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Research Article

Formulation and Evaluation of Herbal Multivitamin Gummies

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ABSTRACT

This study focuses on the formulation and evaluation of Herbal Multivitamin Gummies enriched with natural ingredients including Moringa, Beetroot, Orange Peel Powder, Honey, and Jaggery. These components were selected for their unique nutritional and therapeutic benefits, such as antioxidant, anti-inflammatory, immune-boosting, and cardiovascular-supporting properties. Moringa oleifera, known as the "Miracle Tree," offers a rich source of vitamins A, B, C, D, E, calcium, iron, potassium, and antioxidants, while Beetroot supports blood circulation and Orange Peel Powder contributes high levels of vitamin C, flavonoids, and fiber for immune and digestive health. Jaggery provides essential minerals and acts as a natural sweetener, and Honey adds antibacterial and antioxidant benefits, enhancing both taste and nutritional value. Two formulations (F1 and F2) were prepared using Agar-Agar as a gelling agent. The method involved heating the ingredients, followed by molding into gummies of various shapes. The prepared gummies were evaluated for physical appearance, pH, swelling index, and ash value. Both formulations showed favorable organoleptic properties with a pleasant odor, light brown color, and glossy appearance. The pH ranged from 7.15 to 7.22, indicating a slightly alkaline nature. Swelling index tests demonstrated good water absorption capacity, and ash value analysis provided insight into the mineral content. Overall, the study highlights the successful incorporation of herbal and natural ingredients into multivitamin gummies, offering a functional, palatable, and health-boosting supplement suitable for daily consumption.

INTRODUCTION

Introducing our Herbal Multivitamin Gummies, a powerful blend of nature's most nourishing

ingredients, designed to boost your health and vitality. These delicious gummies are infused with Moringa, Beetroot, Orange Peel Powder, and Honey. Each carefully selected for its unique

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health benefits. our Herbal Multivitamin Gummies, a delightful and convenient way to nourish your body with the power of nature. Formulated with a carefully selected blend of potent herbal ingredients, these gummies provide a comprehensive range of essential vitamins and minerals to support your overall health and well-being. Each gummy is made with a special blend of potent components, such as honey, orange peel powder, beetroot, and moringa. Because of its high nutrient density, moringa is a plant that is rich in vitamins and minerals that support vitality, energy, and immunological function. Beetroot promotes cardiovascular health and improves blood circulation. While honey gives extra antioxidants and antibacterial properties, orange peel powder naturally boosts the immune system with vitamin C and antioxidants. With each mouthful, our Herbal Multivitamin Gummies deliver the most potent nutrients found in nature, supporting your daily wellness routine in an easy and fun way. These candies are the ideal complement to your lifestyle, whether your goal is to increase vitality, boost energy, or strengthen your immune system. Discover the inherent health benefits of herbs and botanicals with each gummy and experience the difference.

Bioactive substances obtained from food sources, known as nutraceuticals, have medicinal qualities that can alter the immune system. Herbal Multivitamin Gummies, a powerful blend of nature's most nourishing ingredients, designed to boost human health and vitality. These delicious gummies are infused with Moringa, Beetroot, Orange Peel Powder, and Honey. each carefully selected for its unique health benefits. Each gummy is made with a special blend of potent components, such as honey, orange peel powder, beetroot, and moringa. Because of its high nutrient density, moringa is a plant that is rich in vitamins and minerals that support vitality, energy, and

immunological function. Beetroot promotes cardiovascular health and improves blood circulation. While honey gives extra antioxidants and antibacterial properties, orange peel powder naturally boosts the immune system with vitamin C and antioxidants.

Moringa oleifera., originally from India, thrives in tropical and subtropical climates worldwide. Commonly referred to as the 'drumstick tree' or 'horseradish tree,' it is resilient to both extreme drought and light frost, making it widely cultivated globally. Due to its exceptional nutritional profile, nearly every part of the plant serves either dietary or commercial purposes. The leaves are especially rich in vitamins, minerals, and vital phytochemicals. Leaf extracts are used to combat malnutrition and enhance lactation in nursing mothers. Moringa exhibits numerous therapeutic properties, including antioxidant, anticancer, anti-inflammatory, antidiabetic, and antimicrobial effects. Its seeds act as natural coagulants and are commonly employed in water purification. This study highlights the potential of *M. oleifera* in managing diabetes and cancer and explores its incorporation into commercial products. The review also delves into its cultivation methods, nutritional benefits, commercial applications, and significant pharmacological properties, reinforcing its reputation as a "Miracle Tree." [1] Moringa powder's high nutrient content makes it an essential part of multivitamin candies meant to promote optimal health. This natural superfood is made from the leaves of the *Moringa oleifera* tree, sometimes known as the "Miracle Tree," and is packed with essential vitamins, minerals, and antioxidants. Moringa powder, which is high in calcium, iron, potassium, vitamin A, and vitamin C, offers a variety of minerals that promote healthy bones, vitality, and immune system performance. Additionally, its potent antioxidant content helps combat oxidative stress and protects the body from

harmful free radicals. According to studies, moringa can help lower inflammation, support heart health, and even improve blood sugar regulation.^[2] *M. oleifera* contains a variety of vitamins, including beta-carotene (a precursor of vitamin A), B vitamins such as folic acid, pyridoxine, and nicotinic acid, as well as vitamins C, D, and E.^[3] Each part of *M. oleifera* serves as a reservoir of essential nutrients and antinutrients. Its leaves are particularly abundant in minerals such as calcium, potassium, zinc, magnesium, iron, and copper.^[4]

Orange peels are actually packed with various vitamins and nutrients that can benefit health. Similar to the fruit, the peels are notably high in vitamin C, also known as ascorbic acid. This powerful antioxidant is well-known for its role in protecting cells from damage caused by oxidative stress and free radicals.^[5] Orange Peel Powder is a potent and nutrient-rich ingredient that enhances the nutritional profile of multivitamin gummies. Derived from the peel of oranges, it is packed with beneficial compounds, including high levels of Vitamin C, flavonoids, fiber, and essential oils, which contribute to a wide range of health benefits. The high Vitamin C content in Orange Peel Powder plays a crucial role in boosting the immune system, promoting collagen production for healthy skin, and protecting the body from oxidative stress.^[6] In addition to Vitamin C, the flavonoids in orange peel, such as hesperidin and polymethoxyflavones, are known for their antioxidant and anti-inflammatory properties, which may help reduce the risk of chronic diseases like heart disease and cancer.^[7] Research also highlights the potential of Orange Peel Powder to improve digestion and support gut health. The fiber in the peel aids in promoting healthy bowel movements and supporting a balanced gut microbiome, which is essential for overall digestive health.^[8] Including Orange Peel Powder

in multivitamin gummies provides a natural, enjoyable way to enjoy the many health benefits of this citrus powerhouse. Whether you are looking to boost your immune system, support your skin's health, or improve digestion, Orange Peel Powder offers an effective and natural solution. According to the research, orange peels have been exhibited to contain trace amounts of several B vitamins, such as thiamine (B1), riboflavin (B2), niacin (B3), vitamin B6, and folate (B9)^[9] Orange peels are also considered a good source of vitamin E, a fat-soluble antioxidant. One potential benefit of this compound is its ability to safeguard cell membranes against oxidative damage, which can have detrimental effects on cellular function. Additionally, this compound may contribute to the maintenance of healthy skin.^[10]

Jaggery is rich in essential minerals like iron, calcium, magnesium, and potassium. It is also known for its high antioxidant content, which can help combat oxidative stress in the body. Unlike refined sugar, jaggery provides a slower release of energy, making it a better option for those looking for a natural source of sweetness with added health benefits. The integration of jaggery into multivitamin gummies may offer an improved alternative to sugar-laden gummy formulations, thus appealing to health-conscious consumers. Several studies have highlighted the potential health benefits of jaggery. For instance, research indicates that jaggery can support digestion, promote liver health, and enhance immune function due to its high mineral and vitamin content.^[11] Additionally, jaggery's ability to improve blood circulation and its natural detoxifying properties further boost its appeal as an ingredient in health supplements.^[12]

Honey is a natural sugar that has been used for centuries due to its potential to boost energy and support various bodily functions. By incorporating honey into herbal multivitamin gummies,



manufacturers can offer a sweetener that has additional nutritional benefits compared to refined sugars.^[13]





The addition of honey can complement the therapeutic properties of herbal ingredients. For example, honey's antibacterial and anti-inflammatory properties can enhance the effectiveness of herbs like echinacea, elderberry, or ginger, which are commonly found in immune-boosting multivitamins.^[14] Honey has also been shown to work synergistically with herbal components to improve digestive health.^[15]


Honey is rich in antioxidants, including flavonoids and phenolic compounds, which can help

neutralize harmful free radicals in the body. When combined with herbal ingredients like turmeric, ginseng, or green tea—which also have antioxidant properties—honey adds a potent synergistic effect in herbal multivitamin gummies.^[16]

One of the primary reasons for including honey in herbal multivitamin gummies is its ability to naturally enhance the flavor. Many herbal extracts can have a bitter or strong taste, which may deter consumers from taking them regularly. Honey's natural sweetness can mask these flavors, making the gummies more palatable and easier for consumers, especially children or those with sensitive tastes, to consume.^[17]

Table 1: Benefits of herbal drugs used in formulation of multivitamin gummies

Sr. No	Sources	Biological Source	Images	Therapeutic uses	Vitamins
1.	Beet Root	Roots of plant <i>Beta vulgaris rubra</i> (<i>Amaranthaceae</i>)		Anti-oxidant, Anti-inflammatory, improve digestion and improve blood flow	vitamin B6 , riboflavin, thiamine, and niacin. ^[18]
2.	Orange Peel powder	Dried or fresh outer rind of the ripe fruit of <i>Citrus sinensis</i> (L.) Osbeck, which belongs to the family Rutaceae .		antioxidant, anti-inflammatory, and cardioprotective potential.	B-complex vitamins like thiamine, riboflavin. ^[19-23]
3.	Moringa Powder	Leaves of plant <i>Moringa olifera</i> .		supports vision, immune function, and skin health, energy metabolism, red blood cell formation, and nervous system maintenance	Vitamin A, C E, B-complex vitamins (B1, B2, B3, B6, and folate) ^[24]
4.	Honey	honeybees (<i>Apis mellifera</i> species) from the nectar of flowers		Natural sweetener, Antioxidant activity,	complex vitamins (niacin, riboflavin, pantothenic acid) and vitamin C ^[25-27]

5.	Jaggery	Jaggery is obtain from sugarcane.		It is used as sweetner it contains carbohydrates, support energy metabolism and nervous system health.	B-complex vitamins: such as niacin, riboflavin, folate, and thiamine, Vitamin A ^[28-30]
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MATERIAL AND METHOD

Material:

The main material used in this study beetroot powder, moringa powder, orange peel powder, honey and jiggery (Figure 1), procured from local market of Kopargaon, Ahilyanagar and passed through a 500-mesh screen after grinding. The other excipients used were pharmaceutical grade or food-grade, namely Agar-agar a gelling agent

Method:

Table 2: Formulation table

Sr. No.	Ingredients	Quantity (F1)	Quantity (F2)
1	Orange peel	2gm	1 gm
2	Beetroot powder	2gm	1 gm
3	Moringa powder	1gm	2 gm
4	Honey	3gm	6 gm
5	Jaggery	15gm	7.5 gm
6	Agar-Agar (Gelling agnt)	2gm	4 gm
7	Water	q.s.	q.s.

Method of Preparation for Multivitamin Gummies:

- 1) All ingredients were weighed in the required quantity. A beaker was placed on a heating mantle, and 50 ml of water was added to the beaker. Agar-Agar powder, used as the gelling agent in the formulation, was added to the water and the mixture was heated up to 70°C.

Jaggery, used as the sweetening agent, was then added and stirred with a glass rod.

- 2) Moringa powder, orange peel powder, beetroot powder, and honey were subsequently added to the mixture, and constant stirring was maintained until a uniform mixture was developed in the beaker.
- 3) The heating mantle was then turned off, and the beaker was placed in cooled water to allow the mixture to cool.
- 4) The mixture was then transferred into silicone molds in various shapes, such as teddy bear and star shapes, and left at room temperature for 15 minutes. Afterward, the gummies were carefully removed from the molds.
- 5) The gummies were taken out of the molds and their physical properties were examined.
- 6) Finally, the gummies were stored at room temperature for one day for observation and further evaluation.

Evaluation Parameters of Herbal Multivitamin Gummies:

1. Physical Appearance

The visual characteristics of the formulated gummies were evaluated through inspection to determine color, clarity, uniformity, and surface consistency. To assess tactile attributes such as grittiness and stickiness, the gummy was gently rubbed between the thumb and index finger.



2. pH Measurement

The pH of the gummies was determined using a digital pH meter. A gummy sample was dissolved in distilled water, and the electrode of the pH meter was immersed in the solution to obtain the pH reading.

3. Swelling Index

The swelling capacity was evaluated by calculating the difference in gummy weight before and after immersion in water, indicating the amount of water absorbed. Initially, the gummy's weight was recorded (W_0). It was then soaked in 100 mL of distilled water at room temperature (25–30°C) for 10 seconds. After removal, excess surface water was gently blotted with filter paper and the gummy was weighed again (W_s). The swelling ratio was determined using the formula: W_s = weight of chewable gummy after soaking.

W_0 = weight of chewable gummy before soaking.

$$\text{Swelling ratio} = \frac{\text{Weight at time } t}{7.00}$$

6. Ash Value Determination

To determine the ash content, 3 g of the gummy sample was placed in a silica crucible and

incinerated over a flame until completely charred. The residue was then transferred to a muffle furnace and heated at 600–650°C for approximately 6 hours until white, carbon-free ash remained. The ash was cooled, filtered, and weighed. The percentage of ash was calculated using the formula:

$$\% \text{ Ash} = \frac{[(\text{Initial Weight} - \text{Final Weight}) / \text{Initial Weight}] \times 100}$$

RESULT AND DISCUSSION:

1. Organoleptic Properties:

Table 3: Organoleptic Properties

Parameters	Observation
Colour	Light brown
Odour	Pleasant
Appearance	Glossy, uniform, no visible granules or separation

2. pH Test

Table 4: pH test of both batches

Sr. No.	Batch	Observation
1.	F1	7.15
2.	F2	7.22

3. Swelling ratio

Table 5: Swelling ratio of both batches

Time (sec)	F1 weight	F1 Swelling ratio	F2 weight	F2 Swelling ratio
0	7.01	1.00	7.1	1.01
10	7.2	1.02	7.23	1.03
20	7.4	1.05	7.45	1.06
30	7.5	1.07	7.60	1.08
40	7.65	1.09	7.78	1.11
50	7.77	1.11	7.85	1.21
60	7.85	1.21	7.94	1.13
70	7.95	1.13	8.1	1.15



4. Ash value

$$\% \text{ASH} = (\text{Weight of ash} / \text{initial weight of sample}) * 100$$

Initial weight of sample F1 = 7.01 gm

F2 = 7.23 gm

Final weight of ash F1 = 1.02 gm

F2 = 1.06

$$\% \text{Ash F1} = (\text{Weight of ash} / \text{initial weight of sample}) * 100$$

$$= 1.02 / 7.01 * 100$$

$$= 14.55 \%$$

$$\% \text{Ash F2} = (\text{Weight of ash} / \text{initial weight of sample}) * 100$$

$$= 1.06 / 7.23 * 100$$

$$= 14.66 \%$$

Table 6: Ash value

Batch	Ash Value %
F1	14.55%
F2	14.66 %

DISCUSSION

The formulated Herbal Multivitamin Gummies (F1 and F2), enriched with Moringa, Beetroot, Orange Peel Powder, Jaggery, and Honey, were thoroughly evaluated for their physical and physicochemical properties to assess their quality and suitability as nutraceutical supplements. Both batches exhibited a **light brown color, pleasant odor, and glossy, uniform appearance** with no visible granules or phase separation. This suggests that the formulations had good aesthetic appeal and homogeneity, which are important parameters for consumer acceptability, particularly in chewable and confectionery dosage forms. The pH values for batch F1 (7.15) and F2 (7.22) were slightly alkaline. This slightly basic pH may help in maintaining the stability of certain vitamins (like B-group vitamins) and reduce the risk of dental erosion compared to acidic formulations. It

also indicates that the herbal components did not significantly acidify the product, and the pH remained within a physiologically acceptable range. The swelling behavior demonstrated gradual water absorption over time, with the swelling ratio increasing from approximately 1.00 at the start to 1.21 in F1 and 1.15 in F2 at 70 seconds. This suggests that the gummies have good water-holding capacity, likely due to the presence of agar-agar as the gelling agent and fiber-rich components like orange peel and beetroot. Such swelling behavior can influence the mouthfeel, texture, and release profile of the active ingredients. The ash values were found to be **14.55% for F1 and 14.66% for F2**, indicating the presence of significant mineral content from natural sources like Moringa, Jaggery, and Beetroot. The ash value reflects the total amount of inorganic material (minerals) remaining after complete combustion and is an important quality control parameter for herbal formulations. The slightly higher ash value in F2 can be attributed to its higher Moringa content, which is particularly rich in minerals such as calcium, iron, potassium, and magnesium. Overall, both formulations demonstrated **good physical stability, uniformity, and mineral content**, confirming that herbal and natural ingredients can be effectively incorporated into multivitamin gummy formulations. These gummies have the potential to serve as palatable and convenient nutraceutical supplements that combine both health benefits and consumer appeal.

CONCLUSION

The development of multivitamin gummies using moringa powder, beetroot powder, orange peel powder, jaggery, honey, and agar-agar offers a fresh and natural approach to dietary supplementation. These gummies are notable for their high nutritional value, pleasant taste, and chewable form, making them suitable for both



children and adults. The carefully selected ingredients provide a balanced mix of vitamins, minerals, antioxidants, and dietary fiber. By incorporating traditional, nutrient-dense components like moringa and jaggery, the gummies present a more holistic alternative to conventional synthetic multivitamin tablets. Additionally, the exclusion of artificial flavors, colors, and refined sugars aligns with the rising consumer preference for clean-label, natural health products. The preparation method is straightforward, adaptable for small-scale or home production, and can also be scaled up for commercial manufacturing. Using agar-agar as the gelling agent offers a vegetarian-friendly, stable texture, while natural preservatives help maintain product safety and extend shelf life.

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