

An Overview of formulation and evaluation of herbal multivitamin chocolate with protein

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Abstract - The increasing demand for functional foods has led to the exploration of natural ingredients with therapeutic and nutritional benefits. This study aims to formulate a multivitamin-rich chocolate incorporating Moringa (*Moringa oleifera*), Beetroot (*Beta vulgaris*), Tulsi (*Ocimum sanctum*), Jaggery, and Cardamom (*Elettaria cardamomum*), targeting both nutritional enhancement and consumer acceptability. The objective of this research is to develop a palatable chocolate-based nutraceutical product that delivers essential vitamins, minerals, and bioactive compounds derived from plant sources. Moringa is utilized for its high content of vitamins A, C, calcium, and iron; beetroot contributes to folate and iron levels, supporting blood health; tulsi offers adaptogenic and immune- modulating properties; jaggery serves as a natural sweetener rich in iron and micronutrients; and cardamom is included for its digestive and flavor-enhancing qualities. The chocolate was formulated using cocoa butter, cocoa powder, and the above herbal ingredients through conventional melting and molding techniques.

The prepared formulation was evaluated for physical characteristics, taste acceptability, nutritional content, and shelf stability. The results suggest that the developed chocolate not only meets sensory expectations but also offers a natural and effective means of dietary supplementation. This formulation has the potential to serve as a functional confectionery with broad consumer appeal and health benefits.

Keyword:-Functional food, Multivitamin chocolate Moringa oleifera, Beetroot, Ocimum sanctum (Tulsi) Jaggery

I. INTRODUCTION

In recent years, there has been a significant shift in consumer preference towards foods that offer not only nutritional value but also therapeutic benefits. Functional foods and nutraceuticals have emerged as an innovative approach to bridge the gap between

nutrition and medicine. Among these, chocolate traditionally regarded as a confectionery item has gained attention as a potential carrier for health-promoting bioactive compounds due to its rich antioxidant profile and widespread consumer acceptance. Moringa (*Moringa oleifera*), often referred to as the “miracle tree,” is a powerhouse of essential vitamins and minerals including vitamin A, vitamin C, calcium, iron, and potassium. Beetroot (*Beta vulgaris*) is well-known for its high content of iron, folate, and natural nitrates that support blood health and stamina. Tulsi (*Ocimum sanctum*), revered in Ayurvedic medicine, possesses adaptogenic, antimicrobial, and immune-boosting properties. Jaggery, a traditional unrefined sweetener, is rich in iron and various trace minerals, and is often used as a healthier alternative to refined sugar. Cardamom (*Elettaria cardamom*) not only enhances flavor but also aids in digestion and exhibits antioxidant properties. The integration of these herbal and natural ingredients into a chocolate base provides an opportunity to create a palatable, nutrient-rich product that aligns with current health trends. This study aims to formulate and evaluate a multivitamin chocolate using moringa, beetroot, tulsi, jaggery, and cardamom. The goal is to develop a product that not only delivers essential nutrients but also meets consumer expectations in terms of taste, texture, and shelf stability. This formulation addresses nutritional deficiencies common in various populations, especially in children and adolescents, and promotes the consumption of medicinal herbs in an acceptable and enjoyable format. Through this work, an effort is made to create a novel, health-oriented confectionery that blends traditional knowledge with modern food technology.

History:-The concept of combining food with health-promoting ingredients dates back to ancient

civilizations. In traditional systems of medicine such as Ayurveda, herbs like Tulsi, Moringa, and Cardamom have long been used for their medicinal properties. These natural ingredients were commonly consumed in the form of decoctions, powders, or mixed with honey and jaggery to enhance their taste and effectiveness. Such practices laid the foundation for what is today known as functional foods or nutraceuticals. Chocolate, originally derived from the cacao bean in ancient Mesoamerican cultures, was consumed as a bitter drink and considered a sacred and medicinal beverage. The Mayans and Aztecs used it in rituals and believed it had invigorating and therapeutic properties. Over time, with the introduction of sugar during European colonization, chocolate evolved into the sweet confectionery known today. In modern times, chocolate has gained recognition not just as a treat but also as a vehicle for nutrient delivery, especially due to its antioxidant-rich components like flavonoids. This has led to the development of fortified chocolates, incorporating vitamins, minerals, and herbal extracts. Meanwhile, Moringa oleifera has been rediscovered globally as a “super food” due to its exceptional nutritional profile. Similarly, Beetroot has been studied for its iron and nitrate content, promoting blood health and stamina. Tulsi (Holy Basil) continues to be valued for its immune-boosting and stress-relieving qualities. Jaggery, used for centuries in Indian households, offers a healthier sweetening alternative compared to refined sugar. Cardamom, often known as the “Queen of Spices,” has a long-standing use in culinary and medicinal applications. The combination of these time-tested herbal ingredients into a chocolate matrix represents a fusion of traditional health wisdom with modern food technology.

II. BENEFITS OF FORMULATED CHOCOLATE

1. Nutrient-Rich Supplementation The inclusion of Moringa, Beetroot, and Jaggery enhances the chocolate’s nutritional profile with essential vitamins and minerals like vitamin A, C, calcium, iron, and folate. This helps combat common deficiencies, especially in children, women, and the elderly.
2. Immune System Support Tulsi (*Ocimum sanctum*) is known for its immunomodulatory and antioxidant properties. Regular consumption can help strengthen the immune system and improve resistance to infections.
3. Natural Sweetener Jaggery serves as a healthier alternative to refined sugar. It contains iron, magnesium, and potassium and helps improve hemoglobin levels while also providing energy without harmful sugar spikes.
4. Improved Blood Health Beetroot is rich in iron and folates, which support red blood cell formation and improve blood circulation. This makes the formulation especially beneficial for individuals suffering from anemia or fatigue.
5. Digestive Health Cardamom aids digestion, reduces bloating, and helps in relieving gastrointestinal discomfort. It also adds a pleasant aroma and flavor to the chocolate, enhancing palatability.
6. Adaptogenic and Anti-Stress Effects Tulsi is an adaptogen that helps the body cope with physical and emotional stress. Regular intake may promote mental clarity and reduce fatigue.
7. Antioxidant Properties Both cocoa and the herbal ingredients (especially moringa, beetroot, and tulsi) are rich in antioxidants, which help combat oxidative stress, reduce inflammation, and support overall cellular health.
8. Enhanced Acceptability of Herbal Nutrition By incorporating these herbs into a chocolate matrix, the bitter or unpleasant taste of some medicinal plants is masked, making it more acceptable, especially to children and picky eaters.
9. Convenient and Palatable Form The chocolate format offers a user-friendly way to consume daily micronutrients without the need for pills or syrups. It can easily be included as a snack or part of a daily diet.
10. Supports General Wellness The synergistic effects of these ingredients contribute to overall wellness, supporting metabolism, immune function, detoxification, and energy levels.

III. IDEAL CHARACTERISTICS OF MULTIVITAMIN CHOCOLATE

1. Organoleptic Properties Appearance: Smooth, glossy surface with uniform color (mild brown to dark brown depending on ingredient concentration).

Taste: Balanced sweetness with slight herbal undertones; no bitterness from moringa or tulsi.

Aroma: Pleasant, with prominent notes of cardamom and cocoa.

Texture: Smooth, creamy, and melt-in-mouth consistency without grittiness.

2. Nutritional Profile Rich in essential vitamins (A, C, B-complex) and minerals (iron, calcium, magnesium, potassium). Contains natural antioxidants and phytochemicals from herbs. High in dietary value but moderate in calories.
3. Functional Benefits Provides daily nutritional support. Boosts immunity, supports digestion, improves blood health, and helps combat fatigue. Safe for all age groups when consumed in moderation.
4. Shelf Life and Stability Stable for 2–3 months under normal storage conditions (cool and dry place). Free from moisture absorption, bloom (white sugar/fat spots), or ingredient separation. Retains aroma and flavor throughout shelf life.
5. Safety and Acceptability Free from synthetic preservatives, artificial flavors, or colors. Easily digestible and suitable for vegetarians. High consumer acceptability due to familiar ingredients and enhanced taste.
6. Convenient Dosage Form Can be molded into bite-sized bars or cubes for ease of consumption. Each unit should deliver a consistent amount of nutrients for accurate dosing.
7. Cost-Effective and Scalable Ingredients should be locally available and affordable. Manufacturing process should be simple and scalable for small- or large-scale production.

IV. USES OF MULTIVITAMIN CHOCOLATE

1. Dietary Supplement Acts as a nutritional supplement, providing essential vitamins and minerals for individuals with dietary deficiencies, especially children, women, and the elderly.
2. Immunity Booster Regular intake supports the immune system due to the presence of antioxidant-rich herbs like tulsi and moringa.
3. Energy Enhancer Provides a quick source of natural energy through jaggery and beetroot, ideal for students, athletes, or individuals with active lifestyles.
4. Anemia Support Helps improve hemoglobin levels

and blood health due to its iron-rich content from beetroot, moringa, and jaggery.

5. Stress Relief Tulsi acts as an adaptogen, helping the body manage stress and improve overall mental clarity and focus.
6. Digestive Aid Cardamom in the chocolate helps in aiding digestion, reducing bloating and improving appetite.
7. Palatable Herbal Intake Makes the consumption of medicinal herbs easier, especially for children, by masking the bitter taste in a chocolate format.
8. Healthy Snack Alternative Serves as a guilt-free snack, combining the pleasure of chocolate with health benefits, unlike regular sugary confections.
9. Preventive Health Support Can be incorporated into daily diets to support overall health and well-being and reduce the risk of lifestyle-related illnesses.
10. Post-Illness Recovery Beneficial during convalescence to help regain strength, nutrients, and immunity after illness.

V. ADVANTAGES OF MULTIVITAMIN CHOCOLATE

1. Enhanced Nutritional Value Provides essential vitamins and minerals (e.g., iron, calcium, vitamin A, C, folate) in a single, tasty product.
2. Natural and Herbal Composition Made from natural ingredients like moringa, beetroot, tulsi, jaggery, and cardamom free from synthetic additives or preservatives.
3. Improved Palatability Masks the bitter taste of herbs with the sweet and familiar flavor of chocolate, increasing acceptance among children and adults.
4. Multiple Health Benefits Combines properties such as immunity-boosting, blood purification, digestion support, and stress reduction in one formulation.
5. Convenient Consumption Easy to consume, portable, and does not require water—suitable for on-the-go use or daily snacking.
6. Appealing to All Age Groups Loved by both children and adults, making it a universal health supplement in an enjoyable form. Supports Preventive Healthcare Can be used to prevent nutritional deficiencies and support general well-being when included in a daily diet. Cost-

Effective and Accessible Uses affordable, locally available ingredients, making it suitable for large-scale production and distribution in low-resource areas.

7. Cultural Acceptance Utilizes traditional Indian herbs and ingredients familiar to many, improving cultural relevance and trust.
8. Safe and Non-Invasive Offers an alternative to tablets, syrups, or capsules, especially for individuals who have difficulty swallowing medications or supplements.

Ingredients:

1. Moringa powder
2. Beetroot powder
3. Tulsi powder
4. Cardamom powder
5. Dalchini powder
6. Jaggery powder
7. Dark compound
8. Almonds
9. Cashew
10. Peanuts

VI. FORMULATUON OF MULTIVITAMIN CHOCOLATE

Sr.no.	Ingredients	Quantity	Function
1.	Dark compound (cocoa base)	50gm	Base chocolate matrix, antioxidant source.
2.	Jaggery powder	5gm	Natural sweetener, iron source.
3.	Moringa powder	1gm	Multivitamin and mineral source.
4.	Beetroot powder	3gm	Iron and folate source, natural colorant.
5.	Tulsi powder	0.5gm	Immunity booster, adaptogen.
6.	Cardamom powder	0.05gm	Flavoring agent, digestive aid.
7.	Dalchini powder	0.02gm	Flavoring, blood sugar regulation.
8.	Cocoa butter / Ghee (optional)	1gm	Texture enhancer, helps in smooth melting.
9.	Cashew powder	3 gm	improving the blood pressure & strengthening the bone
10.	Almonds powder	3gm	Support heart health, blood sugar control
11.	Peanuts powder	3mg	Heart healthy fat, improved blood flow

Procedure.

Melting: Melt the dark compound using a double boiler at around 40–45°C until smooth and lump-free.

Mixing: Gradually add jaggery powder, followed by moringa, beetroot, tulsi, cardamom, and dalchini powders. Mix thoroughly to ensure uniform distribution of all herbal powders.

Molding: Pour the mixture into chocolate molds.

Cooling & Setting: Allow the chocolates to set at room temperature or refrigerate for 30–60 minutes.

Packaging: Once solidified, demold and package the chocolates in airtight wrappers to prevent moisture entry.

Evaluation of Multivitamin Chocolate

Sr.no.	Parameters	Method	Ideal /Acceptance criteria
1.	Organoleptic Evaluation (Sensory Testing)	Sensory panel using 5 or 9-point hedonic scale	Color: Uniform rich brown-Taste: Sweet, mild herbal.
2.	pH Measurement	pH meter (sample melted before testing)	pH range of 6.0- 7.0
3.	Moisture Content	Hot air oven or moisture analyzer	Less than 2%
4.	Melting Point	Melting point apparatus or water bath	34-37°C (body temperature range)
5.	Hardness/Texture Analysis	Texture analyzer or manual snap test.	Firm structure with clean snap break.
6.	Microbial testing	Total plate count, yeast & mold	Should comply with FSSAI/WHO

		count, coliform tests	microbial safety limits
7.	Shelf Life Study	Store samples at room temperature; periodic testing over time	Stable taste, color, texture, low microbial load, vitamin retention
8.	Nutritional Analysis	Spectrophotometry /Certified lab analysis	Must meet declared label claims (RDA level of vitamins, iron, calcium)
9.	Weight Variation	Weigh individual pieces; calculate deviation	Within $\pm 5\%$ of average weight
10.	Bloom Test (Fat/Sugar Bloom)	Visual inspection during storage	No white spots or surface crystallization

VII. RESULT

The herbal multivitamin chocolate was successfully formulated using dark compound (cocoa base) as the primary ingredient (50 gm). Jaggery powder (5 gm) was used as a natural sweetener, while Moringa powder (1 gm), Beetroot powder (3 gm), and Tulsi powder (0.5 gm) were incorporated as herbal multivitamin sources due to their rich nutritional profiles. Cardamom powder (0.05 gm) and Dalchini (cinnamon) powder (0.02 gm) were added to enhance the flavor and aroma. Cocoa butter or ghee (1 gm, optional) was used to improve the texture and mouthfeel of the chocolate.

The mixture was thoroughly blended, molded, and allowed to set. The final formulation showed good consistency and texture with a uniform appearance. The chocolate had an acceptable herbal taste, smooth finish, and no grittiness. The presence of herbal powders did not adversely affect the palatability. Overall, the formulation was stable, organoleptically acceptable, and successfully integrated nutritional and herbal benefits into a chocolate base.

VIII. CONCLUSION

The formulated multivitamin chocolate, developed using a cocoa base enriched with natural powders like moringa, beetroot, tulsi, jaggery, cardamom, and dalchini, offers a nutritious and functional alternative to conventional chocolates. The inclusion of moringa powder provides essential vitamins (A, C, and minerals such as calcium and iron. Beetroot powder contributes antioxidants and folate, while tulsi powder enhances immunity and provides adaptogenic benefits. Jaggery adds a natural sweetener rich in iron

and trace minerals, and the use of spices like cardamom and dalchini supports digestion and offers additional antioxidant properties. The optional addition of cocoa butter or ghee enhances mouthfeel and aids in better absorption of fat-soluble vitamins. This multivitamin chocolate is not only palatable but also acts as a nutraceutical, suitable for both children and adults seeking a healthy and tasty supplement option.

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