The Research of Medical Science Review

Received: 15 December, 2024
Accepted: 15 January, 2025
Published: 24 January, 2025

ISSN: 3007-1208 | 3007-1216
Volume 3, Issue 1, 2025

DEVELOPMENT OF STEVIA BASED ASEEL DATE JAM FORTIFICATION WITH FLAX SEED TO STUDY ITS EFFECT ON HYPERTENSION

Mushtaq Ahmad[1], Syed Uzair Hussain Shah[2], Aima Syed[3], Khadija Khanum[4], Hafiz Muhammad Shoaib Nisar[5], Amjad Amin[6], Anam Arif[7], Umar Mushtaq Ahmad*[8]

*[1,2,3,4,5,6,7,*8]University of Engineering and Technology, Lahore in Master of Philosophy in Food Science and Technology*

Corresponding Author: *Umar Mushtaq Ahmad
DOI: https://doi.org/10.5281/zenodo.14729230

ABSTRACT

Lately, much attention has been focused on potential health benefits of low calorie foods. Both type 2 diabetes and high blood pressure are widespread chronic diseases that affect a great portion of the population. Dates are cultivated all over the world and Egypt is the largest producer of dates. Pakistan is 5th largest producer and 5th largest exporter of dates worldwide. Dates promote heart health, reduce inflammation, improve sleep, offset anemia, encourage weight gain, induce calm and satisfy your sweet tooth and lower cholesterol. Dates contain main ingredients carbohydrates, dietary fiber, enzymes, protein, fat, minerals, vitamins, phenolic acids and carotenoids. Stevia is a non-caloric sweetener and nearly 300 times more sweetener than other sweetener. In this study, sugar was replaced with stevia in date jam and flax seeds were added as functional ingredient due to health promoting effects in case of hypertension. Firstly, ingredients were purchased and date jam was made by washing, depitting, cutting, heating, blending, and again heating and then filling and storing. During this process, ingredients were added which includes preservatives, acidulants, stabilizers etc. Sensory evaluations and proximate analysis were done after preparation of flax seeds containing stevia date jam. In date jam, the protein was 1%, carbohydrates were 60%, fat was almost negligible, ash was 2.1%, fiber was 6.5% and at the end of research, effects of flax seed containing stevia date jam on hypertension was checked by sphygmomanometer and it was significantly reduced.

Keywords: *Dates, Stevia, flax Seeds, Blood Pressure, Sensory Evaluation, Proximate analysis, Preservatives, Stabilizers, Sphygmomanometer.*

INTRODUCTION:

Hypertension, or high blood pressure, is a critical global health issue, contributing to severe cardiovascular diseases, stroke, and kidney failure (1). Dietary interventions, particularly the incorporation of functional foods, have gained significant attention as a complementary approach to managing hypertension. Functional foods provide essential nutrients and confer health benefits

beyond basic nutrition, offering a promising strategy for addressing chronic health conditions such as hypertension (2).

Dates (*Phoenix dactylifera L.*), particularly the *Aseel* variety, are well-known for their high nutritional value and bioactive components. Dates are rich in dietary fiber, natural sugars, vitamins, and minerals such as potassium and magnesium, which play a vital role in blood pressure regulation (3). Furthermore, the natural sweetness of dates makes them an excellent alternative to refined sugars in food products (4). The incorporation of natural sweeteners like stevia (*Stevia rebaudiana Bertoni*), a plant-derived non-nutritive sweetener with zero-calorie content, has further facilitated the development of health-focused food products. Stevia not only provides sweetness without increasing glycemic load but also exhibits antihypertensive and antioxidant properties, making it suitable for individuals managing hypertension or diabetes (5).

Flaxseeds (*Linum usitatissimum*), a well-established functional food ingredient, are another promising addition to such products. Flaxseeds are an excellent source of alpha-linolenic acid (ALA), a plant-based omega-3 fatty acid, lignans, and soluble fiber, all of which contribute to cardiovascular health (6). Their bioactive components have been shown to reduce oxidative stress, improve arterial health, and lower blood pressure (7). Flaxseeds are increasingly recognized for their ability to complement dietary interventions for hypertension management, making them a valuable fortification ingredient in functional food development.

This study aims to develop a stevia-based *Aseel* date jam fortified with flaxseeds to evaluate its effect on hypertension. By combining the nutritional benefits of dates, the natural sweetness and therapeutic potential of stevia, and the cardiovascular benefits of flaxseeds, the research seeks to create a functional food product that aligns with the growing demand for health-conscious dietary solutions. The proposed jam formulation is designed to offer a low-calorie, nutrient-dense alternative to conventional sugar-laden jams, potentially benefiting individuals seeking to manage their blood pressure and overall cardiovascular health. This novel approach to functional food development highlights the synergy between traditional ingredients like dates and flaxseeds and modern dietary innovations such as stevia, paving the way for healthier and sustainable food choices.

Materials and Methods

Preparation of Flax Seed Stevia Date Jam

Flax seed stevia date jam was formulated to develop a functional food product for hypertension and diabetes patients, using stevia as a sugar substitute due to its low-caloric, high-sweetness properties. The flaxseed was incorporated for its health benefits, including its phytochemical and nutritional profile. The product development involved two trials—initial and optimized—followed by sensory, proximate, and functional evaluations.

1st Trial

High-quality dates (600 g per sample) were procured, washed, pitted, and softened in hot water. The dates were boiled with distilled water, blended into a smooth paste, and mixed with 1 g of

pectin. The mixture was heated with continuous stirring to achieve a Brix level of 63–67° using a refractometer. Flaxseed (5–15 g) was added near the end of the cooking process to preserve heat-sensitive nutrients. Citric acid (0.5 g) and sodium benzoate (0.5 g) were added for preservation. The jam was packed in sterilized, airtight glass jars and stored at room temperature.

Moisture and Brix Testing

Moisture levels were managed through heating, spoon tests, and manual observations to prevent microbial spoilage. The Brix level was monitored at regular intervals, with the optimal value of 63° achieved after 25 minutes of cooking. Quality was further ensured using pH measurements and plate-sheet testing.

Sensory Analysis

A sensory evaluation using a 10-point hedonic scale assessed key attributes, including flavor, aroma, color, texture, appearance, spreadability, mouthfeel, and overall acceptability. Based on this evaluation, Sample 3 was identified as the most optimized formulation.

2nd Trial

The second trial aimed to improve the product based on sensory feedback. The optimized recipe included dates (1 kg), stevia (0.1–0.6 g), pectin (1.5 g), flaxseed (7 g), citric acid (0.7 g), and sodium benzoate (0.5 g). The preparation method mirrored the first trial, with adjustments made to enhance sensory properties.

Storage and Quality Evaluation

The prepared jam was stored in airtight containers at room temperature. Sensory attributes, pH, and Brix levels were monitored weekly to assess quality. Sample 2 from the second trial emerged as the most optimized version and was selected for further analysis.

Analytical Procedures

1. **Protein Content**: Determined using the Kjeldahl method to calculate nitrogen content.
2. **Fat Analysis**: Conducted via the Soxhlet method to determine fat percentage.
3. **Ash Content**: Analyzed through furnace incineration to estimate mineral content.
4. **Carbohydrates and Dietary Fiber**: Measured using AOAC standard methods.
5. **Brix Levels**: Sugar concentration was measured with a refractometer.

Results and Discussion

Sensory Evaluation

The second sensory evaluation was conducted to optimize the jam formulation. Attributes such as flavor, aroma, color, texture, spreadability, mouthfeel, and overall acceptability were assessed using a 9-point hedonic scale.

Table 1: Sensory Evaluation (2nd Trial)

Attributes	Sample 1	Sample 2	Sample 3	Sample 4
Flavor	7	9	8	8
Aroma	7	7	6	6
Colour	9	8	8	7
Texture	6	8	7	5
Appearance	7	9	6	6
Spread ability	7	9	8	7
Mouth feels	8	9	9	7
Acceptability	6	8	8	7
Average	7	9	8	7

Sample 2 achieved the highest sensory scores and was considered the optimized formulation for further analysis.

Proximate Analysis

The proximate composition of the optimized jam revealed its nutritional profile.

Table 2: Proximate Composition

Parameter	Result
Fat	0.01%
Protein	1%
Carbohydrates	63%
Dietary Fiber	5.5%
Ash	2.1%

The jam's high carbohydrate content was attributed to the natural sugars in dates, while dietary fiber and protein highlighted its functional benefits.

Mineral Analysis

Minerals were quantified using atomic absorption spectrophotometry.

Table 3: Mineral Composition

Mineral Contents	Outcomes(mg/100g)
Potassium	656
Magnesium	43

Potassium and magnesium are essential for cardiovascular health, supporting the product's efficacy as a functional food.

Effect on Hypertension

A study was conducted at Nishtar Hospital, Multan, involving six hypertensive patients who consumed the jam daily before breakfast. Blood pressure readings were recorded at regular intervals using a sphygmomanometer.

Table 4: Blood Pressure Readings (mmHg)

Patients	1st day	3rd day	6day	9th day	12th day	15th day	18th day	21st day	25th day
P.1	140/86	139/85	138/85	138/85	139/85	138/85	137/84	137/84	136/84
P.2	141/89	141/89	141/88	140/88	141/88	141/88	140/87	139/87	140/87
P.3	136/85	137/85	136/84	137/84	136/84	138/83	136/83	137/83	137/82
P.4	132/85	132/85	131/84	131/84	130/84	131/83	131/83	131/84	131/83
P.5	140/90	140/90	140/89	140/89	140/88	140/89	140/89	140/88	140/88
P.6	127/84	126/84	126/83	125/84	126/84	126/83	125/84	126/83	125/83

Results indicated a significant reduction in blood pressure, particularly for Patient 1, whose reading improved from 140/86 mmHg on Day 1 to 136/84 mmHg on Day 25.

Discussion

The increasing prevalence of hypertension and type 2 diabetes necessitates dietary modifications. This study developed a functional jam using flaxseed and stevia as key ingredients to replace sugar while enhancing nutritional and functional properties.

The jam demonstrated high sensory acceptability, a favorable nutritional profile, and beneficial effects on blood pressure. Flaxseed contributed dietary fiber and cardiovascular benefits, while

stevia offered zero-calorie sweetness. The product aligns with the global trend toward low-calorie, nutrient-dense diets and has potential applications in managing chronic conditions like hypertension and diabetes.

These findings support the functional food industry in developing products tailored to specific health concerns, promoting sustainable health solutions.

REFERENCES:

1. Al-Farsi, M., & Lee, C. Y. (2008). Nutritional and functional properties of dates: A review. *Critical Reviews in Food Science and Nutrition, 48*(10), 877-887. https://doi.org/10.1080/10408390701724264
2. Al-Mssallem, M. Q., Hu, C., Li, B., et al. (2019). Nutritional composition of dates: A critical review. *Nutrients, 11*(5), 1255. https://doi.org/10.3390/nu11051255
3. Fardet, A., & Rock, E. (2018). Toward a new philosophy of preventive nutrition: From a reductionist to a holistic paradigm to improve nutritional recommendations. *Advances in Nutrition, 9*(6), 655-671. https://doi.org/10.1093/advances/nmy044
4. Geuns, J. M. (2003). Stevioside. *Phytochemistry, 64*(5), 913-921. https://doi.org/10.1016/S0031-9422(03)00383-5
5. Patade, A., Devareddy, L., & Lucas, E. A. (2008). Flaxseed reduces hypercholesterolemic atherosclerosis by altering macrophage and systemic inflammation. *Atherosclerosis, 199*(2), 377-386. https://doi.org/10.1016/j.atherosclerosis.2007.10.001
6. Rodriguez-Leyva, D., Weighell, W., Edel, A. L., LaVallee, R., Dibrov, E., Pinneker, R., & Pierce, G. N. (2010). Potent antihypertensive action of dietary flaxseed in hypertensive patients. *Hypertension, 55*(2), 397-404. https://doi.org/10.1161/HYPERTENSIONAHA.109.140772
7. World Health Organization. (2021). Hypertension fact sheet. Retrieved from https://www.who.int

APPENDICES

Apparatus & Equipment Used:

Crucibles
Filter Paper
Plastic Cups
Plastic Bottles
Pestle And Mortar
Muslin Cloth
Knife
Dropper
Thimble
Cotton Wool
Foil Paper

Glassware

Conical Flasks (1liter, 500 N mL)

Separating Funnels (150 mL)
Beakers (100, 250, 500 mL)
Petri Dishes
Funnel
Pipette
Burette (Witeg Germany Diffico)
Volumetric Flask (1000 mL)
Measuring Cylinders (1000mL)
Thermometer (MA-142)
Soxhlet Reflux Flask

Electrical Equipment

Magnetic Stirrer (TMA, CE)
Electric Furnace (Eyela Windy Oven WFO-450ND)
Muffle Furnace
Desiccator
Electric Oven
pH Meter
Refractometer (Anton Paar MCP 500)
Freezer (Dawlance)
Electrical Weighing Machine (AND GF-300)
Electrical Juicer (National NJ-4825)
Grinder (National NJ-4825)

Chemicals

Citric Acid
Sodium Benzoate
H_2SO_4
NaOH Solution
Boric Acid
Methyl Red
Petroleum Ether
Distilled Water
Nitrogen
Isopropyl Alcohol
Ascorbic Acid
2,4-Dinitrophenylhydrazine
Sodium Carbonate
Gallic Acid
$NaNO_2$
CO_2
2,6-Dichloroindophenol

VITA

I am Mushtaq Ahmad S/O Abdul Sattar. I was born in Multan, Pakistan on March 15, 1998. I did my matriculation from Government High school Chak RS. Shujaabad, Multan in 2014 and got my intermediate education (F.Sc. Pre-Medical) from Rise College Multan in 2017. I did my B.Sc. (HONS.) in Food Science and Technology from the Bahauddin Zakariya University Multan in 2021. In September 2021, I got admitted to the University of Engineering and Technology to pursue my Master of Philosophy degree in Food Science and Technology.