WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 10, 1023-1051. Research Article ISSN 2277–7105

PREPARATION AND EVALUATION OF HEMATINICS CHOCOLATE

Sneha Surkar[1]*, Dr. Parina Dobariya[2], Dhimesh Vasoya[1], Spenishkumar Patel[1]

[1]Associate Professor, Shree Swaminarayan College of Pharmacy, Swaminarayan University, At & Po. Ahmedabad Mehsana Highway, Saij, Kalol, Gujarat 382725, India.

[2]Associate Professor, Shree Swaminarayan College of Pharmacy, Swaminarayan University, At & Po. Ahmedabad Mehsana Highway, Saij, Kalol, Gujarat 382725, India.

Article Received on
26 March 2025,

Revised on 16 April 2025,
Accepted on 06 May 2025

DOI: 10.20959/wjpr202510-36651

***Corresponding Author**
Sneha Surkar
Associate Professor, Shree Swaminarayan College of Pharmacy, Swaminarayan University, At & Po. Ahmedabad Mehsana Highway, Saij, Kalol, Gujarat 382725, India.

ABSTRACT

In recent years, there has been a growing attraction in innovation methods to address nutritional deficiencies, mainly in the domain of Vita foods. This project report looks at the preparation and evaluation of haemoglobin-enriched chocolates as a potential solution for increasing haemoglobin and treating iron deficiencies, a health concern globally. The project investigates various aspects including the formulation, sensory attributes as well as the nutritional efficacy of haemoglobin chocolate. The preparation of haematinics chocolate involves mixing of haemoglobin, a crucial iron containing protein into chocolate which is loved by almost all the age groups through optimised techniques. The parameters are evaluated systematically to ensure stability of chocolate. Overall, this thesis aims an approach to enhance the nutritional profile of chocolate by addition of our key ingredients Beetroot, Carrot, Moringa powder as well as dry fruits and honey to make it more palatable. The synergistic effects of Beetroot, Carrot, and Moringa powder are explored to enhance nutrition, appearance, with the taste of chocolate while imparting hematinic properties.

KEYWORD: Beetroot Powder, Moringa Olifera, Carrot Powder.

1. INTRODUCTION

According to WHO, Anaemia is a condition in which the number of red blood cells or the haemoglobin concentration within them is lower than normal. Haemoglobin is needed to carry oxygen and if you have too few or abnormal red blood cells, or not enough

haemoglobin, there will be a decreased capacity of the blood to carry oxygen to the body's tissues. This results in symptoms such as fatigue, weakness, dizziness and shortness of breath, among others. The optimal haemoglobin concentration required to meet physiologic needs varies by age, sex, elevation of residence, smoking habits and pregnancy status. Anaemia may be caused by several factors: nutrient deficiencies through inadequate diets or inadequate absorption of nutrients, infections (e.g. malaria, parasitic infections, tuberculosis, HIV), inflammation, chronic diseases, gynaecological and obstetric conditions, and inherited red blood cell disorders. The most common nutritional cause of anaemia is iron deficiency, although deficiencies in folate, vitamins B12 and A are also important causes.

Anaemia is a serious global public health problem that particularly affects young children, menstruating adolescent girls and women, and pregnant and postpartum women. WHO estimates that 40% of children 6–59 months of age, 37% of pregnant women, and 30% of women 15–49 years of age worldwide are anaemic.

The WHO Regions of Africa and South-East Asia are most affected with an estimated 106 million women and 103 million children affected by anaemia in Africa and 244 million women, and 83 million children affected in South-East Asia.

Signs and symptoms

Anaemia causes symptoms such as fatigue, reduced physical work capacity, and shortness of breath. Anaemia is an indicator of poor nutrition and other health problems.

Common and non-specific symptoms of anaemia include

- tiredness
- dizziness or feeling light-headed
- cold hands and feet
- headache
- Shortness of breath, especially upon exertion.

Severe anaemia can cause more serious symptoms including

- Pale mucous membranes (in the mouth, nose etc.)
- pale skin and under the fingernails
- rapid breathing and heart rate
- dizziness when standing up

- bruising more easily

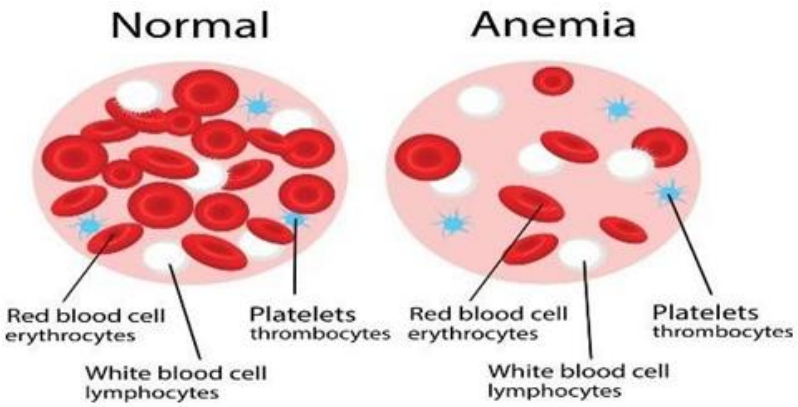

Figure 1: Blood Cells.

Iron deficiency anaemia is a common type of anaemia — a condition in which blood lacks adequate healthy red blood cells. Red blood cells carry oxygen to the body's tissues. Complications Mild iron deficiency anaemia usually doesn't cause complications. However, left untreated, iron deficiency anaemia can become severe and lead to health problems, including the following

- **Heart problems.** Iron deficiency anaemia may lead to a rapid or irregular heartbeat. Your heart must pump more blood to compensate for the lack of oxygen carried in your blood when you're anaemic. This can lead to an enlarged heart or heart failure.

- **Problems during pregnancy.** In pregnant women, severe iron deficiency anaemia has been linked to premature births and low birth weight babies. But the condition is preventable in pregnant women who receive iron supplements as part of their prenatal care.

- **Growth problems.** In infants and children, severe iron deficiency can lead to anaemia as well as delayed growth and development. Additionally, iron deficiency anaemia is associated with an increased susceptibility to infections.

Prevention

You can reduce your risk of iron deficiency anaemia by choosing iron-rich foods.

Fruits and Vegetables High in Iron

The 2020-2025 Dietary Guidelines for Americans recommends consuming 1.5 to 2.5 cups of fruits and 2 to 4 cups of vegetables daily. These fruits and veggies are good sources of non-

heme iron:

- Beet
- Broccoli
- Spinach
- Peas
- Raisins

Nuts and Seeds High in Iron

Nuts and seeds are nutritional powerhouses, containing healthy fats, fibre, and protein and compounds that support cardiovascular health. The following options are rich in iron:

- Almonds
- Cashews
- Pistachios
- Pine nuts
- Peanut

1.1 BEETROOT POWDER

- Beetroots are a good source of nutrients, fiber, and many plant compounds. The health benefits of this vegetable include improved heart health, the ability to reduce blood pressure, and enhanced exercise capacity.
- Beetroot (*Beta vulgaris*) is a root vegetable also known as red beet, table beet, garden beet, or just beet.
- Packed with essential nutrients, beetroots are a great source of fiber, folate (vitamin B9), manganese, potassium, iron, and vitamin C.
- Beetroots and beetroot juice have been associated with numerous health benefits, including improved blood flow, lower blood pressure, and increased exercise performance
- Many of these benefits are due to their high content of inorganic nitrates.
- Their leaves — known as beet greens — can also be eaten.
- There are numerous types of beetroot — yellow, white, pink, or dark purple.

NUTRITIONAL FACTS

Beetroot powder nutrition is rich in carbohydrates, protein, fibre, Magnesium, Phosphorus, loads of vitamins, namely Vitamin A, Vitamin C, Vitamin B6, Iron, folate, calcium.

According to the USDA Agricultural Research Data, There are 20 g of fibre, 80 g of carbs, and 20 g of protein in one portion of Beetroot powder.

Figure 2: BEET.

VITAMINS AND MINERALS

Beetroots are a great source of many essential vitamins and minerals.

- **Folate (vitamin B9).** One of the B vitamins, folate is important for normal tissue growth and cell function. It's particularly necessary for pregnant women.
- **Manganese.** An essential trace element, manganese is found high amounts in Beetroot.
- **Potassium.** A diet high in potassium can lead to reduced blood pressure levels and positive effects on heart health.
- **Iron.** An essential mineral, iron has many important functions in your body. It's necessary for the transport of oxygen in red blood cells.
- **Vitamin C.** This well-known vitamin is an antioxidant that is important for immune function and skin health.

Other Plant Compounds

Plant compounds are natural plant substances, some of which may aid health. The main plant compounds in beetroots are:

- **Betanin.** Also called beetroot red, betanin is the most common pigment in beetroots, responsible for their strong red color. It is believed to have various health benefits.
- **Violaxanthin**. A yellow or orange pigment found in beetroots and yellow beets.

Inorganic nitrate. It includes nitrates, nitrites, and nitric oxide. Beetroots and beetroot juice are exceptionally high in nitrates.

Research shows that diets rich in nitrites and nitrates can have positive health effects, including lower blood pressure levels and decreased risk of many diseases. Our body can convert dietary nitrates — into nitric oxide. This substance travels through artery walls, sending signals to the tiny muscle cells around arteries and telling them to relax. When these muscle cells relax, blood vessels dilate, and blood pressure goes down.

Health benefits of Beetroot

- Lower blood pressure: Beetroot helps to reduce blood pressure by using organic nitrates.
- Increase exercise capacity: Numerous studies suggest that nitrates can enhance physical performance, particularly during high-intensity endurance exercise.
- Dietary nitrates have been shown to reduce oxygen use during physical exercise by affecting the efficiency of mitochondria, the cell organs responsible for producing energy.

1.2 MORINGA OLIEFERA

- *Moringa oleifera* is a large tree native to North India
- Almost all parts of the tree are eaten or used as ingredients in traditional herbal medicine.
- Moringa oleifera is rich in antioxidants. Like quercetin and cholinergic acid which help to lower blood pressure.
- Moringa also helps to lower blood sugar level. According to one study 30 women showed that taking 1.5 teaspoons (7 grams) of moringa leaf powder every day for three months reduced fasting blood sugar levels by 13.5%, on average. It is due to the presence of isothiocyanates.

Vitamin & Mineral Content of Moringa All values are per 100 grams of edible portions		
	Fresh Leaves	Dried Leaves
Vitamin A	6.78 mg	18.9 mg
Niacin (B3)	0.8 mg	8.2 mg
Riboflavin (B2)	0.05 mg	20.5 mg
Thiamine (B1)	0.06 mg	2.64 mg
Vitamin C	220 mg	17.3 mg
Calcium	440 mg	2,003 mg
Carbohydrates	12.5 g	38.2 g
Protein	6.70 g	27.1 g
Calories	92 cal	205 cal
Copper	0.07 mg	0.57 mg
Fat	1.70 g	2.3 g
Fiber	0.90 g	19.2 g
Iron	0.85 mg	28.2 mg
Magnesium	42 mg	368 mg
Phosphorus	70 mg	204 mg
Potassium	259 mg	1,324 mg
Zinc	0.16 mg	3.29 mg

Table 1: Nutritional value of moringa.

- Moringa is also responsible for lowering blood sugar levels.
- Moringa oleifera may help to lower blood pressure
- Moringa oleifera may reduce cholesterol level.
- Moringa oleifera reduces inflammation.
- Inflammation is the body's natural response to infection or injury. It's an essential protective mechanism but may become a major health issue if it continues over a long period of time. Scientists believe that isothiocyanates are the main anti-inflammatory compound.
- Moringa oleifera may protect against arsenic toxicity.
- Arsenic contamination of food and water is a problem in many parts of the world.
- Moringa leaves are also highly nutritious and should be beneficial for people who are lacking in essential nutrients

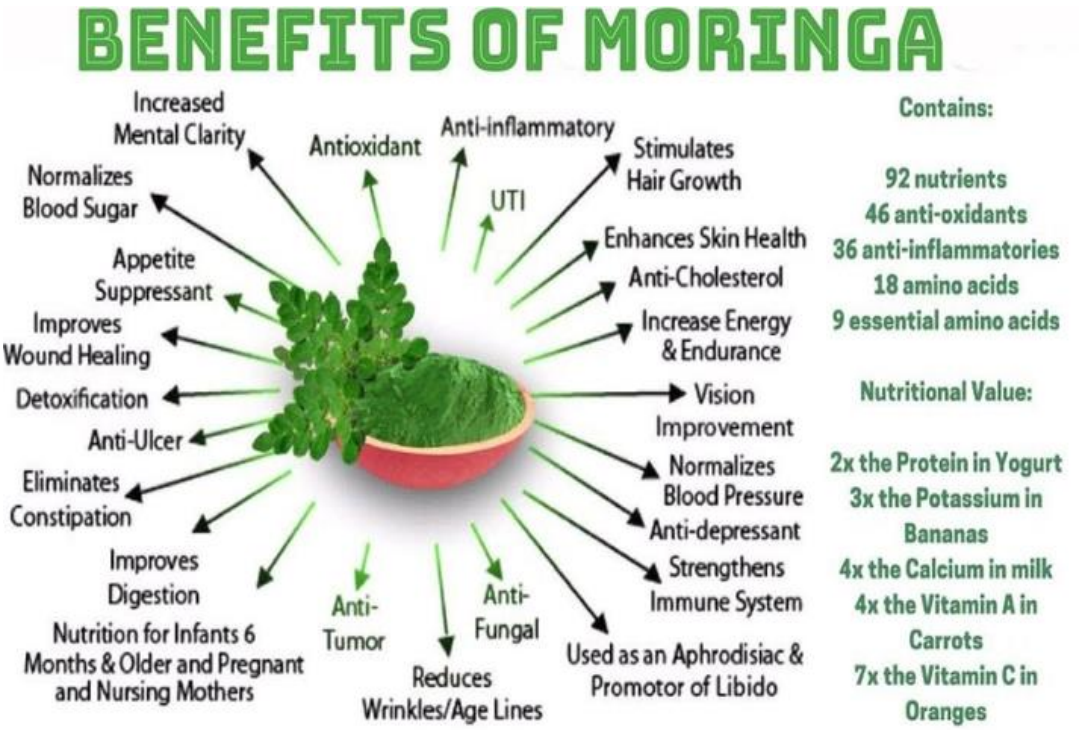

Figure 3: MORINGA.

1.3 CARROT POWDER

Carrot powder is a versatile and nutritious ingredient that has gained popularity in the culinary and health worlds. Derived from dried carrots, this vibrant orange powder is packed with essential nutrients and offers a wide range of uses. In this blog post, we'll dive into the benefits, uses, and ways to incorporate carrot powder into your daily routine.

Benefits of Carrot Powder

- **Rich in Nutrients:** Carrot powder is a concentrated source of vitamins and minerals, including vitamin A, vitamin C, potassium, and dietary fiber. These nutrients play a crucial role in maintaining overall health and well-being.
- **Antioxidant Powerhouse:** Carrot powder contains antioxidants like beta- carotene, which helps protect cells from damage caused by free radicals. Antioxidants contribute to skin health, and immune function, and may even reduce the risk of chronic diseases.
- **Vision Support:** The high vitamin A content in carrot powder is beneficial for maintaining good vision. Vitamin A is essential for the health of the retina and may help prevent conditions like night blindness.
- **Digestive Health:** The dietary fiber in carrot powder supports digestive health by promoting regular bowel movements and aiding in digestion. It can also contribute to a

feeling of fullness, which might be helpful for weight management.

- **Skin Health:** The vitamins and antioxidants in carrot powder can contribute to healthy skin by promoting collagen production and reducing oxidative stress, potentially slowing down the aging process.

Figure 4: CARROT.

Nutrition Facts

- Portion Size74 g
- Amount per Portion252 Calories, % Daily Value
- Total Fat 1.1g1 %
- Saturated Fat 0.2g1 %
- Sodium 204mg9 %
- Total Carbohydrate 59g21 %
- Dietary Fiber 17g61 %
- Sugar 29g
- Protein 6g12 %
- Vitamin D 0mcg0 %
- Calcium 157mg12 %
- Iron 2.9mg16 %
- Potassium 1880mg40 %

The % Daily Value (DV) tells you how much nutrient in a serving of food contribute to a daily diet. 2000 calories (about 160 minutes of running) a day is used for general nutrition advice.

1.4 ALMONDS

The almond is a tree nut native to the Mediterranean region. Historically, almond trees grew

there wild and were later cultivated as early as 3000 BC. Almonds are even referenced in the first book of the Bible, Genesis, as a prized food given as gifts. The edible part of the almond is a seed from a drupe, a fruit in which the outer shell and hull layers are typically not eaten. After extracting the almond seed, the shells and hulls are often used for livestock feed and bedding.

Source Of

- Vitamin E
- Monounsaturated fats
- Fiber
- Biotin
- Minerals: Calcium, Phosphorus, Magnesium
- Trace minerals: Copper
- Phytonutrients, specifically flavonoids, plant sterols, phenolic acids

This nutrition information, for one ounce of almonds (28g) or about 24 whole almonds, is provided by the USDA.

- **Calories**: 164
- **Fat**: 14.2g
- **Sodium**: 0.3mg
- **Carbohydrates**:6.1g
- **Fiber**: 3.5g
- **Sugars**: 1.2g
- **Protein**:6g
- **Vitamin E**: 7.3mg
- **Magnesium**: 76.7mg

Carbs

A single serving of almonds provides 6.1 grams of carbohydrates. Almonds are a good source of fiber and have a lower glycemic index than many other nuts, making them a good choice for people on low-carb diets. In fact, almonds make up a key ingredient of many of the best low-carb snacks.

Fats

Almonds are high-fat foods, providing about 22% of the recommended daily amount of fat in a single ounce. However, most of the fat found in almonds is monounsaturated fat, which has cardio-protective properties. There is just over 1 gram of saturated fat, 9 grams of monounsaturated fat, and 3.5 grams of polyunsaturated fat in a serving of almonds.

Protein

Almonds are a good source of plant-based protein, containing small amounts of all the essential and non-essential amino acids. There are 6 grams of protein in an ounce of almonds.

Vitamins and Minerals

One ounce of almonds contains 37% of the daily recommended intake of vitamin E, 8% of the daily recommended amount of calcium, and 6% of the daily recommended amount of iron.

Vitamin E confers antioxidant properties and supports immune function. Calcium is essential for maintaining the structure of teeth and bones. Iron helps in the production of certain hormones and getting oxygen to muscles.

Almonds are a rich source of manganese aid magnesium. Manganese is vital in carbohydrates, amino acids, and cholesterol metabolism. Magnesium is involved in over 300 metabolic pathways, including energy production, protein synthesis, cell signaling, and structural functions like bone formation.

Calories

Almonds are a calorie-rich food, providing 164 calories (about 13 minutes of running) per single ounce. Most of the calories come from healthy fat, with smaller amounts coming from carbohydrates and protein.

Health Benefits

Almonds are widely promoted for the nutritional and health benefits that they provide. Scientific studies have provided some insights into the ways that consuming almonds may affect human health.

Reduces Risk of Heart Disease

According to a review of 29 studies conducted in 2016, eating 28 grams of nuts per day as

part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease. When it comes to almonds specifically, this may be because they provide lipid-lowering monounsaturated fat, fiber, and vitamin E.

Almonds also contain phytonutrients, especially plant sterols and flavonoids, which are heart-healthy and offer antioxidant benefits. To maximize these nutrients, enjoy your almonds with the skins (flavonoids are concentrated there). Helps LowerCholesterol Studies investigating the health benefits of nuts have pointed out that consuming almonds may help lower LDL cholesterol levels. Low-density lipoproteins are considered "bad cholesterol" because elevated levels are linked to heart disease.

Almond consumption has also been linked to higher HDL cholesterol levels. HDL is "good cholesterol" because it is instrumental in removing LDL cholesterol from the body. Study authors suggested that almonds could even be a food used in treating people with high cholesterol who do not wish to take or cannot tolerate large doses of medication.

Improves Diabetes Risk and Management

Some studies suggest that higher intakes of magnesium are associated with a reduced risk of developing diabetes. Since almonds provide magnesium, they may deliver this benefit. But other evidence supports the consumption of almonds to prevent diabetes.

For instance, a study on adolescents and young adults at risk for developing diabetes found that those who consumed 56 grams of almonds daily showed reduced HbA1c, LDL cholesterol, and total cholesterol levels in 12 weeks (about 3 months).

Some studies have also suggested that almond consumption can help those with diabetes control blood sugar and lipid profiles.

Supports Gut Health

A comprehensive research review published in 2021 explored the health benefits of almonds. The study authors pointed out the benefits to the gut microbiota. Specifically, they found that consuming the nuts can support colon health by promoting microflora richness and diversity, improving the microflora ratio, and boosting concentrations of health-promoting colonic bioactive.

May Provide Metabolic Benefits

That same 2021 research review suggested that almonds may offer metabolic benefits.

Specifically, the authors found that diets containing almonds helped study participants feel less hungry and more satiated, increasing resting energy expenditure. Almonds also helped create small but significant decreases in body weight and fat mass compared to other nuts.

FIGURE 5: ALMONDS.

1.5 CASHEWS

Cashews contain substantial amounts of essential nutrients, particularly copper. They are also a source of protein, magnesium, iron, and zinc.

Cashews are especially rich in unsaturated fats — a category of fats linked to a lower risk of premature death and heart disease.

They're also low in sugar, a source of fiber, and contain almost the same amount of protein as an equivalent quantity of cooked meat.

In addition, cashews contain a significant amount of copper, a mineral essential for energy production, healthy brain development, and a strong immune system. They're also a great source of magnesium and manganese, nutrients important for bone health.

The following nutrition information is provided by the USDA for 1 ounce (28g) of raw, unsalted cashews.

- **Calories**:157
- **Fat**: 12g
- **Sodium**: 3.4mg

- **Carbohydrates**:8.6g
- **Fiber**:0.9g
- **Sugars**: 1.7g
- **Protein**: 5.2g
- **Iron**: 1.9mg
- **Magnesium**: 82.9mg
- **Copper**: 0.6mg
- **Manganese**: 0.5mg
- **Vitamin B6**: 0.1mg
- **Vitamin K**: 9.7mcg

Carbs

A single serving of cashew nuts is 1 ounce (about 29.57 ml)—or about 18 nuts. One serving contains 157 calories and just under 9 grams of carbohydrates. Most of the carbohydrates in cashews are starch. A small amount is Fiber (just under 1 gram), and the rest (about 1.7 grams) is sugar.

The estimated glycemic load of cashews is 3 if you consume a 1-ounce serving. Glycemic load takes serving size into account when estimating a food's impact on blood sugar. Foods with a glycemic index of 10 or less are considered low glycemic.

Fats

Most of the calories in cashews come from fat. There are 12 grams of fat in a serving if you consume the full ounce. Most of the fat is monounsaturated fat (6.8g) or polyunsaturated fat (2.2g). Unsaturated fats are healthier forms of fat. There are also about 2.2 grams of less healthy saturated fat in a serving of cashews.

Protein

Cashew nuts provide just over 5 grams of protein per serving. As a basis for comparison, cashews provide less protein than peanuts, which provide over 7 grams per one ounce serving.

Vitamins and Minerals

Cashew nuts provide vitamin K (about 12% of your daily needs). You'll also benefit from thiamin and vitamin B6 when you consume cashews.

Cashews are an excellent source of magnesium, phosphorus, copper, and manganese and a good source of zinc and iron.

Calories

One ounce (28g) of raw, unsalted cashews has 157 calories (about 13 minutes of running), 12% of which come from protein, 21% from carbs, and 67% from fat.

Health Benefits

Consumption of nuts in general—and cashews, in particular—is associated with certain health benefits.

Aids Weight Control

Nuts can make a smart snack if you are trying to lose weight. The healthy fat, protein, and fiber in nuts may help you to feel full and satisfied after meals or at snack time. But since nuts are high in calories, it's important to consume them in moderation.

One study investigating nut consumption found that regularly eating nuts (approximately one handful daily) over the long term can be incorporated as a component of a healthy diet for the prevention of obesity and type 2 diabetes. But the study investigated nuts as a replacement for less healthy foods. It is unclear from this study whether nuts themselves provide any unique benefit.

May Help Decrease Cholesterol

Cashews may help lower LDL cholesterol in some adults, according to a study published in a 2017 issue of the journal *Nutrients.* Researchers found that when adults with mildly high cholesterol consumed28 to 64 grams of cashews per day, they saw an average 24% decrease in LDL cholesterol when compared to a control diet.

Study authors noted that the fatty acid profiles, vegetable proteins, fibers, vitamins, minerals, carotenoids, and phytosterols in cashews and other nuts are responsible for nut health benefits.

May Reduce Risk of Gallstones

There is some limited evidence that eating nuts can reduce the incidence of gallstones in both men and women. Research shows that nuts like cashews can reduce gallstone risk. This is likely due to the bioactive components, particularly unsaturated fatty acids, fiber, and

minerals.

May Aid Diabetes Management or Prevention

Several studies have investigated the relationship between nut consumption and diabetes. Researchers have found that patients with type 2 diabetes may gain health benefits from consuming nuts. Research has shown that cashew consumption by people with diabetes is associated with better insulin control and cholesterol ratio, and increased HDL cholesterol and lower systolic blood pressure.

Promotes Better Heart Health

Cashews, like all nuts, are a high-fat food, but they provide both poly- and monounsaturated fats—a healthy form of fat that helps boost heart health and reduce cholesterol levels when consumed in moderation. Cashews also provide diet-friendly fiber which is associated with a heart-healthy diet.

Studies also show that plant-based diets that include healthy fats and protein from nuts and seeds (rather than meat products) can boost heart health. Studies have even shown that nut consumption is significantly associated with a lower risk of cardiovascular disease, especially in those with type 2 diabetes.

Helps Prevent Copper Deficiency in Special Diets

Cashews are one of the top food sources of copper, after seafood and beef. This makes them ideal for those on a plant-based diet who may be at risk for copper deficiency. Copper is necessary for bone and muscle health and almost two-thirds of the body's copper is in the skeleton and muscle.

Those with celiac disease are at a higher risk than the general population of having copper deficiency. Cashews are naturally gluten-free and safe for those with celiac disease.

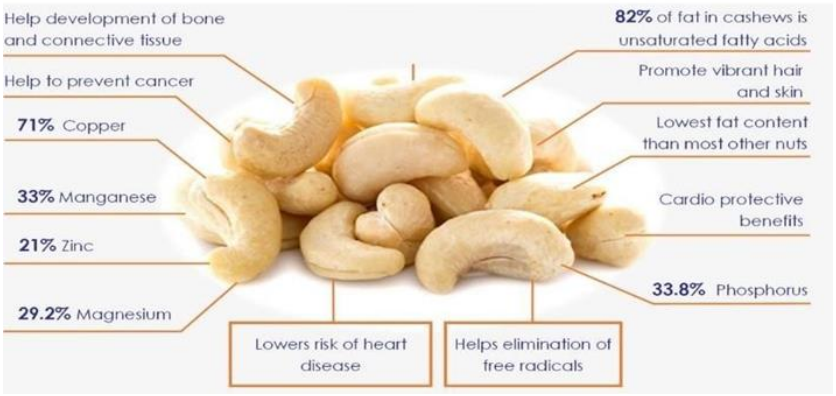

Figure 6: CASHEWS.

1.6 RAISINS

A raisin is a dried grape. Raisins are produced in many regions of the world and may be eaten raw or used in cooking, baking, and brewing. In the United Kingdom, Ireland, New Zealand, Australia and South Africa the word raisin is reserved for the dark-colored dried large grape, with sultana being a golden-colored dried grape, and currant being a dried small Black Corinth seedless grape.

Figure 7: RAISINS.

Raisins are a good source of iron. 100g of Iron contains 2.6 g of Iron.

- Rich in Nutrients
- Improve Digestion
- Promote bone health
- Boost energy
- Support Heart Health

- Aid in weight management
- Helps in blood sugar levels

The USDA provides the following nutrition information for 1/2 ounce (14g) of dark, seedless raisins. A half-ounce is the equivalent of one miniature box.

- **Calories**: 42
- **Fat**: 0g
- **Sodium**: 3.6mg
- **Carbohydrates**: 11g
- **Fiber**: 0.6g
- **Sugars**: 9.1g
- **Protein**: 0.5g

Carbs

Raisins have 11 grams of carbs per half-ounce (14g), compared to fresh American typegrapes, which have about 2.5 carbs in a similar serving size of 6 grapes (14.4g).

Grapes, depending on the variety, have fewer calories than raisins, but also less fiber. The carb, calorie, and fiber counts in golden raisins are similar to dark raisins. Raisins with seeds provide more fiber, with similar amounts of carbs and calories.

While raisins are high in carbohydrates, their sugar is mostly fructose, which has a lower glycemic index. The glycemic index is a ranking of how much a food would raise your blood sugar compared with pure glucose, which has a ranking of 100. The actual amount any food raises your blood sugar has to do with how glycemic it is, how much of it you eat, and what else you eat with it. The glycemic load attempts to combine these concepts, and some diets use the glycemic load for this reason.

Depending on where you look, the glycemic index of raisins is in the low to moderate range. Keep in mind that glycemic index is a complex topic, and individuals can have varying responses to foods. Eating too many raisins can result in a large blood sugar rise in people with diabetes because raisins have a significant amount of carbohydrates per serving.

Fats

Raisins have a negligible amount of unsaturated fat.

Protein

With just under 1 gram of protein per 1-ounce serving, raisins are not a good source of protein.

Vitamins and Minerals

An ounce of raisins provides 4% of your daily needs for potassium. Raisins also contain iron, vitamin B6, vitamin C, magnesium, and calcium.

Health Benefits

Although grapes lose some of their nutrients during the drying process, raisins are still a good source of antioxidant chemicals, including polyphenols and phenolic acids, as well as fiber.

Associated With Better Overall Diet

A study of data from the 2001-2012 National Health and Nutrition Examination Survey showed that those who consumed raisins had a higher quality diet overall. They ate more fresh fruits, vegetables, and whole grains than those who didn't eat raisins. The raisin eaters also had lower body weight, lower body mass index (BMI), a lower waist circumference, and were 39% less likely to be obese or overweight and had 54% less risk of metabolic syndrome than those who didn't eat raisins.

Body Mass Index (BMI) is a dated, biased measure that doesn’t account for several factors, such as body composition, ethnicity, race, gender, and age.

Despite being a flawed measure, BMI is widely used today in the medical community because it is an inexpensive and quick method for analyzing potential health status and outcomes.

Lowers Heart Disease Risk

Eating raisins has also been shown to potentially lower your risk for heart disease.

Supports Gut Microbiome

The dietary fiber found in raisins is both soluble and insoluble, and includes prebiotics, such as inulin. These prebiotics help support the growth of "good" bacteria in the gut, which can help lower cholesterol, improve metabolism, and immune system function.

Provides Quick Energy

Athletes need fuel in the form of carbohydrates during long training sessions and races. Many turn to sports chews and gels, but raisins can work just as well. One small study showed they were as effective as special sports jellybeans in improving athletic performance during moderate to high-intensity exercise.

Improves Dental Health

Some of the nutrients in raisins, including oleanolic acid, linoleic acid, and linolenic acid, have antimicrobial properties that can fight the bacteria that cause dental problems, such as cavities and gum disease.

1. RATIONALE OFTHE PROJECT

The main rationale of these projects is to improve hemoglobin count in the patient and in the normal people also. Many people are suffering from various diseases due to lack of nutrition. Our main motive is to improve hemoglobin count and nutritional value which are required to the normal physiologic function of the body by making an acceptable choice of formulation.

The rationale behind "hemoglobin-increasing" chocolate likely involves the presence of certain nutrients that support the production of hemoglobin, such as iron, vitamin B12, and folate. Cocoa, the main ingredient in chocolate, contains some iron, although not in very high amounts. Additionally, certain types of chocolate may contain other ingredients or additives aimed at promoting overall health, including blood health. However, it's important to note that while chocolate may have some nutritional benefits, it should be consumed in moderation as part of a balanced diet. It is beneficial for all age groups, likely lies in its formulation to provide essential nutrients that support healthy blood function.

Hematinic typically contains nutrients such as iron, vitamin B12, and folic acid, which are important to produce hemoglobin and red blood cells. By incorporating these nutrients into chocolate, it becomes a convenient and enjoyable way for people of all ages to supplement their diets with these essential nutrients. Chocolate is a widely accepted and liked treat, making it an attractive option for delivering these nutrients to a broad audience, including children, adults, and the elderly. However, it's crucial to ensure that such products are formulated and consumed in appropriate quantities to avoid excessive intake of sugar or other potentially harmful ingredients.

2. AIM AND OBJECTIVES OF THE PROJECT

AIM: ***Preparation and Evaluation of Hematinics Chocolate*** for increasing hemoglobin count and delivering sufficient nutrition to the particular.

OBJECTIVES: The objective of the study is to design and fabricate hematinics chocolate formulation by chocolate drug delivery system

- Preparation of Chocolate
- Evaluation of Chocolate
- To improve Patient compliance.

3. METHODOLOGY

3.1 KEY INGREDIENTS

- Beetroot Powder
- Moringa Powder
- Carrot Powder
- Honey
- Almond
- Cashew
- Raisin
- Cocoa Butter
- Chocolate Base

Amount of Ingredients

Table 2: ***Amount of Dry fruit powder.***

Dry fruits	Amount in Grams
Total Weight	20 Grams
Cashew Powder	8 Grams
Almond Powder	8 Grams
Raisin Powder	4 Grams

Table 3: approx. Amount of ingredients.

Name Of Ingredients	Amount in Grams Per Dose
Total Weight	10.30gms
Beetroot Powder	1.66 gms
Moringa Powder	1.33 gms
Carrot Powder	0.66 gm
Dry Fruits	1 gm
Chocolate Base	5.68 gms

3.2 METHOD OF PREPARATION

DRYFRUIT POWDER

- Weight 8 grams cashew powder, 8 grams almond powder and 4 grams of raisins.
- Mix them well which will give approx. 20 grams of dry Fruit powder

CHOCOLATE

WEIGHING

Weigh 25 gm Beetroot Powder Weigh 20 gm Moringa Powder Weigh 10 gm Carrot Powder Weigh all the ingredients separately.

Melting

Melt (By hot vapor) 50 gm of cocoa butter and 50gm of chocolate base.

Mixing

After melting mix all these ingredients properly.

Stirring

Stir the mixture for 5 minutes to mix up all the ingredients and then transfer it into silicon chocolate mold while adding dry fruits.

Freezing

Freeze for 2 hours.

4. EVALUATION AND RESULT

A) Evaluation of chocolate base

Taste, texture and mouth feel characteristics of chocolate were evaluate by taking review from 5 human volunteers on a rating scale 1-5.

Table 4: *Evaluation of chocolate.*

Sr. No.	Character	Criteria	Scale
1.	Appearance	Glossy, shiny and no dots	1-5 with 5 being the best
2.	Aroma or smell	Chocolaty, fresh with no chemical smell	1-5 with 5 being the best
3.	Taste	Chocolaty, good after taste	1-5 with 5 being the best
4.	Texture	Creamy and smooth; promptly and even melts in mouth	1-5 with 5 being the best

B). Evaluation of Hematinic chocolate

(1) Sensory evaluation

It includes organoleptic characteristics of chocolate like color, odor, taste etc.

Table 5: *Sensory Evaluation.*

Sr. No.	Characteristics	Result
1.	Color	Pink + Leafy green
2.	Odor	Pleasant
3.	Taste	Sweet
4.	Texture	Smooth

(2) Physical evaluation

It includes Thickness and Weight variation.

THICKNESS: The thickness of the formulations from three different batches was measured by using Vernier calipers.

Table 6: thickness.

Batch	Thickness (mm)
B1	12.99± 0.02
B2	12.36±0.09
B3	12.18±0.05

WEIGHT VARIATION TEST

The Weight Variation study for three different batches was performed according to USP.

Table 7: Weight Variation.

BATCH	WEIGHT VARIATION (gms)
B1	10.06±0.23
B2	10.02±0.33
B3	10.10±0.28

5. USES

Haematinic chocolate is a specialized dietary supplement designed to provide essential nutrients, primarily iron, folic acid, and vitamins, in a palatable chocolate-based form. It is widely used for the prevention and management of iron deficiency and related health conditions. The pleasant taste and easy consumption make it a preferred option for individuals who may struggle with traditional iron supplements.

1. **Treatment and Prevention of Anemia**

- **Iron Deficiency Anemia (IDA):** Haematinic chocolate is often prescribed to individuals suffering from IDA, a condition caused by inadequate iron levels leading to reduced red blood cell production.
- **Nutritional Anemia:** It is beneficial in cases of anemia due to poor dietary intake of iron,

folic acid, or vitamin B12.

- **Chronic Blood Loss Anemia:** Useful in patients with chronic blood loss from conditions like peptic ulcers, heavy menstrual bleeding, or gastrointestinal diseases.

2. **Use in Specific Population Groups**

- **Children and Adolescents:** Growing children and teenagers require higher iron intake to support rapid growth and development. Haematinic chocolate provides a convenient and enjoyable way to meet these nutritional needs.
- **Pregnant and Lactating Women:** Pregnancy significantly increases iron and folic acid requirements for fetal development and maternal health. Haematinic chocolate helps prevent anemia and reduces the risk of complications.
- **Elderly Individuals:** Older adults may face challenges with nutrient absorption, increasing the risk of anemia. Haematinic chocolate offers a well-tolerated iron supplement option.
- **Women with Heavy Menstrual Bleeding:** Regular consumption can help replenish iron lost during menstruation, preventing fatigue and weakness.

3. **Recovery and Convalescence**

- **Post-Surgical and Postpartum Recovery:** After surgery, childbirth, or any significant blood loss, haematinic chocolate supports faster recovery by restoring hemoglobin levels.
- **After Illness:** For individuals recovering from illnesses that affect red blood cell production or iron metabolism, it serves as a restorative supplement.

4. **General Health and Well-being**

- **Prevents Fatigue and Weakness:** Adequate iron intake boosts hemoglobin levels, improving oxygen transport in the blood, thus reducing fatigue and weakness.
- **Supports Cognitive Function:** Iron plays a critical role in brain function and cognitive performance. Haematinic chocolate enhances concentration, memory, and mental clarity.
- **Boosts Immunity:** Folic acid and iron contribute to maintaining a healthy immune system, reducing susceptibility to infections.

5. **Compliance and Acceptability**

- **Enhanced Palatability:** Unlike conventional iron tablets or syrups that may have an unpleasant metallic taste, haematinic chocolate is more enjoyable to consume.

- **Reduced Gastrointestinal Side Effects:** It is generally well-tolerated and causes fewer gastrointestinal issues like constipation or nausea.
- **Improved Adherence:** The chocolate formulation encourages regular intake, especially among children and pregnant women, leading to better treatment outcomes.

6. EVALUATION

Evaluation of chocolate

Taste, Texture and Mouth Feel Characteristics of chocolate base was determined by using 5 Human Volunteers and it was found to be satisfactory.

Table 8: Ratings of Human Volunteers.

Volunteer	Rating (5 being the best)			
	Appearance	Aroma	Taste	Texture
A	4.5	4.8	5.0	4
B	5	5	5	5
C	4	5	5	4.8
D	5	4.5	5	4
E	5	5	5	5

Evaluation of Hematinic chocolate

1. General appearance

Chocolate having shape as like mold structure, leafy green and dark pink color, having pleasant smell and smooth in texture.

2. Thickness

The thickness of the formulations was measured by using Vernier calipers. The mean thickness was almost uniform in all the batches The range are as per shape different.

3. Weight Variation

The average percentage deviations of all formulations were in the range of 3.06±0.24 gms-3.10±0.28 gms respectively. The weights of all the formulations were almost uniform with low standard deviation values indicating effective mixing of the drug and excipients.

4. Nutritional Fact

As per the analysis of test report, obtained from Pramukh laboratory, 100 gm of chocolates contain sufficient amount of protein as well as limited amount of total fat in which saturated fats and cholesterol levels are negligible. But, the same contains high amount of carbohydrates and sugar which might cause deleterious effects to health. So, they must be

modified by replacing sugar with sugar free substances.

7. CONCLUSION

From this project, it is concluded thatthe prepared chocolates are good in appearance, taste, texture, mouth feel and even uniform in thickness and weight. Nutritional reports for testing of iron, vitamin B12 and folates are found to be expensive. we will modify this formulation and give them for detailed analysis of all possible nutrients as well will perform pre-clinical and clinical evaluation of these chocolates for enhancing hemoglobin level.

However, these chocolate offers a convenient and enjoyable way to supplement essential nutrients, which are crucial for healthy blood function. By incorporating these nutrients into chocolate, it becomes accessible to individuals of all age groups, making it a convenient option for addressing potential deficiencies in these nutrients. However, it's important to consume hematinic chocolate in moderation and as part of a balanced diet to avoid excessive intake of sugar and calories.

8. PRODUCT PHOTOS

8.1 PRODUCT LOGO

9. REFERENCES

1. Firriolo JF. Oral cavity: a review. Oral Surgery Med Oral Pathol., 1994; 78: 189-93.
2. Sastry SV, Nyshdham JR. Review of formulation used in oral cavity. Pharm Sci Technol Today, 2000; 3: 138-45.
3. Batheja P. Basic biopharmaceutics of buccal and sublingual absorption, enhancement in drug delivery. London, New York. Touitou E, Barry BW. editors. CRC Press: Taylor and Francis Group, 2006; 189.
4. https://journals.innovareacademics.in/index.php/ijcpr/article/view/22156/12501
5. Albasher, G., Albrahim, T., Alsultan, N., Alfaraj, S., Alharthi, M. S., Kassab, R. B., & Abdel-Moneim, A. E. 2020.
6. Gar J. Patterns of Chocolate Consumption. Am J Clin Nutr., 1994; 60: 1060-1064.
7. Chocolate Consumption Linked to Longer Life. Brit Med J. 1998.
8. Batheja P. Basic biopharmaceutics of buccal and sublingual absorption, enhancement in drug delivery. CRC Press., 2006; 189.
9. Knight Ian. Chocolate and Cocoa: Health and Nutrition.
10. https://www.healthdailyadvice.com/anemia
11. https://www.mayoclinic.org/diseases-conditions/iron-deficiency-anemia/symptoms-uses/syc-20355034
12. https://1drv.ms/w/c/2c28215e18d525a2/ETx6CIsbxKBKjymGBWK7A9IBIDdsDSp9V7UKjyByhtu-dg?e=qegAId
13. https://www.medikonda.com/blogs/medikonda-blog/carrot-powder-benefits-top- benefits-of-carrot-powder

14. https://www.medicalnewstoday.com/articles/269468
15. https://www.hsph.harvard.edu/nutritionsource/food-features/almonds/
16. https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.credihealth.com%2Fblog%2Falmond-benefits-for-health&psig=AOvVaw1UI4zgJMwmuFxlYUoaKdEt&ust=1712498679338000&source=images&cd=vfe&opi=89978449&ved=0CBIQjRxqFwoTCMCUy_XgrYUDFQAAAAAdAAAAABAE
17. https://images.app.goo.gl/tJJ5nSgy5aTjL5gx8
18. https://www.verywellfit.com/almond-nutrition-facts-calories-and-health-benefits-4108974
19. https://www.verywellfit.com/cashew-nutrition-facts-4586608
20. https://www.verywellfit.com/carb-counts-for-raisins-2241818
21. https://www.thehealthsite.com/diseases-conditions/ways-to-include-beetroot-in- your-diet-to-improve-your-haemoglobin-levels-d715-307791/
22. https://1drv.ms/w/c/2c28215e18d525a2/Ec7vZxpFVOZMvLXseDEnyskBWdoNvAB8UnU9nBMO2xX4Rg?e=Y6vnWn
23. Moringa oleifera - Wikipedia
24. Are Almonds High in Iron? - Tastylicious
25. Beetroot -- the perfect home remedy to fight anaemia naturally | TheHealthSite.com
26. 7 Iron Rich Drinks To Boost Your Hemoglobin - HealthifyMe
27. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8565237/
28. https://learn.freshcap.com/tips/beetroot-powder-benefits/#:~:text=Two%20to%20five%20teaspoons%20per,your%20second%20half%20during%20dinner
29. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9916933/
30. https://www.nature.com/articles/s41438-019-0150-6
31. https://www.1mg.com/ayurveda/moringa-168?wpsrc=Google+Organic+Search
32. https://journals.innovareacademics.in/index.php/ijcpr/article/view/22156/12501
33. https://www.jscimedcentral.com/jounal-article-info/Journal-of-Drug-Design-and- Research--/Design-and-Development-of-Medicated-Chocolate-10172
34. Firriolo JF. Oral cavity: a review. Oral Surgery Med Oral Pathol., 1994; 78: 189-93.
35. Sastry SV, Nyshdham JR. Review of formulation used in oral cavity. Pharm Sci.,