita, arand-kharpuja, papaya, papaya, papaya.Used parts containing fruit, leaves and bark.

[3]. MEDICINAL PROPERTIES

Pumpkin exhibits the following medicinal properties:

Antioxidant properties:

Oxidative stress can lead to the production of unwanted radicals leading to complications such as heart disease, Alzheimer's disease as well as cancer. [13]In scientists from Greece showed that pumpkin seeds are rich in antioxidants and have high levels of vitamin E (tocopherol), which is also a very good antioxidant.

Anti-cancer properties:

Carotenoid pigments found in pumpkin seed oil have been linked to preventing prostatecancer. People who consume diets rich in pumpkin seeds are at risk of adenocarcinoma lower prostate, stomach, breast, lung and colorectal.

Anti-diabetic:

Pumpkin is used to treat type 2 diabetes in Mexico, where traditional healers administercrudeextracts of pumpkin to patients.

Antibacterial and antiparasitic drugs:

Pumpkin seeds are used to treat human acute schistosomiasis, a serious parasitic disease transmitted by snails. Proteins and oils extracted from pumpkin seeds are good candidatesfor these drugs because they inhibit growth. of types of bacteria, fungi and yeast.

Anti-Bladderstone:

Pumpkin seeds are known to reduce the concentration of substances that promote stone formation in urine and increase the concentration of substances that inhibit the formation of stones

Antidepressant:

Due to the high tryptophan content in pumpkin seeds, pumpkin seeds have been recommended for the treatment of depression.

Anti-Inflammation:

oil extracted from pumpkin seeds has anti-inflammatory properties similar to indomethacin,a well-known anti-inflammatory drug. Despite their many beneficial effects, the shelf life of papaya and pumpkin is limited due to their perishability. The shelf life of these fruits can be increased when using them in the manufacture of various products with low water activity.In the past, many efforts have been made in this direction.

Papaya Shows Following Medicinal PropertiesColon Cancer:

The fibre of papaya is able to bind cancer-causing toxins in the colon and keep them away from the healthy colon cells. These nutrients provide synergistic protection for colon cells from free radical damage to their DNA.

Anti-Inflammatory Effects;

Protein enzymes including papain and chymopapain and antioxidant nutrients found in papaya; including vitamin C, vitamins E, and betacarotene, reduce the severity of the conditions such as asthma, osteoarthritis, and rheumatoid arthritis.

Rheumatoid Arthritis:

Vitamin C-rich foods, such as papaya, provide humans with protection against inflammatory polyarthritis, a form of rheumatoid arthritis involving two or more joints.

Promote Lung Health:

if you are smoker or if you are frequently exposed to second hand smoke. Eating vitamin a rich foods, such as papaya, help your lung healthy and save your life.

Wound healing activity C.

papaya juice extract[100 mg/(kg.d) for 10 days] had wound healing properties in streptozotocin-induced diabetic rats out using an excision and dead space wound model. Aqueous extract showed a 77% reduction in wound area compared to 59% contraction in control wounds.Therefore, the results showed that the aqueous extract of C. Papaya has powerful medicinal properties[14]**.**

Antimalarial activity

Petroleum ether extract of crude papaya peel at concentrations ranging from 0.05 to 1000 µg/mL. Extract showed significant antimalarial activity [15]

[4]. TRADITIONAL USES OF CARICAPAPAYA:

Ancient and traditional uses of Papaya

Papaya seeds have antibacterial properties, protect the kidneys from damage caused by toxins, eliminate intestinal worms and detoxify the liver. Several studies demonstrate that th seeds are high in fat and protein, and contain high amounts of calcium, phosphorus and magnesium, although the USFDA has not listed the nutritional profile of papaya seeds. [16]

Health benefits and disease prevention

Papaya is beneficial for the skin, making it brighter, reducing acne and giving a bright look to the face. Rubbing ripe papaya flesh on ringworm will help relieve pain. It controls dandruff and is good for hair, beneficial in cases of irregular menstruation. Papaya reduces high cholesterol levels as it is a good source of fiber. The antioxidants present in papaya are Vitamin A, Vitamin C and Vitamin E which do not allow the oxidation of cholesterol. When cholesterol is oxidized, it sticks to the walls of the arteries, causing them to narrow insid e,leading to heart disease.Fiber content also reduces cholesterol. Papaya improves immunity due to its vitamin C, E and A content and its benefits in treating throat infections like tonsils etc. Eating papaya is effective in preventing jaundice. Papaya and green tea are beneficial for preventing prostate cancer [17].

Application of Caricapapaya:

Wastewater from the textile, leather, paper, plastic, cosmetics, food, and mineral processing

industries contains a large amount of dyes and is discharged directly into the environment, causing environmental pollution. Synthetic dyes are hazardous materials, especiallythose with a benzene nucleus and are difficult to remove from wastewater.

Most of the dyes like indigo carmine and Congo red can cause serious health problems in humans such asdermatitis, cancer, jaundice, tumors, skin irritation and heart defects etc. [18] Carica papaya seeds contain high value-added compounds such as proteins, fatty oils, carbohydrates and crude fiber that have beneficial properties. Papaya seeds and papaya peel contain a soluble polysaccharide that has outstanding effects on human health. Therefore, some studies have proposed the use of papaya seeds in medicine and as an adsorbent for dyes, heavy metals, and to remove turbidity from wastewater.

[5].MATERIALS AND METHODS:

Raw materials:

Chilean papaya (V. pubescens) of similar maturity were purchased from a local market (Elqui Valley, Coquimbo, Chile). Fruits were selected to obtain samples with uniform shape, size and ripeness based on skin color (80–90D44 yellow).

The selected fruits were washed and peeled with boiling solution of NaOH (10%) and fastpeel additive (1%; Quimica Norte Verde Ltda., La Serena, Chile) and immediately washed with cold water to remove Discard the remaining shell. Peeled fruits were cut into slices (9.0x
1.5 cm) with a thickness of 0.4 cm after removing seeds and mucilage.

Papaya slices were divided into five batches for freezing, vacuum drying, solar drying, convection, and infrared drying.

Drying Freeze-drying (FD):

Fresh papaya slices (1.05 kg) were first frozen at -80 °C for 24 hours. The sample was then separated horizontally on three metal drying trays with a loading density of (4.25 kg m−2 per tray) and dried in a freeze dryer (VirTis Wizard 2.0 Advantage Plus XL-70, Gardiner, NY, USA) for 73 hours in two stages: programmed primary drying with 8 temperature increments from
-40 to 15 °C and secondary drying at 20 °C under vacuum pressure 0.027 kPa. Vacuum drying (Ex) Fresh papaya slices (0.60 kg) are evenly distributed on two specialized stainless,steel trays with a loading density of 2.48 kg m−2 on each tray and then Then dried in a vacuum oven (Memmert, model VO 400, Schwabach, Germany) at 70°C and 15 kPa pressure for 480 minutes.The drying temperature was chosen based on previous studies by Sehrawat et al.[20].

Solar Drying (SD) The solar dryer was designed and manufactured at the Department of Food Engineering at La Serena University, Chile and the drying oven was installed at Elqui Valley (about La Serena city 20 km). Fresh papaya slices (4.00 kg) were spread on two stainless steel trays with a loading density of 4.13 kg m−2 per tray and placed in an ambient air solar drying chamber.

The surrounding area is heated by the solar collector by circulating the drying air. The collector used a copper plate to absorb incident solar radiation and a glass plate as a transparent coating.

Drying conditions varied during the day and were recorded using a data logger (lascar EL-USB-2, Whiteparish, UK). The temperature ranges from 31.0 to 49.9 °Cair humidity

Fresh papaya slices (1.44 kg) were placed evenly on two stainless steel trays with a loading density of 3.77 kg m−2 on the tray**,** then dehydrated using a designed convection heat dryer**.** And was constructed at the Department of Food Engineering of Universidad de La Serena at 70°C for 270 min and a gas flow rate of 1.5 m/s**.**The drying conditions were selected based on previous research by Lyu et al [21]

Infrared dryer (IRD) IR dryer designed and manufactured at the Department of Food Engineering of La Serena University**,** Chile with two 175 W IR incandescent lamps installed (Philips, PAR38 IR 175W E27 240V CL 1CT /12) inside furnace as a radiation source**.**

Fresh papaya slices (0.255 kg) were placed on a holding tray (21 x 30 cm) in front of an infrared lamp**.** The distance between the lamp and the sample was set to 20 cm. The drying process was carried out at a temperature set at 70°C for 390 minutes**.**

All the different dehydrated samples were ground into powder using a basic analytical mill (IKA A-11, USA) and sample wa**s** passed through a 500 µm 35-mesh sieve **(**US Standard Sieve Series, Dual Manufacturing Co. USA). The powder samples were sealed and stored in plastic bags at 5°C until further analysis. Drying characteristics and drying rate curves Drying characteristic curves were obtained to describe the effect of different drying conditions on the drying kinetics of papaya.

The moisture content of the sample during drying can be expressed by as follows**:** whereMR is the moisture content (dimensionless); Mt [kg water kg−1 dry matter[(DM)] is the moisture cont Rephrase Additionally**,** drying rate (DR) refers to the loss of moisture per unit time which can be calculated according to Eq. (2) where t1 and t2 are the drying time, min, Xwt1 and respectively.

DR = (2) Xwt2 − Xwt1 t2 – t

Proximate composition and dietary fiber The moisture content (AOAC no. 934. 06), fat (AOAC no.960. 39), crude fiber (AOAC no.962.

09) and crude ash (AOAC no.923. 03) were determined according to AOAC methods [21]. Total protein content was determined by the Dumas combustion method (AOAC no. 99033; Elementar, rapid N pass**,** Donaustrasse, Germany). The water activity (aw) of the samples wasmeasured at 25°C using a AQUA LAB instrument

(4 TE, Pullman, WA, USA).

All papaya samples were analyzed for soluble fiber fractions (SDF) and insoluble fiber fractions (IDF) Enzymatic gravimetric method (AOAC N**o.** 991. 43**).** Total of Dietary Fiber Assay Kit (TDF100A; Sigma-Aldrich, St. Louis, MO, USA), Enzymatic Digestion and Filtration System(VELP Scientifica, GDE—CSF6, Usmate, Italy& #41**;** were used

Total fiber (TDF) was calculated as the sum of 4,444 soluble and insoluble fibers and expressed as g 100 g - 1 dry matter (DM). All measurements were performed three times.

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