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ORIGINAL ARTICLE

Study on the Nutritional and Functional Properties of Developed Bar Using *Bombax ceiba*

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ABSTRACT The study was done to find out nutritional and functional properties of therapeutic bar using *Bombax ceiba* root powder. The bar was developed as the nutritious snack enrich with *Bombax ceiba* root powder. *Bombax ceiba* has been known as ancient medicine which hold various medicinal properties that was used in treating number of aliments and lifestyle health problems. The ingredients were chosen carefully and thoughtfully to contribute better health benefits on consumption. Apart from nutritional benefits the sensory attributes were also kept in mind to ensure acceptability of product and commercial production could be made possible. It is important the people receive enriched food products n order to fight day to day health problems and smooth functioning of body.

Keywords: *Bombax ceiba*, Dehydrated root powder, nutritional properties, functional properties

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INTRODUCTION

In recent years, consumers have become increasingly aware of foods of high nutritional value with therapeutic qualities related to regular production. *Bombax ceiba* roots are being used for very long time in Ayurveda, unani, and siddha as cooling effect and is useful in numerous aliments such as diarrhoea, diabetes, bladder borders, urinary disorders, gynaecological problems, dysentery, heart disease, debility and impotence (Verma *et al.,* 2011) which was revealed by preliminary Phyto-chemical analysis of roots existence of saponins, tannins, glycosides, cardiac flavonoids, phenols beside amino acid and carbohydrates. The phenolic content found in dried form of root was 4.85% and tannin were 1.70% (Saklani *et al.,* 2013).

In present days' lifestyle people prefer to eat food each are not only easily accessible but also provide nutrition to meet their dietary allowances, bars such as these are great in-between meal dietary snack. The bar was designed in a way that it not only satisfies hunger but also provide immediate strength and energy to keep working till next meal.

Keeping qualities of *Bombax ceiba* in mind and considering most consumed and preferred Bars the ingredients of bar were selected.

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Caramel, chocolate, peanuts, almonds, and butter were chosen as ingredients for preparation of bar. These ingredients are not only widely liked but also provide instant energy and sugar delays feeling of hunger for few hours. The addition of dried *bombax ceiba* root powder provide coolness in stomach, helps to calm and provides senses of fullness.

The layering technique of various ingredients were done for equivalent distribution of flavours in the bar and to avail all ingredient in single bite. The crunchiness of nuts makes bars chewy which gives sense of fulfilment while eating the bar. The nuts also provide important oils and minerals to consumer which helps in curbing the hunger and providing essential nutrients. The nuts used in development of bar were Peanuts (roasted and dehusked) and Almonds (Salt roasted and crushed).

MATERIAL AND METHODS

Materials

The Developed Bar enriched with *Bombax ceiba* powder with flavoured with butter caramel, chocolates and nuts (peanuts

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and roasted almonds). Each bar weighs 50±2 grams, dimension of bar 14*5*2.5 centimetres. This bar is 100% vegetarian.

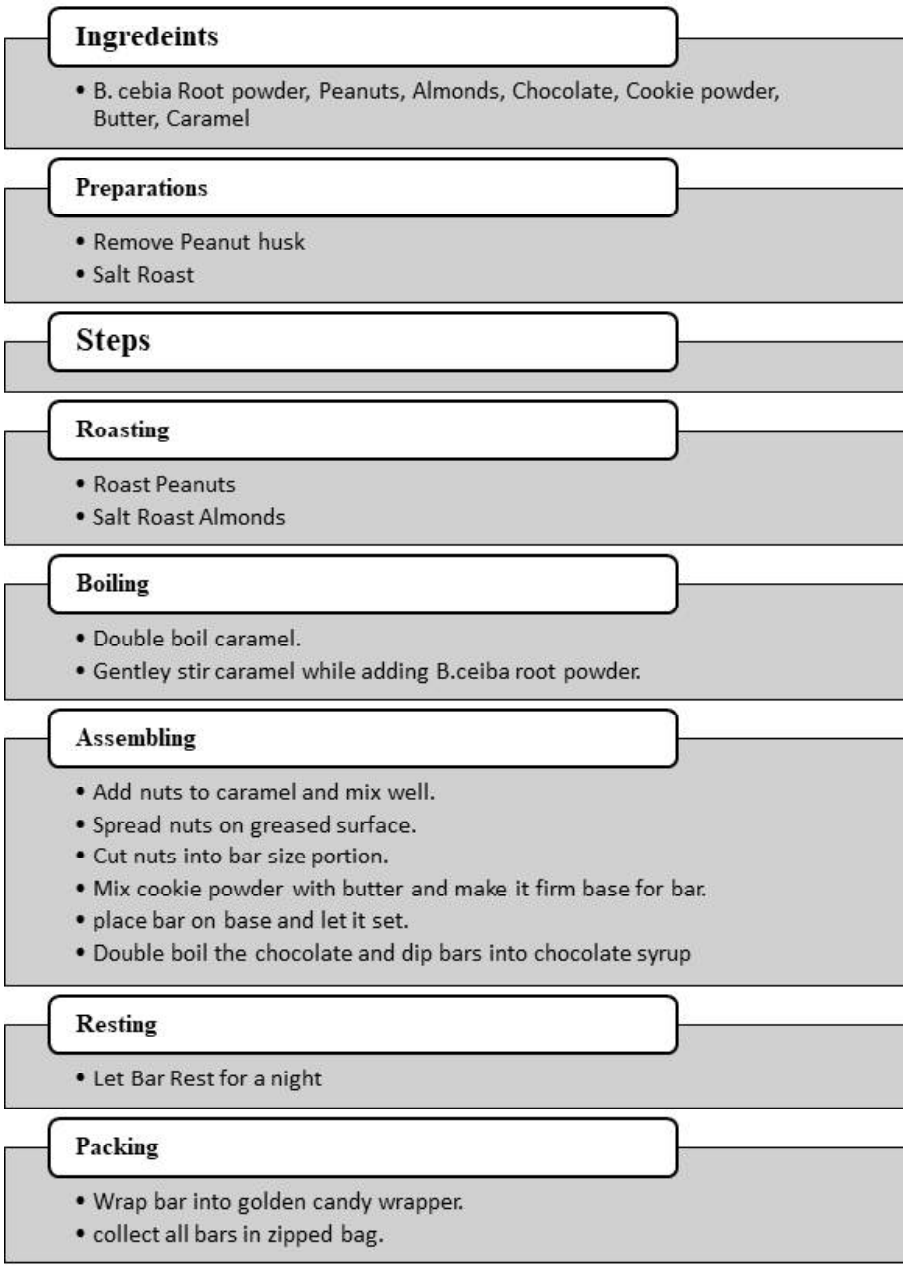
Ingredients

B. ceiba root powder 30 g, peanuts 50 g, almonds (salt roasted), Caramel 80 g, Chocolate syrup 30 g, cookie powder 40 g, butter 10 g.

Procedure

Pour caramel in a glass bowel and prepare double boiler. While melting caramel add root powder and stir thoroughly, do not let caramel to come to boil. Keep caramel bowel of the heat and add crushed nuts to the caramel. Spread carameled nuts on grease butter maintain height on 1.5 cm. Cut the carameled nut into bar shape with width of 2.5 cm. Mix cookie powder with butter and make it hold it shape. Place the carameled nut bar in cookie base and press slightly then let it set for 1 hour. Till then break chocolate (milked and sweetened) in bowel and prepare double boiler. Melt the chocolate till smooth slurry is achieved. Put aside boiler and take out bars. Dip single bar in chocolate syrup and place it on grill to let excess chocolate drip away. Leave chocolate bars for one hour at room temperature. Later when chocolate coating firm place bars in refrigerator and leave them overnight.

Figure 1: Showing Steps Involved in Preparation of Bar



Physio-Chemical Characterization of Extracted Root Powder

pH

The 5g of each of the root powder sample was weighed and blended appropriately with 15ml distilled water. The blend was poured into boiling distilled water to makeup 100 ml of slurry. The slurry was permitted to cool. Utilizing a digital pH meter, the pH of the slurry was estimated.

Moisture

5 g of the extracted samples were weighed accurately in the moisture dish. The samples were dried in the oven at 105 °C and weighed. The dish was placed in the oven maintained at 105±20 °C, for 4hours. After 4hours, the samples were cooled in the desiccator and weighed. It was calculated as,

$$The\ loss\ of\ weight = \frac{Initial\ weight - Final\ weight}{Initial\ weight} \times 100$$

The loss of weight equals to moisture percentage present in the sample.

Ash

5 g of the sample was accurately weighed in a tared, clean and dry crucible. The material in the dish was ignited with the flame of a suitable burner for about one hour. The ignition is completed by keeping it in a muffle furnace at 550 °C until grey ash is formed. The dish is cooled in the desiccator and weighed. The ash content is estimated as follows,

$$Ash(\%)(dry\ basis) = \frac{M_2 - M}{M_1 - M} \times 100$$

where, M = Mass of the empty crucible (g)

M_1 = Mass of the crucible with the sample before drying (g)

M_2 = Mass of the crucible with the sample after drying (g)

Fat

5 g of sample was placed in thimble and a piece of cotton wool was plucked at the top to distribute the solvent evenly as it drops on the sample during extraction. The thimble was placed in the butt tubes of the Soxhlet extraction apparatus. Petroleum ether (150 drops/min) was used for extraction for 6 hours without interruption by gentle heating. It was allowed to cool and dismantle the extraction flask. The ether was evaporated on a water bath until no odor of ether remained. Cooling was done at room temperature. The dirt or moisture was carefully removed outside the flask and weighed the flask. Observations were recorded and calculated as;

$$Fat(\%) = \frac{W_1 - W_2}{W} \times 100$$

were, W: Mass of the sample (g)

W_1: Mass of the thimble with extracted fat (g)

W_2: Mass of the empty thimble (g)

Protein

2 g of sample was taken in a Kjeldahl's flask and 1-2 g of catalyst mixture was added. The flask was kept in the protein digester. 30 g potassium sulphate and 0.5 g anhydrous cupric sulphate were added to the tube. Further 10 ml of concentrated H_2SO_4 was added. After Completion of digestion, the tube was cooled at room temperature. Further the tube was placed into automatic digestion unit and 40 ml 40% NaOH and 25 ml 4% Boric acid was added in receiver by machine. Distillation is done for 9 minutes. Then the receiver flask is removed and 2-3 drops of indicator is mixed following titration with 0.1 N HCl/1 N H_2SO_4 till end point shows pink color. The titration value is noted down and the protein content is estimated as follows,

$$Protein(\%) = \frac{(titration\ value \times normality\ of\ HCl \times 6.25 \times 2.089)}{Sample\ weight \times 0.2 \times 1000} \times 100$$

Bulk Density

A known weight of the each of the root powder were poured in two different 50 ml graduated cylinders and the volume was noted. The bulk density was calculated as,

$$Bulk\ Density\left(^{g}/_{ml}\right) = \frac{Weight\ of\ powder(g)}{Volume\ of\ the\ powder(ml)}$$

True Density

True density was determined by adding 5 g of each of root powder in 25 ml toluene in two different 100 ml measuring cylinders. The final volume was noted and true volume of root powder sample was determined from as,

$$True\ Density(g/ml) = \frac{Weight\ of\ the\ powder(g)}{true\ volume(ml)}$$

Porosity

porosity is the level of air between the particles contrasted with a unit volume of particles. Porosity permits gases, for example, air and fluids to move through a mass of particles alluded to as a pressed bed in drying and refining tasks. Beds with low porosity (low-rate air space) are increasingly impervious to liquid stream what's more, along these lines are progressively hard to dry, warmth or cool. With high porosity, wind streams without any problem through the bed, drying is quick, and the force required by fans and siphons is low.

RESULTS AND DISCUSSION

Nutritional and Physiological Properties of *Bombax ceiba*

The young roots of the plant have recorded useful in numerous ailments like diarrhea, diabetes, bladder borders,

urinary disorders, gynecological problems, dysentery, heart condition, debility and impotence (Verma *et al.*, 2011). Revealed by preliminary phyto-chemical analysis of roots existence of tannins glycosides, saponins, cardiac flavonoids, hormones, phenols besides amino acids and carbohydrates. The phenolic content found in dried sort of root powder was 4.85% and tannin are 1.70% (Saklani *et al.*, 2013). Young root contains more sugars, carbohydrates like starch and pectic substances as compared to the roots that are old, but they contain not much amount of oil, colouring matter and cellulose (Springer Briefs in Pharmacology and Toxicology, n.d.). The qualitative analysis of bark less roots is given below;

The proximate analysis revealed that extraction values in petroleum ether 9.6%, alcohol 19.2% and water 16.8% were observed. Loss on drying of *Bombax ceiba* roots powder was found to be 6.8%. Percentages of total ash, water-soluble ash and acid insoluble ash were found to be 4.8, 4.4 and 0.5%, respectively. The Phyto-chemical evaluation showed the presence of saponins, thus foaming index and haemolytic index were determined and found to be 142.9 and 500.0, respectively. (Chaudhary *et al.*, 2014)

Successive solvent extraction values in various organic solvents were observed like petroleum ether 1.1%, chloroform 2.2%, methanol 5.3% and water 15.0% in percentage yield.

The qualitative phytochemical evaluation by chemical tests of all the extracts obtained after successive extraction showed the presence of alkaloids, glycosides, flavonoids, saponins and tannins. HPTLC fingerprinting studies was performed on the hydro-alcoholic extract of red silk-cotton tree roots. The results obtained are depicted in Figure 4.

The presence of steroids was confirmed by use of detecting agent, anisaldehyde-sulphuric acid. Table 5 shows the comparative Rf values observed. The presence of lupeol within the hydro-alcoholic extracts was confirmed by HPTLC at Rf value ~ 0.26. Through screening of the literature on B. ceiba shows that it's a standard plant by ethnobotanical way. The crude extract and aqueous extracts of stem bark, root and leaf of B. *ceiba* have be screened for a few pharmacological activities like hepatoprotective, antiangiogenic, analgesic and antioxidant, hypoglycemic, antimicrobial activity and cholinesterase activity (Versiani, 2007). Other parts of plants like gum, seed and seed oil

Table 1: Chemical Analysis of Bark Less Root (Springer Briefs in Pharmacology and Technology, n d.)

Test	Values (%)
Moisture	7.5
Starch	71.2
Sugars	8.2
Proteins	1.2
Fat	0.9
Ash	1.09
Bulk Density(g/ml)	0.45
True Density(g/ml)	0.58
Porosity (%)	40.9
pH	6.5

Table 2: TLC Profile for Hydro-Alcoholic Extract of *Bombax ceiba* Roots Powder

Groups	Mobile Phase	Detection	Rf Value
Anthraglycosides	Ethyl acetate: methanol: water (100:13.5:10)	Bornträger reagent	Absent
Bitter Principles	Ethyl acetate: methanol: water (77:15:8)	Vanillin-Sulphuric acid reagent	0.62
Alkaloids	Toluene: ethyl acetate:diethylamine (70:20:10)	Dragendorff reagent	0.78
Flavonoids	Ethyl acetate: formic acid: glacial acetic acid: water (100:11:11:26)	Aluminium chloride reagent	0.91
Saponins	Chloroform: glacial acetic acid: methanol: water (64:32:12:8)	Vanillin-sulphuric acid reagent	0.42
Essential oils	Toluene: ethyl acetate (93:7)	Vanillin-sulphuric acid reagent	Absent
Coumarins	Diethyl ether: toluene (1:1) saturated with 10% acetic acid	UV 365 nm	Absent
Steroid	Cyclohexane: diethyl ether: ethyl acetate (4:6:2.5)	Anisaldehyde-sulphuric acid	0.3, 0.85, 0.88

Table 3: Preliminary Phytochemical Screening of *Bombax ceiba* Root Extracts

Name of Chemical Test	Petroleum Ether Extract	Chloroform Extract	Methanol Extract	Water Extract
Carbohydrates	-	-	+	+
Protein and amino acid	-	-	+	+
Fat and oils	+	-	-	-
Steroid	+	+	-	-
Glycosides				
Cardiac glycosides	-	-	-	-
Anthraquinone glycosides	-	-	+	+
Saponin glycosides	-	-	+	+
Flavonoid glycosides	-	-	+	+
Alkaloids	-	-	+	+
Tannins and phenolic compounds	-	-	+	+

which are well documents to possess valuable medicinal properties aren't explored its biological potential (Versiani, 2007). In future study the isolated principle from B. ceiba must be evaluated in animal model and clinic trial to know the molecular mechanism of action, in search of lead molecules from natural resources.

CONCLUSION

The purpose of this study was to extract powder from root of red silk-cotton tree and evaluate the nutritional properties and phytochemical of the extracts. so as to spot different and improved potential sources of compatible raw materials which will supplement; augment or enhance current supplies, this purpose of research has been extended. Natural resources provide botanical products high in certain raw resources, but are commonly left unused.

The convention followed during this investigation allowed a production of economic therapeutic bar so as to form people choose healthier and therapeutic options from commercial products which are just fulfilling taste sense. The properties of the extracts were evaluated for its end utility. The physicochemical properties assessed were bulk density, true density, porosity, pH, moisture, ash, protein and fat. The nutritional profile was checked to guage the presence of phytochemical that help human to heal aliments and daily health issues. the standard of prepared bar was much above commercial bars because it has pure ingredient without and adulterants and use of harmful food additives with addition of medicinal properties of B. *ceiba*. The analysis of the extract characteristics established its end efficacy. The properties of the separated recommend that it'd have expansive prospects as a fixing in food frameworks and other mechanical application. The food products prepared were found to possess favourable levels of acceptability and palatability. With the modification in extracted root powder, it's going to be utilized within the development of large-scale food products, that hold medicinal and therapeutic properties. the present findings illuminate the extraction and use B. *ceiba* root powder could also be consider novel ingredient in future use. Furthermore, adjustments during the extraction may prompt improvement in its utility. these discoveries illuminate extraction and usage of powder from B. *ceiba* roots for its business applications in several food enterprises. And commercialize the therapeutic snack to exchange unhealthy options.

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