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# Formulation and Evaluation of Multivitamin and Antioxidant Herbal Chocolate

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**Abstract:** *The present study focuses on the formulation and evaluation of a novel herbal chocolate enriched with multivitamins and natural antioxidants. The aim was to develop a palatable and nutritionally enhanced confectionery product that combines the health benefits of herbal extracts with the consumer appeal of chocolate. Herbal ingredients such as Withania somnifera (Ashwagandha), Emblica officinalis (Amla), and Ocimum sanctum (Tulsi) were selected for their known antioxidant and adaptogenic properties. These were incorporated into a dark chocolate base along with essential vitamins including A, C, E, and B-complex. The formulation was evaluated for physical properties (texture, melting point, and appearance), phytochemical content, antioxidant activity (DPPH assay), and sensory attributes. The final product demonstrated good stability, high antioxidant potential, and acceptable sensory characteristics.*

*The growing consumer demand for functional foods has led to increased innovation in delivering essential nutrients through enjoyable and convenient formats. This research focuses on the development of a nutraceutical chocolate product fortified with multivitamins and enriched with herbal extracts possessing potent antioxidant properties. The primary objective is to combine the therapeutic potential of traditional herbs with the nutritional benefits of essential vitamins, thereby creating a palatable, health-enhancing confectionery item.*

*The formulation includes a base of high-quality dark chocolate, selected for its inherent flavonoid content, which is further fortified with a spectrum of essential vitamins—namely vitamin A, B-complex (B1, B2, B6, B12, niacin, folic acid), vitamin C, vitamin D, and vitamin E. These vitamins were microencapsulated to ensure stability during the chocolate manufacturing process.*

**Keywords**: Polyherbal, chocolate, multivitamins, Moringa, formulation

## I. INTRODUCTION

**NEED OF INVESTIGATION:**

1. Rising Demand for Functional Foods With increasing consumer awareness regarding health and wellness, there is a growing demand for functional foods—foods that provide health benefits beyond basic nutrition. Chocolate, being a popular food product, can serve as an ideal vehicle for delivering nutraceuticals like multivitamins and antioxidants in a palatable form.
2. Palatability and Compliance: Chocolate improves taste and acceptability, especially among children and elderly individuals who may be reluctant to take tablets or capsules
3. Bridge the gap between nutrition and enjoyment by creating a product that delivers essential nutrients and antioxidants in a palatable, easily consumed form.
4. Evaluate the stability and bioefficacy of vitamins and herbal extracts when incorporated into a chocolate base.
5. Offer an innovative solution for individuals, especially children and elderly populations, who have difficulty consuming conventional supplements.
6. Support preventive healthcare efforts by providing an alternative dietary intervention that may help mitigate oxidative stress and nutrient deficiencies.
7. Contribute to the functional food industry by developing a scientifically validated, consumer-acceptable product with commercial potential.

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**Objective:**

1. To develop a palatable chocolate-based delivery system that incorporates a balanced composition of essential vitamins (A, B-complex, C, D, and E) without compromising taste, texture, or consumer acceptability.
2. To integrate herbal extracts known for their antioxidant and adaptogenic properties—such as green tea (Camellia sinensis), ashwagandha (Withania somnifera), turmeric (Curcuma longa), and holy basil (Ocimum sanctum)—into the chocolate matrix in bioavailable and stable forms.
3. To assess the antioxidant activity of the formulated chocolate using standard in vitro assays (e.g., DPPH, FRAP, ORAC), comparing results against non-fortified chocolate.
4. To evaluate the stability and shelf-life of the incorporated vitamins and herbal bioactives under typical storage conditions.
5. To ensure consumer safety and product compliance by adhering to recommended daily intake limits and food safety standards.
6. To explore the potential of the product as a functional food supple

The Food and Nutrition Board (FNB) at the National Academies of Sciences, Engineering, and Medicine establishes RDAs and AIs. RDAs are the average daily level of intake of essential nutrients sufficient to meet the requirements of nearly all (97–98%) healthy individuals. These values vary by age, sex, and nutrient. The FNB establishes AIs for nutrients when evidence is insufficient to develop an RDA; intakes at this level are assumed to ensure nutritional adequacy . The U.S. Food and Drug Administration (FDA) develops DVs to help consumers compare the nutrient contents of foods and dietary supplements within the context of a total diet.

Consumer demand for healthier foods with improved taste and convenience has urged the food industry to develop functional foods added with bioactive ingredients that can supplement basic nutrition (food supplement)or exert a pharmacological effect (nutraceuticals). Chocolate could be used as an ideal carrier to deliver bioactiveingredients, mainly due to its high acceptability by consumers. The physicochemical properties and sensory acceptability of the functional chocolates presented are also highlighted. Finally, future perspectives, such as the use of nanotechnology to improvethe bioaccessibility and bioavailability of active ingredients, as well as the need for clinical trials to validate the pharmacological effect of functional chocolates.

Using the term “antioxidant” to refer to substances is misleading. It is really a chemicalproperty, namely, the ability to act as an electron donor. Some substances that act as antioxidants in one situation may be pro-oxidants electron grabbers in a different situation. Another big misconception is that antioxidants are interchangeable. They aren’t. Each one has unique chemical behaviors and biological properties.

They almostcertainly evolved as parts of elaborate networks, with each different substance (or family of substances) playingslightly different roles. This means that no single substance can do the work of the whole crowd . Randomized placebo-controlled trials, which can provide the strongest evidence, offer little support that taking vitamin C,vitamin E, beta-carotene, or other single antioxidants provides substantial protection against heart disease, cancer, or other chronic conditions. The results of the largest trials have been mostly negative.

**Multivitamins:**

Multivitamins are dietary supplements that contain a combination of essential vitamins and minerals required by the human body for normal physiological functioning. These micronutrients play critical roles in energy production, immune support, cognitive function, bone health, and cellular repair. While a balanced diet is ideally the primary source of vitamins and minerals, modern dietary habits, lifestyle factors, and certain health conditions often lead to nutritional deficiencies.

The World Health Organization (WHO) and various national health agencies have recognized micronutrient deficiencies—especially in vitamins A, D, B12, and folic acid—as a widespread public health concern. These deficiencies can lead to a range of health issues including anemia, weakened immunity, impaired growth, and chronic diseases.

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Multivitamin supplements serve as an accessible and convenient strategy to address such deficiencies. They are commonly recommended for individuals with increased nutritional

**Antioxidant:**

Antioxidants are molecules that help neutralize free radicals—unstable atoms or molecules that can damage cells, proteins, and DNA. Free radicals are generated naturally in the body through metabolic processes, but their levels can increase significantly due to external factors such as pollution, UV radiation, smoking, alcohol, poor diet, and stress. When free radical production exceeds the body's antioxidant defenses, it leads to oxidative stress, a condition linked to aging and various chronic diseases, including cardiovascular disorders, diabetes, cancer, and neurodegenerative conditions.

Antioxidants work by donating electrons to free radicals without becoming unstable themselves, effectively halting the chain reaction of cellular damage. The body naturally produces some antioxidants (e.g., glutathione), but it also relies heavily on dietary sources. These include vitamins (especially A, C, and E), minerals like selenium and zinc, and a wide range of plant-derived compounds known

**Why antioxidants are necessary ?**

Oxygen is absolutely essential for the life of aerobic organism but it may become toxic if supplied at higher concentrations. Dioxygen in its ground state is relatively unreactive; its partial Reduction gives rise to active oxygen species (AOS) such assinglet oxygen, super oxide radical Anion, hydrogen peroxide etc. ‘

This is partly due to the oxidative stress that is basically the adverse effect of oxidant on physiological function. The generation of reactive oxygen species (ROS) and other free radicals (R) during metabolism is a necessary and normal process that ideally is compensated for by an elaborate endogenous antioxidant system.

However, due to many environmental, lifestyle, and pathological situations, excess radicals can accumulate, resulting in oxidative stress. Free oxygen radicals plays cardinal role in the etiology of severaldiseases like arthritis, cancer, atherosclerosis etc.The oxidative damage to DNA may play vital role in aging and the presence of intracellular oxygen also can be Responsible to initiate a chain of inadvertent reaction at the cellular level and these reaction cause Damage to critical cell biomolecules. These radicals are highly toxic and thus generate oxidative Stress in plants. Plants and other organism have in built wide range of mechanism to combat with These Free Radical problems.

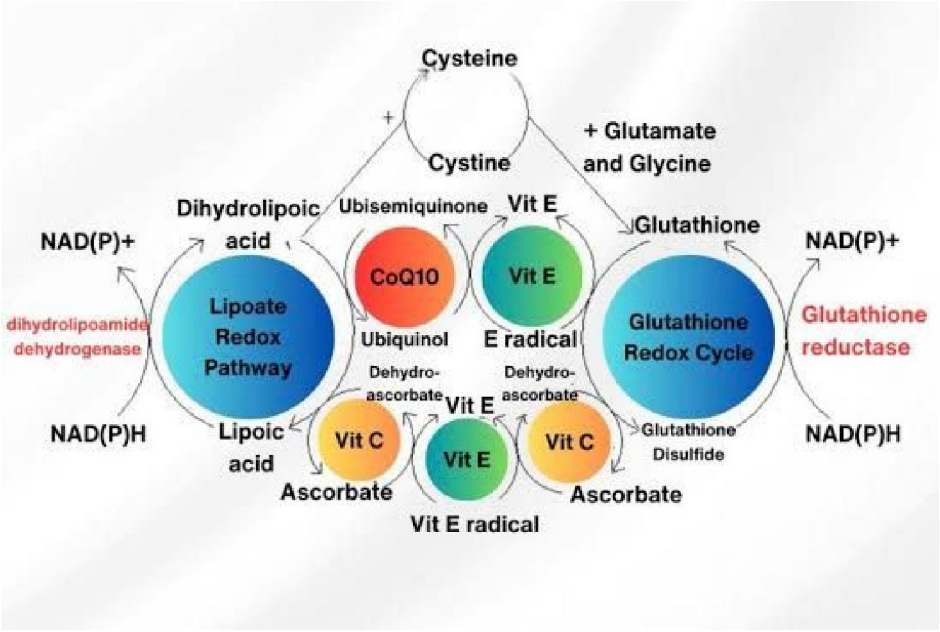


**Fig.1. Antioxidant cycle**

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**DRUG PROFILE:**

***Moringa:-***

**1. Synonyms (Common Names):**

English: Drumstick tree, Horseradish tree, Ben oil tree
Hindi: Sahjan / Munga

**2. Biological Name:**

Scientific name: Moringa oleifera
Family: Moringaceae

**3. Major Chemical Constituents:**

Vitamins: Vitamin A, C, E, and B-complex
Minerals: Calcium, Potassium, Iron, Magnesium, Zinc
Phytochemicals:

Flavonoids (e.g., quercetin, kaempferol)
Phenolic acids
Glucosinolates (e.g., glucomoringin)
Isothiocyanates (e.g., moringin)
Saponins ,Tannins
Alkaloids
Proteins (including all essential amino acids)
Omega-3 and Omega-6 fatty acids (in seeds)

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**4. Medicinal Uses:**

1. Anti-inflammatory, antioxidant, antidiabetic, antimicrobial
2. Helps regulate blood sugar and cholesterol
3. Boosts immunity and fights malnutrition
4. Promotes lactation in nursing mothers
5. Improves digestion and liver health
6. Supports brain and eye health

***Beetroot powder:-***

**1. Synonyms (Common Names):**
English: Beetroot powder, Beet powder
Hindi: Chukandar powder

**2. Biological Name:**
Scientific name: Beta vulgaris
Family: Amaranthaceae (previously Chenopodiaceae)

**3. Major Chemical Constituents:**
Betalains (especially betanin – gives red color)
Nitrates (natural nitric oxide precursors)
Phenolic compounds
Flavonoids
Vitamins: Vitamin C, Folate (B9)
Minerals: Iron, Potassium, Magnesium, Manganese
Fiber (if not fully refined)

**4. Uses:**
Health & Medicinal Uses:
Improves blood circulation (via nitric oxide production),Supports cardiovascular health
Enhances exercise performance and stamina,Lowers blood pressure,Boosts liver detoxification
Anti-inflammatory and antioxidant effects

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***Thyme:-***

**1. Synonyms (Common Names):**
English: Thyme powder
Other: Garden thyme, Common thyme
**2. Biological Name:**
Scientific name: Thymus vulgaris
Family: Lamiaceae (Mint family)
**3. Major Chemical Constituents**:
Essential oils (especially thymol, carvacrol)
Flavonoids (e.g., apigenin, luteolin)
Phenolic acids (e.g., rosmarinic acid)
Tannins
Terpenes
Vitamins: Vitamin C, Vitamin A, B-complex
Minerals: Iron, Manganese, Calcium, Magnesium

**4. Medicinal Uses:**
Antimicrobial, antifungal, antiviral (due to thymol and carvacrol),Used for coughs, colds, sore throat, and bronchitis,Acts as a digestive stimulant (relieves bloating, indigestion),Antioxidant and anti-inflammatory properties,May support immune system and respiratory health,Used in oral care for bad breath and gum health
Nutritional & Culinary Uses:Used as a spice or seasoning in meats, stews, soups.

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***Tulsi :-***

**1. Synonyms (Common Names):**
English: Holy Basil powder
Other Names: Sacred Basil, Queen of Herbs
**2. Biological Name:**
Scientific name: Ocimum sanctum or Ocimum tenuiflorum
Family: Lamiaceae (Mint family)
**3. Major Chemical Constituents:**
Essential oils: Eugenol, methyl eugenol, caryophyllene
Flavonoids: Apigenin, luteolin
Triterpenoids: Ursolic acid
Phenolic compounds: Rosmarinic acid
Saponins, tannins, alkaloids

**4. Medicinal Uses:**

1. Adaptogen: Helps the body cope with stress
2. Antiviral, antibacterial, antifungal properties
3. Treats cough, cold, asthma, and bronchitis
4. Supports immune function and fights infections
5. Antioxidant: Reduces oxidative stress
6. Promotes mental clarity and reduces anxiety
7. Supports digestion and liver health
8. Used in diabetes management (helps lower blood sugar)

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**EXCIPIENTS PROFILE:**

***Cinnamon powder*:**

**1 Synonyms (Common Names):**

English: Cinnamon powder

**2. Biological Name:**

Scientific name: Cinnamomumverum (True/Sri Lankan cinnamon)

Cinnamomum cassia (Cassia – a common, cheaper variety)

**Family:** Lauraceae

**3. Major Chemical Constituents:**

Cinnamaldehyde (main active compound – gives aroma and flavor)

Eugenol Coumarin (in higher amounts in cassia – can be toxic in large doses)

**4. Uses:**

Medicinal Uses: Supports heart health (may reduce cholesterol)

Used in colds and flu for its warming, decongestant action

May help improve brain function and memor

**Cardamom powder:**

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**1. Synonyms (Common Names):**
English: Cardamom powder
**2. Biological Name:**
Scientific name: Elettariacardamomum
Family: Zingiberaceae (Ginger family)
**3. Major Chemical Constituents:**
Essential oils (mainly 1,8-cineole, α-terpinyl acetate)
Flavonoids and phenolic compounds
Limonene, Linalool, Myrcene,Starch, fixed oils
Tannins
Vitamins: B-complex (esp. B6), Vitamin C
Minerals: Iron, Magnesium, Manganese, Potassium
**4. Uses:**
Medicinal Uses:
Acts as a carminative – relieves gas and bloating
Supports digestion, relieves nausea and acidity
Has antimicrobial, antioxidant, and anti-inflammatory propertie

**Jaggery:**

**1. Synonyms for Jaggery:**
Gur (Hindi)
Unrefined sugar
**2. Biological Name:**
Saccharumofficinarum (Sugarcane)
**3. Major Chemical Constituents**:
Jaggery is mostly composed of carbohydrates, with additional minerals and organic acids:
Sucrose (main sugar component)
Glucose & Fructose (reducing sugars)
Calcium, Iron, Magnesium, Potassium, Phosphorus – Essential minerals
**4. Uses of Jaggery:**
A. Nutritional and Medicinal:

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Natural sweetener – Used as a healthier alternative to refined sugar
Digestive aid – Traditionally consumed after meals to help digestion
Liver detoxifier – Believed to help cleanse the liver
Anemia treatment – High in iron, useful for increasing hemoglobin
Energy booster – Slow release of energy compared to white sugar
Respiratory health – Used in Ayurveda to relieve coughs and asthma

**Dark chocolate:**

**1. Synonyms for Dark Chocolate**:
Bitter chocolate
**2. Biological Name:**
Theobroma cacao
**3. Major Chemical Constituents:**
Theobromine – A mild stimulant similar to caffeine
Caffeine – Present in smaller amounts than theobromine
Flavanols – Such as epicatechin and catechin (potent antioxidants)
**4. Uses of Dark Chocolate:**
A. Nutritional and Medicinal:
Antioxidant support – Rich in polyphenols that reduce oxidative stress
Cardiovascular health – May improve blood flow and lower blood pressure
Mood enhancement – Stimulates endorphin production and contains serotonin precursors
Cognitive function – Flavanols may support memory and brain performance
Anti-inflammatory – Reduces markers of inflammation in the body

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**MATERIAL AND METHOD:**

| Sr.no | Ingredient | Role of Ingredient |
|---|---|---|
| 1. | Morning Powder | Antioxidant |
| 2. | Beetroot Powder | Natural health-boosting supplement |
| 3. | Thyme Powder | Antioxidant |
| 4. | Tulsi Powder | Improves Immunity |
| 5. | Cinnamon Powder | Powerhouse of Antioxidant |
| 6. | Cardamon Powder | Improves blood circulation |
| 7. | Chocolate | Contains Anti-oxidants that can protectcells |
| 8. | Jaggery | Detox the liver and blood |

**Table 1: Ingredient and their role for Herbal Chocolate**

**METHODS OF PREPRATION:**

**FORMULATION TABLE:**

| Ingredient | Quality of Ingredient(in gm) | | |
|---|---|---|---|
| | F1 Batch | F2 Batch | F3 Batch |
| Moringa Powder | 0.5 | 1.5 | 0.8 |
| Beetroot Powder | 2 | 1 | 1 |
| Thyme Powder | 0.5 | 0.7 | 1 |
| Tulsi Powder | 0.05 | 0.05 | 0.05 |
| Cinnamon Powder | 0.002 | 0.002 | 0.002 |
| Cardamon Powder | 0.005 | 0.005 | 0.005 |
| Jaggery powder | 7 | 7 | 7 |
| Dark Choclate | 20 | 20 | 20 |

**Table:2 Formulation Table For Herbal chocolate**

**Methodology:**

**Procedure of chocolate:**

To formulate herbal multivitamin antioxidant chocolate all ingredients are weighedappropriately according to formula.

↓

7 gm of Jaggery was weighed and 10 ml water was added in Jaggery powder.

↓

Jaggery powder solution was melted in water bath by using double boiler method.

↓

When the Jaggery solution was formed then weighed powdered herbal ingredients areadded in the Jaggerysolution.

↓

The powdered herbs mixed homogeneously with Jaggery solution.

↓

Dark chocolate was weighed and melted in water bath by using double boiler method

↓

Then melted chocolate was added to the herbal solution and mixed it throughly till itbecome homogeneous.

↓

Then the prepared chocolate containing Herbal drug extract was poured in moulds Andkept in freeze to set Overnight.

↓

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Total 3 formulations were prepared by Varying the concentration of herbal drugExtract used, while the Concentration of Excipients was kept constant

**Storage:**

1. Cool Temperature

Best range: 15–20°C (59–68°F)

Avoid frequent temperature fluctuations and do not refrigerate, as this can cause condensation and sugar bloom.

2. Dry Environment

Humidity can degrade both chocolate and herbal components.

Aim for humidity below 50%. Moisture can lead to mold or spoilage, especially with botanicals.

3. Dark Place

Store in an opaque, airtight container or a dark cupboard.

Light (especially UV) can degrade herbal compounds like essential oils and flavonoids.

**Packing:**

1. Primary (Inner) Packaging

This layer is in direct contact with the chocolate.

Ideal Materials:

Aluminum foil: Offers excellent barrier against light, moisture, and oxygen.

Food-grade biodegradable films (PLA, cellulose): Eco-friendly and good for artisan/herbal brands.

Wax paper or parchment paper: Good for wrapping individual pieces in a rustic or natural product line.

Vacuum-sealed pouches (for bulk herbal chocolate or bars): Maximize shelf life by limiting oxidation.

## EVALUATION AND CHARACTERIZATION

**General appearance:-**

The visual identity and overall elegance of a chocolate formulation are what determine its Overall appearance, which is important for consumer acceptability and trouble-free Manufacture

**Dimensions:-**

The dimension of the chocolate was evaluated while using Vernier's callipers.

**Weight Variation :**

Six chocolate recipes were weighed separately and collectively. The weight of all the Chocolate was used to calculate the average weight. The average weight was contrasted with the individual weights. The weight variation's percentage difference must stay within the Allowed bounds. The following formula was used to determine the percent deviation.

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**%Deviation =.** $\frac{\text{Individual weight final weight X 100}}{\text{Average weight}}$

**Hardness test :-**

To shatter a chocolate bar across its circumference, a certain amount of hardness is needed. The strength of chocolate can be determined by how hard it is. Using a Monsanto Hardness Tester, the hardness was determined. Kg/cm2 was used to express the values

**pH of chocolate formulation:-**

**Procedure for pH measurement:**

1.Rinse the electrode.

2.3.4. Electrode is calibrated by using distilled water till the pH become 7

Put the meter into measurement mode.

The electrode is inserted into the chocolate sample.

5.Readings are recorded

**Drug content determination:**

Drug content of medicated chocolate was determined by Thin Layer Chromatography. Here,

control was taken as Aqueous moringa extract and test as melted chocolate Sample.

TLC plates were prepared by using silica G and Plates were activated for ½ Hr. Spotting was carried out

On both plates i.e., control and test plate by using Capillary.

Run both the plates in mobile phase i.e.,Chloroform :Methanol: Water having ratio 12:3:1 of both plates air drying of plates was carried Out.

After Running

Further, visualization of both plates was carried out By using iodine chamber.

By comparing the RF value of both the plates i.e., control and test, Drug content in Medicated chocolate

**RESULT AND DISCUSSION:**

| Parameters | F1 | F2 | F3 |
|---|---|---|---|
| Colour | Brown | Brown | Brown |
| Odour | Chocolaty | Chocolaty | Chocolaty |
| Taste | Sweet and slightly Better | Sweet and slightly Better | Sweet and slightly Better |
| Mouth feel | Smooth | Smooth | Smooth |
| Appearance | Glossy | Glossy | Glossy |

.

**Dimensions:-**

It was measured by Vernier's callipers

Avg. Width of 5 chocolate formulations. $\frac{1.85+1.90+1.84+1.85+1.86}{5}$

**The average width of 5 chocolate is observed to be = 1.86 Weight variation determination:-**

Average Weight of 5 formulations: $\frac{W1+W2+W3+W4+W5}{5}$

Average weight calculated to be (for batch 3) $=\frac{5.9+5.8+5.6+5.7+5.9}{5}$

Average weight calculated to be (for batch 3) **= 5.78gm**

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**Stability study:-**

F3batch was selected for stability study.

Stability of the chocolate is evaluated by studying it with appropriate storage conditions of nearly 2-8°C at time of preparation and after 15days of storage at given storage conditions

**pH of chocolate formulation:**

| Formulation | F1 | F2 | F3 |
|---|---|---|---|
| pH | 6.41 | 6.26 | 6.35 |

## II. CONCLUSION

In the present study, development of Herbal Chocolate having antioxidant activity was carried out. Aqueous extract of Tulsi leaves was prepared and phytochemical analysis was carried out to check the presence of desired compounds that shows the acceptable results.From above study, we concluded that the chocolate provides smooth and creamy texture to the formulation and are good for masking the unpleasant taste associated with some drugs.Also, good oral drug delivery system to gives therapeutic effect.

The resulting chocolate exhibited good appearance and smooth texture among the different batches ,the **F2 batch** demonstrated optical hardness and stability.

Multivitamin and antioxidant herbal chocolate represents an innovative fusion of wellness and indulgence. By combining the rich flavor and mood-enhancing properties of premium chocolate with the health-supportive benefits of herbal extracts and essential micronutrients, this functional treat offers a unique solution for health-conscious consumers. It not only satisfies the palate but also supports overall vitality, immune function, and cellular protection through a synergistic blend of vitamins, minerals, and plant-based antioxidants.

Proper formulation, packaging, and storage are crucial to maintain the efficacy of active ingredients and ensure a high-quality, stable product. With growing demand for convenient, natural wellness solutions, herbal multivitamin chocolate stands out as both a delicious and functional alternative in the nutraceutical and confectionery markets**.**

## REFERENCES

**[1].** Stephen A. Gravina, Gregory L. Yep, Mehmood Khan. Human Biology of Taste, 2013; volume 33 Pg no.217

**[2].** Niroumand, M. C., Heydarpour, F., & Farzaei, M. H. (2018). Pharmacological and therapeutic effects of Vitex agnuscastus L.: A review. Pharmacognosy Reviews, volm.12 pg.no.(23).

**[3].** Ranasinghe, P., Pigera, S., Premakumara, G. S., Galappaththy, P., Constantine, G. R., & Katulanda, P. (2013). Medicinal properties of 'true'cinnamon (Cinnamomum zeylanicum): a systematic review.BMC complementary and alternative medicine, volume 13(1),pg.no 275.

**[4].** Pandey, G., & Madhuri, S. (2010). Pharmacological activities of Ocimum sanctum (tulsi): a review. Int J Pharm Sci Rev Res,volm 5(1),pg.no 61-66.

**[5].** Konar, N., Toker, O. S., Oba, S., & Sagdic, O. (2016). Improving functionality of chocolate: A review on probiotic, prebiotic, and/or synbiotic characteristics. Trends in Food Science & Technology, 49, 35-44.

**[6].** Palpu, P., Rawat, A. K. S., Rao, C. V., Ojha, S. K., & Reddy, G. D. (2007). U.S. Patent No. 7,247,322. Washington, DC: U.S. Patent and Trademark Office.

**[7].** Rajesh. H, Rao S. N, Prathima. K. Shetty, Megha Rani. N, Rejeesh E.P, Lovelyn Joseph.2013 Phytochemical analysis of aqueous extract of ocimum sanctum linn. International Journal of Universal Pharmacy and Bio Sciences, volm 2(2): pg.no.462-468

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onal Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
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**[8].** Firoj A. Tamboli, Harinath N. More.2016 Evaluation of Anti ulcer and Antioxidant activity of Barleria gibsoni Dalz. Leaves. Pharmcognosy Research, volume 8(4): pg.no 226-230.

**[9].** Tamboli F, Rangari V, Killedar S, Jadhav S, Ghatage T, Kore V. Comparative phytochemical evaluation of natural and micropropagated plants of Bacopa monnieri (L.). Marmara Pharm J, 2018; 22(1): 66-73

**[10].** Kasote DM, Katyare SS, Hegde MV, Bae H.2015 Significance of Antioxidant Potential of Plants and its Relevance to Therapeutic Applications. International Journal of Biological Sciences, (2015): pg.no.982-991.

**[11].** Mahajan N, Rawal S, Verma M, Poddar M, Alok S.2013 A phytopharmacological overview on Ocimum species with special emphasis on Ocimum sanctum. volm 3: 185–92.

**[12].** Vishal P, Shivendra Kumar D, Yusuf Ali J.2012 Chocolates as dosage form- an overview. International Journal of Pharmaceutical and Research Sciences. 1(6): 397-412.

**[13].** Jayaprakasha G.K, Rao L.J.M. Chemistry, biogenesis, and biological activities of Cinnamomum zeylanicum ,Critical Reviews in Food Science and Nutrition. (2011), 51(6): 547–562.

**[14].** Geng S, Cui Z, Huang X, Chen Y, Xu D, Xiong P.2011 Variations in essential oil yield and composition during Cinnamomum cassia bark growth. Industrial Crops and Products. 33(1):248–252.

**[15].** .Lobo V, Patil A, Phatak A, Chandra N. Free radicals, antioxidants and functional foods: Impact on human health, (2010): 118-26.

**[16].** Kothari, S K; Bhattacharya, A K, "Volatile Constituents in Oil from Different Plant Parts of Methyl Eugenol-Rich Ocimum tenuiflorum" Journal of Essential Oil Research, 2008: 09-05.

**[17].** Mathew S, Abraham TE. Studies on the antioxidant activities of cinnamon (Cinnamomumverum) bark extracts, through various in vitro models. Food Chemistry. 2006, 94(4): 520–528