



Development and nutritional analysis of stevia chocolates fortified with flaxseeds (*Linum usitatissimum*)

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Abstract

Flaxseeds are the rich sources of omega 3 fatty acids, dietary fibre and lots more. Stevia on the other hand has zero calorie and 250-300 times more sweeter than sucrose. Chocolates are the rich source of antioxidant and can be used to uplift the mood. The present study was carried out with the objective to develop stevia chocolates fortified with flaxseeds and to evaluate the nutritional aspect of the best acceptable product. Organoleptic evaluation was done using the nine point hedonic scale. Nutrition analysis was done of the best accepted product. The best accepted product contains: Energy-70.9 kCals; Protein-2.42gm; Unsaturated Fat-2.4gm; Saturated Fats-2.20gm per serving, i.e. 25gms.

Keywords: nutritional, stevia chocolates, flaxseeds, *Linum usitatissimum*

Introduction

Chocolate is a typically sweet, usually brown food preparation of *Theobroma cacao* seeds, roasted and ground. It is made in the form of a liquid, paste, or in a block, or used as a flavoring ingredient in other foods. Cacao has been cultivated by many cultures for at least three millennia in Mesoamerica. The seeds of the cacao tree have an intense bitter taste and must be fermented to develop the flavor. After fermentation, the beans are dried, cleaned, and roasted. The shell is removed to produce cacao nibs, which are then ground to cocoa mass, unadulterated chocolate in rough form. Cocoa solids are a source of flavonoids and alkaloids, such as theobromine, phenethylamine and caffeine. Chocolate also contains anandamide. (<https://en.wikipedia.org/wiki/Chocolate>)

High-cocoa polyphenol-rich chocolate improves blood pressure in patients with diabetes and hypertension. High polyphenol chocolate is effective in improving TG levels in hypertensive patients with diabetes and decreasing blood pressure and FBS without affecting weight, inflammatory markers, insulin resistance or glycemic control. (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4460349/>)

Health benefits of chocolates

- 1. Healthy Heart:** The latest research backs up claims that chocolate has cardiovascular benefits: In a 9-year Swedish study of more than 31,000 women, those who ate one or two servings of dark chocolate each week cut their risk for heart failure by as much as a third. (<https://www.womenshealthmag.com/health/benefits-of-chocolate/slide/4>)
- 2. Weight Loss:** Researchers from the University of Copenhagen found that dark chocolate is far more filling, offering more of a feeling of satiety than its lighter-colored sibling. (<https://www.womenshealthmag.com/health/benefits-of-chocolate/slide/4>)

3. Protection from disease-causing free radicals:

Antioxidants are the compounds that are believed to neutralize free radicals and protect the body from their damage. Antioxidants include vitamins, minerals and phytochemicals - helpful plant compounds. (<https://draxe.com/benefits-of-dark-chocolate/>)

4. Improve blood flow and lower blood pressure:

The flavanols in dark chocolate can stimulate the endothelium, the lining of arteries, to produce Nitric Oxide (NO), which is a gas. One of the functions of NO is to send signals to the arteries to relax, which lowers resistance to blood flow and therefore reduces blood pressure. There are many controlled trials showing that cocoa and dark chocolate can improve blood flow and lower blood pressure, but the effects are usually mild.

5. May improve brain function:

One study of healthy volunteers showed that 5 days of consuming high-flavanol cocoa improved blood flow to the brain? Cocoa may also significantly improve cognitive function in elderly people with mental impairment. It also improves verbal fluency and several risk factors for disease. Cocoa also contains stimulant substances like caffeine and theobromine, which may be a key reason cocoa can improve brain function in the short term. (<https://www.healthline.com/nutrition/7-health-benefits-dark-chocolate>)

On the other hand, Stevia is a sweetener and sugar substitute extracted from the leaves of the plant species *Stevia rebaudiana*. The legal status of stevia as a food additive or dietary supplement varies from country to country. Steviol glycosides, the compounds which give stevia its sweet taste, have a level of sweetness graded at 250-300 times sweeter than sugar (sucrose). Steviol glycosides, whilst sweet, can have a bitter aftertaste when stevia is consumed in its

purest form Stevia can be used in cooking, particularly where the primary role of stevia is to add sweetness. Stevia does not caramelize and may not function so well as a direct substitute for sugar in recipes in which sugar is an integral part of the structure or texture.

Method of extraction of stevia extract

Ingredients

- Leaves from a stevia plant
- 1/4 cup pure homegrown stevia
- 1 cup hot filtered water

Method of preparation

1. Harvest your stevia plant by cutting off the branches at the base of the plant.
2. Wash the branches/leaves in clean filter water.
3. Pick leaves off stevia plant, discard the stems, and dry the leaves for 12 hours in the sun.
4. Once your leaves are dry, grind them in a food processor or coffee grinder to make pure stevia.
5. To make liquid stevia, dissolve 1/4 cup pure homegrown stevia powder with 1 cup hot filtered water. Stir and leave out at room temperature for 24 hours. After 24 hours strain the stevia out of the liquid and store the liquid stevia in the refrigerator. (<https://wholelifestylenutrition.com/videos/how-to-make-your-own-pure-stevia-liquid-stevia-part-2/>)

Flaxseeds (*Linum usitatissimum*), also known as common flax or linseed, is a member of the genus *Linum* in the family Linaceae. Flaxseeds occur in two basic varieties: brown and yellow or golden (also known as golden linseeds) Most types have similar nutritional characteristics and equal numbers of short-chain omega-3 fatty acids. The exception is a type of yellow flax called solin (trade name Linola), which has a completely different oil profile and is very low in omega-3 FAs. Flaxseeds produce a vegetable oil known as flaxseed oil or linseed oil, which is one of the oldest commercial oils. It is an edible oil obtained by expeller pressing, sometimes followed by solvent extraction.

Nutritional Facts- (Amount per 100gm)

Calorie: 534; *Protein:* 18gm; *Polyunsaturated Fats:* 29gm; *Saturated Fats:* 3.7gm (<https://en.wikipedia.org/wiki/Flax>)

Health benefits of flaxseeds

Studies showed that consuming flaxseed or its derivatives may reduce total and LDL-cholesterol in the blood, with greater benefits in women and those with high cholesterol.

Other health benefits include:

1. Rich source of lignans which reduces the risk of cancer
 2. Rich in dietary fibre
 3. They improves cholesterol
 4. They may lower blood pressure
- They may help control blood sugar levels

- They are high in Omega 3 fatty acids (<https://www.healthline.com/nutrition/benefits-of-flaxseeds>)

Methods and Methodology

The study was conducted to develop and assess the nutritional value of the Stevia Chocolates fortified with flaxseeds. Three types of chocolates were prepared depending upon varying amount of flaxseed. Three chocolates were coded as I, II, III.

Ingredients of chocolates were-

Sample I: Cocoa Powder- 25gm; Milk Powder- 50gm; Liquid Stevia- 25gm; Butter- 20gm; Flaxseed Powder- 15gm

Sample II: Cocoa Powder- 25gm; Milk Powder- 50gm; Liquid Stevia- 25gm; Butter- 20gm; Flaxseed Powder- 20gm

Sample III: Cocoa Powder- 25gm; Milk Powder- 50gm; Liquid Stevia- 25gm; Butter- 20gm; Flaxseed Powder- 25gm

Sample Size

A total of 45 people were included in this study. This was done to get impartial and genuine opinion of the people. It consists of two panels and the members of panel were Trained as well as Semi-Trained panelists.

Data Collection Tool

For the study, a sensory sheet was developed and distributed among the people of the panels. Panelist filled the sensory sheets on the basis of certain parameters like, Taste, Flavor and Acceptance.

Preparation of the test-

Sample: Three samples were developed. In Sample I the amount of flaxseed powder was least in amount. In Sample II the amount of flaxseed powder was more than Sample I but less than Sample III. In Sample III the amount was maximum.

Test Procedure

The samples were kept without giving any prior information about the three coded samples. They were supposed to taste it and give score on the scale.

Coding of the sample: The samples were coded as Sample I, II, III

Amount of the sample

Chocolates were made in the shape of a bar. One piece out of that bar was given per panelist for tasting.

Nutritional Aspect

Once, the tasting was done panelists were asked to fill the sensory sheet and on the basis of the sensory sheets. The most accepted sample was Sample II, containing 20gms of flaxseed powder. Nutritional assessment which were done included- Calorie and Protein evaluation.

Results

Sensory Evaluation

Table 1: Sensory Evaluation using 9-Point Hedonic Scale

Panelist Hedonic Rating	Liking Score	Sample I	Sample II	Sample III
Like Extremely	9	-	12	5
Like Very Much	8	10	19	12
Like Moderately	7	6	6	17
Like Slightly	6	15	7	-
Neither Like nor Dislike	5	7	-	6
Dislike Slightly	4	3	1	-
Dislike Moderately	3	4	-	1
Dislike Very Much	2	-	-	4
Dislike Extremely	1	-	-	-
		45	45	45

Therefore, the best accepted sample is Sample II.

Nutritive Analysis (for Sample II)

Table 2a: Nutritive Value per 200 gm

Ingredient	Brand	Amount (gm/ml)	Calorie (kCals)	Protein (gm)	Unsaturated Fats (gm)	Saturated Fats (gm)
Cocoa Powder	Weikfield	25	82.7	5.7	2.5	0
Milk Powder	Amulya India	50	230	10	3.5	6.5
Stevia Extract	-	25	0	0	-	-
Butter (Unsalted)	Amul India	20	148	0.12	6	10.4
Flaxseeds	24 Mantra organic Flax seeds	20	106.8	3.6	7.4	0.74
Total:			567.5	19.42	19.4	17.64

Table 2b: Nutritive Value per serving (25gm)

Nutrient	Nutritive Value per 25gm
Energy	70.9 kCals
Protein	2.42 gms
Unsaturated Fats (MUFA, PUFA)	2.4 gms
Saturated Fats	2.20 gms

Conclusion

Chocolates have always been the most popular among all the age groups. These chocolates being rich in flaxseeds and stevia, will be a great alternative for diabetics and cardiovascular patients around the globe. Flaxseeds are not only rich in dietary fibre but also maintain the blood glucose levels. Being rich in PUFA and MUFA they can be a good alternative of cashew nuts or other nuts rich in saturated fats. These are the healthy version of chocolates which one can have.

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