

Anti- Anemi Cformulation: Medicinal Chocolate to Treat Anemia

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Abstract—Anemia is the most prevalent nutritional deficiency disorder in the world affecting all age groups but the most vulnerable are preschool-age children, pregnant women, and non-pregnant women of child bearing age. Globally, anemia affects 1.62 billion people, which corresponds to 24.8% of the population. Prevalence of anemia in all the groups is higher in India as compared to other developing countries influencing 50% of the population. National Family Health Survey statistics reveal that every second Indian woman is anemic and one in every five maternal deaths is directly due to anemia. In the present investigation an attempt has been made to formulate effective herbal anti-anemic formulation to combat health related complications associated with anemia. Formulation is designed especially centering its acceptability by children. The prepared formulation is subjected to invivo anti anemic activity on experimental animals. The formulation is also evaluated by suitable parameters like sensory characteristics, pH, viscosity, stability and phytochemical analysis.

1. INTRODUCTION

Anemia is the most prevalent nutritional deficiency disorder in the world affecting all age groups but the most vulnerable are preschool- age children, pregnant women, and non-pregnant women of childbearing age. Globally, anemia affects 1.62 billion people, which corresponds to 24.8% of the population. Prevalence of anemia in all the groups is higher in India as compared to other developing countries influencing 50% of the population. National Family Health Survey statistics reveal that every second Indian woman is anemic and one in every five maternal deaths is directly due to anemia.

Table 1: The normal Hb Values

Age Group	Hb Count (Normal)
Male	13
Female (non-pregnant)	12
Female (pregnant)	11
Children (6 month-6yr.)	11
Children (6 yr.-14yr.)	12

A. Anemia Symptoms

The signs of anemia can be so mild that you might not even notice them. At a certain point, as your blood cells decrease, symptoms often develop. Depending on the cause of the anemia, symptoms may include:

1. Dizziness, light headness, or feeling like you are about to pass out
2. Fast or unusual heartbeat
3. Headache
4. Pain, including in your bones, chest, belly, and joints
5. Problems with growth, for children and teens
6. Shortness of breath
7. Skin that's pale or yellow
8. Cold hands and feet
9. Tiredness weakness

B. Types:

1. Aplastic anemia: Aplastic anemia is a condition that occurs when your body stops producing enough new blood cells. The condition leaves you fatigued and more prone to infections and uncontrolled bleeding.
2. Anemia of inflammation: Diseases that cause on going inflammation can keep the body from making enough red blood cells. Examples are cancer, HIV/AIDS, rheumatoid arthritis, kidney

disease and Crohn's disease.

3. Anemias linked to bone marrow disease: Diseases such as leukemia and myelofibrosis can affect how the bone marrow makes blood. The effects of these types of diseases range from mild to life-threatening.
4. Hemolytic anemias: This group of anemias is from red blood cells being destroyed faster than bone marrow can replace them. Certain blood diseases increase how fast red blood cells are destroyed. Some types of hemolytic anemia can be passed through families, which is called inherited.
5. Iron deficiency anemia: Iron deficiency anemia is a common type of anemia a condition in which blood lacks adequate healthy red blood cells. Red blood cells carry oxygen to the body's tissues.
6. Sickle cell anemia: Sickle cell anemia is one of a group of inherited disorders known as sickle cell disease. It affects the shape of red blood cells, which carry oxygen to all parts of the body.
7. Thalassemia: Thalassemia (thal-uh-SEE-me-uh) is an inherited blood disorder that causes your body to have less hemoglobin than normal. Hemoglobin enables red blood cells to carry oxygen. Thalassemia can cause anemia, leaving you fatigued.
8. Vitamin deficiency anemia: Vitamin deficiency anemia is a lack of healthy red blood cells caused by lower than usual amounts of vitamin B-12 and folate. This can happen if you don't eat enough foods containing vitamin B-12 and folate, or if your body has trouble absorbing or processing these vitamins.

Drug Profile Chart - Ferrous Sulphate

Sr. No.	Parameter	Details
1	Generic Name	Ferrous Sulphate
2	Category	Hematinic / Iron Supplement
3	Chemical Class	Iron Salt
4	Molecular Formula	$\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
5	Molecular Weight	278.01 g/mol
6	IUPAC Name	Iron (II) sulfate heptahydrate
7	Appearance	Pale green crystalline powder
8	Taste	Metallic / Astringent
9	Melting Point	Approximately 64 °C
10	Solubility (Solution)	Soluble in water

11	pKa	Not applicable
12	Biological Half-life	Approximately 6 hours
13	Uses	Treatment and prevention of iron deficiency anemia
14	Storage	Store in a cool and dry place
15	Structure	$\text{Fe}^{2+} \left[\begin{array}{c} \text{O} \\ \parallel \\ \text{O} - \text{S} - \text{O} \\ \parallel \\ \text{O} \end{array} \right]^{2-} \cdot 7\text{H}_2\text{O}$

B. Causes:

- Anemia occurs when the blood doesn't have enough hemoglobin or red blood cells this can happen if:
- The body doesn't make enough hemoglobin or red blood cells.
- Bleeding causes loss of red blood cells and hemoglobin faster than they can be replaced.
- The body destroys red blood cells and

II. ANTI-ANEMIC CHOCOLATE

Sr. No.	Ingredient	Quantity(ingm)
1.	Ferrous sulfate	2g
2.	Cocoa powder	40g
3.	Milk powder	5g
4.	Compound Base	40g
5.	Flavouring Agent (Chocolate & Peppermint)	Q. S
6.	Sugar Powder	10g

III. EVALUATION OF CHOCOLATE BASE

- Viscosity determination of chocolate base
Brookfield Rotational digital viscometer is used to measure the viscosity(cps) of the prepared chocolate base. The spindle is rotated at 20 rpm; samples of chocolate base are heated at 50°C before the measurements are taken.
- Taste, texture and mouth feel characteristics assessment
Taste, texture & mouth feel characteristics of chocolate are evaluated by taking panel of 10 human volunteers on a rating scale of 1-5 (Table 1).

IV. EVALUATION OF MEDICATED CHOCOLATES

A. General Appearance

The general appearance of a chocolate formulation, its visual identity and overall “elegance,” is essential (i)For Consumer acceptance (ii)For control of lot-to-lot uniformity and (iii)Form on it oring trouble free manufacturing. The control of the general appearance of a chocolate involves the measurement of number of attributes such as chocolate’s color, presence or absence of an odor, taste, surface texture and physical flaws. Dimensions

The dimension of chocolate is measured by Vernier’s caliper.

B. Moisture content determination

Moisture content of chocolate formulation is determined by using digital Karl Fischer titrator.

These instruments are designed to calculate percentage (%) water content by using formula: $\text{Water} = \left[\frac{\text{Volume (mL) TS of water determination consumed} \times f}{\text{mg/m}} \right] \times 100 (\%)$

Where, f= The number of mg of water (H₂O) corresponding to 1ml of water Determination TS, TS= Water determination test sample.



C. Blooming test

1. Fat bloom

When a thin layer of fat crystals forms on the surface of the chocolate formulation. This will cause the chocolate to lose its gloss and a soft white layer will appear, giving the finished article an unappetizing

look. Fat bloom\ is caused by the recrystallization of the fats and/or a migration of a filling fat to the chocolate layer. Storage at a constant temperature will delay the appearance of fat bloom.

2. Sugar bloom:

This is a rough and irregular layer on top of the chocolate formulation. Sugar bloom is caused by condensation (when the chocolate is taken out of the refrigerator). This moisture will dissolve the sugar in the chocolate. When the water evaporates afterwards, the sugar recrystallizes into rough, irregular crystals on the surface. This gives the chocolate an unpleasant look.

3. In vitro drug Release:

In vitro drug release study of chocolate formulation is performed in USP dissolution apparatus Type 1 (Basket), using 0.1N HCl as a dissolution media. The vessel of the dissolution apparatus is filled with 900 ml of 0.1N HCl is placed and allowed to attain a temperature of $37 \pm 0.5^\circ\text{C}$ and 50rpm. A chocolate formulation is placed in the basket. At predetermined time in terval samples are withdrawn and volume is replaced with equal quantity of fresh medium. The collected samples are filtered and analyzed by UV Spectroscopy.

V. EVALUATION OF HEMATINIC ACTIVITY

Hematinic activity means the ability to increase blood hemoglobin and red blood cell production.

Parameters:

- Hemoglobin level (Hb)
- RBC count
- Hematocrit (PCV)
- Serum iron level

Study Design

Experimental animals or volunteers can be divided into:

- Control group
- Standard group (marketed iron preparation)
- Test group (anti-anemic medicated chocolate)

Expected Outcome

The medicated chocolate should:

- Increase hemoglobin level
- Improve RBC count
- Restore serum iron level
- Show better patient acceptability than conventional iron tablets/syrup

VI. MEDICATED CHOCOLATES

Table3: Evaluation of herbal chocolate

Parmeter	Values
Weight	7.5±0.5gm
Color	Brown
Ph	6.8
Stability	No liquid exudates were separated at different temperatures.

VII. RESULT

Oral administration of ferrous Sulphate for one-week induced anemia in rats. Anti-anemic Chocolate used in the management of anemia. As a result there is an increase in the Hb count within 1 week.

VIII. CONCLUSION

The new trend in food manufacturing is functional or health-promoting foods. These foods prevent illnesses such as heart disease, osteoporosis, cancer, diabetes, etc. Epidemiological studies have shown that consumption of diets rich in fruits promotes lower risk of chronic diseases, including cancer, heart disease, stroke, and also diabetes control and reduced risk of obesity. Chocolate flavour resides not only in a volatile aromatic fraction of flavour-active components but also in non-volatile compounds influencing taste perception. Its complex composition depends on the cocoa bean genotype, specifically on contents of bean storage proteins, polysaccharides and polyphenols. The organoleptic characteristics of bitter and unpleasant flavors of drug can be masked by chocolate. Thus, chocolate drug delivery is a promising tool for delivery of drug through oral route.

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