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Formulation and Evaluation of Energy Booster Powder from Moringa oleifera Leaves

Ms. Kalyani G. Avhale, Mr. Shivprasad S. Deokar, Mr. Rahul S. Mohan,

Ms. Mayuri P. Lodha, Ms. Shivani V. Matsagar

Nandkumar Shinde College of Pharmacy Vaijapur, Maharashtra-423701.

Abstract:

This study focuses on the formulation and evaluation of an energy booster powder derived from Moringa oleifera leaves, a plant renowned for its exceptional nutritional and medicinal properties. The aim is to develop a natural, plant-based supplement that can enhance energy levels and overall vitality. Moringa oleifera leaves were collected, dried, and processed into fine powder, then blended with other natural ingredients such as dried fruits, cereals, and herbs to improve palatability and nutritional profile. The formulated product was evaluated for its physicochemical properties, including moisture content, pH, bulk density, and flowability, as well as nutritional composition such as protein, carbohydrate, fat, fiber, vitamins, and minerals. Sensory evaluation was also conducted to assess taste, texture, color, and overall acceptability. Results indicated that the energy booster powder is rich in essential nutrients and bioactive compounds, with high acceptability among the panelists. The findings support the potential of Moringa oleifera-based formulations as effective natural energy supplements, promoting health and wellness.

Keyword: Energy booster, Moringa oleifera, liquorice root, beet root, banana powder, black salt.

Introduction:

In today's fast-paced world, maintaining consistent energy levels throughout the day has become a significant challenge for individuals of all age groups. Increased academic, professional, and personal demands often lead to physical and mental fatigue, necessitating the need for energy-boosting supplements. Traditionally, synthetic energy products have been used to combat fatigue; however, the growing awareness about the side effects and long-term health risks associated with chemical-based supplements has shifted the focus toward natural and plant-based

alternatives[1]. In this context, the development of energy booster powders from natural sources has gained considerable attention, with Moringa oleifera emerging as a promising candidate due to its exceptional nutritional and therapeutic properties.

Moringa oleifera, commonly referred to as the drumstick tree, horseradish tree, or simply moringa, belongs to the family Moringaceae[2]. It is native to the Indian subcontinent and widely cultivated across tropical and subtropical regions around the world. Moringa is often termed a "miracle tree" because almost every part of the plant, including the leaves, seeds, pods, flowers, and roots, is known for its high nutritional value and medicinal uses[3]. Among these, the leaves are particularly renowned for their rich composition of essential nutrients and bioactive compounds that contribute to enhancing energy levels, improving immunity, and supporting overall health.

The leaves of Moringa oleifera are an abundant source of vitamins such as Vitamin A, Vitamin C, and Vitamin E, minerals like calcium, potassium, magnesium, and iron, high-quality plant proteins, and a variety of phytochemicals including flavonoids, phenolic acids, and glucosinolates. These components play a crucial role in combating oxidative stress, reducing inflammation, enhancing metabolic functions, and boosting stamina and vitality naturally[4]. The high iron content in moringa leaves helps in preventing anemia—a common cause of fatigue—while the abundance of antioxidants aids in protecting cells from damage caused by free radicals, thus promoting sustained energy levels[5].

Energy booster powders are intended to deliver immediate and prolonged energy by supporting metabolic pathways, enhancing nutrient absorption, and minimizing fatigue without causing harmful side effects[6].

The use of moringa in health supplements aligns with several Sustainable Development Goals (SDGs) outlined by the United Nations, particularly those focusing on good health and well-being (SDG 3), zero hunger (SDG 2), and responsible consumption and production (SDG 12)[7]. Therefore, promoting the use of moringa as a natural energy booster not only benefits individual health but also contributes positively to broader global health and environmental goals.

Advantages of Energy Booster Powder from Moringa Leaf:

a) Rich Natural Source of Nutrients:

Moringa leaves contain high amounts of proteins, essential amino acids, iron, calcium, potassium, magnesium, and vitamins (A, C, E, and B-complex), all vital for energy production and stamina[8].

b) Boosts Physical Energy Naturally:

Unlike synthetic energy boosters that rely on caffeine or sugar, Moringa provides sustained energy by improving metabolic function and supporting muscle health[9].

c) Strong Antioxidant Activity:

Moringa is rich in antioxidants like flavonoids, polyphenols, and vitamin C, which help fight oxidative stress, reduce fatigue, and improve recovery time after exertion.

d) Supports Mental Alertness:

The vitamins and minerals in Moringa promote better brain function, memory, and concentration, helping users stay alert and focused.

e) Safe and Non-Toxic:

Being a natural, food-based product, Moringa powder is safe for long-term consumption with minimal or no side effects compared to chemical-based supplements.

f) Improves Immunity and General Health:

Regular intake strengthens the immune system, enhances digestion, and helps maintain overall vitality, providing not just energy but comprehensive health benefits.

g) Convenient and Easy to Use:

The powder form allows easy incorporation into daily routines — it can be mixed with water, smoothies, juices, or food items.

h) Free from Artificial Stimulants:

No caffeine, no added sugars, no artificial colors or preservatives — making it suitable for all age groups, including elderly people and children (with proper dosing).

i) Affordable and Sustainable:

Moringa trees grow quickly even in poor soil and require minimal water, making the final product cost-effective and environmentally friendly.

j) Potential for Combating Malnutrition:

Moringa-based products can help address issues of micronutrient deficiency and malnutrition, especially in developing countries.

k) Enhances Muscle Strength and Endurance:

Due to its protein and iron content, it supports muscle health, hemoglobin production, and better oxygen transport, boosting endurance during physical activities.

l) Natural Anti-inflammatory Properties:

Moringa helps reduce inflammation, aiding faster recovery from fatigue, injuries, or stressrelated exhaustion[10].

Material and Method:

The present research paper deals with the formulation and evaluation of energy booster powder for improving digestive health by using natural ingredients i.e. moringa leaves powder, liquorice root powder, ginger powder, banana powder, beetroot powder and black salt. All the ingredients authenticated at Pharmacognosy department of Nandkumar Shinde College of Pharmacy, Vaijapur. The details of ingredients used to formulate digestive powder is given below:

(I)Moringa leaf:

Fig. 1: Moringa Leaf

- **Synonym:** Drumstick
- **Biological Source:** It is obtained from dried leaves of Moringa oleifera Lam.
- **Family:** Moringaceae
- **Chemical Constituents:** Vitamin, mineral, Proteins and Amino acid, Phenolic Compounds, alkaloids and Tannins, Glucosinolates and Isothiocyanates.
- **Pharmacological Activity:** Moringa may act as an adaptogen, helping the body adapt to stress and fatigue, improving physical endurance and mental clarity.

(II)Liquorice root powder:

Fig. 2: Licorice root powder

- **Synonym:** Glycyrrhiza hirsute, Glycyrrhiza pallida
- **Biological Source:** It is obtained from dried root and stolons of the plant Glycyrrhiza glabra Linn.
- **Family:** Fabaceae
- **Chemical constituent**: Glycyrrhizin, Flavonoids, Isoflavone
- **Pharmacological Activity:** Employed in skin-lightening and anti-aging products due to its antioxidant properties.

(III)Ginger:

Fig. 3: Ginger

- **Synonym:** Gingerin, Rhizoma zingiberis, Zingibere, Ginger Officinale.
- **Biological source:** The ginger is the rhizomes of Zingiber officinale Roscose.
- **Family:** Zingiberaceae
- **Chemical Constituents:** Numerous active ingredients are present in ginger including terpenes and oleoresin which called ginger oil. Ginger also constitutes volatile oils approximately 1% to 3% and non-volatile pungent components oleoresin. The major identified components from terpene are sesquiterpene hydrocarbons and phenolic compounds which are gingerol and shogaol and lipophilic rhizome extracts, yielded potentially active gingerols, which can be converted to shogaols, zingerone, and paradol[13].
- **Pharmacological Activity:** Ginger boosts the secretion of amylase, lipase, and proteases, enhancing carbohydrate, fat, and protein digestion.

(IV)Beetroot:

Fig. 4: Beetroot

- **Synonym:** Chukandar, Garden beet

- **Biological Source:** It is obtained from fresh or dried root of Beta vulgaris Linn.
- **Family:** Amarnathaceae
- **Chemical Constituent:** Betalains, vitamins, minerals, nitrates, sugars and phenolic compounds.
- **Pharmacological Activity:** Beetroot is rich in inorganic nitrates, which are converted in the body to nitric oxide. It relaxes blood vessels, improving blood flow to tissues.

(V)Banana:

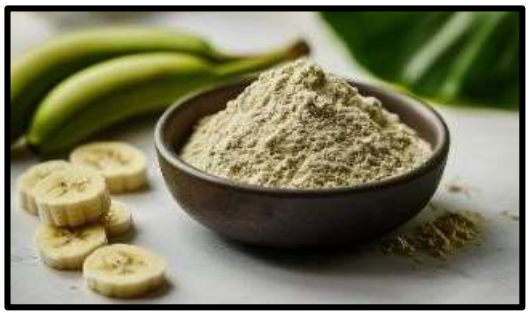

Fig. 5: Banana

- **Synonym:** Plantain, kela
- **Biological Source:** It is obtained from fruit, root, or leaf of the plant Musa paradisiaca Linn.
- **Family:** Musaceae
- **Chemical constituents**: Carbohydrate, Vitamins, Minerals, Fibers, Phenolics and tannins.
- **Pharmacological activity:** Banana not only adds natural sweetness to energy booster powders but also offers several functional health benefits. Its use as a natural sweetener contributes more thanm taste. It provide energy, nutrients**.**

(VI)Black salt:

Fig. 6: Black salt

- **Synonym:** Kala Namak, Sulemani namak
- **Biological source:** It is derived from halite (rock salt), a naturally occurring mineral form of sodium chloride (NaCl), which is mined from salt deposits.
- **Category:** Mineral enhancer

- **Chemical Constituents:** Besides the presence of sodium chloride in larger amounts, this salt also possesses impurities of sodium sulphate, sodium bisulphate, sodium bisulphite, sodium sulphide, iron sulphide and hydrogen sulphide in traceable amounts.
- **Pharmacological Activity:** Black salt provides essential minerals like sodium, potassium, magnesium, calcium and iron which supports overall digestive health.

Method of Preparation:

Collect moringa leaves

↓

The leaves were cleaned and washed with distilled water to remove impurities.

↓

Cleaned leaves were shade dried for 7-10 days to retain bioactive compounds.

↓

The dried leaves were coarsely crushed and then finely powdered using a mechanical mixer.

↓

The powder was passed through sieve no. 80-100 for uniform particle size.

↓

Other herbal ingredients were separately dried, powdered and mixed with the moringa leaves powder in appropriate ratios.

Formulation of Energy Booster Powder:

Table 1: Formulation of Energy Booster Powder

Sr. No.	Ingredients	Quantity	Category
1	Moringa leaves powder	6gm	Antioxidant
2	Liquorice root powder	2.5gm	Anti inflammatory
3	Beet root powder	4gm	Electrolytes
4	Banana powder	4gm	digestive
5	Black salt	0.5gm	Mineral enhancer
6	Ginger powder	3gm	Carminative

Fig. 7: Formulated Energy Booster Powder

Evaluation of Energy booster powder:

I.Organoleptic Evaluation:

The prepared energy booster powder was evaluated for various organoleptic parameters such as color, odour, taste and texture.

II.Physicochemical Evaluation:

The prepared energy booster powder was evaluated for various physicochemical parameters such as pH, moisture content, loss on drying and ash value.

i.pH: Take 1gm of powder and dissolve in 100 ml distilled water. Stir well for about 15-20 minutes and filter if required. Calibrate the pH meter using standard buffer solutions and then insert the electrode into the solution and record the pH once it stabilizes.

ii.Moisture content: Weigh empty dish (w_1). Add 2gm of powder and weigh again (w_2). Put the dish in hot air oven at 105℃ for 3-4 hours. Cool it in a desiccator and weigh again (w_3).

$$\% \text{ Moisture content} = (w_2\text{-}w_3/w_2\text{-}w_1)100$$

iii.Ash value: Weigh empty crucible(w_1). Add 2gm of powder and weigh again (w_2). Heat gently over flame and place in a muffle furnace at 500-600℃ (about 4-6 hours). Cool in desiccator and weigh(w_3)[28].

$$\text{Ash}\% = (w_3\text{-}w_1/w_2\text{-}w_1)100$$

III.Physical Evaluation:

i.Bulk density: Fill the powder into the measuring cylinder and note the volume filled (Bulk volume).

$$\text{Bulk density} = \text{Weight of powder(gm)/Bulk volume(ml)}$$

ii.Tapped density: Fill the powder into the measuring cylinder and tapped 100 times. Note the volume (Tapped volume).

Tapped density = Weight of powder(gm)/Tapped volume(ml)

iii.Carr's Index:

Carr's Index = (Tapped density – Bulk density/ Tapped density)

iv. Hausner ratio:

Hausner ratio = Tapped density/Bulk density

v.Angle of repose: Fill the funnel with powder. Allow powder to fall onto the flat surface, forming a cone. Measure the height(h) of the cone from base to tip. Measure the radius(r) of the cone′s base[29].

Angle of repose = $\tan^{-1}$ (h/r)

Where, h = Height of the cone from base to tip.

r = Radius of the cone′s base.

Result and Discussion:

I.Organoleptic Evaluation:

The formulated energy booster powder was light green in color, characteristic in odour and aromatic in taste with fine and smooth texture.

Table 2: Organoleptic Evaluation

Sr. No.	Parameter	Observation
1	Colour	Light green
2	Odour	Characteristic
3	Test	Aromatic
4	Texture	Fine and smooth

II.Physicochemical Evaluation:

The pH of formulated energy booster powder was found to be 6.70, which indicates that the formulation is slightly acidic and suitable for oral consumption. The moisture content was 7.5%, which indicates the powder is dry and stable. The ash value was within normal range, indicating low impurity level.

Table 3: Physicochemical Evaluation

Sr No	Parameter	Observation
1	PH	6.70
2	Moisture content	7.5%
3	Ash value	6.8%

III.Physical Evaluation

The formulated energy booster powder was tested for flow properties. The Carr's index and Hausner ratio indicates good flow and angle of repose indicates fair flow.

Table 4: Physical Evaluation

Sr. No.	Parameter	Observation
1	Bulk density	20g/ ml
2	Tapped density	18 g/ml
3	Carr's index	11.1 %
4	Hausner ratio	0.9
5	Angle of repose	40.2°

Conclusion:

The present study successfully formulated and evaluated an energy booster powder using Moringa oleifera leaves as the primary ingredient. The formulation demonstrated favorable physicochemical properties, good nutritional content, and stability over time. The presence of essential vitamins, minerals, amino acids, and antioxidants in Moringa oleifera contributes significantly to its energy-boosting and fatigue-reducing properties.

The addition of complementary herbal ingredients such as Ashwagandha, Amla, and black pepper enhanced the overall efficacy, palatability, and bioavailability of the formulation. Functional evaluations, including antioxidant activity and nutritional analysis, confirmed the product's potential as a natural and effective energy supplement.

Microbial and stability studies further validated the product's safety and shelf life under standard storage conditions. Therefore, this formulation presents a promising alternative to synthetic energy boosters, offering a natural, plant-based solution to support physical performance, vitality, and general wellness. Future work may include clinical validation and consumer acceptability studies for commercialization.

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