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Research Article

FUNCTIONAL GROUP ANALYSIS OF JAMUN (*SZYGIUM CUMINI*) PULP DRIED IN CROSS FLOW DRYER

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ABSTRACT

Syzygium cumini fruit is a medicinal plant which is used in many pharmaceuticals in this modern age. The aim of this study is to found the active functional group when the pulp is being subjected to drying in various temperature like 50°C, 60°C and 70°C in cross flow dryer. FT-IR was applied and IR-Spectrum with the mid infrared region was used for identifying the functional compound. Generally *Syzygium cumini* fruit is mainly used for many Ayurvedic and diabetics treatment. During this study the findings are the presence of characteristic functional groups such as Alkyl Halides, Aromatic rings, Phosphine, Carboxylic acids, Alkenese, Phenyl ring, Thicarbonyl, Bioactive fraction, Nitro compounds and amines. On varying the temperature there is much difference in functional group whereas phenyl ring and aromatic ring was found in all the three temperature. So this pulp can be dried even till the temperature reaches at 70°C with these functional groups.

Keywords: *Syzygium cumini*, FT-IR, Cross Flow Dryer, Functional group.

INTRODUCTION

Syzygium cumini (Family Myrtaceae) is also known as *Syzygium jambolanum* and *Eugenia cumini*. Other com-mon names are Jambul, Black Plum, Java Plum, Indian Blackberry, Jamblang, Jamun etc. Today these trees are found growing throughout the Asian subcontinent, Eastern Africa, South America, Madagascar and have also naturalized to Florida and Hawaii in the United States of America[1]. The ripe fruits are used for health drinks, making preserves, squashes, jellies and wine. Jamun seeds are reported to be a rich source of ellagitannins (ETs), including corilagin, 3, 6-hexa hydroxyl diphenoyl glucose and its isomer 4, 6-hexahydroxy diphenoyl glucose, 1- galloyl glucose, 3-galloyl glucose, gallic acid, and ellagic acid (EA)[2]. Jamun fruit reduces the sugar in the blood and is very good in the control of diabetes. Its seeds contain Glucoside, Jamboline and El-lagic acid, which are reported to have the ability to check the conversion of starch into sugar in case of excess production of glucose[3]. Infrared spectroscopy in food analysis led to the use in food analysis[4]. Fourier transform infrared (FT - IR) spectroscopy is a flexible approach to provide qualitative and in some cases, quantitative information with little or no sample preparation[5,6]. Fourier transform infrared (FTIR) spectroscopy is a powerful tool for composition analysis, and has been widely used to analyze the grain[7] of the cell wall. Recently soft and hard wheat ingredients, the use of infrared spectroscopic imaging combined with multivariate statistical analysis and determine the starchy endosperm tissue. IR is the most studied polysaccharides cellulose, α and beeta - (1-4) connected glucan, which is universal in plants and in algae and bacteria[8]. Cellulose type of FT - IR study covers identification[9] the crystallinity and determine the source and batch variation on microcrystalline cellulose Crystallization. Infrared spectroscopy is a particularly useful tool to connect to the polymer chain and the proportion of direct measurement of the colour separation is an important parameter in the direction of the functional constituencies. Polarized radiation recorded in the native cellulose crystal orientation of the sample spectrum to provide a variety of functional groups and the fibre axis[10] the transition moment direction of the information. Cellulose and glucose are normal coordinate analysis has been run several carbohydrates[11]. At present FT-IR spectroscopy is very often applied in the analysis of plant cell wall polysaccharides. The different techniques of FT-IR spectroscopy allow the identification of particular polysaccharides present in the intricate network of the cell wall[12,13].

MATERIALS AND METHODS

Plant Materials

Jambola mature fruits were directly obtained from producers in the region of Pollachi. The fruits were sorted by its maturity and the fully ripped fruits were washed in normal tap water. The free water in the fruit was removed using hair dryer and wiped out with tissue papers. Pre weighed 100 g of the Jamun fruits were packed in each PP zip lock bag and kept in deep freezer at -30°C for further use

Drying Condition

The stored Jamun fruits were taken from the deep freezer and kept in room temperature till it reach its normal state. Jamun pulp was extracted manually by separating the pulp from the seed. Approximately 500 g of pulp was taken for drying experiment. Equipment Cross flow drier (Sakav Oven Dryers and Furnaces with tray type dryers, 32’’×16’’× 1.25’’, heat load- 27 kW) with temperature varied from 50°C, 60°C and 70°C is used for drying of Jamun pulp. The drying process was performed in duplicate for each drying temperature.

Instrumentations

The samples were analysed to get FTIR spectra using FTIR Spectrometer (Thermo Nicolet, USA) equipped with software OMNIC version 6.0 a. The FTIR spectra of the fruit of different batches were analysed by chemo-metrics, principle component analysis (PCA), to evaluate identification, classification and differentiation using Perkin Elmer application software.

FTIR Spectra Recording

Each sample was analysed in triplicate to get FTIR spectra using KBr discs as: 1 mg of the Jamun pulp powder (100 mesh) and 100 mg KBr salt were ground together and the mixture was transferred to a mould. The material was then compressed in the mould in hydraulic press to produce KBr discs. Then the disk was removed and placed in a sample holder and FTIR spectrum was recorded in the mid-IR region 4000-400 cm^{-1}

Table 1: Functional Groups Identified by FT-IR Spectroscopy for Jamun Pulp Powder Dried in Cross Flow Dryer

Sample	Peak Value	Intensity	Functional Group	Bond
T50°C	451.34	82.413	Alkyl Halides	C-H bending
	806.25	79.197	Alkyl Halides	C-H bending
	1624.06	77.217	Aromatic Ring	C=C stretch
	2360.87	70.34	Phosphine	P-H medium
	3387	62.508	Carboxylic Acids	C-O stretch
T60 °C	775.38	15.341	Alkenes	C-H bend
	817.82	18.189	Alkenes	C-H bend
	866.04	22.088	Phenyl Ring	C-H bend
	1058.92	4.201	Thiocarbonyl	C=S Stretch
	1236.37	9.814	Bioactive fraction	C-N stretch
	1448.54	8.479	Alkenes Aromatic	C=C stretch
	1633.71	4.172	Nitro compounds	NO_2
T70 °C	650.01	25.4	Alkynes	C-H bend
	777.31	28.46	Phenyl Ring	C-H bend
	1078.21	13.82	Amines	C-N stretch
	1546.91	12.72	Aromatic Ring	C=C stretch
	1546.91	11.44	Aromatic Ring	C=C stretch
	1635.64	10.24	Amines	N-H stretch

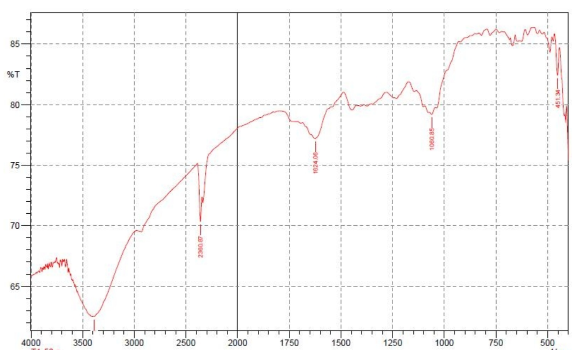

Figure 1: FTIR- Result of Jamun Pulp Powder Dried at 50°C in Cross Flow Dryer

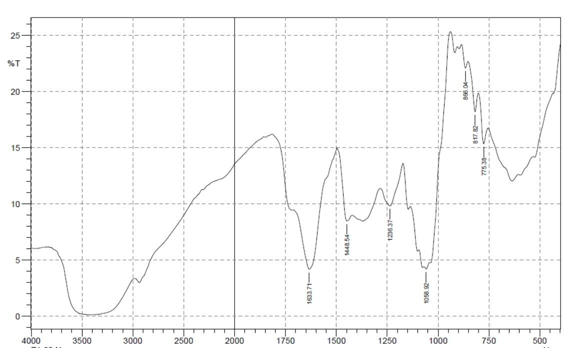

Figure 2: FTIR- Result of Jamun Pulp powder dried at 60°C in Cross Flow dryer

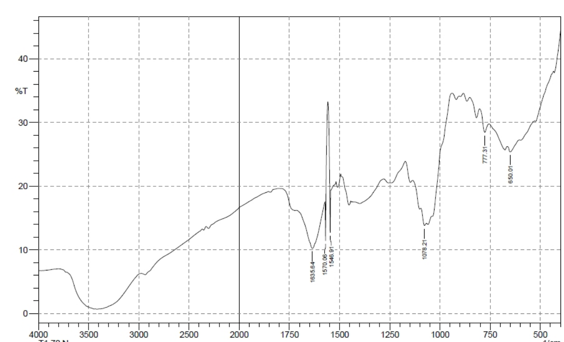

Figure 3: FTIR- Result of Jamun Pulp powder dried at 70°C in Cross Flow dryer

RESULTS AND DISCUSSION

FTIR profiles are important in quality assessment of herbal materials. FT-IR spectroscopic Study reveals the presence of various functional groups present in Jamun pulp dried in various temperatures in Cross flow dryer the results are shown in Table 1. Plants are very important source of functional components for the development[14] of new chemotherapeutic agents. The differences in the extract yields from the extracted plant materials in the present analysis might be attributed to the different availability of extractable components, resulting from the varied chemical composition of plants. FT-IR results of Jamun pulp power are shown in Figure 1, Figure 2 and Figure 3. Jamun pulp dried at 50°C in cross flow dryer shows five main peak value 451.32 cm^{-1} are correspond to Alkyl Halides C-H bending frequency respectively. A band at 806.25 cm^{-1}; is also correspond to Alkyl Halides, C-H bending frequency respectively. The peak at 1624 cm^{-1} represent aromatic ring with C=C stretch. A sharp peak at 2360.87 shows that presence of Phosphine with P-H medium bond and with carboxylic acids group shows a peak at 3387 cm^{-1}. When jamun pulp dried at temperature 60 °C in cross flow dryer seven peaks were obtained. The peak at 775.38 and 817.82 cm^{-1} assigned to C-H bend which means there is some presence of Alkenes group. The peak obtained at 866.04 cm^{-1} indicated the presence of C-H bend where there is Phenyl Ring. The C=S Stretch shows that there is presence of thiocarbonyl compound found at the peak vale 1058.92 cm^{-1}. Bio active fraction and nitro compounds were found in 1237.37 and 1633.71 cm^{-1} peak with C-N stretch and NO_2 bond, Alkenese Aromatic compound were found in peak 1448.54 cm^{-1} with C=C stretch. And when the temperature raise up to 70 still there are aromatic ring found in 1546.91 cm^{-1} peak with C=C stretch. The phenyl ring with C-H bend was found at peak 777.31cm^{-1}. Amines group with C-N stretch and N-H stretch was found in peak 1078.21 and 1635.64 cm^{-1}, Cyanogenic glycosides were present due to the presence of C-N stretch.

CONCLUSION

The functional group identified by FT-IR Spectrophotometer study in cross flow dried Jamun pulp were C-H bending, C=C stretch, P-H medium, C-O stretch, C=S Stretch, C-N stretch, C=C stretch, NO_2 and N-H stretch. The presence of characteristic functional groups are Alkyl Halides, Aromatic rings, Phosphine, Carboxylic acids, Alkenese, Phenyl ring, Thicarbonyl, Bioactive fraction, Nitro compounds and amines. On varying the temperature there is much difference in functional group Phenyl ring and aromatic ring was found in all the three temperature; whereas the bioactive fraction obtained to be good in temperature 60°C. From the study it reveals that most of aromatic compound and phenyl compound are maintained in both 60 and 70°C. So this pulp can be dried even till the temperature reaches at 70°C. Further studies are needed with this Jamun to identify the unknown functional groups, isolate, characterize and elucidate the structure of the bioactive compounds which are responsible for the antimicrobial activity and other medicinal values.

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