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Development of nutrition bar from powder extract of *Moringa oleifera* and *Ocimum sanctum* leaves

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Abstract

By harnessing the nutritional value of foods that are easily accessible locally, this study aims to provide chocolate to endurance athletes. We utilize chocolate, Tulsi leaves (*Ocimum sanctum*), and Moringa leaves (*Moringa oleifera*). The samples were analyzed in a laboratory for food. In this study, dried leaves were used for their low-glycemic index carbohydrates, while moringa powder and Tulsi powder was used for its calcium and protein content.

Keywords: Calcium; *Moringa oleifera*; Carbohydrates; Dried; *Ocimum sanctum*

1. Introduction

The MO plant's vitamins and phenolic components such asquercetin and kaempferol are frequently attributed with the leaves' strong antioxidant activity and reputation as a rich source of vitamins and minerals (JP Coppin et al., 2013). Additionally, studies have demonstrated the high antioxidant activity of MO leaves. As a result, giving animals a diet supplement that includes leaves might be a helpful way to keep them healthy and increase the quality of the meat they generate for human consumption (K Qwele et al, 2013). Numerous fatty acids, vitamins, minerals, glucosinolates, and phenolics (flavonoids, anthocyanins, proanthocyanides, and cinnamates) are found in the MO plant (M. Akhtar et al., 2007). The plants are used to treat a range of illnesses, along with anaemia, skin infections, blackheads, anxiety, bronchitis, catarrh, breathing difficulties, asthma, venous impurities, cholera, glandular, bulging, headaches, conjunctivitis, cough, eye and ear infections, fever, respiratory disorders, scurvy, and semen deficiency (SP Mishra et al., 2012 and M. Horwathand, V. Benin, 2011).

Tulsi (*Ocimum sanctum* L.), which would be known in Ayurveda as Dashemani Shwasaharni (antiasthmatic) and antikaphic medicines, has been thoroughly researched for its therapeutic potentials (Kaphaghna) (Sirkar, 1989). Although Tulsi has been widely used by Indian traditional healers to treat a variety of disease issues since ancient times, nothing is known about the way it works, and there is also no practical way to integrate this ancient form of medicine with the current state of modern medicine. Numerous investigations have been conducted in recent years by scientists and researchers in India to propose the significance of eugenol and essential oils in the medicinal potentials of *Ocimum sanctum* L. (Sen, 1993 and Rajeshwari, 1992). *Ocimum sanctum* L., often known as "Holy Basil" in English and "Tulsi" in Hindi, is an upright, softly haired, scented herb or undershrub that can be found all over India. In gardens, Tulsi is frequently grown. *Ocimum sanctum* L. is found in cultivation in two different forms: Krishna Tulsi, which has purple leaves, and Sri Tulsi, which has green leaves (Pandey and Anita, 1990). Hindus revere *Ocimum sanctum* L., which is used regularly in Indian homes as a medicine for a variety of illnesses (Rajeshwari, 1992).

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The seeds of the Theobroma cacao shrub are used to make the food product known as chocolate. Theobroma cacao seeds were roasted, ground, and commonly flavor with vanilla to create chocolate (Vishal P et al., 2012). It is available in a number of shapes, such as paste, liquid, and solid. These extra dishes, both savoury and sweet, also have chocolate flavoring. Cocoa is the best provider of calories, protein, magnesium, calcium, iron, and riboflavin in various amounts. It is a crop with a high nutrient density. It is essential for both mental and cardiovascular wellness. Copper, sulphur, and vitamin C are abundant in cocoa grains (Cooper KA et al., 2008).

2. Material and methods

Moringa and Tulsi leaves were obtained from local farm in Surat. Sugar-Free dark compound was obtained from local store in Surat. Tulsi and Moringa were used to make chocolate for increasing nutritional and biological value of chocolate. Various tests were conducted on the product by food laboratory. The ash, Protein, Crude fat, Crude fibre in the product were analyzed by standard methods (AOAC, 2010). The calcium was extracted by method of Kim and Zemel. The ingredients used for production of nutritional chocolate are powder extract of Moringa oleifera and *Ocimum sanctum* (Tulsi) leaves with a formulation comparison in Table 1. The leaves were collected and were washed properly to remove dirt on the surface. After washing they were cleaned with a clean cloth. Thereafter the leaves which are not good were discarded. Then the leaves were sundried till they become dried. Then the sugar-free dark chocolate was melted at high temperature. The dried leaves using grinder were crushed into fine powder. The powder was added to the melted chocolate by using sieve so that the bigger particles like sand and stones does not enter in the chocolate. Stir continuously till the powder and the chocolate are mixed properly. After that the chocolate were poured in the mold of desired shape and refrigerated till it gets hard. Finally, the chocolates were wrapped in different colored aluminum foils.

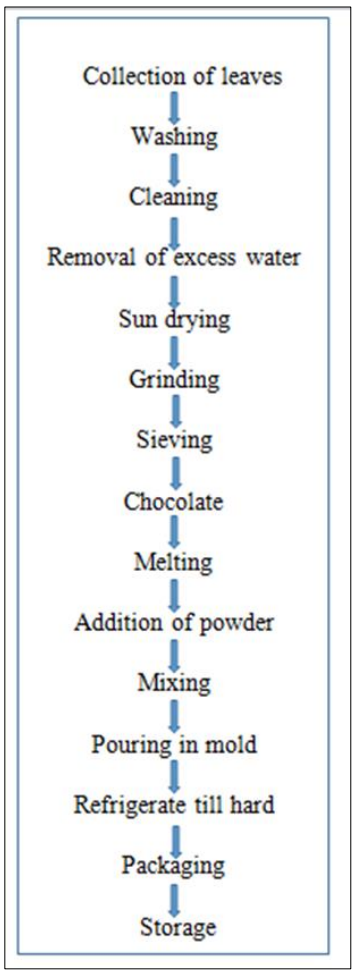

Figure 1 Flow chart for preparation of *Moringa oleifera* and (*Ocimum sanctum*) based chocolate

Table 1 Formulation of chocolate based on Moringa and Tulsi leaves

Sr. No.	Ingredients	T0	T1	T2	T3	T4
1	Chocolate	100 gm	100 gm	100 gm	100 gm	100 gm
2	Moringa	0 gm	10 gm	15 gm	5 gm	10 gm
3	Tulsi	0 gm	10 gm	5 gm	15 gm	10 gm
4	Cinnamon	0 gm	0 gm	5 gm	5 gm	5 gm

2.1. Analysis of Chemical Properties

Using the standard analytical techniques outlined by AOAC, International in 1990, the chemical characteristics such as moisture, fat, fiber, calcium, protein, ash, and Vitamins were examined.

2.1.1. Moisture

Moisture Utilizing the AOAC (1990) technique, moisture content was assessed. The sample was measured and placed inside a sterile porcelain dish at a weight of 5 g. (W1 g). The dish was then shaken to ensure that the contents were dispersed equally before being placed in a hot air oven, which was kept at 105°C plus 2°C, and dried for minimum two hours. The lowest weight was then recorded after it had been cooled in desiccators (W2 g). The moisture content was calculated using the formula below.

Determination of Moisture Content:

$$\%\ moisture\ content\ = \frac{\text{Loss in weight}}{\text{Initial weight of the sample}} \times 100$$

2.1.2. Ash

Ash By placing known weights of freshly collected and dried specimens in tarred silica crucibles, the total amount of ash was calculated. Following moisture analysis, the oven-dried samples were gradually heated over a hot plate till the majority of the organic stuff was burned. The crucibles then were placed in a muffle ash furnace at 550°C to produce a white ash that was free of carbon and had a constant weight. While ash content in powder was given on a dry basis, it was expressed on a fresh weight basis for raw materials. Following that, the ash content of the samples was determined and reported as a percentage on a basis of fresh weight as shown below (Ranganna,2009).

Determination of %ash content:

$$\%\text{ash content}\ = \frac{weight\ of\ ash}{weight\ of\ sample} \times 100$$

2.1.3. Crude fibre

The organic remnant that persists after one specimen has been treated under controlled circumstances using standardized boiling alkali and acid solutions is referred to as "crude fibre." Using normally boiled alkali and acid solutions, the Fibro-tron was indeed a highly sophisticated instrument designed to evaluate raw fibre samples. The crude fibre content was calculated using a traditional technique (AOAC).

$$\%\text{Crude fiber}\ = \frac{loss\ in\ weight}{weight\ of\ sample} \times 100$$

2.1.4. Protein

The AOAC (1990) technique was utilized to calculate the protein content. The following equation was employed to calculate the percentages of nitrogen and protein.

$$\text{Protein}\ (\%)\ = \frac{\text{Ts} - \text{Tb}\ x\ \text{normalityofacid}\ x\ \text{Meq. ofN2}}{Weight\ of\ sample\ (s)}$$

- TS = Titre volume of the sample, ml
- Tb = Titre volume of Blank, ml
- Meq. of N2 = 0.014 and
- % Protein = Nitrogen× 5.7

2.2. Minerals (Calcium)

According to a method described by the Association of Analytical Communities (AOAC; Method 985.35, 2010), the calcium content of the milk chocolate sample was determined.

2.3. E-coli

Straight out from liquid culture or, if using solid media, in clean tap water, a really light & thin smear spanning a small area is formed on a clean, grease-free slide. By moving back and forth over a flame, the smear is solidified and cooled. For 30 seconds, cover the spread with stain (a), pour off the stain, wash with (b), cover with (b), and let sit for 30 seconds. As soon as the color stops streaming out, wash it off with ethanol. Wash under running water from the faucet and use (C) for about a minute. Wash with tap water, then pat dry before examining (IS 5887 part 1).

2.4. Moulds

Moulds were checked visually by plating method.

2.5. Sensory Evaluation

Five panelists evaluated the control specimen and specimens of chocolate made with Moringa and Tulsi for their sensory qualities of color, taste, texture, and overall acceptance using a 9-Point Hedonic Scale. Samples were rated on a scale of 1 to 9, with 9 being the most acceptable. The mean value was determined by averaging the five panelists' scores. We'll examine at the chocolate's nutritional profile which has received the top reviews.

2.6. Scores to Be Given as Follows

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

3. Results and discussion

Table 2 Proximate composition of moringa and tulsi based chocolate

Sr No.	Parameter	Result
1	Moisture	1.15%
3	Protein	7.14%
4	Fibre	12.61 gm/100 gm
5	Vitamin	A, D, E, K
7	E coli	Absent
8	Mold	Absent
9	Minerals: Calcium	1121.15 mg/1 kg
10	Ash	2.07%

The evaluation results for the parameters of moisture content, protein content, ash content, fibre content, minerals, Vitamins, Ecoli and Moulds for the Moringa and Tulsi chocolate are shown in table 2.

3.1. Organoleptic Evaluation of *Moringa oleifera* and Tulsi (*Ocimum sanctum*) Chocolate

For sugar-free dark chocolates, acceptability tests for sensory evaluation were conducted. They were created by mixing sugar-free dark chocolate, *Moringa* and Tulsi (*Ocimum*) leaves powder, and cinnamon in various amounts to determine the acceptability of the final items. The acceptability scores were calculated based on a number of sensory factors, including color, flavor, texture, appearance, and general acceptability.

Table 3 Organoleptic evaluation of moringa based chocolate

Sr No.	Parameter	T0	T1	T2	T3	T4
1	Color	8	7	8	8	9
2	Flavor	8	8	5	7	8
3	Texture	6	5	7	6	6
4	Appearance	7	5	5	7	7
5	Overall Acceptability	7	6	6	7	8

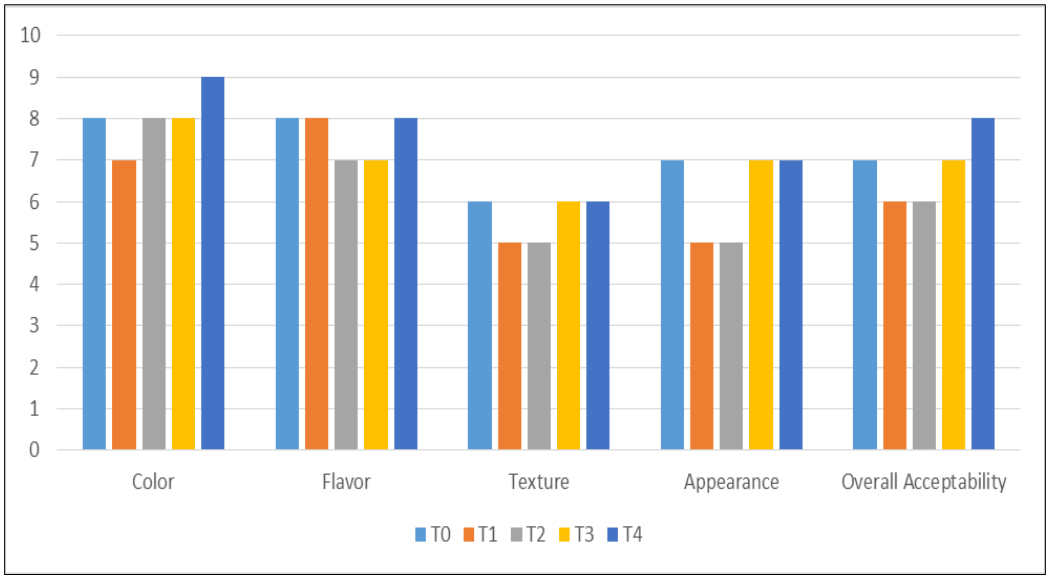

Figure 2 Organoleptic evaluation of moringa and Tulsi based nutritious chocolate

It was noted that Sample T4 8 received the greatest overall acceptability score since it received favorable results for its color, flavor, texture, look, and overall acceptability. T4 sample was thus chosen for further examination based on sensory data.

4. Conclusion

Powder extract of Moringa oleifera and *Ocimum sanctum* were incorporated to sugar free dark chocolate to increases the chocolates nutritional properties. These chocolates sensory evaluation were done by 5 panelists and according to sensory evaluation T4 got the highest score and which was further investigated for proximate analysis and the results were obtained. The chocolate contains 1.15% moisture, 2.07% ash, 7.14% Protein, 12.61 gm/100 gm, Vitamin A, D, E, K, 1121.15mg/1kg calcium. There are a lot of difficult unanswered questions in the market there is a huge need for snacks. As a result, adding Moringa and Tulsi to snacks that combat malnutrition offers advantages.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there is no conflict in general.

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