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Original Article

Extraction and primary characterization of water soluble contents from Pumpkin Fruit

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ABSTRACT

The use of natural herbs as excipients in pharmaceutical dosage form helps in preparing effective dosage form. The main objective of present study is extraction and characterization of water soluble contents from pumpkin fruit. In the present investigation the water soluble contents from pumpkin fruit was extracted. The hot water extraction method was used. Pumpkin fruits accumulate soluble carbohydrate; hence the product was found water soluble polysaccharides. The water soluble contents were characterized by Fourier transform infrared spectroscopy, X-ray diffractometry and Differential scanning calorimetric studies. High swelling index and low viscosity indicates the high wetting and dispersion properties. Hence it can be concluded that, natural, biodegradable and eco-friendly water soluble product of desired properties obtained from pumpkin fruit is novel approach in solubility enhancement of poorly water soluble drug.

Key Words: Dispersion, Drug carrier, Natural excipients, Pumpkin fruit, Solubility, Wettability,

INTRODUCTION

Natural sources have promising effect in the development of various pharmaceutical dosage forms. Different natural excipients were used as binder, disintegrant, coating agent, polishing agent etc [1, 2]. The solubility enhancement is one of most challenges in front of pharmaceutical societies for poorly water soluble drugs. Most of the natural excipients extracted from aqueous extraction were used in solubility enhancement through solid dispersion like hupu gum, tamarind seed xanthan gum, locust bean gum [3-5].

In recent times, increased attention has been focused on under-utilized indigenous crops, for example the pumpkin, and their promotion would help maximize the available resources, eradicate the dearth in food supply and be useful in food industries in the formulation of value added products thus cater for the daily needs of the citizens nutritionally. Despite the pumpkin being regarded as a 'poor mans' food and as an orphaned crop, it represents a cheap but quality nutrition for large parts of the population in both rural and urban areas [6]

Pumpkin is one of the well-known edible plants and has substantial medicinal properties due to the presence of unique natural edible substances. The plant is a fast-growing vine that creeps on the surface in a similar fashion like that of other *Cucurbitaceae* family vegetables and fruits such as cucumber, squash, cantaloupes etc. It is one of the most popular field crops cultivated around the world, including the India at the commercial scale for its fruit, and seeds. Cucurbitapepo contain highest 5% carbohydrate, 2% protein, 0.5% total fat and 2% dietary fiber. The use of herbal remedies individually or in combination with standard medicines has been used in various medical treatises for the cure of different diseases as well as food supplement [7, 8]. In the present investigation pumpkin fruit was selected for the study. The main objective of the study is to extract water soluble extract bearing desire properties for drug carrier.

Cucurbitapepo Linn. is originated from different parts of India, where it has been reported to have variety of uses ranging from domestic to medicinal. Pumpkin has been an important food in India for centuries. Fruits are processed and consumed in variety of ways. Nearly nature fruits are stuffed with meat and other ingredients and then baked. The immature fruits are eaten.

This humble backyard low calorie vegetable contains vitamin A, flavonoid poly-phenolic antioxidants such as leutin, xanthin, and carotenes

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in abundance. Pumpkins vary greatly in shape, size and colors. Giant pumpkin generally weighs 4-6 kg with the largest capable of reaching a weight of over 25 kg. Golden nugget pumpkins are flat, smaller in size and have sweet creamy orange color flesh.

MATERIALS AND METHODS

Plant Material: Ripe fruit of pumpkin (*Cucurbitapepo*) was collected from an experimental field at Chikhli province in the west of India in May 2013, authenticated, stored for later use.

Extraction and Purification of Water Soluble contents: Outer yellowish green layer was removed and then Pumpkin fruit was cut in to small pieces. Small pieces of pumpkin were pre-extracted successively with light petroleum to remove fatty materials. The pretreated pumpkin residue was extracted thrice with water by boiling in water bath for 4 hour at 55 ^{o}c. The filtrate was centrifuged and supernatant was precipitated with excess volume of acetone and the precipitates were washed with excess acetone, collected and dried. The dried water soluble content was further purified by using excess of isopropyl alcohol [9, 10].

Identification of Water Soluble Contents: Hot water extracted materials from *Cucurbitapepo* were exposed to various identification tests. The product was identified by Molisch's, Iodine, Tannic acid and Barfoed's tests.

Primary Characterization Study

Water solubility study: In the laboratory, 10 ml water was taken each in five different test tubes. The extracted product of pumkin fruit was added in concentration of 10mg, 20 mg, 30mg, 40mg and 50mg in five test tubes. The soultions were shaked for 5min.

FTIR Spectra: Fourier transformed infrared (FTIR) spectra of Water Soluble extracts of pumpkin fruit was obtained on a FTIR (Schimadzu IR Affinity-1S). The scan frequency was 4000 to 600 cm^{-1} at resolution 4.

Loss on drying: Loss on drying was determined by drying extracted product at 105 ^{0}C as per British Pharmacopoeia 2009 method.

Swelling index: Dry sample of *Cucurbitapepo* was soaked in 100 ml volumetric flask containing distilled water for 24 h. The raised level due to swollen material was measure and the swelling index was calculated as;

$$swelling\ index = \frac{Lf - Li}{Li}$$

Where Lf is the final level of water and Li is the initial level of water.

Thermal Analysis: A differential Scanning Calorimetric curve of Water Soluble drug carrier was obtained. The sample was sealed in an aluminium pan. A sample with accurate weight of ~5 to 10 mg was subjected the DSC run at a heating rate of 10°C/min from 30°C to 300°C in nitrogen atmosphere. The temperature was calibrated using pure indium with a melting point of 156.40^{0} C. An empty pan was used as reference. (DSC 60 Shimadzu, Japan).

X-Ray Diffraction Study: The Powder X-ray diffraction (XRD) of Water Soluble drug carrier was performed by PW 1140, Mettler Toledo (Columbus, OH, USA) diffractometer using Ni-filtered, Cu-kα radiation. Diffractograms were run at a scanning speed of 2°/mm and a chart speed of 2°/2 cm per 2θ.

RESULT AND DISCUSSION

The extracted water soluble contents were identified as polysaccharides. The dried material was dark brown color with 6-8% weight loss on drying and high swelling index was 51.13, which indicates that C*ucurbitapepo* possesses a good dispersibility and water holding capacity.

FT-IR Study: The absorption bands in the Fourier Transfer Infrared (FTIR) spectrum of extracted drug carrier were assigned by comparing with the literature values of similar materials (fig 1). The assignment of the observed absorption bands are 3259.536 cm $^{-1}$ (weak to medium NH symmetric stretch in R-C(O)-NH_2), 2924.619 cm $^{-1}$ (strong O-H stretch in carboxylic acid and C-H stretch in alkanes), 1617.491 cm $^{-1}$ (very weak =C=C stretch), 1399.309 cm $^{-1}$ (C-C stretch-aromatic in CH_3 C-H bend), 1235.288 cm $^{-1}$ (very strong C-F stretch, C-N stretch in aliphatic amines), 1017.057 cm $^{-1}$ (C-N stretching in aromatic amines, very strong C-F stretch in alkyl halides). The bands at 1650 and 1550 cm^{-1} due to NHCO- of protein units was absent, which confirm the absence of protein substances.

Thermal Analysis: DSC spectra of water soluble drug carrier shown in fig 2 and suggested that the extracted product is amorphous as reveled by absence of sharp endothermic peak and also demonstrate melting with decomposition on heating at high temperature (240°C). The spectra

didn't shown any oxidative peaks, hence indication stability at higher temperature.

Powder XRD study: XRD spectra of extracted product of soybean seeds reveals the amorphous nature of material as spectra did not demonstrate any characteristic sharp peaks at 2θ (fig 3). That was increase the surface area, wettability and dispersibility of poor water soluble drug and hence increased solubility.

CONCLUSION

In this investigation, ecofriendly, biocompatible water soluble drug carrier extracted from *Cucurbitapepo* fruit bears all desirable properties of drug carrier. This ecofriendly, biocompatible, water soluble polysaccharides may be used in different application of pharmaceutical sciences. Due to amorphous nature, good wetting property and dispersibility of pumpkin fruit extract, it may be use as drug carrier as novel approach in solubility enhancement.

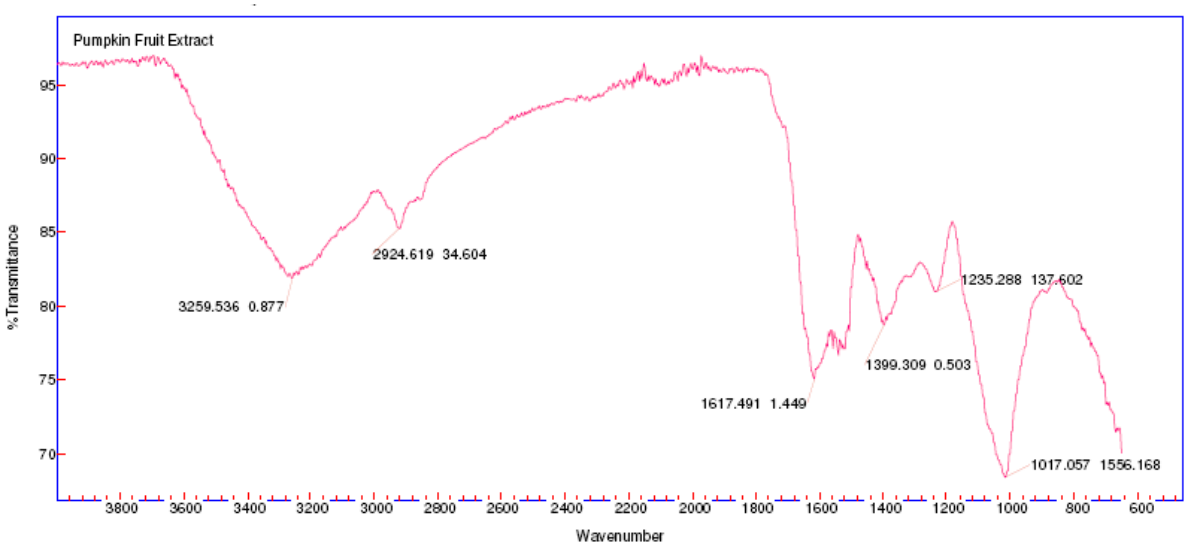

Fig. 1: FTIR spectra of pumpkin fruit extract

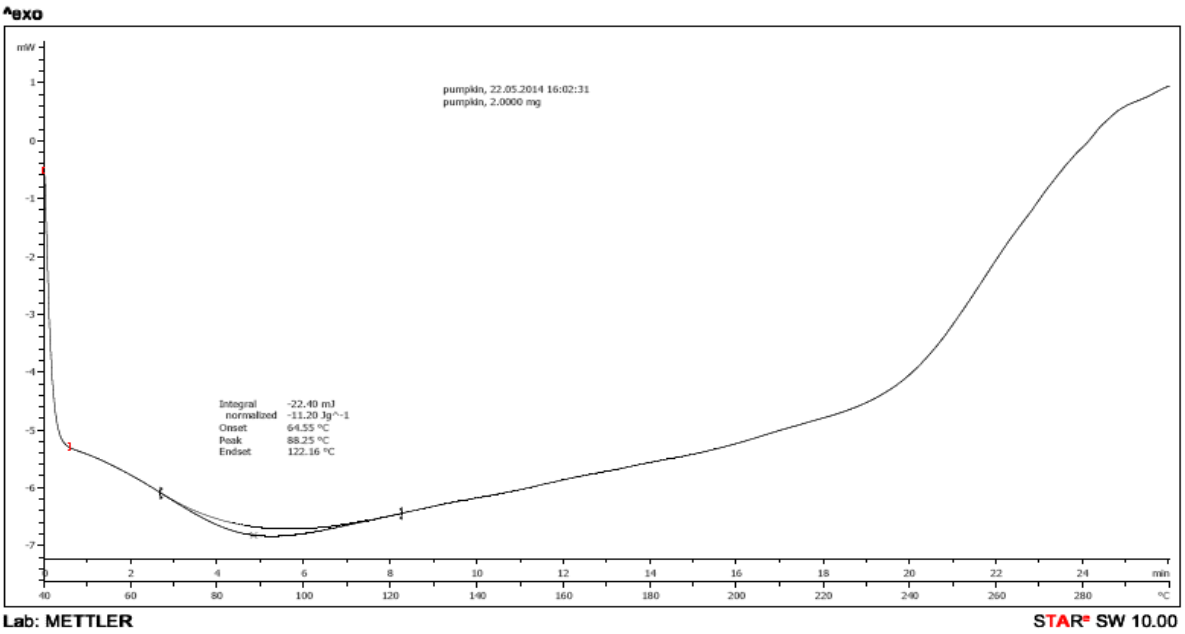

Fig. 2: DSC graph of pimpkin fruit extract

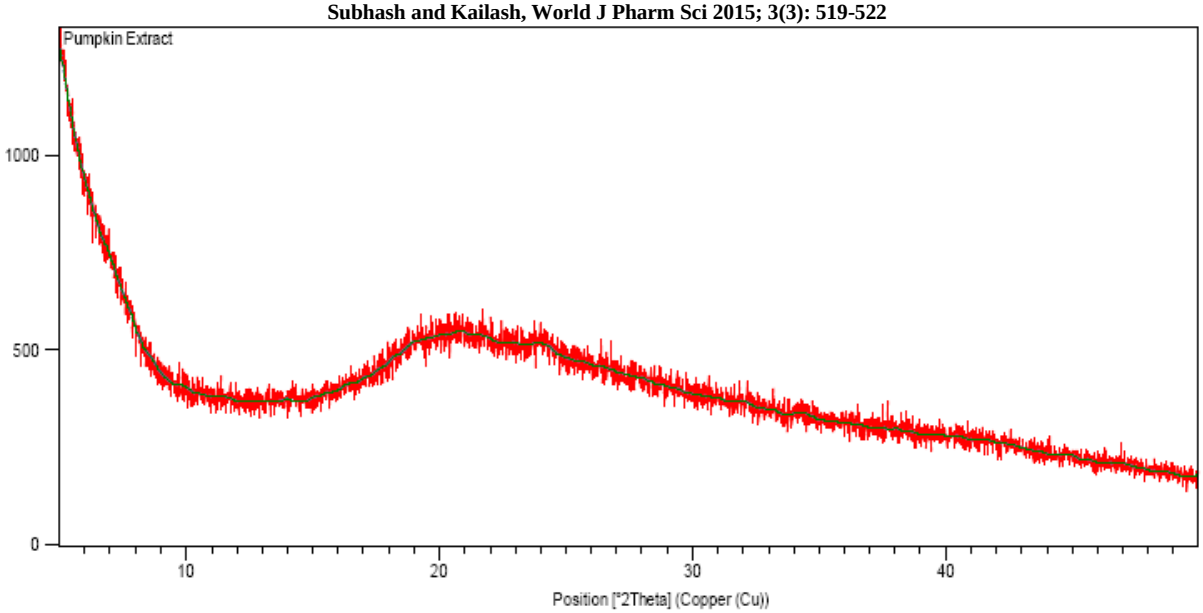

Fig. 3: XRD of pimpkin fruit extract

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