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Standardization of Chocolate from Powder Extraction of Jamun Seeds, Flax Seeds and Pumpkin Seeds

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ABSTRACT

A study on the evolution of chocolate was carried out at the Parul Institute of Applied Sciences of Parul University in Vadodara. The major goal of the study was to create a chocolate that is nutrient-rich, can be consumed by people with diabetes, some other disease, and will give the body enough protein and energy. Flaxseeds, pumpkin seeds, jamun seeds, and chocolate compound were used to create chocolate. Different concentrations of three seeds powder were used in three separate compositions. Per 100gm of composition A1 consider (FS-13gm, PS-15gm, JS-22gm) A2 (PS-13gm, JS-15gm, FS-22gm) and A3 (JS-13gm, FS-15gm, PS-22gm). On the basis of sensory evaluations such as flavour, texture, colour, mouthfeel, and general acceptance, the best. Physical-chemical, microbiological, and sensory characteristics of a selected A3 sample were evaluated. Selected A3 had Dietary fibre- 6.4gm, Protein- 4.2gm, Carbohydrates- 60.8gm, Fat- 30.2gm, Ash -2.10%, Moisture- 2.28%, E-coil – Absent, Yeast & Mould-1.20×10 Cfu/gm.

Key Words : Milk chocolate, Jamun seeds, Flax seeds, Pumpkin seeds

INTRODUCTION

Jamun (*Syzgium cumini*) is a legendary medicinal plant with a long history in medicine. The terms jamun, java plum, jambul, blackberry, Malabar plum, and black plum are also used to refer to it. It is a tropical evergreen tree from the Myrtacea genus. It is one of the most revered plants in Ayurveda and is frequently utilised in conventional Indian healthcare systems (Imtiyaz *et al.,* 2013). Researchers have examined the nutritional properties and uses of jamun seed (JS) in a variety of food matrices to ascertain the seed's potential for value addition. In Ayurveda, jamun seeds have been used for centuries to cure diabetes and digestive issues. The health-promoting qualities of JSs are now being validated, and numerous bioactive substances, such as phenolics, terpenoids, phloroglucinol derivatives, and saponins, have been found as being the cause. In-depth biological potential research is currently underway, and isolated compounds, extract fractions, and seed extracts are being examined for their potential as anti-diabetic, anti-inflammatory, antioxidant, anticancer, and antimicrobial agents as well as their cardioprotective, hepatoprotective, and neuroprotective properties. The jamun seeds also contain nutrients, according to research (Singh *et al.,* 2022; Kannan and Puraikalan, 2015 and Priyanka and Mishra, 2015). The seeds contain significant amounts of dietary fibre, as well as significant amounts of anthocyanins, chlorophyll, phytosterols, amino acids, vitamin C, vitamin B complexes (thiamine, riboflavin, and folic acid), essential minerals and trace elements (calcium, iron, sodium, magnesium, zinc, phosphorus, and potassium), essential oil, albumin, and fats Singh *et al.,* 2022; Kannan and Puraikalan. 2015 and Priyanka and Mishra, 2015; Qamar *et al.,* 2022; Venu Gopal and Anu-Appaiah, 2017). According to the seeds' fatty acid profiles, the major fatty acids include lauric, myristic, palmitic, stearic, oleic, linolenic, malvalic, and sterculic acids, along with the

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phytosterol -sitosterol (Dangour *et al.,* 2009). Consuming jamun is helpful for treating diabetes mellitus, inflammation, ulcers, cough, cancer, mouth blisters, piles, and acne. It also acts as a liver tonic, strengthens teeth and gums (Katte *et al.,* 2021)

Flaxseed, also known as Linseed (*Linum usitatissimum*), is a blue blooming *Rabi* crop and a part of the Linacea family. In Indian languages, it is also referred to as Alsi, Jawas, and Aksebija. Canada is the world's largest producer of flax, accounting for around 38% of global production, with an annual production of 3.06 million tonnes (Anonymous, 2000). Flax seed is recognised to be a rich source of dietary fibre components, phenolics, antioxidants, and protein. However, the omega-3 fatty acids that make up a larger portion of its composition—especially polyunsaturated fatty acids like α-linolenic acid—are the cause of this interest (Bhatty, 1995). α-linolenic acid (ALA), lignans, and dietary fibre are flaxseed's functional components that have positive health effects (Hall *et al.,* 2006). Flax is high in dietary fibre, protein, and fat. Brown Canadian flax was found to have an average of 41% fat, 20% protein, 28% total dietary fibre, 7.7% moisture, and 3.4% ash (Morris, 2003). It contains lignans in relatively high concentrations (610–1330 mg per 100 g) (Johnsson *et al.,* 2000). With high amounts of polyunsaturated fatty acids (73% of total fatty acids), moderate levels of monounsaturated fatty acids (18%), and low concentrations of saturated fatty acids (9%), flaxseed oil has a very healthy fatty acid profile. About 16% of the polyunsaturated fatty acids are linoleic acid (LA), ω- 6-fatty acid, and 57% are alpha-linolenic acid (ALA), ω- 3 fatty acid (Johnsson *et al.,* 2000 and Morris, 2001). Increased interest in dietary fibre-rich sources is a result of the spread of several disorders, including colon cancer, diverticulosis, and cardiovascular diseases, which are all linked to inadequate dietary fibre. The amount of dietary fibre in flax seed has been calculated to be 30 g/100 g, with the soluble fraction accounting for around one-third of this amount (Shearer and Davies, 2005). Flaxseed can be used to enhance the diets of gluten-sensitive celiac patients because it doesn't contain gluten (Rodrigues *et al.,* 2012).

Generally produced as a vegetable around the world, pumpkin (Cucurbita) is a member of the Cucurbitaceae family. Including cucumbers and squash, these are grown in tropical and subtropical climates. Three different varieties of pumpkins known as Cucurbita pepo, Cucurbita maxima, and Cucurbita moschata are being grown around the world (Lee *et al.,* 2003). Pumpkins are produced all over the world as food and medicine. The pumpkin has long been utilised as a traditional treatment in various nations, including China, Pakistan, India, Yugoslavia, Argentina, Mexican regions, America, and Brazil (Jia *et al.,* 2003 and Andrade-Cetto and Heinrich, 2005). The usage of pumpkin seeds for the treatment of various ailments and the use of herbal therapies either alone or in combination with pharmaceuticals. Due to the presence of numerous edible components and phytochemicals, the pumpkin is one of the famous edible plants that is used as a treatment for various ailments (Yadav *et al.,* 2010). These seeds are good sources of nutrients and are rich in minerals, particularly zinc, phosphorus, magnesium, potassium, and selenium, which are essential for battling disease. They can be used as a weapon to combat conditions like arthritis, inflammation, prostate cancer, and other conditions (Patel and Rauf, 2017). They are also a good source of zinc, lignans, phytosterols like delta 7- and delta 5-sterols, essential amino acids like tryptophan and glutamate, and they have other health benefits like maintaining the immune system, promoting cell growth and multiplication, maintaining the health of the eyes and skin, regulating insulin, and supporting male sexual functions like sperm production and testosterone metabolism (Montesano *et al.,* 2018 and Karrar *et al.,* 2019). From 11 to 31% of the total weight was oil. The range of total unsaturated fatty acid concentration was 73 to 81%. Linoleic, oleic, palmitic, and stearic acids were found to be predominant. The oils' contents of c- and -tocopherol ranged from 75 to 493 mg/g and 27 to 75 mg/g, respectively (Ryan *et al.,* 2007). According to an investigator and his associates' analysis of the physical characteristics, chemical makeup, and fatty acid ratio, pumpkin seeds comprised 41.59% oil, 25.4% protein, 5.2% moisture, 25.19% carbs, 5.34% fibre, and 2.49% total ash. In terms of mg of galic acid per kg of oil, total phenolic compounds, total sterols, total waxes, and total tocopherols, they were 66.25, 1.86%, 1.56%, and 882.65, respectively (mg tocopherol per kg oil) (Gohari *et al.,* 2011).

METHODOLOGY

The current study adopted an experimental methodology and a totally random design. The development of milk chocolate containing jamun seeds, flax seeds, and pumpkin seeds, and their effects on sensory and dietary parameters. The components needed

to make milk chocolate that has been enhanced with jamun seeds, flax seeds, and pumpkin seeds, along with a formulation comparison in Table 1.

Material:

Jamun seeds, flax seeds, pumpkin seeds, Aluminium foil, flat bottom vessel, sieve, weighing scale, plastic chocolate moulds, refrigerator, induction, and weighing machine.

Formulation of chocolate:

Table 1 : Formulations of Chocolate Jamun seeds, Flax seeds and Pumpkin seed, based chocolate

Sr. No.	Ingredients	T_1	T_2	T_3
1.	Chocolate	100gm	100gm	100gm
2.	Jamun seeds	22gm	15gm	13gm
3.	Flax seeds	13gm	22gm	15gm
4.	Pumpkin seeds	15gm	13gm	22gm

Procedure of chocolate making:

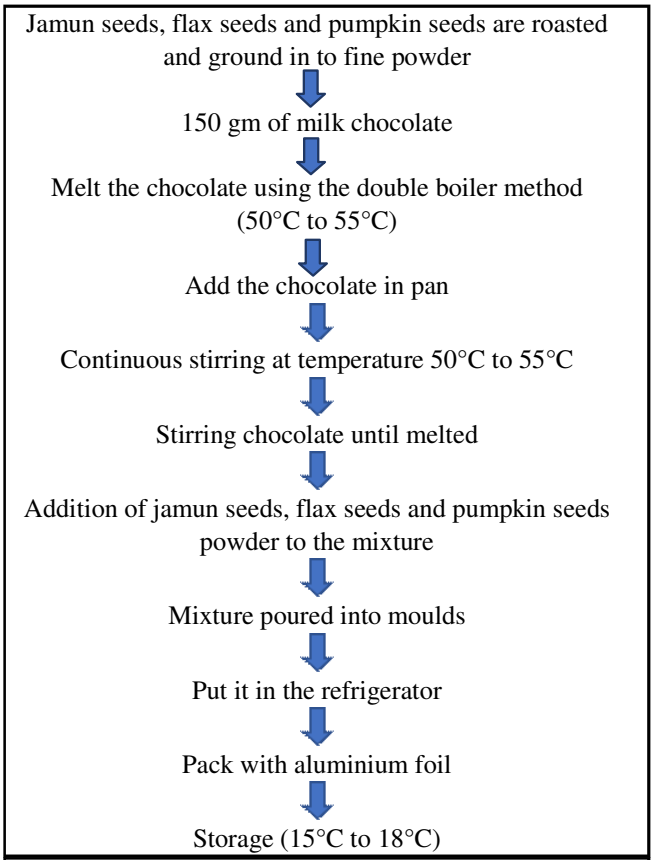

Fig. 1 : Flow chart for preparation of Jamun seeds, Flax seeds and Pumpkin seed, based chocolate

Analysis of chemical properties:

The chemical characteristics such as Dietary fibre, Protein, Carbohydrate, Fat, Ash, Moisture were analysed by different methods.

Dietary Fibre:

The Dietary Fibre content of the samples was assessed using AOAC Official Method 993.21. Using the following formula, the percentage of Dietary Fibre was determined.

$$TDF, \% = \frac{100 \times Wr - [(P + A)/10] \times Wr}{Ws}$$

Wr = mg residue
P = % protein in residue
A = % ash in residue
Ws = mg test portion

Protein:

The protein content of the samples was assessed using IS 7219: 1973 (RA 2005). Using the following formula, the percentage of protein was determined

Protein (%) = Meq.N_2 = 0.014 and % Protein = Nitrogen× 5.7

TS = Titre volume of the sample
ml Tb = Titre volume of Blank, ml

Carbohydrate:

The samples' total carbohydrate content was calculated as the difference between the observed amounts of protein, fat, ash, and moisture, and 100 (Pearson, 1976).

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

Fat content:

The fat content of the samples was assessed using IS 6287: 1985 (RA 2010). Using the following formula, the percentage of fat was determined

$$\text{Fat, per cent by mass (on dry basis)} = \frac{M_1}{M_2\,[100 - M]}$$

Ash content:

The ash content of the samples was assessed using FSSAI Manual - Fruit and Vegetable Product: 2016, Method -11.3. Using the following formula, the percentage of ash was determined.

$$\% \text{ Total ash} = \frac{W_3 - W_1}{W_2 - W_1} \times 100$$

W_1 = Weight of empty dish
W_2= Weight of dish containing sample
W_3 =Weight of dish containing ash

Moisture content:

The moisture content of the samples was assessed using FSSAI Manual - Fruit and Vegetable Product: 2016, Method -4.1 Using the following formula, the percentage of moisture was determined.

$$\text{Moisture per cent by weight} = \frac{100\,[M_1 - M_2]}{[M_1 - M]}$$

M_1 = weight in gm of dish with material before drying
M_2 = weight in gm of dish with the dried material

Analysis of Microbial Properties:

Microbial analysis is the ideal quality evaluation procedure used in food product quality analysis. The microbial quality of prepared chocolate was determined. In the current investigation, many microbiological characteristics, including E-coil, yeast and mould, were investigated. Additionally, samples were tested while being stored at room temperature.

E-coil:

The E-coil content of the samples was assessed using IS: 1622. E- coil is absent in chocolate sample A3.

Yeast and Mould:

The Yeast and Mould content of the samples was assessed using IS:5403. Using the following formula, the percentage of Yeast and Mould was determined.

$$\frac{\Sigma C}{(n1 + O.1n2)d}$$

ΣC = The sum of the colonies counted on all the plates

n1 = The number of plates counted in the first dilution

n2 = The number of plates counted in the second dilution

d = The dilution from which the first counts were obtained

Sensory Evaluation:

Five panellists examined chocolate samples made with jamun seeds, flax seeds, and pumpkin seeds for various sensory qualities. A nine-point hedonic scale was used to rate the sensory qualities of each sample, including appearance, colour, taste, scent, texture, and overall acceptability.

Scores to Be Given as Follow:

1. Liked extremely – 9
2. Liked very much – 8
3. Liked moderately – 7
4. Liked slightly – 6
5. Neither liked nor disliked – 5
6. Disliked slightly – 4
7. Disliked moderately – 3
8. Disliked very much – 2
9. Disliked extremely – 1

RESULTS AND DISCUSSION

Organoleptic evaluation of Jamun seeds, Flax seeds and Pumpkin seeds chocolate:

Testing on milk chocolates' sensory evaluation and acceptance was done. They were created by mixing milk chocolate, jamun seeds, flax seeds, and pumpkin seeds powder in various ratios to determine whether the final goods would be palatable. The sensory parameters such as appearance, colour, scent, texture, and acceptability were assigned acceptance scores (Table 2 and Fig. 2).

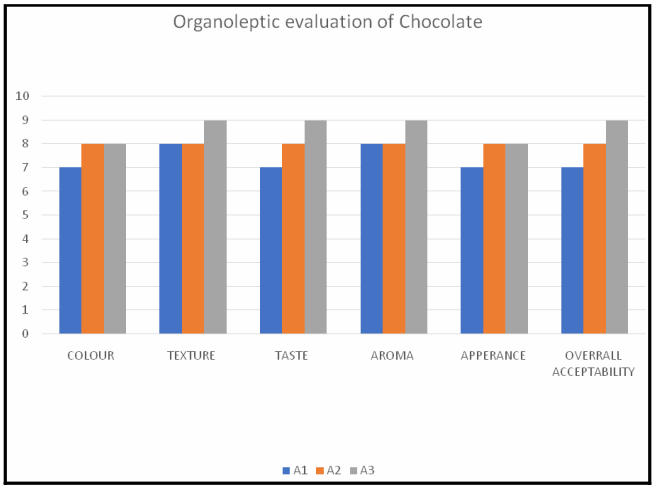

Fig. 2 : Organoleptic evaluation of Jamun seeds, Flax seeds and Pumpkin seeds, based chocolate

It was noted that Sample A1 9 received the highest rating for overall acceptability due to its acceptable results in terms of appearance, colour, scent, texture, taste, and overall acceptability. As a result, A1 sample was decided upon based on sensory information for further research.

Table 2 : Organoleptic evaluation of Jamun seeds, Flax seeds and Pumpkin seeds, based chocolate

Sr. No:	Sample code	Appearance	Colour	Aroma	Texture	Taste	Overall acceptability
1.	A1	7	7	8	8	7	7
2.	A2	8	8	8	8	8	8
3.	A3	8	8	9	9	9	9

Proximate analysis of Jamun seeds, Flax seeds and Pumpkin seeds chocolate:

The parameters, including dietary fibre, protein, carbohydrate, fat, ash, and moisture content, were assessed for jamun seeds, flax seeds, and pumpkin seeds chocolate. The results are shown in Table 3.

Table 3 : Proximate analysis of Jamun seeds, Flax seeds and Pumpkin seeds chocolate

Sr. No:	Parameter	Per 100gm
1.	Dietary Fibre	6.4gm
2.	Protein	4.2gm
3.	Carbohydrates	60.8gm
4.	Fat	30.2gm
5.	Ash	2.10%
6.	Moisture	2.28%
7.	E-coil	Absent
8.	Yeast and Mould	1.20 × 10 Cf u/gm

Conclusion:

The improvement of food is a crucial strategy for managing weight or preventing certain nutritional deficiencies. Additionally, to reducing the risk of heart disease, stroke, diabetes, hypertension, diabetes mellitus, inflammation, ulcers, cough, cancer, mouth blisters, piles, and acne, it can also work as a liver tonic and reduce the risk of a variety of cancers. This study shows that this formulation is the most effective. 100 grams of developed chocolate includes 6.4 gm of Dietary Fibre, 4.2 gm of Protein, 60.8 gm of Carbohydrates, 30.2 gm of Fat, 2.10% Ash, 2.28% Moisture, E-coil is Absent and 1.20 × 10 Cf u/gm of Yeast and Mould. This chocolate is suitable for consumption by those with diabetes and certain other diseases. It can be a healthy eating alternative to unhealthy ones. The ingredients for chocolate manufacture were thoughtfully chosen with the goal of providing adequate Nutrients that can be beneficial to people with diabetes and some other diseases.

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