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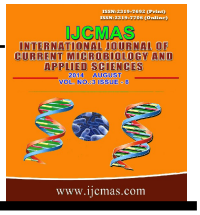

Original Research Article

Physicochemical and functional characteristics of powder prepared from palmyra fruit pulp (*Borassus flabellifer* L.)

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A B S T R A C T

This study investigated the physicochemical and functional properties of plamyra fruit pulp. Thus the fruits were procured from local market and several analyses such as ash, moisture, pH, protein, fat, total sugars, carbohydrate, starch, energy value, calcium, vitamin C using common scientific methods of food characteristics determination were performed. The results showed that the pH range between 5.5 to 6, TSS of the fresh pulp is 16.5^0 Brix, moisture content is 74-77%,ash content is 1.2 g, carbohydrate content is 22.5g, caloric value (energy) is 102.83 kcal/100g, reducing and non reducing sugars content is 9.5 g and 13g, starch is 12.6g, Maltose is 0.5g, Ascorbic acid is 16mg and calcium is 8.76 mg. The water absorption capacity of the palmyra pulp powder is 18 % (2.5 ml/g), The fat absorption capacity was found to be 2.8 % , bulk density of the sample obtained from the study is 0.78 gcm^{-3}, the powder has swelling power value of 4 and the percent foam capacity is about 2.5 %.

Keywords

Palmyra fruit pulp, water absorption capacity, Bulk density

Introduction

Borassus flabellifer L. , belongs to family Arecaceae,(Asmussenet al., 2006)commonly known as Palmyra palm or Asian toddy palm is a native of tropical Africa but cultivated and naturalized throughout India (Nesbitt, 2005). The coconut like fruits are three sided when young, becoming rounded or more or less oval, 12-15 cm wide, and capped at the base with overlapping sepals (Morton, 1988).This plant has a commercial and medicinal value (Ghosh et al., 2012).

The fruit pulp of *B. flabellifer* has been used in traditional dishes and the sap, which was trapped from the flower part, has been used as a sweetener for diabetic patients (Masayuki et al., 2007). The different parts of the plant is used for the various ailments like secondary syphilis, antiperiodic, heart burns, liver and spleen enlargement etc. It has anti-inflammatory effects (Nadkarni, 1954; Vaidyaratnam, 1994; Kapoor, 2000).The juice contain sugars, proteins,

lipids, vitamin A, B-complex, vitamin C and others minerals (Barhet al., 2008). It has also been reported to possess immunosuppressant properties (Revesz et al., 1999). Therefore, the aim of this present study is to assess the physicochemical and functional properties of the palmyrafruit pulp.

Materials and Methods

According to Ali et al. 2010, as soon as they arrived the laboratory, the fruits were sorted out in order to remove damaged ones and were separated on the basis of the state of ripeness, similarity in shape and size. The fruits were then washed, weighted, peeled and pulped. The pulp was stored at 4^0C and some of the pulp was dried at 60^0C for 24 to 48 hrs. The dried pulp was finally milled using pulverizer to pass through 250 µm sieve. The samples were then packaged in polyethylene bag and kept in a refrigerator (4^0C) for further use.

Physicochemical Properties

The pH of the fresh pulp was determined with digital pH meter (Ranganna 1986).The estimation of protein was made by Lowry et al (1951), lipids were extracted according to the method using soxhlet apparatus (Ranganna 1986), ash content was determined by heating sample at 450^0 C for 3-6 hrs. Starch, reducing sugar and total sugar were determined by Thimmaiah (1999).Non reducing sugars were estimated by subtracting the reducing sugars from the total sugars. Vitamin C content was obtained with the method of Tillmanns and Hirsch (1932), calcium content of the sample was determined by using AOAC (1990) method. The Energy (caloric value) estimation was done by summing the multiplied values for crude protein, fat and carbohydrate (excluding crude fiber) by their respective ATWATER factors (4,9 and 4). The content of total carbohydrate and moisture was determined by the following equations:

Carbohydrate(%) = 100- {Moisture(%) + Protein (%) + Fat (%) + Ash (%)}

Moisture (% wet basis) = (M1 – M2)/M1 X 100

Functional Properties

The following were determined using standard methods of analysis: The total soluble solid (TSS) of the fresh pulp was determined with a hand refractrometer (Ranganna, 1986). Water absorption capacity was determined by the method of beuchat (1977),bulk density was determined by the method of Narayana and NarasingaRao (1984). Swelling power was determined with the method of leach et al (1959). Narayana and Narasinga Rao (1982) method was used for the determination of foam capacity (FC) and foam stability (FS).

Results and Discussion

Physicochemical Properties

The pH of palmyrapulp powder is slightly acidic i.e pH range between 5.5 to 6 as shown in table.1. pH value gives a measure of the acidity or alkalinity of the powder. This parameter is used to estimate the quality of the pulp powder. The TSS of the fresh pulp is 16.5^0Brix, with these desirable characteristics the pulp can be used for food additive to enrich nutritional values.

Moisture provides a measure of the water content of the palmyra pulp powder and for that matter its total solid content. It is also an index of storage stability of the pulp powder. The moisture content of the pulp powder is 74-77% (Table 1). The lower the moisture content, the better its shelf stability and hence pulp should be dried for storage.

Table.1 Physicochemical properties of plamyra pulp powder

Parameter	Values for 100 g
pH	5.5-6
Total soluble solids (0Brix)	16.5
Moisture (%)	74-77%
Ash (%)	1.2
Fat (%)	0.8
Total Carbohydrates	22.5
Reducing sugars (%)	9.5g
Non Reducing Sugars (%)	13g
Starch (%)	12.6g
Maltose	0.5g
Protein	1.24g
Ascorbic acid (mg $100g^{-1}$)	16mg
Calcium	8.76mg
Energy (Kcal 100 g^{-1})	102.83k.cal

Table.2 Functional properties of palmyra pulp powder

Parameter	Values
Water absorption capacity (%)	18
Fat absorption capacity (%)	2.8
Bulk density (gcm^{-3})	0.78
Swelling Power (gg^{-1})	4
Foam capacity (%)	2.5

The fat content of the palmyra fresh pulp was 0.8 % (Table 1). This value is relatively high when compared to other pulps (Sankaralingam et al., 1999).

The ash content of the pulp powder is 1.2 g (Table 1). The ash content is the organic residue remaining after the organic matter has been burnt away. It is not necessarily of exactly the same composition as the mineral matter present in the original pulp powder as there may be losses due to volatilization or some interactions between constituents. The protein content of the pulp powder was 1.24g (Table 1).

The major component of the pulp powder is carbohydrate. The value obtained from the study was 22.5g. The caloric value (energy) of the pulp powder was 102.83 kcal/100g (Table 1). The pulp powder also contain significant amount of sugars and minerals i.e reducing sugar is 9.5 g, non reducing sugar is 13g, starch is 12.6g, maltose is 0.5g, ascorbic acid is 16mgand calcium is 8.76 mg.

Functional Properties

The colour of the pulp is light orange. The pulp is partially soluble in water, alcohol and acid solutions, completely soluble in ether and chloroform.

The water absorption capacity of the palmyra pulp powderis18 % (2.5ml/g)

(Table 2). Water absorption capacity describes pulp- water association ability under limited water supply. WACcan influence both the sensory and keeping quality of foods apart from affecting their processing behaviour. The result obtained shows that the pulp has a good ability to bind water sopalmyra pulp powder could be used in bakery industry. The fat absorption capacity was found to be 2.8 % (Table 2). Fat absorption is an important property in food formulations because fats improve the flavour and mouth feel of foods (Kinsella, 1976).

Bulk density is depending upon the particle size of the samples and is measure of heaviness of sample. The value obtained from the study was 0.78 g/cm3. Increase in bulk density is desirable in that it offers greater packaging advantage, as a greater quantity may be packed within a constant volume (Fagbemi, 1999).

The palmyra pulp powder has swelling power value of 4. Swelling poweris a measure of hydration capacity, because the determination is a weight measure of swollen starch granules and their occluded water. Food eating quality is often connected with retention of water inthe swollen starch granules (Rickard *et al*., 1992). The percent foam capacity is about 2.5 % which is very low. Foam ability is reported to be related to the amount of solubilized protein (Narayana and Narasinga Rao, 1982; Lin et al., 1974) and the amount of polar and non-polar lipids in a sample (Nwokolo, 1985).

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