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TO FORMULATE AND EVALUATE A HERBAL HEMATINIC SYRUP USING NATURAL PLANT-BASED INGREDIENTS

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ABSTRACT

The present study focuses on the formulation of seabuckthorn-based herbal lozenges using a natural and effective approach. Seabuckthorn extract was prepared by maceration using a suitable solvent, followed by filtration and concentration to obtain a thick extract rich in bioactive constituents. The formulation of lozenges was carried out using jaggery as a base and corn syrup as a binding agent, along with citric acid for flavor enhancement. The molten base was prepared by heating jaggery and corn syrup, into which the seabuckthorn extract was incorporated with continuous stirring to ensure uniform distribution. The mixture was further processed to obtain a semi-solid consistency and poured into moulds, followed by cooling and solidification at room temperature. The prepared lozenges were collected and stored in airtight containers to maintain stability. The formulation demonstrated desirable physical characteristics, uniformity, and ease of preparation. The use of natural ingredients enhances the therapeutic potential and patient acceptability of the formulation. Overall, seabuckthorn lozenges represent a promising herbal dosage form with potential health benefits.

KEYWORDS: Seabuckthorn, Herbal Lozenges, Maceration, Oral Dosage Form, Nutraceutical.

INTRODUCTION

Herbal medicine has been an integral part of human healthcare since ancient times. With the increasing awareness about the adverse effects of synthetic drugs, there has been a significant shift towards the use of herbal and natural remedies.[1] Herbal formulations are considered safer, economical, and more compatible with the human body. Among

these, herbal hematinic preparations have gained considerable importance due to their ability to improve hemoglobin levels and treat anemia naturally.[2]

A hematinic is defined as an agent that increases the hemoglobin content of the blood and improves the quality and quantity of red blood cells (RBCs). Hematinics are commonly used in the treatment of anemia, a condition characterized by a deficiency of hemoglobin or red blood cells in the body.[3] Anemia is one of the most prevalent nutritional disorders worldwide, affecting millions of people, especially women, children, and elderly individuals. The major cause of anemia is iron deficiency, although deficiencies of folic acid, vitamin B_{12}, and other nutrients can also contribute.[4]

Conventional hematinic formulations generally contain iron salts such as ferrous sulfate, ferrous gluconate, and ferrous fumarate.[5] Although these formulations are effective, they often produce side effects such as nausea, constipation, gastric irritation, and poor patient compliance. Therefore, there is a growing demand for herbal hematinic preparations that are effective, safe, and free from such adverse effects.[6]

Herbal hematinic syrups are prepared using plant-based ingredients rich in iron, vitamins, and antioxidants.[7] These ingredients not only help in increasing hemoglobin levels but also improve overall health by enhancing digestion, immunity, and metabolism.[8] The combination of different herbs provides a synergistic effect, making the formulation more effective than individual components.[9]

In this project, an attempt has been made to formulate and evaluate a herbal hematinic syrup using natural ingredients such as beetroot, amla, palak, methi, ashwagandha, and pomegranate.[10] These ingredients are well known for their nutritional and medicinal properties and have been used traditionally in Ayurveda for the treatment of anemia and related disorders.[11]

Anemia and its Significance

Anemia is a condition in which the hemoglobin level in the blood is lower than normal. Hemoglobin is a protein present in red blood cells that carries oxygen from the lungs to various parts of the body. When hemoglobin levels decrease, the body tissues do not receive sufficient oxygen, leading to symptoms such as fatigue, weakness, dizziness, shortness of breath, and pale skin.[12]

Iron deficiency anemia is the most common type of anemia and is mainly caused by inadequate dietary intake of iron, poor absorption, blood loss, or increased physiological demand such as during pregnancy. According to global health reports, a significant percentage of the population suffers from anemia, particularly in developing countries.[13]

Herbal hematinic formulations play an important role in managing anemia by providing natural sources of iron along with essential nutrients that enhance its absorption and utilization in the body.[14]

Anemia is one of the most common nutritional disorders worldwide, especially in developing countries. It mainly occurs due to iron deficiency, although deficiencies of folic acid and Vitamin B12 may also contribute.[15]

Causes of Anemia include iron deficiency, poor diet and malnutrition, chronic diseases, blood loss, poor absorption of nutrients.[16]

Symptoms of Anemia include fatigue and weakness, pale skin, shortness of breath, dizziness and headache. Herbal hematinic preparations are beneficial in treating anemia because they provide natural iron along with supportive nutrients, improving both blood quality and general health.[17]

The need for herbal hematinic syrup arises due to the limitations associated with synthetic iron supplements. These include gastrointestinal side effects, poor bioavailability, low patient compliance, risk of toxicity at higher doses. The increasing use of herbal products is due to the following reasons i.e. safer than synthetic drugs, better patient compliance, nutritional benefits along with medicinal effects, easily available and cost-effective, minimal side effects.[18]

The use of herbs in syrup form is advantageous because syrups are easy to administer, palatable, and suitable for all age groups, especially children and elderly patients.[19]

Herbal formulations offer several advantages such as better absorption due to natural constituents, presence of Vitamin C which enhances iron absorption, minimal side effects, additional health benefits like antioxidant and immune-boosting properties. The use of herbal syrups is also preferred due to their ease of administration, palatability, and suitability for all age groups.

Herbal Syrup Dosage Form

A syrup is a concentrated aqueous preparation of sugar or sugar substitutes with or without flavouring agents and medicinal substances. Herbal syrups are widely used due to their sweet taste, ease of swallowing, better patient compliance and stability. In this formulation, sugar syrup and honey are used as the base to improve taste and provide additional therapeutic benefits.

Advantages of herbal hematinic syrup include natural and safe formulation, rich in iron and vitamins, improves immunity, enhances digestion and absorption, suitable for long-term use and minimal side effects.

Disadvantages include slow onset of action compared to synthetic drugs, taste may not be highly pleasant, stability issues may occur.

Mechanism of herbal hematinic syrup

Herbal Ingredients
(Beetroot + Amla + Palak + etc.)
↓
Iron + Vitamins Supply
↓
Increased Hemoglobin
↓
Improved Oxygen Transport
↓
Reduced Fatigue & Anemia

PLANT PROFILE

1. Beetroot

- Biological Name: Beta vulgaris
- Family: Amaranthaceae
- Common Name: Beetroot

Description

Beetroot is a root vegetable known for its deep red colour and high nutritional value. It is widely used as a natural remedy for improving blood health.

Chemical Constituents

- Iron
- Folic acid
- Vitamin C
- Antioxidants (betalains)

Uses

- Increases hemoglobin levels
- Improves blood circulation
- Acts as antioxidant

Role in Hematinic Syrup

Beetroot acts as a primary source of iron, helping in the formation of red blood cells.

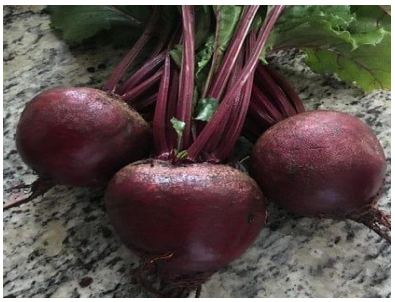

Figure 1: Beetroot.

2. Amla

- Biological Name: Emblica officinalis
- Family: Phyllanthaceae
- Common Name: Indian Gooseberry

Description

Amla is a highly nutritious fruit rich in Vitamin C and widely used in Ayurveda.

Chemical Constituents

- Vitamin C
- Tannins
- Polyphenols

Uses

- Enhances iron absorption
- Boosts immunity
- Improves digestion

Role in Syrup

Amla improves bioavailability of iron, making the formulation more effective.

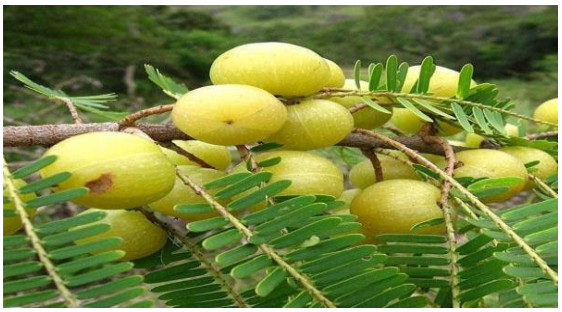

Figure 2: Amla.

3. Palak (Spinach)

- Biological Name: Spinacia oleracea
- Family: Amaranthaceae

Description

Spinach is a green leafy vegetable rich in iron and minerals. Chemical Constituents

- Iron
- Calcium
- Folic acid
- Chlorophyll

Uses

- Supports RBC formation
- Improves energy levels

Role in Syrup

Acts as a natural iron supplement.

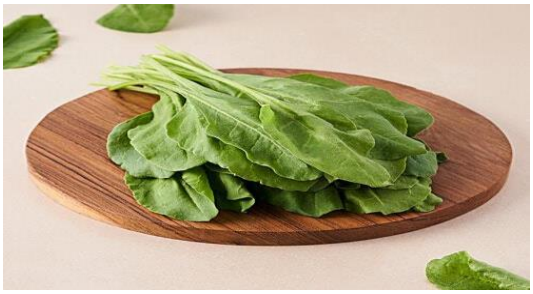

Figure 3: Spinach.

4. Methi (Fenugreek)

- Biological Name: Trigonella foenum-graecum
- Family: Fabaceae

Description

Methi seeds are commonly used in traditional medicine for digestive and metabolic benefits.

Chemical Constituents

- Alkaloids
- Saponins
- Fiber

Uses

- Improves digestion
- Enhances nutrient absorption

Role in Syrup

Helps in better absorption of nutrients, increasing effectiveness of formulation.

Figure 4: Spinach.

5. Ashwagandha

- Biological Name: Withania somnifera
- Family: Solanaceae

Description

Ashwagandha is an important adaptogenic herb used in Ayurveda.

Chemical Constituents

- Withanolides
- Alkaloids

Uses

- Reduces fatigue
- Improves strength and immunity

Role in Syrup

Helps in reducing weakness associated with anemia.

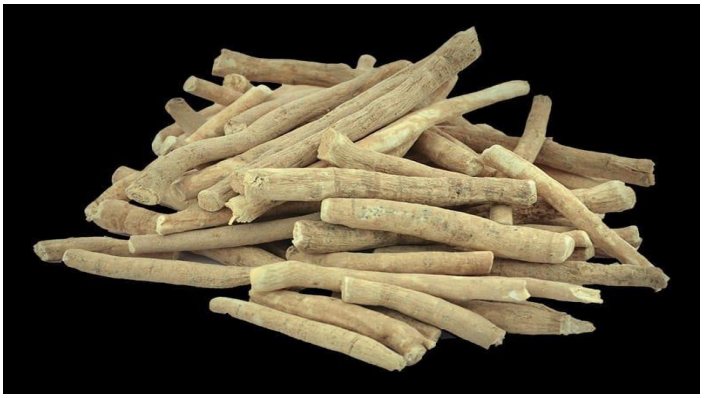

Figure 5: Ashwagandha.

6. Pomegranate

- Biological Name: Punica granatum
- Family: Lythraceae

Description

Pomegranate is a fruit rich in iron and antioxidants. Chemical Constituents

- Iron
- Vitamin C
- Polyphenols

Uses

- Increases hemoglobin
- Improves blood circulation

Role in Syrup

Supports RBC production and blood purification.

Figure 6: Pomegranate.

METHODOLOGY

Materials Required

The following natural ingredients and excipients were used for the preparation of herbal hematinic syrup:

Table 1: List of Ingredients.

Sr. No.	Ingredient	Quantity	Category	Function
1	Beetroot powder	2 g	Herbal drug	Iron source, hematinic
2	Amla powder	1.5 g	Herbal drug	Vitamin C source
3	Palak powder	1 g	Herbal drug	Iron supplement
4	Methi powder	0.5 g	Herbal drug	Improves digestion
5	Ashwagandha powder	0.5 g	Herbal drug	Adaptogen
6	Pomegranate powder	2 g	Herbal drug	RBC enhancer
7	Honey	20 ml	Natural excipient	Sweetener, antioxidant
8	Sugar syrup	q.s. to 100 ml	Vehicle	Base of syrup
9	Sodium benzoate	0.1 g	Preservative	Prevents microbial growth

Equipment Used

Table 2: Equipment Required.

Sr. No.	Equipment	Use
1	Weighing balance	Accurate measurement
2	Beaker	Mixing and preparation
3	Stirring rod	Uniform mixing
4	Measuring cylinder	Volume measurement
5	Heating mantle	Preparation of syrup
6	Filter paper	Filtration
7	Glass bottle	Storage

Method of Preparation

The herbal hematinic syrup was prepared using the following method:

Step 1: Preparation of Sugar Syrup

Sugar was dissolved in purified water and heated gently until a clear syrup was obtained. This syrup acts as the base of the formulation.

Step 2: Weighing of Ingredients

All herbal powders (beetroot, amla, palak, methi, ashwagandha, pomegranate) were accurately weighed using a digital balance.

Step 3: Mixing of Herbal Powders

The weighed powders were mixed thoroughly in a clean, dry container to ensure uniform distribution.

Step 4: Incorporation into Syrup

The powder mixture was slowly added to the sugar syrup with continuous stirring to avoid lump formation.

Step 5: Addition of Honey

Honey was added to improve taste and provide additional therapeutic benefits.

Step 6: Addition of Preservative

Sodium benzoate was dissolved in a small quantity of water and added to the mixture to prevent microbial growth.

Step 7: Volume Adjustment

The final volume was adjusted to 100 ml using purified water.

Step 8: Filtration

The syrup was filtered using filter paper to remove any undissolved particles.

Step 9: Storage

The prepared syrup was stored in a clean, dry, amber-coloured bottle to protect it from light and contamination.

Formulation Table

Table 3: Final Formulation Composition.

Ingredient	Quantity
Beetroot powder	2 g
Amla powder	1.5 g
Palak powder	1 g
Methi powder	0.5 g
Ashwagandha powder	0.5 g
Pomegranate powder	2 g
Honey	20 ml
Sodium benzoate	0.1 g
Sugar syrup	q.s. to 100 ml

Evaluation Methods

The prepared herbal syrup was evaluated using the following parameters:

Table 4: Evaluation Parameters.

Sr. No.	Parameter	Method
1	Color	Visual inspection
2	Odor	Sensory evaluation
3	Taste	Organoleptic test
4	Ph	pH meter
5	Viscosity	Viscometer
6	Stability	Storage study
7	Microbial test	Standard methods

1. Organoleptic Evaluation

The colour, odour, taste, and appearance of the syrup were evaluated using sensory methods.

2. pH Determination

The pH was measured using a pH meter and was found to be within the acceptable range (4– 6).

3. Viscosity

Viscosity was measured to ensure proper flow and consistency of the syrup.

4. Stability Study

The formulation was stored at different conditions to check changes in colour, odour, and precipitation.

5. Microbial Test

The syrup was tested for microbial contamination to ensure safety.

Storage conditions

The prepared syrup was stored under the following conditions:

- Temperature: Room temperature
- Container: Airtight amber bottle
- Protection from light and moisture

RESULT

Evaluation Parameters

The prepared herbal hematinic syrup was evaluated based on the following parameters:

Table 5: Evaluation Parameters.

Sr. No.	Parameter	Purpose
1	Organoleptic properties	To check appearance and acceptability
2	pH determination	To ensure compatibility with oral use
3	Viscosity	To check flow property
4	Specific gravity	To determine density
5	Stability study	To check shelf life
6	Microbial test	To ensure safety
7	Sedimentation	To check uniformity

1. ORGANOLEPTIC EVALUATION

Organoleptic evaluation includes the study of colour, odour, taste, and appearance of the formulation. These parameters are important because they directly affect patient acceptance.

- Colour: The syrup was observed visually under natural light.
- Odour: Evaluated by smelling the formulation.
- Taste: Checked carefully for sweetness and herbal flavour.
- Appearance: Checked for clarity and presence of particles.

Table 6: Organoleptic Evaluation

Parameter	Observation
Color	Reddish-brown
Odor	Characteristic herbal
Taste	Sweet with slight bitterness
Appearance	Slightly turbid but uniform

Result: The formulation showed acceptable organoleptic properties, making it suitable for oral use.

2. PH DETERMINATION

The pH of the syrup is an important factor for stability and patient comfort. It was measured using a digital pH meter.

- A small quantity of syrup was diluted with distilled water.
- The pH electrode was immersed in the solution.
- Reading was recorded.

Table 7: pH Determination.

Trial	pH Value
1	4.5
2	4.7
3	4.6

Average pH: 4.6

Result: The pH is within the acceptable range (4–6), indicating the formulation is safe and stable.

3. VISCOSITY

Viscosity determines the flow property and consistency of the syrup.

- Measured using a viscometer.
- Ensures easy pouring and proper coating.

Table 8: Viscosity Measurement

Trial	Viscosity (cP)
1	120
2	125
3	123

Average: 122.6 cP

Result: The syrup shows moderate viscosity, suitable for oral administration.

4. SPECIFIC GRAVITY

Specific gravity indicates the density of the syrup.

- Measured using a specific gravity bottle.

Table 9: Specific Gravity.

Trial	Value
1	1.25
2	1.27
3	1.26

Average: 1.26

Result: Indicates proper concentration of the syrup.

5. SEDIMENTATION STUDY

Sedimentation test ensures uniform distribution of particles.

- The syrup was stored undisturbed.
- Observed for sediment formation.

Table 10: Sedimentation Study.

Time	Observation
0 hr.	No sediment
24 hr.	Slight sediment
48 hr.	Minimal sediment

Result: Slight sedimentation observed, which can be redispersed by shaking.

6. STABILITY STUDY

Stability study ensures that the formulation remains unchanged over time.

- Stored at room temperature.
- Observed for changes in colour, odour, and consistency.

Table 11: Stability Study.

Time	Color	Odor	Observation
0 days	Reddish	Normal	Stable
15 days	No change	Normal	Stable
30 days	No change	Normal	Stable

Result: The formulation is stable under normal conditions.

7. MICROBIAL TEST

Microbial testing ensures the absence of harmful microorganisms.

- Performed using standard microbiological methods.

Table 12: Microbial Test.

Test	Result
Bacterial growth	Absent
Fungal growth	Absent

Result: The formulation is safe for consumption.

8. HOMOGENEITY

Homogeneity ensures uniform distribution of ingredients.

- Checked by visual inspection.

Table 13: Homogeneity.

Parameter	Observation
Uniformity	Good
Phase separation	Absent

9. TASTE EVALUATION

Taste plays a key role in patient compliance.

- Evaluated by sensory method.

Table 14: Taste Evaluation

Parameter	Observation
Sweetness	Good
Bitterness	Slight
Acceptability	High

Results

The results obtained from different evaluation parameters are summarized below:

Table 15: Summary of Evaluation Results.

Sr. No.	Parameter	Result	Interpretation
1	Color	Reddish-brown	Indicates presence of herbal ingredients
2	Odor	Characteristic	Acceptable herbal smell
3	Taste	Sweet with slight bitterness	Palatable
4	Ph.	4.6	Suitable for oral use
5	Viscosity	122.6 cP	Good flow property
6	Specific gravity	1.26	Proper concentration
7	Sedimentation	Slight	Redispersible
8	Stability	Stable	No significant changes
9	Microbial test	Absent	Safe formulation
10	Homogeneity	Good	Uniform mixture

DISCUSSION

The prepared herbal hematinic syrup showed satisfactory results in all evaluation parameters, indicating that the formulation is suitable for oral administration and effective in anemia management. The syrup exhibited a reddish-brown colour, which is mainly due to the presence of beetroot and pomegranate. The characteristic odour confirms the presence of herbal components, while the taste was found to be sweet with slight bitterness. The addition of honey and sugar syrup improved palatability, making the formulation acceptable for patients of all age groups. The pH of the formulation was found to be 4.6, which lies within the acceptable range for oral syrups. The viscosity of the syrup was observed to be 122.6 cP, indicating moderate thickness. The specific gravity value of 1.26 indicates that the syrup has proper density and concentration. Slight sedimentation was observed during storage, which is common in herbal formulations due to the presence of natural plant particles. mThe stability study showed no significant changes in colour, odour, or consistency over a period of time. This confirms that the formulation is stable under normal storage conditions and has a good shelf life. The absence of microbial growth confirms that the formulation is safe for consumption. The formulation was found to be homogeneous, indicating uniform distribution of all ingredients.

CONCLUSION

The present study was carried out to formulate and evaluate an herbal hematinic syrup using natural plant-based ingredients such as beetroot, amla, palak, methi, ashwagandha, and pomegranate. The primary objective of this formulation was to develop a safe, effective, and economical alternative to synthetic hematinic preparations for the management of anemia.

Anemia is one of the most common nutritional deficiencies worldwide, particularly affecting women, children, and elderly individuals. Conventional iron supplements, although effective, are often associated with several side effects such as gastrointestinal irritation, nausea, constipation, and poor patient compliance. Therefore, there is a growing need for herbal formulations that are not only effective but also free from adverse effects. The use of herbal ingredients provides a natural and holistic approach to improving hemoglobin levels and overall health.

In this study, the selected herbal ingredients were chosen based on their known hematinic and therapeutic properties.

Beetroot and pomegranate are rich sources of iron and play a direct role in increasing hemoglobin levels and red blood cell production. Amla, being a rich source of vitamin C, enhances iron absorption and improves bioavailability. Palak provides essential nutrients required for blood formation, while methi improves digestion and nutrient absorption. Ashwagandha acts as an adaptogen, helping in reducing fatigue, improving energy levels, and enhancing overall well-being. The combination of these ingredients provides a synergistic effect, making the formulation more effective.

The preparation of the herbal hematinic syrup was carried out using a simple and cost-effective method. Sugar syrup and honey were used as the base to improve the taste and acceptability of the formulation. Sodium benzoate was added as a preservative to enhance shelf life and prevent microbial contamination. The method of preparation ensured uniform mixing and stability of the formulation.

The prepared syrup was evaluated for various parameters such as organoleptic properties, pH, viscosity, specific gravity, sedimentation, stability, and microbial safety. The results of these evaluations confirmed that the formulation meets all the required standards for oral administration. The syrup exhibited a pleasant reddish-brown colour, characteristic odour, and sweet taste with slight bitterness, making it acceptable for patients. The pH was found to be within the acceptable range, ensuring stability and safety. The viscosity was moderate, allowing easy administration, while the specific gravity indicated proper concentration of the formulation.

The stability study showed that the formulation remained stable over a period of time without any significant changes in its physical characteristics. The microbial test confirmed the absence of harmful microorganisms, indicating that the formulation is safe for consumption. Although slight sedimentation was observed, it was easily redispersible upon shaking, which is acceptable for herbal formulations.

Overall, the results obtained from the evaluation studies indicate that the formulated herbal hematinic syrup is stable, safe, and effective. The formulation not only improves hemoglobin levels but also provides additional health benefits such as improved digestion, enhanced immunity, and reduced fatigue. The use of natural ingredients ensures minimal side effects and better patient compliance.

In conclusion, the herbal hematinic syrup developed in this study can be considered a promising alternative to synthetic hematinic preparations. It offers a natural, economical, and effective solution for the management of anemia. Further studies, including clinical trials, can be carried out to validate its efficacy on a larger scale and to explore its potential for commercial production. This formulation has significant potential to contribute to the field of herbal medicine and improve the quality of life of individuals suffering from anemia.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this research work.

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