



FORMULATION AND EVALUATION OF NUTRITIONAL VALUE IN MORINGA OLEIFERA CHOCOLATE

Jatin Chachapara, Kruti Chaudhari, Christian Stacey, Himanshu Pandya, Bharat B Maitreya

Department of Botany, Bioinformatics and Climate Change Impacts Management

ABSTRACT

Everybody loves chocolate if it's tasty and with health benefits its variety of chocolate known as herbal chocolate with Moringa contains, which used for its medical benefits for many years. Moringa is a fantastic complement to chocolate since it is a rich source of antioxidants, vitamins, and minerals; Moringa chocolate made with herbal ingredients has several possible health advantages. Moringa chocolate contains dark cocoa powder, pea nut cardamom and cinnamon, cocoa butter, and Moringa powder. The present study shows that chocolate has a little nutty, mouth fresh and earthy flavor that balances off its sweetness, and quality evaluation were done for Moringa. Physiochemical analysis was done for Moringa chocolate to check the amount of protein, fat, energy, Fiber, and carbohydrates which indicates the presence of different bimolecular present in Moringa chocolate.

Keywords: Moringa Oleifera, herbal chocolate, Nutrition value, cocoa powder

INTRODUCTION

Moringa (*Moringa oleifera*) is a native of the Indian subcontinent that has been naturalized around the world in tropical and subtropical environments. It thrives in rainy tropics as well as scorching dry areas, can tolerate poor soils, and is not harmed by drought (Anwar et al., 2007). It can endure a wide variety of rainfall, with the lowest annual rainfall requirements estimated to be 250 mm and the highest annual rainfall requirements estimated to be greater than 3000 mm (Palada and Changl, 2003). *Moringa oleifera* is a high-nutritional-value vegetable produced in a variety of locations, including India, Pakistan, the Philippines, Hawaii, and several African countries (Anwar et al., 2005). The tree is also known as the Benzolive, Drumstick, Horseradish, Kelor, Marango, Mlonge, Mulangay, Saijihan, and Sajna trees in its native country (Fahey, 2005) Moringa every component used for food, medicine, or industry, it is recognized as one of the most useful trees on the planet (Anjorin et al., 2010) This tree has the potential to improve nutrition, raise food security and encourage rural development (Hsu, 2006). There has lately been a substantial upsurge of interest in the nutritional advantages of Moringa in most regions where it is not native (Oduro et al., 2008). According to studies, *M. oleifera* leaves can be consumed fresh, roasted, or dried and stored for several months without losing much nutritional content (Fahey, 2005) A Moringa plant contains the vitamins and phenol components, such as quercetin and kaempferol, are commonly linked to the leaves' strong antioxidant activity and reputation as a rich source of vitamins and minerals. (JPCoppin et al., 2013). In the Philippines, it is called a "mother's best friend," and it is used to increase a female's milk supply and is also given for anemia. (Anwar et al., 2007). Furthermore, research has shown that Moringa leaves have strong antioxidant activity. Several parts of this venerated tree have been related to medicinal advantages. In South Asian indigenous medicine, almost all parts of this plant (root, bark, gum, leaf, fruit, and pods), flowers, seed, and seed oil, have been used to treat a variety of ailments, including inflammation and infectious diseases, as well as cardiovascular, gastrointestinal, hematological, and hepatorenal disorders (Siddhuraju and Becker, 2003). The Moringa plant contains a variety of fatty acids, vitamins, minerals, glycosylates, and phenolics (flavonoids, anthocyanins, proanthocyanides, and cinnamates) (Akhtar et al., 2007). The plants are used to treat 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 (Mishra et al., 2012 and Horwath and Benin, 2011). Moringa leaves contain a lot of calcium. Because of its multiple uses, notably in health and nutrition, Moringa leaves are known as "magic plants." Fresh Moringa leaves provide 1077 mg of calcium per 100 g. (Fahey, 2005)

It is also possible to fortify processed cocoa bean products, such as chocolate. Certain chocolate products, such as dark chocolate, are made from cocoa paste with a small amount of sugar added. White chocolate is manufactured from cocoa butter, sugar, and milk powder, whereas milk chocolate is created from cocoa paste, cocoa butter, sugar, and milk powder. There are also couvertures chocolates, which are widely employed by specialists in the area to produce pastries or cakes. (Agus, 2012) Chocolate is made from the seeds of the shrub *Theobroma cacao*. To make chocolate, *Theobroma cacao* seeds were roasted, pulverized, and usually flavored with vanilla (Vishal et al., 2012). It comes in a variety of forms, including paste, liquid, and solid. These extrudates, both savory and sweet, are flavored with chocolate. In varied amounts, cocoa is the best source of calories, protein, magnesium, calcium, iron, and riboflavin. It is a highly nutrient-dense

crop. It is necessary for both mental and physical health. Cocoa granules are high in copper, sulfur, and vitamin C. (Cooper et al., 2008).

The present study aims to providing a healthier alternative to traditional chocolate and supporting overall health and wellness, to get a better combination of health and taste in a product and a supplement product for a calcium-rich diet boosting energy and reducing fatigue. The total experiment is based to get a desired product to support health and wellness along with the loving sweetness in the product which makes it diet-loving as well as healthy and brings a desire to eat it more often. Even the convenient method explained in the experiment to compose the chocolate with stated ingredients makes it time efficient.

MATERIALS AND METHODS

INGREDIENTS

Moringa Oleifera, cocoa powder, cocoa butter, jaggery, Cinnamon, Cardamom, sugar, peanut

Method Collection

The fresh leaves of Moringa were collected from Gujarat University campus and washed with water to remove dust. Moringa fresh leaves baked in an oven for 4 hr at 110 °C.

Preparation of nutritious chocolate liquor

Take 20 gm of cocoa butter taken in a bowl and heated for a few minutes in a double-boiler. Then, to this melted cocoa butter, 5 gm of cocoa powder and 3gm sugar were added. This mixture was allowed to heat on a double-boiler for approximately 2 min.

Preparation of Inner Filling for Chocolate

10- gram jaggery was taken in a vessel and cooked for 2-3 min. In this jaggery, spice like cinnamon and cardamom was added. And then it was allowed to cook for 2 min.

Preparation of chocolate

In a chocolate mold, the previously prepared Moringa chocolate liquor was added and the entire inner walls of the mold were well covered in chocolate. The excess chocolate liquid was removed. Then the chocolate mold was kept for 30 min in the fridge to allow the chocolate to set. Or then the chocolate was allowed to be set by keeping mold in the fridge for 30 min. After 30 min, jaggery filling was added to the chocolate mold and again it was allowed to be set by keeping it in a freezer at 2 °C for 1-2 hours. After 1-2 hr remove the mold and add chocolate liquid. The filling was covered with the help of chocolate liquor and keep mold in the fridge again to allow the chocolate to cool down.

Quality Evaluation

The mineral substance (ash) was determined by the calcination method in Muffle furnace at 550 °C. The Kjeldahl method performed to estimate protein content in chocolate by using a conversion factor of 6.38. Soxhlet Method performed to estimate fat content in the Moringa chocolate was discovered by Franz von in 1879. Carbohydrates content was obtained by difference: 100-(Protein+Ash+ Fats) in 100g of food.

Estimation of Energy was calculated as: Carbohydrate × 4. Protein × 4, Fat × 9. (www.fssai.gov.in)

RESULT AND DISCUSSION

Formulation

Sensory Evaluation of Moringa chocolate Was done Following parameters were considered like color brown, taste sweet, consistency solid, shape star, hart, combination herb and Moringa leaves.

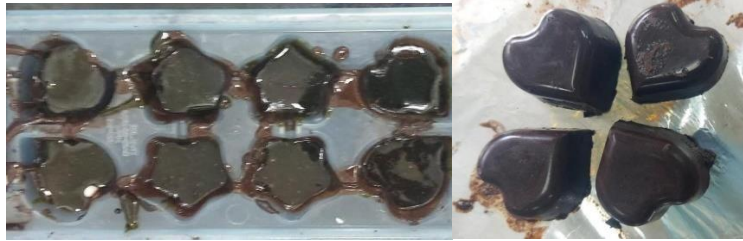


Figure 1 Picture of Moringa chocolate

Quality evaluation: Various parameters were considered and further tested for the Moringa chocolate to prove its safety and quality for human consumption.

Quality parameters	Concentration
Protein	11.01
Fat	6.94
Energy	355.94Kcal
Ash	14.13
Carbohydrate	62.36

Table 1: Concentration of different quality parameter (per 100gm)

Table 1 shows the protein content in the chocolate is 11.01/100g which is a good aspect of the chocolate. Fat content is 6.94/100g which can be considered appropriate. Ash is 14.13/100g good for health in various ways. Carbs are 62.36/100g meeting as a diet supplement as mentioned in our objectives and energy content is quite legitimate as 355.94 Kcal.

CONCLUSION

The leaves of Moringa contain more vitamin C than oranges, more magnesium than eggs, more vit. B3 than peanuts and more vit. B2 than bananas. Moringa can contribute to everything from better vision and immunity to bone health and skin radiance. Moringa leaf powder was used to make a final product with cinnamon, jaggery, groundnuts and cardamom in a cocoa powder formulation. Qualitative analysis was done for Moringa chocolate to check the amount of protein, fat, energy, and carbohydrates which indicates the presence of different biomolecules present in Moringa chocolate. This paper concluded that Moringa chocolate made from leaves contains protein, fat, carbohydrate and energy which has brain, heart and digestive health may improve.

REFERENCE

- 1) Anwar, F., & Rashid, U. (2007). Physico-chemical characteristics of Moringa oleifera seeds and seed oil from a wild provenance of Pakistan. *Pak. J. Bot*, 39(5), 1443-1453.
- 2) Palada, M. C., & Chang, L. C. (2003). Suggested cultural practices for Moringa. *International Cooperators' Guide AVRDC*. AVRDC pub, 03-545.
- 3) Anwar, F., Latif, S., Ashraf, M., & Gilani, A. H. (2007). Moringa oleifera: a food plant with multiple medicinal uses. *Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives*, 21(1), 17-25.
- 4) Anjorin, T. S., Ikoikoh, P., & Okolo, S. (2010). Mineral composition of Moringa oleifera leaves, pods and seeds from two regions in Abuja, Nigeria. *International Journal of Agriculture and Biology*, 12(3), 431-434.
- 5) Hsu, D. H. (2006). Venture capitalists and cooperative start-up commercialization strategy. *Management Science*, 52(2), 204-219.
- 6) Oduro-Kwarteng, S., & van Dijk, M. P. (2008). Performance of private companies involved in urban solidwaste management: Evidence from three cities in Ghana.



- 7) Fahey, J. W. (2005). Moringa oleifera: a review of the medical evidence for its nutritional, therapeutic, and prophylactic properties. Part 1. *Trees for life Journal*, 1(5), 1-15.
- 8) Coppin, J. P., Xu, Y., Chen, H., Pan, M. H., Ho, C. T., Juliani, R., & Wu, Q. (2013). Determination of flavonoids by LC/MS and anti-inflammatory activity in Moringa oleifera. *Journal of Functional Foods*, 5(4), 1892-1899.
- 9) Anwar, F., Latif, S., Ashraf, M., & Gilani, A. H. (2007). Moringa oleifera: a food plant with multiple medicinal uses. *Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives*, 21(1), 17-25.
- 11) Siddhuraju, P., & Becker, K. (2003). Antioxidant properties of various solvent extracts of total phenolic constituents from three different agroclimatic origins of drumstick tree (*Moringa oleifera* Lam.) leaves. *Journal of agricultural and food chemistry*, 51(8), 2144-2155.
- 12) Akhtar, M., & Dickinson, E. (2007). Whey protein-maltodextrin conjugates as emulsifying agents: An alternative to gum arabic. *Food Hydrocolloids*, 21(4), 607-616.
- 13) Mishra, S. P., Singh, P., & Singh, S. (2012). Processing of Moringa oleifera leaves for human consumption. *Bulletin of Environment, Pharmacology and life sciences*, 2(1), 28-31.
- 14) Mulingo, T. K. (2013). Phytochemical composition, antioxidant and potential anti-cancer activity of extracts from Drumstick (*Moringa oleifera*) and Quinine tree (*Rauwolfiacaffra*) (Doctoral dissertation, University of Nairobi).
- 15) Cooper, K. A., Donovan, J. L., Waterhouse, A. L., & Williamson, G. (2008). Cocoa and health: a decade of research. *British Journal of Nutrition*, 99(1), 1-11.