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PREPARATION OF CHOCOLATE COATED DATE FRUIT STUFFED WITH DATE FRUIT POWDER,ALMONDS AND CHIA SEEDS AND ITS ANALYSIS

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Abstract: The development and analysis of chocolate-coated date fruit were investigated in this research paper. Proximate analysis was conducted to determine the nutritional composition, including moisture, protein, fat, carbohydrates, and ash content. Sensory analysis was performed to evaluate the organoleptic properties such as taste, texture, aroma, and overall acceptability of the chocolate-coated date fruit. Furthermore, the antioxidant activity of the product was assessed using the DPPH (2,2-diphenyl-1-picrylhydrazyl) assay. The shelf life analysis was conducted using the Agar Diffusion Method to determine the product's microbial stability over time. The results of the proximate analysis showed that the chocolate-coated date fruit had favorable nutritional composition. The sensory analysis indicated high consumer acceptance of the product, with positive ratings for taste, texture, aroma, and overall quality. The antioxidant analysis revealed significant antioxidant activity, highlighting the potential health benefits of the chocolate-coated date fruit. The shelf life analysis demonstrated adequate microbial stability over the studied period. These findings suggest that the developed chocolate-coated date fruit is a nutritious, palatable, and antioxidant-rich product with a satisfactory shelf life and potential as a healthy snack alternative.

Key Words: *Chocolate Coated Date Fruit, Date Fruit Powder, Almonds,Chia seeds, Dark compound Chocolate, Antioxidant, Shelf-life*

1. Introduction

Date fruit (P. dactylifera, L.) is an important fruit of arid and semiarid regions. The total global production of dates amounted to 88,71,351 t in 2018 with the top producing countries located in the Middle East and North Africa region. The date fruit is intricately woven in the Arabic heritage and remains a major food security resource in some countries. The date fruit bears a good nutritional profile as a rich source of carbohydrates, dietary fiber, certain essential vitamins, and minerals. Moreover, it exhibits further health beneficial effects due to the presence of different bioactive compounds such as phenolic compounds, anthocyanins, sterols, and carotenoids. (Fayeza Hasan et al 2020)

Theobroma cacao L. is a tropical crop of high importance, mainly due to the commercial value of its beans. Cocoa beans are part of the cocoa plant fruit. The botanical name of this plant in Latin means “Food of the Gods”, whereas the common name cocoa emerged from an Aztec language Nahuatl word xocolatl, which is derived from xococ (bitter) and atl (water). The cocoa tree is native to North Brazil,

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 12, Iss 2, 2023

Colombia, Costa Rica, Ecuador, French Guiana, Guyana, Peru, Suriname, and Venezuela, but it was introduced to some tropical parts of Africa and Asia as well. Nowadays, it is grown on a large scale on several continents (South America, Africa, and Asia), whereas in many countries worldwide, it is used for cocoa production, marketing, and consumption. Moreover, the beans are used to prepare various products such as cocoa butter, chocolate, jelly, liqueurs, cosmetics, etc. Cocoa beans for chocolate production are obtained from three major varieties: Forastero, Criollo, and Trinitario, which grow in different tropical regions and produce cocoa beans with varying taste characteristics. Varieties grown in Central and South America (Trinitario and Criollo) produce the "fine" cocoas, which are distinguished by preferred aroma and colour, and are usually used for the production of dark chocolate. Chocolate can be classified into dark, milk, and white, depending on manufacturing. In commercial dark chocolate, the solid cocoa content ranges from 47% (sweet dark) to 70%, 75%, or even above 90% for highly dark chocolate. Nowadays, the trends in the chocolate industry are changing, influenced by increasing consumer concern with the nutritional status.(Simona Jaćimović et al 2022). dark chocolate contains high levels of antioxidants, minerals, and flavonoids, which contribute to its positive effects on human health. Dark chocolate is rich in antioxidants and potent source of antioxidants, such as flavonoids, polyphenols, and catechins. These compounds help neutralize harmful free radicals in the body, protecting cells from oxidative damage. The flavonoids found in dark chocolate help lower blood pressure, reduce inflammation, improve blood flow, and enhance the function of the endothelium (the inner lining of blood vessels). Regular consumption of dark chocolate has been associated with a reduced risk of heart disease and stroke.

The antioxidants present in dark chocolate can have a positive impact on skin health. They help protect the skin against damage from UV rays, improve hydration, and promote better blood flow to the skin, leading to a healthier complexion.

The cultivated sweet almond (*Prunus dulcis*) is a nutritionally important and valuable specialty crop grown in many temperate and sub-tropical regions in the world, both for domestic consumption and for trade. Almonds belong to the genus *Prunus* and the subgenus *Amygdalus*, within the Rosaceae family. The cultivated almond is designated as *Prunus dulcis* (Miller) D.A. Webb; listed synonyms include *Prunus amygdalus* Batsch and *Prunus communis* L. as well as the early designation *Amygdalus communis* L. (Kester et al., 1991, USDA, 2010c). The sweet or bitter flavor characteristic of almond kernels is an inherited trait (Dicenta and García, 1993). Bitter almonds contain significant amounts (3–9%) of amygdalin, a diglucoside, which releases hydrocyanic acid and benzaldehyde upon enzymatic hydrolysis (Wirthensohn et al., 2008); bitter almonds are used primarily in the production of flavor extracts. This review focuses on the sweet almond, which is the predominant type cultivated globally.(Sylvia yada et al 2011).

Almonds are a rich source of essential nutrients. They are particularly high in vitamin E, providing about 37% of the daily recommended intake in a 1-ounce (28-gram)

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 12, Iss 2, 2023

serving. Vitamin E is a potent antioxidant that helps protect cells from oxidative damage. Almonds also contain significant amounts of magnesium, manganese, copper, phosphorus, and B vitamins, which play important roles in various bodily functions also associated with improved heart health. The monounsaturated fats, fiber, and antioxidants found in almonds can help reduce LDL (bad) cholesterol levels and promote a healthy lipid profile. Despite their relatively high-calorie content, almonds can be beneficial for weight management. The combination of protein, fiber, and healthy fats in almonds helps promote satiety and feelings of fullness, which can reduce overeating and aid in weight control. Additionally, the monounsaturated fats in almonds have been associated with a lower risk of abdominal obesity.

Salvia hispanica L. (Lamiaceae), also known as Chia, is an annual herbaceous plant, native of southern Mexico and northern Guatemala. The genus *Salvia* consists of ca 900 species (Ayerza and Coates 2005) and its name comes from the latin word "salvere", referring to the curative properties of the well known culinary and medicinal herb *Salvia officinalis* (Dweck 2005). Nowadays, some species are still used all over the world for their nutritional properties and their beneficial effect on human health. The species *S. hispanica* produces numerous dry indehiscent fruits which are commonly called seeds.(Bruna de Falco et al 2017)

Despite their small size, chia seeds are packed with essential nutrients. They are an excellent source of fiber, omega-3 fatty acids, protein, calcium, magnesium, and antioxidants. These nutrients are crucial for maintaining overall health and well-being

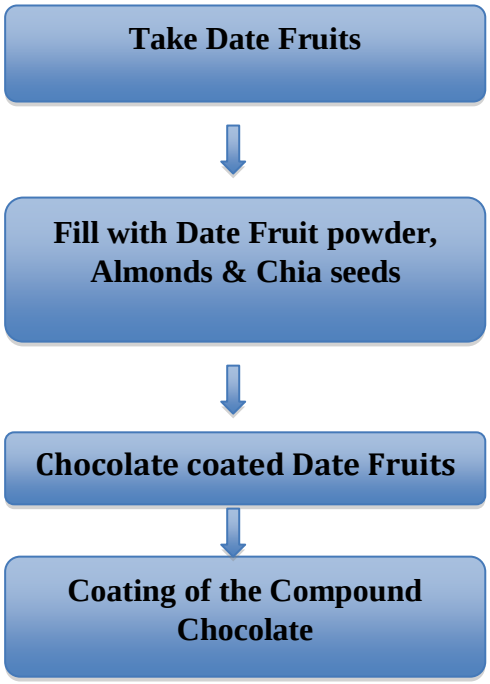
2. Materials

This study was conducted at the department of Food & Nutrition, Babasaheb Bhimrao Ambedkar university, Lucknow, India. During the year 2023. Comercially available Date palm Fruits (Phoenix dactylifera L.), Almonds, Chia seeds, were purchased from the Local market of Lucknow. The Dark compound chocolate was purchased from the Lulu mall hypermarket, Lucknow. The Date Fruit powder was prepared following procedure given by Sablani et al. (2008).

3. MATERIAL & METHODS

Preparation of Chocolate coated Date Fruit, The date powder was made using, with a few modifications, the method described by (Sablani et al., 2008). The dates were pitted and cleaned. Pitted dates were cut into two pieces and arranged in trays, further the dates fruit were filled by the date fruit powder, a piece of almond and a pinch of chia seeds. The filled Date Fruits coated with the Dark Compound Chocolate. The Chocolate Coated Date fruits packed in the Aluminium Embossed foil wrapper.

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 12, Iss 2, 2023



3.1 Phytochemical Analysis

3.1.1 Proximate analysis

The developed Chocolate coated date fruits were analyzed for its proximate composition using methods of AOAC i.e. Association of Official Analytical Chemists. (AOAC, 2010).

3.1.2 Sensory Evaluation

The developed Chocolate coated date fruit was evaluated for its sensory attributes i.e. Appearance, Flavour, texture and aroma, five panel members were asked to score the prepared samble on the above mentioned characteristics on a 9 point hedonic scale. The range of the scale was 9 (Like extremely) to 1 (Dislike extremely).

3.1.3 Determination of Antioxidant

The free radical scavenging activity of methanol extract of energy bar was measured by 1,1-diphenyl-2-picryl-hydrazyl (DPPH) using the method of Blois (1958) The free RSA of the energy bar was tested using a 1,1- diphenyl-

• 2-picryl hydrazyl (DPPH) technique. A total of 24 milligrams of DPPH were dissolved in 100 mL of methanol for making the stock solution. Filtration of DPPH stock solution using methanol yielded a usable mixture with an absorbance of around 0.973 at 517 nm. In a test tube, 3 mL DPPH workable solutions were combined with 100 µL of energy bar and methanol solution.

• Four different concentration of energy bar ranging from 10-1 to 10-4 were prepared for antioxidant analysis in methanol.

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 12, Iss 2, 2023

• Three milliliters of solution containing DPPH in 100 µL of methanol is often given as a standard. After that, the tubes were kept in complete darkness for 30 min. The absorbance was therefore determined at 517 nm. The following formula was used to compute the percentage of antioxidants.

% Of antioxidant activity= [(Ac−As) ÷Ac] × 100

where: Ac—Control reaction absorbance; As—Testing specimen absorbance

3.1.4 Microbial Analysis for Shelf life

Ager diffusion method

Cultivation, maintenance, enrichment, differentiation, tests, and long-term preservation are all possible uses for these medium. Each functional classification is constrained by the formulation and has a limited shelf life. The shelf-life of these culture media refers to the amount of time the medium preserves its chemico-physical properties. Commercially accessible solid growth media on Petri dishes (agar plates) often have a short shelf life, typically ranging from 30 to 90 days. Medium composition (i.e., general-purpose to specialized formulations), sterilization process, storage temperature, exposure to light, and packaging are all important elements that influence total shelf-life and microbiological growth efficiency. Several studies have shown that packed agar plates intended for drug sensitivity testing, isolation, enrichment, or selection have a variable shelf life. Bacteria, fungus, and parasites are all examples of microorganisms. Ulisse et al., for example, examined 12 different media types with varying degrees of complexity, packed in shrink-wrap film, stored at 5 °C, and coded for shelf-lives ranging from 3 to 30 days. These media could be given shelf-lives of 90 to 120 days after testing for weight loss (water loss), sterility, pH, and ability to maintain bacterial growth. It is required to support the target microorganism's development and characterisation. (Tripti Srivastava et al 2022).

Total Plate Count Microbial Shelf Life

• Make a dilution series from a sample upto10-4

• Pipetted out 100µl from the appropriate desired dilution series on to the center of the surface of an agar plate.

• Flamed the glass spreader over a lamp.

• Spread the sample evenly over the surface of agar using the sterile glass spreader, carefully rotating the petri dish underneath at the same time

• Incubated the plate at 37℃ for 24 hours.

• At the end of the incubation period, selected all of the petri plates containing between 30 and 300 colonies. Plates with more than 300colonies cannot be counted and are designated too many to count (TMTC).

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 12, Iss 2, 2023

• Calculated the number of bacteria (CFU) per milliliter or gram of sample by dividing the number of colonies multiplied by dilution factor divided by the amount of specimen added to liquified agar.

• This process was done for different time period (day1,3,4) of same sample. (Tripti Srivastava et al 2022)

4. Result and discussion

4.1 Proximate Analysis:

Following are the results of Proximate Analysis of the developed Chocolate coated date fruit.

S.NO.	Parameter	Results
1	Total energy	424.66
2	Fat	15.6
3	Carbohydrate	67.89
4	Protein	3.375
5	Ash	1.96
6	Moisture	18.25
7	pH	5.118

Table no. 1: Results of Proximate analysis of the sample

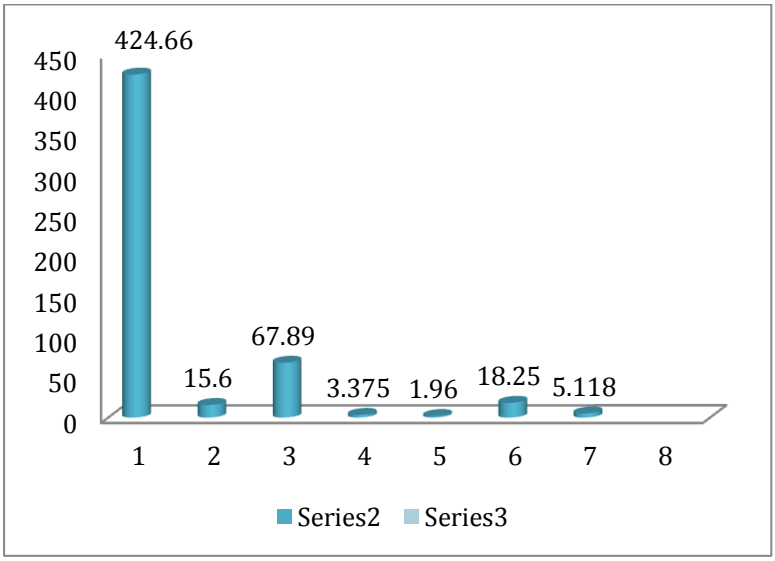


Fig 1: Graphical Representation of Proximate Constituents

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 12, Iss 2, 2023

Attributes	Mean scores
Appearance	8.6
Flavour/ Taste	9
Aroma	8
Texture	7.8
Overall Acceptance	8.2

4.2 Sensory Evaluation

The Chocolate Coated Date fruit was eval+uated by 5 expert panel members on following characteristics:

- Appearance
- Flavour/ Taste
- Aroma
- Texture
- Overall Acceptability

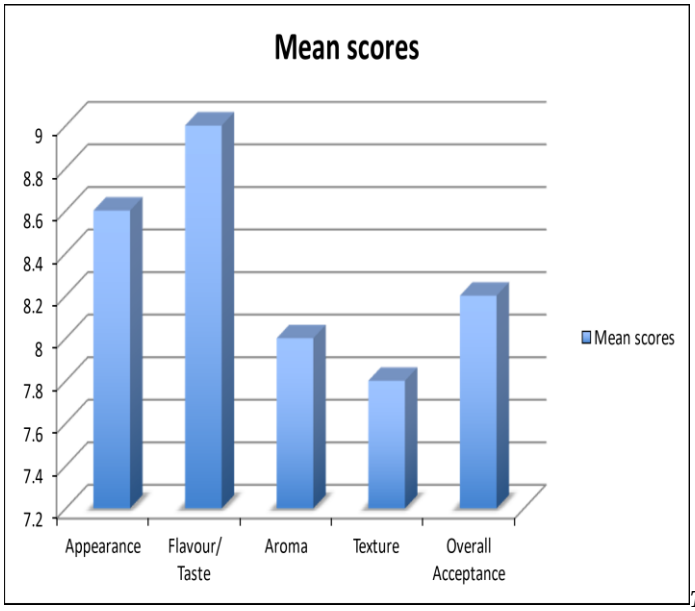


Fig 2: Average Sensory Scores

Table no 2: Average Sensory Scores given by panel members

4.3 Antioxidant analysis of Chocolate Coated Date Fruit

Concentration (µg/ml)	Observed Absorbance
0	0
5	0.126
10	0.146
20	0.98

Table no. 3

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 12, Iss 2, 2023

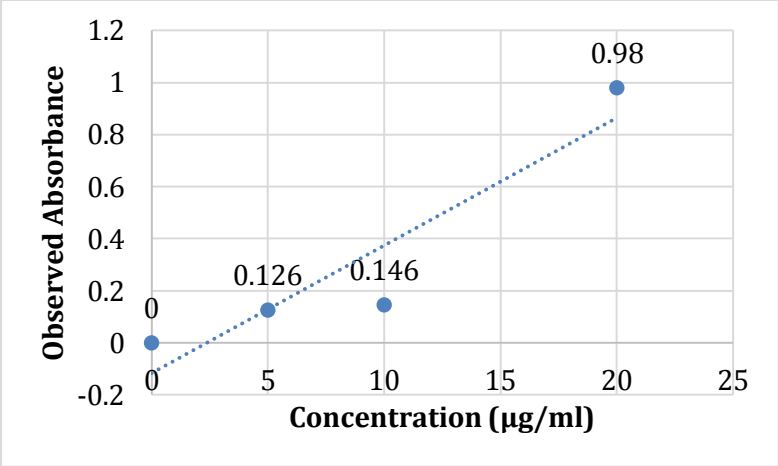


Fig 3: Graphical Representation of Antioxidant Potential

4.4 Shelf-life

Total colonies of TPC	2337.5cfu/gm
Total colonies of Coliform	Absent/gm
Salmonella	Absent/gm
Total colonies of Yeast & Moulds	Absent/gm

Table no. 3 Observation of shelf life of Date powder

REMARK: Sample validity,best before 3months from date of manufacturing

5. Conclusion

The research paper focused on the development and analysis of chocolate-coated date fruit. The proximate analysis revealed favorable nutritional composition, indicating that the product can be a valuable addition to a healthy diet. The sensory analysis demonstrated high consumer acceptance, suggesting that the chocolate-coated date fruit possesses desirable taste, texture, aroma, and overall quality. The antioxidant analysis using the DPPH assay indicated significant antioxidant activity, which implies potential health benefits associated with the consumption of this product. Moreover, the shelf life analysis using the Agar Diffusion Method confirmed that the chocolate-coated date fruit maintains microbial stability over time. These findings collectively emphasize that the developed product is a nutritious, delicious,

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 12, Iss 2, 2023

antioxidant-rich snack with a satisfactory shelf life, offering a novel and enjoyable way to incorporate dates into the diet.

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