

Formulation and evaluation of hemantics chocolate to improve hemoglobin

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Abstract—One of the commonest public health issues is anemia, especially among children, women, and expectant women. It is marked by a low concentration of hemoglobin or red blood cells, which causes a low oxygen-carrying capacity of blood. The symptoms of this condition include fatigue, weakness, dizziness, and shortness of breath. Nutritional deficiency (iron deficiency in particular) and deficiency of folic acid, vitamin B12, and vitamin A are the main causes of anemia. The given work is devoted to the design of a hematinic preparation (e.g., herbal chocolate or supplement), which will help to achieve the desired level of hemoglobin in a natural and patient-friendly way. Different natural ingredients that are high in iron and nutrients were identified and developed into an acceptable dosage form. Parameters that were tested in the prepared formulations include physical appearance, pH, weight variation, thickness, and stability. The findings revealed that the formulation that had been developed had good stability, acceptable physical appearance, and non-irritating skin. The paper has pointed out the prospects of herbal and nutraceutical formulations as being an alternative to traditional iron supplements that have side effects. This study serves the purpose of coming up with cost-efficient and patient-adhering interventions in the management of anemia.

Index Terms—Hematinic Chocolate, Anemia, Hemoglobin Improvement, Iron Deficiency, Nutraceutical, Herbal Formulation, Patient Compliance, Drug Delivery System.

I. INTRODUCTION

Anemia is the most common disease condition in children aged 6 months to 5 years. According to the WHO, anemia is a condition in which the number of red blood cells and hemoglobin concentration in the human body are lower than the normal range. Hemoglobin is required to carry oxygen to the body, and if there is a minimum or abnormal concentration

of red blood cells, there will not be a proper concentration of hemoglobin, which will decrease the 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. The ideal hemoglobin concentration required to meet physiological needs differs by age, sex, socioeconomic status, smoking behaviors, and pregnancy status. Anemia may be caused by numerous factors, including nutrient deficiencies due to insufficient diets or insufficient absorption of nutrients; inflammation; chronic diseases; gynecological and obstetric conditions; and inherited red blood cell disorder infections (e.g., malaria, parasitic infections, tuberculosis, and HIV). The most common nutritional cause of anemia is iron deficiency, although deficiencies in folic acid, vitamin B12, and vitamin A are also important causes. Anemia is a serious global public health problem that particularly affects young children, menstruating teenage girls, women, pregnant women, and perinatal women. WHO estimates that 67% of children aged 6–59 months, 50–52% of pregnant women, and 57% of women aged 15–49 years in India are anemic. The Indian regions are most affected, with an estimated 25 million pregnant women and 241 million children affected by anemia and 274 million women.

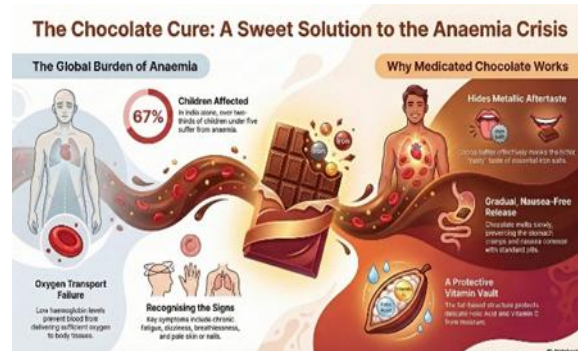


Fig no:- 01

Signs and symptoms of anemia :- 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 .

Fatigue & weakness – due to reduced oxygen supply to muscles and tissues.

- Dizziness/light-headedness – especially when standing up (orthostatic hypotension).
- Cold hands and feet – poor circulation from low hemoglobin.
- Headaches – linked to reduced oxygen in the brain.
- Shortness of breath – noticeable during exertion.
- Pale skin & mucous membranes – visible under fingernails, lips, and inside the mouth.
- Rapid breathing & heart rate – the body compensates for low oxygen.
- Easy bruising – sometimes linked to anemia or platelet abnormalities.

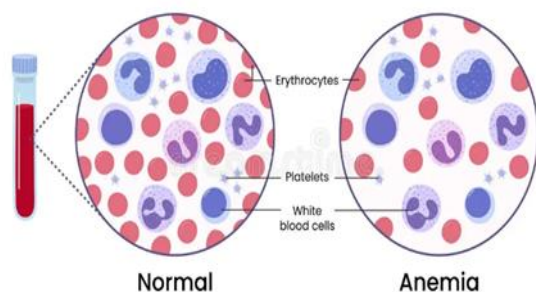


Fig no:-02

1. Nutritional Deficiency Anemia

- Iron Deficiency: Iron deficiency is the body simply can not produce hemoglobin—the "oxygen magnet" inside the cell. This often happens during pregnancy, due to a diet low in iron, through steady blood loss (like heavy periods).
- Vitamin B12 & Folate Gaps: These two are the "DNA designers." Without them the body can not copy genetic code properly to make new cells. This results in "Megaloblastic" anemia, where the cells are too large and heavy to function properly. This can happen if someone lacks a specific stomach protein (Intrinsic Factor) or does not get the proper amount of leafy greens.

2. Genetic & Hereditary Disorders

- Sickle Cell Disease: A genetic problem causes hemoglobin to stiffen into a semicircular or "sickle" shape. These cells are not flexible; they get stuck in traffic jams in the blood vessels, causing pain and breaking down far too early in human body .
- Thalassemia: Common in families from most common in Asian descent, this is a scaling issue where the body just doesn't produce enough of the right hemoglobin parts.
- Aplastic Anemia: This is more of a "factory shutdown." The bone marrow is the birthplace of all blood cells it get damaged by toxins & illness and stops production completely .

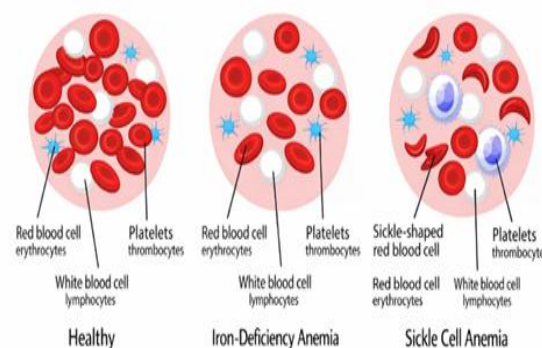


Fig no:-03

IRON DEFICIENCY ANAEMIA PREVENTION

By eating a balanced diet high in iron and other vital minerals, iron deficiency anemia can be avoided. Fruits, vegetables, nuts, seeds, and other plant-based foods are dietary sources of iron.

To maintain a sufficient nutritional intake, people should eat between 1.5–2.5 cups of fruits and 2–4 cups of vegetables each day, according to dietary recommendations.

Fruits & Vegetables High in Iron

Significant levels of non-heme iron can be found in the following fruits and vegetables:

- Beetroot
- Moringa
- Broccoli
- Spinach
- Peas
- Raisins

Iron-Rich Nuts and Seeds

Nuts and seeds are nutrient-dense foods rich in healthy fats, proteins, fibre, and minerals that contribute to cardiovascular and overall health.

Examples include:

- Almonds
- Cashews
- Pistachios
- Pine nuts
- Peanuts
- Pumpkin seeds

AIM: - Formulation and evaluation of hemantics chocolate to improve hemoglobin

OBJECTIVES:

1. Formulation Development:

To formulate and prepare a chocolate fortified with hematinic agents such as iron, folic acid, and other essential nutrients.

2. Ingredient Optimization:

To select and optimize suitable natural and synthetic ingredients that enhance nutritional value, stability, and taste.

3. Physicochemical Evaluation:

To evaluate parameters such as appearance, texture, pH, weight variation, hardness, and uniformity of the formulated chocolate.

4. Nutritional Analysis:

To determine the nutritional content including iron levels, vitamins, and overall composition of the formulation.

5. Palatability and Sensory Evaluation:

To assess taste, aroma, mouthfeel, and overall acceptability among users.

6. Stability Studies:

To study the stability of the formulation under different storage conditions over time.

7. Hematinic Effectiveness:

To evaluate the potential of the formulation in supporting or improving hemoglobin levels.

8. Patient Compliance:

To enhance patient compliance and adherence by providing a tasty, convenient alternative to conventional dosage forms like tablets and syrups.

9. Safety Evaluation:

To ensure the formulation is non-irritant, safe, and suitable for regular consumption.

10. Comparative Study:

To compare the developed formulation with marketed hematinic supplements in terms of effectiveness, taste, and acceptability

II. DRUG AND EXCIPIENTS

BEETROOT POWDER

Beetroot (*Beta vulgaris*) is a root crop or root vegetable, often referred to as red beet, garden beet or table beet. It is well known to be a high-quality food and is widely used in medicine.

Beetroot contains all the nutrients such as dietary fibre, folate (vitamin B9), potassium, manganese, iron, and vitamin C. It is also a vegetable that has a lot of inorganic nitrates, which have a beneficial effect in enhancing blood circulation and cardiovascular condition.

Beetroot powder contains several essential nutrients including:

The composition in question emphasizes a very nutritious, plant-based source that has a certain impact on the health and well-being in general. It is a good source of macronutrients, such as protein that has essential amino acids and is associated with muscle development and healing. The amount of energy is long-lasting due to the presence of carbohydrates, especially natural sugars and dietary fiber, and the low fat level with good lipids improves the condition of the heart.

Vitamin wise it has high Vitamin A (in form of beta-carotene), which sharpens the eyesight and boosts the immune system. The importance of Vitamin B complex that includes thiamine, riboflavin and niacin is to enhance metabolic processes and the functionality of the brain. Also, Vitamin C is an active antioxidant that enhances immunity, and Vitamin E prevents the oxidation and destruction of body cells.

The mineral profile is also not problematic, as there are good amounts of calcium which makes the bones and teeth strong, and plant iron which prevents anemia. Potassium and magnesium help in the normal functioning of the heart and muscles as well as nerve conduction and coordination of muscles respectively. In addition to the simple nutrition, it also includes some phytochemicals such as flavonoids (quercetin and kaempferol) that have anti-oxidant and anti-inflammatory properties. Phenolic acids like

chlorogenic acid help in controlling blood sugar and alkaloids help in various therapeutic effects. Isothiocyanates are produced by the action of glucosinolates which are reported to have anti-cancer properties.

Also, the antimicrobial and anti-inflammatory effects of bioactive compounds like isothiocyanates, anticholesterol effect of saponins, and antioxidant and antimicrobial properties of tannins are found.

As a whole, such a combination of nutrients and compounds has a broad spectrum of health benefits, with a high antioxidant activity that protects cells against damage and aging, anti-inflammatory action that can manage chronic diseases such as arthritis, antidiabetic action that maintains level of blood sugar, cardioprotective action that enhances the health of the heart by reducing cholesterol levels and blood pressure, hepatoprotective activity that aids in detoxification of the liver, and antimicrobial action that helps prevent infections.

MORINGA OLEIFERA

Moringa oleifera is a medical plant that was indigenous to Northern India and is common in traditional herbal medicine. All of the plant such as leaves, pods, seeds and even flower are utilized in nutrition and medicine. The moringa leaves are very nutritious and have antioxidants like quercetin and chlorogenic acid, which prevent blood pressure and prevent oxidative stress.

Health Benefits of Moringa

- 1) Reduces blood sugar levels.
- 2) Reduces blood pressure
- 3) Lowers cholesterol levels
- 4) Reduces inflammation
- 5) Arsenic toxicity prevention.
- 6) Enhances nutritional conditions of those with nutrient deficiencies.

In research studies, the daily intake of three months of 1.5 teaspoons (7 g) of moringa leaf powder has been proven to drastically decrease the level of fasting blood sugar.

Moringa oleifera is a giant tree that is indigenous to North India. The tree is used or eaten almost in all parts of it. Ingredients of traditional herbal medicine. *Moringa oleifera* contains numerous antioxidants. Like quercetin and cholinergic acid that aid in assisting lower blood pressure. Moringa also is used to reduce

the level of blood sugar. One study by 30 women demonstrated that 1.5 teaspoons (7 grams) of moringa leaf reduced the daily dose of powder in three months reduced by 13.5%, on fasting blood sugar average. It is due to the presence of isothiocyanates.

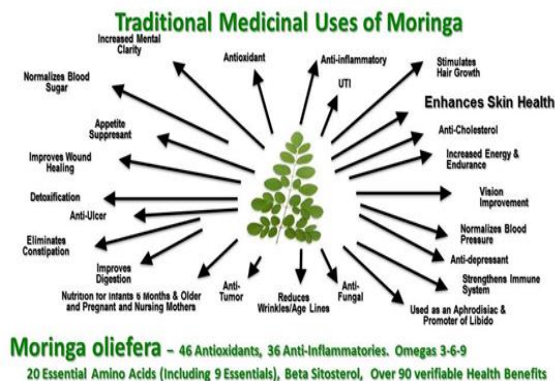


Fig no:-04

Uses of Moringa

Nutritional value of moringa.

- 1) *Moringa oleifera* could also assist in reducing blood pressure
- 2) Moringa also causes the reduction of blood sugar levels.
- 3) *Moringa oleifera* can lower the level of cholesterol.
- 4) *Moringa oleifera* decreases inflammation.
- 5) The normal reaction of the body to inflammation is inflammation.
- 6) infection or injury. It's an essential protective may turn into a significant health mechanism but can question whether it is extended throughout period of time.
- 7) Scientists put forward an idea that are the othiocyanates primary anti-inflammatory agent.
- 8) Arsenic may be guarded by *Moringa oleifera* toxicity.
- 9) Arsenic polluting of food and water is a issue in most areas of the globe.
- 10) The leaves of the moringa are also very nutritious and should do good to individuals who are deficient in vital nutrients.

PUMPKIN SEED POWDER

Pumpkin seed powder is extracted from dehydrated pumpkin seeds (pepitas) and finds a lot of applications as a dietary supplement and food additive. It is rich in vitamins, minerals, and plant-based proteins.

Pumpkin seed powder is a useful as well as nutritious substance that has become popular in the cooking and health worlds. This is made out of pumpkin seeds, which are dried and finely ground. This off-white to greenish powder is filled with vitality nutrients and has an extensive variety of applications. In this section, we shall plunge into the advantages, applications, and how to incorporate the power of pumpkin seeds in your life routine.

Benefits of Pumpkin Seed Powder:

- **Muscle and Tissue Health:** The high plant-based protein and amino acids in pumpkin seed powder help in making the body healthy by stimulating the synthesis of muscle tissue and decreasing fatigue.
- **Good in Minerals:** Pumpkin seed powder is a concentrated dietary supplement of vitamins and minerals, containing magnesium, zinc, iron, and healthy fatty acids. These are vitally important nutrients for blood health and metabolism.
- **Antioxidant All Rounder:** Pumpkin seed powder has antioxidants such as Vitamin E and phenols, which assist in safeguarding the cells against damage by free radicals. Antioxidants contribute to immune function, cell repair, and even minimize the risk of chronic diseases.

Nutrition Facts

Nutritional Composition (Per 100 g Portion)
Calories: 415 kcal
Total Fat: 13 g
Carbohydrates: 15 g
Dietary Fibre: 6 g
Protein: 60 g
Calcium: 80 mg
Iron: 8.8 mg
Potassium: 1450 mg

- **Immune & Zinc Support:** The zinc level is high in pumpkin seed powder, which is useful in the maintenance of normal immune function and cellular division. Zinc is required for the body's natural defense system.

- **Heart and Sleep Health:** The high magnesium content in pumpkin seed powder helps maintain blood pressure levels and assists in the synthesis of serotonin, which promotes better sleep cycles and relaxation.
- **Digestive Health:** The dietary fiber in pumpkin seed powder helps digestive systems by supporting normal bowel movements and assisting in digestion. It may also be a cause of a sense of fullness, which could do well on weight management.

The percentage of daily value (DV) informs you how a serving of food contributes to a large amount of nutrient food intake. 2000 kcal (circa 160 minutes of running) a day is taken to imply general nutrition advice.

The high iron and zinc content of pumpkin seeds helps maintain red blood cell production, making it a powerful natural hematinic against anemia.

ALMONDS

Almond is a Mediterranean tree nut that is full of nutrients and has been grown over thousands of years. Almonds contain good fats, fibre, protein, vitamin e, magnesium and antioxidants.

Nutritional Composition (/28 g Serving)

Health Benefits of Almonds

- 1) Relieves the risk of cardiovascular diseases.
- 2) Reduces the LDL cholesterol level.
- 3) Enhances the management of blood sugar.
- 4) Supports gut microbiota
- 5) Enhances metabolic health

The almond is tree nut that is indigenous to the Mediterranean region. Historically, almond trees grew there wild, and were afterwards cultivated as early as 3000 BC. The almonds are even mentioned in the Genesis, the first book of the Bible as a delicacy given as gifts. Almond has an edible portion that is a fruit of one of the drupes, a fruit whereby the outward cover and the hull layers are not ordinarily eaten. After removing the almond seed, the shells and the hulls are commonly used as animal fodder and bedding.



Fig no:-05 Almond

Source Of Vitamin E Monounsaturated fats Fiber Biotin

Minerals: Calcium, Phosphorus, Magnesium.

Trace minerals: Copper

Plant Phytonutrients, namely flavonoids, sterols, phenolic acids

It can be found in one ounce of this nutrition information a whole lot of almonds (28g) or approximately 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
VitaminE:7.3mg
Magnesium:76.7mg

Carbs One hundred gram of almonds offers 6.1 grams of carbohydrates. Almonds are a good fiber source as well as a lower glycemic index they are an excellent choice of nuts compared to many others for people on low-carb diets. In fact, almonds make up an important component of most of the finest low-carb snacks.

Fats

Almonds are fatty foods, which contain high fat less than 22 percent of the amount of fat in a day recommended in a single ounce. However, most of the fat found monounsaturated fat has in almonds and has cardio-protective properties. There is just over 10g of

saturated, 9g of mono-unsaturated 3.5 grams of polyunsaturated fat in a and 3.5 grams of fat serving of almonds.

Protein

Plant-based almonds are also good sources of almonds protein, which has small quantities of all the essential and non essential amino acids. There are Almonds contain 6g of protein per ounce.

Vitamins and Minerals

One ounce of almonds has 37 percent of vitamin E, 8% of the recommended daily intake the recommended daily intake of vitamin E is 8% the recommended dose of calcium daily, and 6 percent of the daily intake of iron recommended. Vitamin E grants antioxidant property and

supports immune function. Calcium is essential for preservation of the structure of teeth and bones. Iron assists in the manufacture of some hormones and getting oxygen to muscles. The almonds contain a lot of manganese, magnesium. Manganese is essential in carbohydrates, metabolism of amino acids, metabolism of cholesterol.

Magnesium is participating in more than 300 of the metabolic processes pathways, such as energy production, protein cell signaling, synthesis and structural functions. like bone formation.

Calories

Almonds contain a lot of calories and they provide 164 calories (approximately 13 minutes of running)per. single ounce. A majority of the calories are sourced by healthy fat, and smaller portions of which are obtained carbohydrates and protein.

Health Benefits

Almonds are extensively advertised on the basis of health and nutritional advantages that they offer Scientific research has given some information towards the ways that almonds consumption can influence human health.

Lowers the risk of Heart Diseases

A review of 29 studies indicated it taken in 2016, and ate 28 grams of nuts a day as in a diet that is low in saturated fat and cholesterol, can decrease the threat of heart disease. When it applied particularly to almonds, this can be due to the fact that they contain lipid-

lowering monounsaturated fat, fiber, and vitamin E. Phytonutrients are also found in almonds.

particularly the plant sterols and flavonoids which are good for the heart and contain antioxidant properties. To get as much of these nutrients as you can, have your almonds with the skins (the concentration of flavonoids is concentrated there). Helps Less Cholesterol Research into the well being benefits of nuts have indicated that the consumption of nuts has its advantages almonds can be used to reduce LDL cholesterol. The low-density lipoproteins are bad cholesterol" due to high levels of cholesterol being associated with heart disease So has consumption of almonds to increased levels of HDL cholesterol. HDL is "good cholesterol" since it plays a role in the elimination. ELDDL cholesterol out of the body. Study authors had even suggested that almonds might be used as food in treating high cholesterol those people who do not desire to take or is not able to take huge amounts of medication Enhances Diabetes Prevention and Control Certain researches indicate that greater in takes of magnesium are linked to the lower risk of developing diabetes. Since almonds provide they can provide this advantage, magnesium. But there is other evidence that supports the consumption of almonds To prevent diabetes. As an example, a research on teenagers and at risk young adults with diabetes were found that individuals who took 56grams of almonds . daily demonstrated decreased Hb A1c, LDL cholesterol, and total cholesterol during 12 weeks (approximately 3 months).

Other research has also alluded to the fact that alcohol consumption can benefit diabetic people. manage lipid and sugar levels. Supports Gut Health

A systematic literature review.

published in 2021 discussed the health advantages of almonds. The benefits were identified by the authors of the study to the gut microbiota. In particular, they discovered that eating the nuts may help maintain the health of the colon by this encourages the richness and diversity of microflora, enriching microflora ratio, and increasing concentrations of bioactive.

health-promoting Provide Metabolic Benefits May. Colonic The research review of 2021 proposed the same. that almond can contain metabolic advantages. In particular, the authors discovered that the diets with almonds assisted the study participants to feel less hungry and more satiated, augmenting the energy of

rest. expenditure. Almonds also assisted in making small but drastic reductions in body weight and fat mass compared to other nuts.

CASHEWS

Cashew are delicious edible nuts that have been found to contain high nutrient content and are healthy.

They contain a lot of copper, magnesium, iron, zinc, and good unsaturated fats.

Cashews also have large quantities of vital minerals especially copper. They are is also a source of zinc, magnesium, iron and protein. Cashews particularly contain high amounts of unsaturated. fats - a type of fatty acids associated with reduced risk of early mortality and cardiac illnesses.

They also contain little sugar, a source of fiber, and have nearly all the same amount of protein as the amount of cooked meat as its equivalent. Moreover, cashews are rich in a large amount of quantity of copper, a mineral needed to produce energy, healthy brain development, and a strong immune system. They're also a great source Important nutrients include of magnesium and manganese for bone health.



Fig no:- 06 Cashew

The nutrition data is as follows supplied to the USDA (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
VitaminB6: 0.1mg
VitaminK: 9.7mcg

Carbs

One ounce of cashew nuts is sufficient (about 29.57 mg) or about 18 nuts. One serving has 157 calorie content and slightly less than 9 grams of carbohydrates. Most of the carbohydrates in cashews are starch. A small amount is Fiber just less than 1 gram and the rest (approximately 1.7 grams) is sugar. The glycemic load of cashews is estimated 3 when you take 1-ounce of it. Glycemic load factors in serving size in estimating a food's impact on blood sugar. Foods with a glycemic index 10 or lower are regarded as low glycemic.

Fats

The bulk of calorie in cashews is supplied from fat. A serving contains 12 grams of fat provided you consume the full ounce. Most of the fat is monounsaturated fat (6.8g) or polyunsaturated fat (2.2g). The healthier type of fat are unsaturated fats. It also has approximated 2.2 grams of less healthy. One serving of cashews contains saturated fat.

Protein

Cashew nuts are a source of slightly more than 5 grams of protein per serving. As a basis for comparison, Peanuts contain more protein than cashews. present more than 7 grams in each one ounce portion.

Vitamins and Minerals

Cashew nuts contain nutrient vitamin K (12 percent of your daily needs). You will also take advantage in consuming thiamin and vitamin B6. cashews Cashews contain high amounts of magnesium, phosphorus, copper, and manganese as well as a good source of zinc and iron.

Calories

One ounce (28g) of original, unsalted cashews has 157 calories (approximately 13 minutes running), 12 percent of which are protein based, 21% carb based, and 67% from fat.

Health Benefits

Eating of nuts in general--of cashews, in particular. Particular is accompanied by some health benefits.

Aids Weight Control Nuts may be a clever snack when you are trying to lose weight. The healthy fat, protein, and fiber in nuts might have a satiating effect on you after meals or at snack time. But since nuts are high

Calories: it is worth taking them in large amounts Moderation A study on the consumption of nuts. reported that consistent intake of nuts (about one) may be in the long run can be included as an ingredient of a healthy diet obesity and type 2 diabetes prevention. But the research examined nuts as a substitute of less healthy foods. The use of this study is not clear on whether or not nuts per se have no special advantage.

May Assist Cholesterol Reduction Cashews can prevent LDL cholesterol an adult who includes some, a study in a published. Article by Colapinto S. 2017, the journal Nutrients. Researchers identified that adults whose cholesterol was mildly high they are to take 28-64 grams of cashews per day reduced by an average of 24 percent in LDL cholesterol as compared to a control diet. Authors of the studies observed that the fatty acid proteins, vegetable fibers, vitamins, carotenoids, minerals and phytosterols in cashews and other nuts are the health nuts benefits.

May Reduce Risk of Gallstones It is somewhat evidence that there is limited evidence that eating nuts have the power to slow down the occurrence of gallstones in both men and women. Studies indicate that such nuts as cashews are able to lower the risk of gallstones. This is likely because of the bioactive constituents, especially unsaturated fatty acids, fiber and minerals. May Aid Diabetes Management or Prevention. The studies have examined the several studies. correlation between diabetes and the consumption of nuts. It has been discovered that type patients have lower levels of research.

Health benefits of consuming 2 diabetes can be gained nuts. Studies have revealed that the consumption of cashew has been associated with lowering the risk of type II diabetes mellitus. The management of diabetes by people is linked to improved. controlled and improved insulin and cholesterol ratio, and elevated Improve the HDL cholesterol and the lower systolic blood pressure Helps to keep the heart healthier.

As all nuts, cashews are high-fat foods but they furnish poly- as well as monounsaturated.

fats--whole-grain fat that assists in enhancing heart when cholesterol is reduced and health promoted consumed in moderation. Cashews also provide pyrrolinic acid fiber that is diet-friendly and is related to a heart

Healthy diet.

There is also research indicating that vegetarian diets. that contain healthy fats and nuts and protein. vegetable (instead of meat products) can increase heart health. Even studies have depicted that nut a is greatly related to consumption reduced risk of cardiovascular disease, particularly in those with type 2 diabetes. Assisted Prevent Copper Deficiency in Special.

Diets One of the best sources of food is cashews. despite seafood and beef, of copper. This makes them perfect when one is on a vegan diet and might be hungry risk for copper deficiency. Copper is necessary for health of the bones and muscles and nearly two-thirds of the copper in the body is found in the muscle and in the skeleton. Celiac patients are more susceptible. more risk than the rest of the population of owning copper deficiency. Cashews are naturally gluten free and celiac disease safe.

RAISINS

Raisins are dried grapes which are commonly used as natural sweetener and nutritional supplements. They contain a high level of carbohydrates, iron, antioxidants and dietary fibre. A raisin is a dried grape. Raisins are manufactured in most parts of the world and can be. eaten uncooked or cooked, baked and brewed. In the United Kingdom, Ireland, New Zealand, The word raisin is Australia and South Africa by the solemn aged large grape, reserved, with sultana a golden-colored dry grape, and currant a dried little Corinth Black seedless grape. The raisins contain a good amount of iron. 100g of Iron. contains 2.6g of Iron.

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



Fig no: -07 Raisins

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

Carbs

One half of raisins contains 11 grams of carbs ounce (14g), as opposed to fresh American type similar grapes contain approximately 2.5 carbs. serving size of 6 grapes (14.4g). Depending on the variety, grapes possess. calories less than raisins, and less fiber too. The amounts of carb, calorie and fiber in golden raisins are similar to dark raisins. Raisins with seeds provide more fiber, an equal dosage of carbs and calories.

Although raisins contain high amounts of carbohydrates, their fructose is the main ingredient of sugar but has a lower level. glycemic index. The glycemic index is a rating of what percentage would a food increase your blood sugar is lower than that of pure glucose, which has a ranking of 100. The real value any food increases you. blood sugar must have something to do with the glycemic it is a good deal of it you eat, and of what you eat with it These are tried to be combined by the glycemic load calculations, and other diets rely on the glycemic load to calculate this reason. The depending on the location, the raisin glycemic index is low to moderate range. Remember that the glycemic index is a technical subject and people may differ responses to foods. Eating too many raisins can lead to a significant increase in blood sugar of individuals with since raisins contain a considerable level of diabetes per 100 grams of carbohydrates.

Fats

Raisins contain an insignificant portion of unsaturated fat.

Protein

Having a little less than 1 gram of protein per 1-ounce raisins do not contain high protein.

Vitamins and Minerals

One ounce of raisins gives 4 percent of your daily needs for potassium. Raisins also contain iron, vitamin B6 and vitamin C, magnesium, and calcium.

Health Benefits

Grapes lose part of their, although raisins are yet to be dried, yet they still have nutrients a good source of antioxidant chemicals including polyphenols and phenolic acids and fiber. Correlated With improved General Diet. A study of data from the 2001-2012

National Health and Nutrition Surveillance demonstrated that the people who ate raisins had a higher quality diet overall. They are more fresh than those who consume fruits, vegetables and whole grains didn't eat raisins. The eaters of the raisins were also lower body weight, lower body mass index (BMI), a smaller waist circumference, and were 39 per cent smaller.

probably would be obese or overweight and was 54 percent less more risk of metabolic syndrome than otherwise eat raisins. Age and prejudiced Body Mass Index (BMI) measure, which does not take into account a number of factors, as body composition, ethnicity, race, gender, and age.

Although BMI is a poor indicator, it is not a useless measure common in the medical world at present since it is a cheap and fast way of doing examining possible health status and results.

Lowers Heart Disease Risk

Consumption of raisins also has been found to be potentially reducing heart disease risk.

Supports Gut Micro biome

The fiber content of raisins is both soluble and insoluble, and has prebiotics, such as inulin. These prebiotics are beneficial in promoting the growth of the good bacteria in the gut, which may reduce it cholesterol, enhance metabolism, and immune system function.

Provides Quick Energy

Athletes require energy in the following form consuming carbohydrates in extensive trainings and races. Most of them resort to sports chews and gels, yet raisins can work just as well. A single small study jellybeans in enhancing athletic performance. when exercising under moderate to high intensity.

Improves Dental Health

There are other nutrients in raisin such as 10, 12- linoleic acid, 10,12-linoleic acid and Oleanic acid, possess antimicrobial properties that are capable of

fighting the dental causing bacteria, e.g. cavities and gum disease.

IMPORTANCE OF CHOCOLATE: - chocolate combines with the natural goodness of cocoa with added therapeutic value, making treatment more enjoyable & patient-friendly for treatments. Taking iron supplements can be a really unpleasant in taste experience—they regularly taste like rusty & metallic and also can produce tough stomach effects . This is exactly where medicated chocolate becomes a big game-changer for delivering hematinics (blood-building nutrients like iron, folic acid, and vitamin B12).

1. Good Taste

Hiding Metallic Taste: Iron salts have a especially bad, lasting metallic taste. The rich flavor and creamy cocoa butter in chocolate completely coat the taste buds, masking the bitterness.

Favorite to Kids: If you ever tried to force a toddler to take bitter iron syrup, you know the struggle. Turning the medicine into a piece of chocolate transforms a daily chore into a treat, making patients (both young and old) much more likely to stick to their treatment.

2. Easy digestion in the stomach

Nausea free: Traditional iron pills hit the stomach hard and fast, often causing nausea or cramping. Chocolate melts slowly and releases the iron gradually, which can make it much easier on the digestive system.

3. Protective Shield

Protective for Vitamins: Blood-building formulas usually include Vitamin C and Folic Acid, which are highly sensitive to moisture and air. Since chocolate is mostly made of fats (cocoa butter) and contains almost no water, it acts like a protective vault, keeping these vitamins potent until you eat them.

4. Chocolate has its own natural ingredient. A Built-in Boost: Dark chocolate isn't just a carrier; it actually brings its own nutrients to the table. It naturally contains some iron, along with copper and magnesium. Copper is especially important because your body needs it to properly absorb and use iron.

RATIONALE OF THE PROJECT

This project will mainly focus on developing a nutritional formula that will help to enhance the

hemoglobin levels of people with iron deficiency or ineffective nutritional consumption.

Iron deficiency anaemia is a common health challenge witnessing among all persons regardless of their age as a result of poor nutrition. Hence, there is a necessity to create a formulation, which would be able to raise the level of hemoglobin as well as supply the necessary nutrients needed to perform regular physiological processes.

The new idea of good chocolate that improves hemoglobin is hinged on the introduction of iron, vitamin B12, and folic acid as the necessary nutrients when it comes to the formation of red blood cells and hemoglobin. The main component of chocolate is cocoa, which is a source of small portions of iron and antioxidants and, therefore, is appropriate to use as a nutritional supplement.

The formulation will increase the nutritional profile of the product and will improve the health of the blood by adding iron-rich natural ingredients, including beetroot powder, moringa powder, carrot powder, nuts, and dried fruits.

Chocolate is a common product, which is accepted and consumed by both children and the older generation. Hence, chocolate as a source of vital nutrients is a convenient, savory, and acceptable way through which nutritional supplementation can be made.

These formulations are however to be taken in moderation so that one does not consume a lot of sugar and other ingredients. The hematinic chocolate products can be a good and tasting nutritional supplement to boost the levels of hemoglobin and health in general provided that it is developed properly.

III. MATERIALS AND METHODS

Key Ingredients

The preparation will be made on the basis of a combination of nutrient and hematinic ingredients:

Beetroot Powder - natural source of folate and iron.

Moringa Powder - it is full of vitamins, minerals and antioxidants.

Carrot Powder - is a source of essential nutrients and beta-carotene.

Honey - all-natural sweetener that has added health value.

Almonds and Cashews - healthy fats, micronutrients and protein.

Raisins - natural energy (iron and natural sugars).

Cocoa Butter/Chocolate Base - to formulate an acceptable stable palatable chocolate.

TABLES AMOUNT OF INGREDIENTS

Table 1: Amount of Dry Fruit Powder per Dose

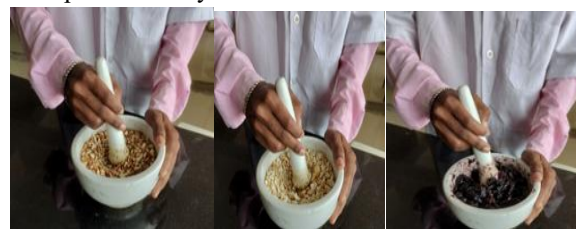
Sr. No.	Name of Ingredient	Amount (g)
1	Cashew Powder	1 g
2	Almond Powder	1g
3	Raisin Powder	1g
Total	-	3g

Table 2: Approximate Amount of Ingredients (Per Dose)

Sr. No.	Name of Ingredient	Amount (g)
1	Beetroot Powder	0.8g
2	Moringa Powder	0.6g
3	Pumpkin seed Powder	0.6g
4	Dry Fruits	3g
5	Chocolate Base	10g
Total	-	15g

IV. METHOD OF PREPARATION OF HEMATINIC CHOCOLATE

1. Preparation of Dry Fruit Powder



- Weight 10g cashew powder, 10g almond powder, and 10g raisin powder.

- Mix all ingredients thoroughly.

- This yields approximately 22g of dry fruit powder.

Flow Diagram: Cashew (10g) + Almond (10g) + Raisin (10g) → Mixing → Dry Fruit Powder (30g)

2. Preparation of Chocolate

a) Weighing

- Beetroot Powder – 8 g

- Moringa Powder – 6g

- Pumpkin seed Powder – 6g

- Chocolate Base – 200g
- Weigh all ingredients separately.



b) Melting

- Melt cocoa butter and chocolate base using hot vapor method.
- Add water in pan boil it and add a stand add chocolate pot.



c) Mixing

- After melting, add all powders and mix properly.



d) Stirring

- Stir the mixture continuously for 15 minutes.
- Transfer into silicone chocolate molds while adding dry fruit powder.

e) Freezing

- Add formulation into moulds .
- Freeze the molds for 2 hours.

V. EVALUATION & RESULTS

Table 3: Evaluation of Chocolate Base

Sr. No.	Characteristic	Criteria	Scale
1	Appearance	Shiny, smooth, no dots	1–5 (5 = Best)
2	Fragrance/Smell	Chocolaty, fresh, no chemical smell	1–5 (5 = Best)
3	Taste	Chocolaty with good aftertaste	1–5 (5 = Best)
4	Touch	Soft, smooth, melts evenly in mouth	1–5 (5 = Best)

Volunteer	Appearance (1-5)	Aroma (1-5)	Taste (1-5)	Texture (1-5)
A	4.5	4.8	5.0	4.0
B	5.0	5.0	5.0	5.0
C	4.0	5.0	5.0	4.8
D	5.0	4.5	5.0	4.0
E	5.0	5.0	5.0	5.0

Table 4: Sensory Evaluation of Hematinic Chocolate

Sr. No.	Characteristic	Result
1	Color	Dark Brown
2	Odor	Pleasant
3	Taste	Sweet
4	Texture	Smooth

Table 5: Thickness Measurement

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

Table 6: Weight Variation Test

Batch	Weight Variation (g)
B1	10.06 ± 0.23
B2	10.02 ± 0.33
B3	10.10 ± 0.28

RESULT

Haematinic chocolate is a specialized nutrition targeted by diet supplement nutrients, mainly iron, folic acid and vitamins in a chocolate-based form, which is palatable. It is widely used of the prevention and management of iron lack and associated illnesses. The easy to swallow and like taste is a good one choice that should be made by those who can find it difficult and with the old time iron supplements.

HEMATINIC CHOCOLATE:

EVALUATION: -

Evaluation of chocolate: Taste, Texture and Mouth Feel Characteristics of chocolate base was determined by using 2 Human Volunteers³ Childrens it was found to be satisfactory.

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

According to the analysis of test report, obtained 100 gm of chocolates, Pramukh laboratory have adequate quantity of protein and amount of total fat limited saturated fats and cholesterol rates are insignificant But, the same has a lot of carbohydrates and sugar in it which may do injurious health effects So, they should be altered with a substitution of sugar with sugar free substances.

VI. SUMMARY & CONCLUSION

The evaluation of hematinic chocolate demonstrated that the formulation successfully combines nutritional efficacy with consumer acceptability. Sensory analysis confirmed high scores for appearance, aroma, taste, and texture, indicating strong palatability and

volunteer satisfaction. The product exhibited uniform thickness and weight variation across batches, reflecting consistency in manufacturing and effective mixing of active ingredients with excipients.

Nutritional profiling revealed adequate protein content and minimal saturated fat and cholesterol, aligning with health-oriented dietary standards. However, the relatively high carbohydrate and sugar levels highlight the need for formulation refinement, particularly through substitution with sugar-free alternatives, to enhance safety and suitability for long-term use.

Overall, hematinic chocolate represents a novel, patient-friendly supplement that addresses iron deficiency in a more acceptable and enjoyable form compared to conventional dosage forms. Its pleasant taste, smooth texture, and reliable physical characteristics make it a promising candidate for broader application in nutritional therapy, provided that sugar content is optimized.

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