International Journal of PharmTech Research
CODEN (USA): IJPRIF, ISSN: 0974-4304
Vol.8, No.1, pp 160-162, 2015

Antioxidant Properties of Coconut Sap and its Sugars

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Abstract: The antioxidant properties of coconut sap were analyzed for which studies were conducted on the reducing power, levels of ascorbic acid, polyphenol content and alpha amylase inhibitory activity. Polyphenols and ascorbic acid are very good antioxidants and possess free radical scavenging activity and thereby exhibit good reducing power. Alpha amylase inhibitors cause delay in the digestion of carbohydrates, therefore causing reduction in the rate of glucose absorption.
Key words: anti oxidants, coconut sap, sugars.

Introduction

A report from Food and Nutrition research Institute has given the nutrient and non nutrient profile of coconut sap and its sugar (coconutboard.gov.in). The report states that Coconut sap and its sugar is rich in iron, zinc, calcium, sodium and potassium, dietary fiber and inulin. They too possess phytonutrient content such as Polyphenols, flavonoids and anthocyanidin. Clinical trial studies had shown that coconut sap and its sugar has low glycemic Index. Palm trees such as *Nypa fruticans, Borassus flabelliform* and *Cocos nucifera* are harvested for their large amounts of high sugar content sap. The extracted sap can be used for preparing syrup, vinegar, sugar, alcoholic beverages and even used for biofuel production. In fact, palm trees are able to produce higher yields in sugar and alcohol compared to conventional crops, such as sugar beetal, maize, cassava, sugarcane and sweet potatoes. Fresh coconut inflorescence sap (FCIS) is used for its sugar and alcoholic beverages by local people and was reported to be highly nutritive and also function as a good digestive agent. Fresh sap is rich in amino acids and vitamins [1]. Many researchers have studied the chemical or microbiological compounds of FCIS and naturally fermented coconut inflorescence sap (NCIS). The study distribution of microorganisms, the changes of physical and chemical contents during natural fermentation of CIS and 166 isolates of yeasts and 39 isolates of bacteria were isolated in this work [2] . Antioxidants protect the body from damage caused by ROS therefore the present research is focused on the medicinal plants protects the system from oxidative damage. Our experimental results testify that the coconut sap has powerful ROS scavenging activity and can be potentially used as the ingredients of functional food. There are few reports about the functional potential of these compounds from fresh or fermented saps, hence the present study was conducted.

Material and Methods

FCIS was collected by tapping the unopened spadix of the palm from three trees of the *C. nucifera* L. and were stored in a container which had been thoroughly washed with boiled water, and then desiccated to avoid microbial contamination. The FCIS was collected and transported to the laboratory maintaining 4°C until processing. A portion of each sap was quickly filtered (Whatman No.1), put into a conical flask covered with cheese cloth, and immediately used for tests and then fermented for about 24 hrs to 3 days at 25 ± 2°C,

respectively in triplicate. An aliquot of the sap was removed from each conical flask and the physicochemical compositions were investigated periodically. Sugar samples (1 g) were dissolved in 10 mL of distilled water.

The syrups were diluted with distilled water to reach the same solid concentration (10° Brix, 25°C) of sugar extracts. The pH of each extract was adjusted to 6–8 and centrifuged at 9,300 *g* for 30 minutes. The supernatant was recovered and then used as the extract for *in vitro* assays. Extractions were performed in duplicate. The total phenolic contents of samples were quantified by the Folin- Ciocalteu's reagent and were expressed as gallic acid equivalents [3]. Ascorbic acid content was determined by spectrophotometer [4]. *α* -amylase inhibitory activity as from Worthington Enzyme Manual[5].

Results and Discussions

Ascorbic acid is easily oxidized and degraded and it determines the quality of the sap. Phenolic compounds contain the phenolic hydroxyl groups which are free radical trappers. Therefore they possess anti-aging, anti-tumor and antimutagen functions. The Ascorbic acid content of FCIS was 20.6 mg/L. It however reduced slowly on day 1 to 19.6 mg/L of fermentation, but has increased on day 2, has reached a maximum of 20.7 mg/L on day 3. The increase may be probably because of enhanced activity of yeast. However, on day 5, the Ascorbic acid fell sharply to and this may be because of decreased activity of the yeast as shown in Fig 1.

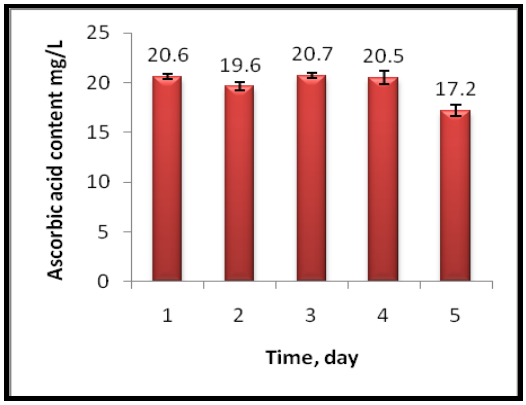

Fig.1: Variation in Ascorbic acid content with Time, p value <0.05

The total phenolic content in the FCIS was 0.34 g/. Day 2 of fermentation the value was (0.6g/L) and thereafter reached a peak value of 1.24 g/L at day 3 after which there was no obvious change as shown in Fig 2. The increased phenolic content is because of plant poly phenols bind with cellulose, protein, sugar, and starch to form glucosidic bonds. Microbial met abolism may too contribute to phenolic substance.

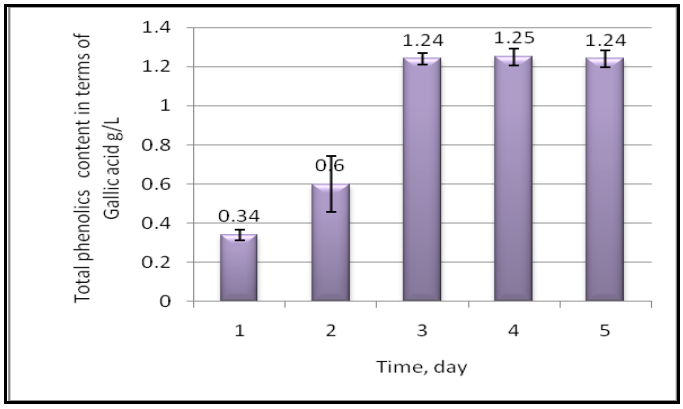

Fig.2: Total phenolics content in terms of gallic acid g/L, p value< 0.05

The total phenolic content of Coconut sap sugar is 2300 *μg Gallic acid g/L*. Sugar extract exhibited 45% inhibition of porcine pancreatic α – amylase at 500 *μ*l and therefore may possess antidiabetic activity.

Conclusion

Ascorbic acid was also found to be the main contributor to the total antioxidant capacity of new fruit juice and skim milk mixture beverages market led in Spain[6]. At the present three amylase inhibitors like acarbose, miglitol and voglinose are available for the treatment of patients with type II diab*et al*es mellitus. These inhibitors of glucosidase and amylase resulted in delayed carbohydrate digestion and glucose absorption with attenuation of postprandial hyperglycemic excursions[7]. Coconut sap sugar can be used as an alternative source for sugar because of its low glycemic index and since it possess α – amylase inhibitory activity but also used as a therapeutic agent in treating type II diabetes mellitus.

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