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Formulation and evaluation of herbal cough syrup of clove by using jiggery base,

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ABSTRACT :

The study focuses on the formulation and evaluation of a herbal cough syrup using clove as the active ingredient and jaggery as the base. The objective was to develop a natural, safe, and effective cough remedy. The herbal syrup was prepared by decocting a blend of raw herbs, including clove, tulsi, fennel, and black pepper, with a jaggery base to enhance the flavor, consistency, and shelf life of the product. The methodology involved boiling the herbs, filtering the extract, and mixing it with a jaggery solution, followed by the addition of flavoring agents and preservatives. The prepared syrup exhibited favorable physical properties, including a brownish color, aromatic odor, and pleasant taste, with a pH of 5.454 and viscosity of 0.03. The use of herbal ingredients offers advantages such as safety, affordability, and accessibility. The final product was found to be effective in addressing various types of coughs, including dry and wet coughs, with minimal side effects, making it a viable alternative to conventional synthetic cough syrups

Keyword: Clove, ginger, jaggery basis, herbal cough syrup, quality control test, etc.

INRODUCTION

Jaggery was used as a foundation and herbal medication decoction was added to create herbal cough syrup.The decoction process is used to create the herbal cough syrup.To thicken and retain the formulation, combine the base of jggery with the herbal medication decoction.That helped to extend the formulation's shelf life.Additionally, some herbal medications may become more palatable with the addition of jaggery sugar.[1] Odor and taste unpleasant.[2] Examine the drug's solubility.[3] In tropical Asia, the spice is one of the components in teas that help people cough.[4] Colds, bronchitis, coughing, asthma, and upper respiratory diseases can all be treated using clove oil's expectorant properties.[5] Coughing is a quick, frequently recurring process that helps rid the vast respiratory tract of secretions, allergens, foreign particles, and microbes.The brain signals the body to cough in order to get rid of a foreign object when there is an obstruction or discomfort in the throat or upper airway.Coughing is typically quite normal.Coughing might help keep phlegm and other irritations out of your throat.On the other hand, persistent coughing may also be a sign of several illnesses.Three components make up the cough reflex: inhalation, forced exhalation against a closed glottis, and a forceful outflow of air from the lungs after the glottis opens, typically accompanied by a characteristic sound.Both deliberate and involuntary coughing are possible.[6] Chest pain, congestion, and an itchy throat are some signs of a cough.Coughing repeatedly causes discomfort and inflammation, which leads to further coughing.[7] Natural products or their derivatives are important sources of medications or lead molecules for the creation of synthetic pharmaceuticals.[8] Manufacturers are drawn to insoluble forms of the therapeutic compounds in aqueous suspension or as dry powder for reconstitution since many antibiotic materials become unstable when kept in solution for a significant amount of time.[9] Coughing is caused by a variety of bacteria, viruses, and microorganisms, which aid in the disease's propagation to new hosts.The most common cause of irregular coughing is respiratory tract infections, but other causes include respiratory tract choking, smoking, air pollution, asthma, GERD, post- nasal drip, chronic bronchitis, lung tumors, heart failure, and medications like angiotensin converting enzyme (ACE) inhibitors.[10] Numerous respiratory
conditions, such as asthma, isolated chronic cough, idiopathic pulmonary fibrosis, chronic obstructive pulmonary disease, and cystic fibrosis, are linked to gastro-oesophageal reflux.[11] More than 90% of adults who have a chronic cough—one that lasts more than eight weeks—have post-nasal drip, asthma, eosinophilic bronchitis, or gastroesophageal reflux syndrome.[12] Many different kinds of medications are used to treat coughing, and they are frequently administered in combination.It is crucial to briefly discuss the nature of cough production, its involvement in sickness, and the desirability of suppressing it before discussing the specific drug type utilized.[13]

Aim: Formulation and evaluation of herbal cough syrup of clove by using jaggery base

2.Type of cough

- Dry coughing
- Wet coughing

The classification of cough:

- Acute cough: No more than three weeks.
- Cough that lasts longer than three weeks.
- Dry cough: No secretions or mucus.
- Wet cough: containing secretions or mucus.
- Both productive and non-productive coughing fits in the chest and throat.
- Recurrent and spasmodic paroxysmal cough.
- Bovine cough: a soundless cough brought on by laryngeal paralysis.
- Psychogenic cough: the patient's self-conscious action to attract attention

Benefits of herbal remedies:

- Damage-free
- Cheap
- No adverse effets
- Common locations for herb growth
- Easily accessible
- No prescription is necessary

Herbal medicine drawbacks:

- Prescription medication ADR.
- The extremely uncommon risk of self-dosing on herbs.
- Herbal remedies take longer to start working because their efficacy is not maximized in a lab.

Jaggery syrup making method:

- 1.100 milliliters of condensed syrup were made by dissolving 40 grams of jaggery in enough water
- 2.After that, the mixture was filtered.There, the vehicle was jaggery syrup.

- Herbal cough syrup methodology:
- A large amount of raw herbs were given
- All of the herbs were placed in a water bath, filled with enough water, and boiled until only one-third remained.
- A syrup solution with different concentrations (40 percent w/v) make
- Herb and jaggery extract that filter
- The filter extract was gradually mixed with the jangery solution while being continuously stirrering
- Add flavor and preservative to 100 ml of volume and observe it

1. Clove:

Fig.1 clove

Synonyms:
Botanical Name: Syzygium aromaticum
Other Names: Clavus, Mother Clove, Caryophyllus

Biological Source:

Clove is the dried flower bud of the plant Syzygium aromaticum, which belongs to the family Myrtaceae.
The plant is a tropical evergreen tree mainly cultivated in Indonesia, India, Sri Lanka, and Madagascar.

Chemical Constituents:

- Volatile Oils (main active component):
- Eugenol (70-85%) — responsible for the characteristic aroma and medicinal properties. Acetyl eugenol
- Beta-caryophyllene Vanillin
- Non-volatile Compounds:
- Tannins, Flavonoids, Triterpenoids, and Sterols.
- Other Compounds: Methyl salicylate, Gallotannic acid, and Resins.

Uses:

Medicinal Uses:

Analgesic (pain reliever) – used to treat toothache and oral infections. Antiseptic – used in dental care, mouthwashes, and disinfectants.
Carminative – helps relieve digestive issues like flatulence and indigestion. Antimicrobial – effective against bacteria, fungi, and viruses.
Anti-inflammatory – reduces inflammation.

2. Jaggery:

Fig.2 Jaggery

Synonyms:

- Other Names: Gur (India), Panela (Latin America), Rapadura (Brazil), Kokuto (Japan) Common Name: Unrefined Cane Sugar, Country Sugar, Palm Sugar (if made from palm sap)

Biological Source:

- Jaggery is a natural sweetener obtained from the concentrated sap or juice of plants like: Sugarcane (Saccharum officinarum, family Poaceae)
- Palm Trees (like Borassus flabellifer or Phoenix sylvestris, family Arecaceae)

Chemical Constituents:

Carbohydrates:

- Sucrose (50-70%) — main sweetening agent. Glucose and Fructose (10-15%).
- Proteins: Trace amounts. Minerals:
- Iron, Calcium, Magnesium, Phosphorus, Potassium, Zinc, and Copper. Vitamins: Small amounts of Vitamin B-complex (B1, B2, B6) and Folic acid. Antioxidants: Phenolic compounds and polyphenols.

Uses:

- **Nutritional Uses:**
- Natural sweetener and healthier alternative to refined sugar. Rich in minerals (especially iron) — used to treat anemia.
- **Medicinal Uses:**

Digestive aid – helps stimulate digestive enzymes, preventing constipation. Detoxifying agent – cleanses the liver by flushing out toxins.
Respiratory benefits – used as a remedy for colds, coughs, and asthma. Energy booster – provides a quick source of energy due to its simple sugars.
Anti-inflammatory and Antioxidant – polyphenols help combat oxidative stress.

Culinary Uses:

- Used in making sweets, desserts, and confectionery (like ladoos, payasam, and chikki). Commonly used in Indian cuisine to balance flavors in curries and chutneys.

Other Uses:

- Used in the production of alcoholic beverages like toddy.
- Utilized in traditional Ayurvedic medicine to improve immunity and health.

3. Tulsi (Ocimum sanctum)

Fig. 3 Tulsi

Synonyms

Holy Basil Sacred Basil
Ocimum tenuiflorum

Biological Source
Tulsi is obtained from the leaves, flowers, and seeds of the plant Ocimum sanctum or Ocimum tenuiflorum, which belongs to the family Lamiaceae. It is a perennial herb or small shrub native to India but is also cultivated in other tropical and subtropical regions.
Chemical Constituents
Tulsi contains a wide range of bioactive compounds, including: Essential oils: Eugenol, methyl eugenol, linalool, and camphor Flavonoids: Luteolin, apigenin, and vicenin
Tannins Alkaloids Glycosides Saponins
Triterpenoids: Oleanolic acid, ursolic acid
Vitamins and minerals: Vitamin C, vitamin A, calcium, iron, and zinc

Uses Medicinal Uses:

Adaptogenic and anti-stress: Reduces anxiety, stress, and depression. Immunomodulatory: Enhances immune response.
Antimicrobial: Effective against bacteria, viruses, and fungi. Antioxidant: Neutralizes free radicals, reducing oxidative stress.

4. Cardamom

Fig:4 cardamom.

Synonyms

- Cardamom
- Elaichi (Hindi) Green CardamomTrue CardamomMalabar CardamomSmall Cardamom

Biological Source:

- Botanical Name: Elettaria cardamomum (L.) Maton
- **Family**: Zingiberaceae

Chemical Constituents:

- Cardamom contains:
- Volatile Oils (4–8%), which include:Cineole (Eucalyptol),α-Terpinyl acetate (major component),Fixed Oils ,StarchProteins ,Resins,Flavonoids, and other phenolic compounds

Uses:

Medicinal Uses:
Carminative (relieves flatulence)
Digestive aid
Antispasmodic
Antimicrobial
Expectorant (used in cough and cold remedies)
Mild diuretic
Breath freshener

5. Black Pepper (Piper nigrum)

Fig. 5 Black pepper

Synonyms
Black Pepper Peppercorn
Kali Mirch (Hindi Piper
Maricha (Ayurvedic term)

Biological Source

Black pepper consists of the dried unripe fruits (peppercorns) of the plant Piper nigrum, which belongs to the family Piperaceae. It is a flowering vine native to South India but is now cultivated in various tropical regions worldwide.

Chemical Constituents

- Black pepper contains a wide range of bioactive compounds, including:
- Alkaloids: Piperine (the most important compound responsible for the pungent taste) Volatile Oils: Limonene, pinene, caryophyllene, and sabinene
- Flavonoids: Kaempferol, quercetin, and rutin Phenolic compounds: Ferulic acid and caffeic acid Tannins: Contribute to its astringency
- Starch: Present

Medicinal uses :

- 1.Digestive Health 2.Respirstory relief
- 3.Anti-inflammatory pain relief

Equipment and Materials:

Material:

Sr.no.	Content	Applications
1	**[API] Clove**	**Anticipatory**
2	**Jaggery**	**The base**
3	**Tulasi**	**Anti-tussive**
4	**Cardamom**	**A flavoring agent**
5	**The Black Pepper**	**Preservative**

Table no.1

Fig.no 6

Equipment :

Sr.no	Equipment
1	UV- Spectrometer
2	pH Meter
3	Colorimeter
4	Centrifuge
5	IR
6	Chromatography

Table no.2

Formula :

Sr.no	Ingredient	Q.T (100ml)	Q.G (60ml)	Uses
1	Tulsi	12ml	6.2ml	Antitussive
2	Cardamom	14.2l	8.5ml	Flavoring Agent
3	Black Pepper	10.5ml	5.5ml	preservative
4	Peppermint	13.5ml	10ml	Cooling Agent
5	Clove	14.3ml	7ml	Expectorant
6	Liqorice	15.2ml	6.5ml	Anti- inflammatory
7	Jaggery	21.3ml	16.3ml	Base

Table no.3

Formulation of herbal cough syrup

- Every herb given
- 500 milliliters of water are combined with herbs.
- All of. the materials were brought to a boil until the combined volume was one-fourth of what it had been before the boiling extract cool and filter
- Filtre used to make the finished syrup.

Fig.no.7

Fig.no 8

Formulation evaluation parameters

Color analysis:

We took two milliliters of prepared syrup and smelled it.
After that, an odor was detected.

Analysis of odor:

We took two milliliters of the prepared syrup and smelled it.
After that, an odor was detected.

Analysis of taste:

Taste analysis: The final syrup's flavor was assessed after a pinch was taken.[16]

pH analysis:

- The glass electrode was rinsed with distilled water and cleaned.
- Set the PH meter's value to 7 by immersing the electrode in PH 7 buffer solution and rotating the calibrate knob.
- The electrode was taken out, cleaned, and rinsed with distilled water.
- The electrode was positioned into the PH 4 buffer solution. Modify the value.
- The PH was then measured when the electrode was submerged in the finished syrup.[17]

Density analysis:

- The bottle of specific gravity was cleaned.
- Distilled water was used to clean the bottle at least twice.
- Using a stopper, I measured the weight of an empty dry container of syrup (w1).

- Calculate the syrup's weight in grams (w2).
- The density of the liquid under test (syrup) is equal to the weight of the syrup under test divided by the volume of the final syrup under test, or W3/V.
- Determine the syrup's weight in grams (w3).

8.4. Examining Viscoty:

Used a mild chromic acid to clean the Ostwald viscometer and, if required, an organic solvent like acetone.
positioned the viscometer vertically on an appropriate stand.
Added water to the dry viscimeter until mark G was reached.
The water flow time from point A to mark B was measured in seconds.
To get an accurate reading, this step was carried out at least three times.
Next, fill the viscometer to mark A with the sample liquid, wash it, and watch how long it takes for the liquid to flow to mark B [18]
This is the viscosity formula:
Viscosity is calculated as follows: density of the test liquid * time needed to flow the liquid
* time needed to flow water * 100

8.5. Testing for stability:

The prepared herbal syrup underwent stability testing while the samples were maintained at accelerated temperatures.
Culture tubes were used to collect the finished syrup.
After that, they were maintained at different accelerated temperatures of 4 degrees Celsius, room temperature, and 47 degrees Celsius.
The samples were examined for turbidity and other physicochemical parameters (color, taste, and odor) at 24-, 48-, and 72-hour intervals to look for any changes.[19]

RESULT:

Preformulation Study

Sr.no	Test	Percentage
1	Moisture content	17.6
2	Water extractive value	27.2
3	Ethanolic extract value	41.2
4	Total ash value	7.5

Table no.4

Determination of RF value by TLC

Sample	Distance travelled by sample	Distance travelled by solvent	RF value
Powder	3.5	6.3	0.55

Table no.5

Determination of solubility of sample

Sr.no	Solvent	Solubility
1	Water	Insoluble
2	Ethanol	Soluble
3	Methanol	Soluble

4	**Choloform**	**Soluble**
5	**Acetone**	**Insoluble**

Table no.6

Discussion:

The formulation of a herbal cough syrup using clove as the active ingredient and jaggery as the base demonstrates a significant step toward the development of a natural, accessible, and cost-effective remedy for cough-related ailments. The integration of traditional herbal ingredients—such as tulsi, black pepper, cardamom, and licorice—into a jaggery-based syrup enhances not only the therapeutic efficacy but also the palatability and shelf-life of the preparation.

Each herbal component contributed specific pharmacological properties: clove served as an effective expectorant and antimicrobial agent; tulsi exhibited immunomodulatory and antitussive effects; black pepper and cardamom added antimicrobial and flavor-enhancing properties; while jaggery provided a sweet base with nutritional and respiratory benefits. The methodology followed for decoction and jaggery syrup preparation was straightforward, reproducible, and scalable.

The evaluation parameters—including pH, viscosity, taste, odor, and stability—indicated that the final product was within acceptable standards. The formulation exhibited a pH of 5.454, mild viscosity, pleasant aroma and taste, and remained stable across various temperatures. Preformulation studies such as moisture content, extractive values, and TLC analysis supported the quality and consistency of the raw materials used.

Conclusion :

The developed herbal cough syrup using clove and jaggery is a promising alternative to synthetic cough remedies. It offers the advantages of being natural, affordable, free of significant side effects, and easily acceptable due to its pleasant taste and aroma. The syrup showed effectiveness against both dry and wet coughs and maintained good physical stability. With further clinical validation, this herbal formulation could be promoted as a safe and effective remedy for respiratory tract infections and cough management.

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