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Development of a Safe and Effective Polyherbal Cough Syrup Using Traditional Medicinal Herbs

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Abstract: *Cough is one of the most common health problems experienced by individuals worldwide over many centuries. It acts as a protective mechanism of the body to clear the respiratory tract. Coughs are further classified based on various factors such as signs and symptoms, duration, type, and character. Among the different dosage forms used for the treatment of cough and cold, syrups are the most commonly prepared, used, and preferred. Herbal syrups are especially favored due to their advantages over synthetic syrups, such as fewer side effects and natural origin. Medicinal plants are widely utilized as primary healthcare agents, particularly in Asian countries. Herbal ingredients with expectorant and antitussive activities are commonly used in the formulation of cough syrups. This study briefly explores cough and its treatment through herbal remedies. The herbal cough syrup, being a liquid dosage form, is easier to administer compared to solid dosage forms and offers faster and more effective relief from cough. The method of preparation of herbal cough syrup was discussed, including the materials used and their respective quantities. In this study, three honey-based batches were formulated with concentrations of 35%, 40%, and 45% w/v. The final syrups were evaluated for quality through post-formulation studies.*

Keywords: Cough, Herbal Syrup, Herbal Formulation, Herbal Treatment

I. INTRODUCTION

Cough, also known as “tussis,” is a common reflex action that helps clear the throat and airways of foreign particles, microbes, irritants, fluids, and mucus. It is a voluntary or involuntary act characterized by the rapid expulsion of air from the lungs, often triggered by irritation or blockage in the throat or upper respiratory tract. In such situations, the brain detects the presence of a foreign element and signals the body to expel it through coughing.

The cough reflex comprises three phases: inhalation, a forced exhalation against a closed glottis, and a sudden release of air upon the opening of the glottis, producing a distinct sound. Coughing is commonly associated with various respiratory conditions such as asthma, viral infections, lung cancer, tuberculosis, and pulmonary embolism. Repetitive coughing can lead to inflammation and discomfort, which, in turn, can exacerbate the coughing cycle.

Respiratory tract infections are widespread, especially among children. Although many such infections are self-limiting with minimal complications, cough remains a significant symptom leading to frequent clinical visits.

Classification of Cough :

Cough can be classified based on type and duration:

Based on Type

1**. Dry Cough:**

Also known as non-productive or ineffective cough.

Associated signs and symptoms:

- Sensitive throat
- No mucus expelled
- Short, dry, and frequent coughing

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- Persistent tickling in the throat

Treatment: Cough suppressants and antitussive agents.

2. **Wet Cough:**
Also referred to as productive or effective cough.
Associated signs and symptoms:

- Presence of phlegm
- Wheezing
- Chest tightness
- Difficulty in breathing

Treatment: Expectorants.

B. Based on Duration
Acute Cough:
Lasts for less than 3 weeks.
Common causes: Common cold, upper respiratory tract infections (URTI), chronic obstructive pulmonary diseases (COPD), environmental pollution, and infectious bronchitis.

Sub-Acute Cough:
Persists for 3 to 8 weeks.
Respiratory causes: Pneumonia, Bordetella pertussis infection.
Non-respiratory causes: Gastroesophageal reflux disease (GERD), and rarely, Tourette's syndrome.

Chronic Cough:
Lasts for more than 8 weeks.
Respiratory causes: COPD, asthma, lung cancer, tuberculosis, and pneumoconiosis.
Cough in Pediatric Population
Cough is a frequent complaint among children and often leads to visits to healthcare professionals. It serves as a sign that the child's body is attempting to eliminate irritants, pollutants, or other foreign materials. Common causes of cough in children include:

Allergies or Sinusitis:
Symptoms:
Prolonged cough, itchy throat, runny nose, watery eyes, sore throat, and skin rashes.
Diagnosis involves allergy tests to identify specific allergens and appropriate management advice.

Asthma: Challenging to diagnose due to symptom variation among children.
Signs: Wheezing cough (especially at night), cough triggered by physical activity such as playing or exercising.
Treatment depends on the underlying cause.

Infections:
Colds lead to mild to moderate hacking coughs.Influenza may result in a severe, dry cough.Croup typically causes a "barking" cough, often occurring at night and accompanied by noisy breathing.

Other Causes:
Habitual coughing after a respiratory illness.Inhalation of foreign bodies (e.g., food particles, small objects).Exposure to irritants like cigarette smoke, pollution, or firecracker smoke.

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Herbal Treatment for Cough

Herbal treatments are highly preferred for managing cough due to their natural origin and minimal side effects. Herbal formulations play a significant role in the healthcare system, particularly for the treatment of respiratory and chronic conditions such as asthma, tuberculosis, cough, pneumonia, diabetes, cancer, kidney disorders, allergies, and viral infections.According to the World Health Organization (WHO), approximately 80% of the global population relies on herbal medicine for their primary healthcare needs. Herbal remedies have long been integral to traditional medicine systems, especially in Asian countries.The primary use of herbal medicine is for health promotion and the management of chronic illnesses, rather than life-threatening conditions. In contrast, synthetic medications often produce adverse effects such as nausea, vomiting, drowsiness, appetite changes, sedation, allergies, addiction, and even organ damage with prolonged use.In recent years, researchers have increasingly focused on the development of herbal drugs and therapies due to their lower risk of side effects during and after treatment.

II. LITERATURE REVIEW

Alastair Sutcliffe. Et al. (2013) :

Cough is a defensive reflex of the respiratory tract which is important to clear the upper airways and should not be suppressed indiscriminately. Cough is thought to be caused by a reflex. It occurs due to stimulation of mechano-or chemoreceptor in throat, respiratory passage or stretch receptor in the lungs. The sensitive receptors are located in the bronchial tree, particularly in the junction of the trachea. These receptors can be stimulated mechanically or chemically e.g. by inhalation of various irritants than nerve impulses activate the cough center in the brain. Traditionally cough is classified as either productive, i.e. Producing mucus usually with expectoration or nonproductive (dry). Therefore, the use of an effective antitussive agent such as dextromethorphan or codeine to suppress the debilitating cough suffered by such patients seems appropriate. Non-Narcotic antitussive agents anesthetize the stretch receptor located in respiratory passages, lungs and pleura by dampening their activity and thereby reducing the cough reflex at its source.

Maher Ashutosh. Et al. (2012) :

Ayurveda, the ancient Indian system of medicine, strongly believes in polyherbal formulations and scientists of modern era often ask for scientific validation of herbal remedies. This plant-based system of medicine has already gained worldwide attention due to its safety and efficacy. With the growing need for safer drugs, attention has been drawn to quality, efficacy and standards of the Ayurvedic formulations1,2. Ayurvedic.Ayurveda is a plant-based system of medicine and consist of various Ayurvedic formulations such as solid dosageforms (pills, powders), liquid dosage forms (asavas, aristhas)and semisolid dosage forms (ghritas, avlehas). Syrups are medicinal preparations made by soaking the drugs (powder or decoction) in a solution of sugar or jaggery for a specified period of time. Adulsa is a marketed Ayurvedic polyherbal formulation included in Ayurvedic formulary containing.

Swain Pramod Kumar. Et al. (2013) :

Respiratory tract infections are an important health problem because of high incidence and economic costs.The World Health Organization identifies honey as a potential demulcent treatment for cough.The aim of this study is to determine: i) patient public perceptions towards a proposed randomized controlled trial (RCT) comparing the effects of honey to placebo for treatment of cough in children; ii) potential participation rates for proposed trial; iii) whether age and gender of parent or child impacts on proposed cough assessment tools. Forty adult participants with children age 1-6 years presenting with an upper respiratory tract infection were enrolled.

AIM AND OBJECTIVE

AIM: formulation and evaluation of polyherbal cough syrup.

THE OBJECTIVES OF STUDY:

- Relieves dry and wet cough.
- Enhances immunity.

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- Cures cold, sore throat and bronchitis.
- Promotes easy breathing.
- Very effective against allergic cough and smoker cough
- It is a non – alcoholic formulation.
- It is effective in dissolution and removing congealed cough and phlegm.
- It is non habit forming.
- Expels sputum accumulated in the chest and prevent forming new sputum.

PLAN OF WORK

Following steps are involved in present study:

- Extensive literature survey.
- Selection of plant, material and method.
- Collection of herbs.
- Drying and processing of herbs.
- Extraction of crude herbal drugs.
- Preparation of polyherbal cough syrup.
- Evaluation of poly herbal cough syrup.

Colour
Odour
Taste
pH
viscosity
result & discussion
Summary & conclusion

III. MATERIAL AND METHOD

Herbal parts are use in formulation of herbal syrup for treatment of cough as shown in Table

Sr.no	Ingredients	Botanical Name
1	Ginger	Zingiber officinale
2	Liquorice	Glycyrrhiza glabra
3	Tulsi	Ocimum tenuiflorum
4	Cinnamon	Cinnamomum verum
5	Turmeric	Curcuma longa
6	Cardamom	Elettaria cardamomum
7	Honey	Apis mellifera
8	Peppermint	Menthe piperita L
9	Adulsa	Justicia adhatoda
10	Clove	Syzygium aromaticum

Table no.3 list of ingredients with their botanical name

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Fig no.1 herbalingredients

Formulation Table:

Three formulation of herbal cough syrup were prepared as shown in Table 4

Sr.no	Ingredients	Quantity			Uses
		F1	F2	F3	
1	Ginger	2-3g	2-3g	2-3g	Antitussive, expectorant
2	Liquorice	4g	4g	4g	Expectorant,
3	Tulsi	15-20leaves	15-20leaves	15-20leaves	Antitussive, expectorant
4	Cinnamon	2g	2g	2g	Aromatic, expectorant
5	Turmeric	1-2g	1-2g	1-2g	Antitussive
6	Cardamom	2g	2g	2g	Aromatic, flavouring agent
7	Honey	35%	40%	45%	Base, viscosity modifier , sweetner
6	Peppermint	2g	2g	2g	Pain relief
9	Adulsa	3g	3g	3g	Antitussive
10	Clove	2g	2g	2g	Expectorant

Table no.4 ingredients with quantity and uses

Method of preparation

Herbal cough syrup was prepared by using decoction method. Procedure of herbal cough syrup preparation as shown in chart

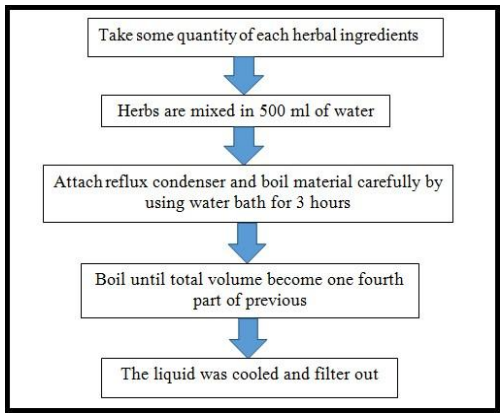

Fig no 2 method of preparation

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Fig no 3 method of evaluation

Fig no4 method of extraction

IV. RESULT AND DISCUSSION

Sr.no	Test	Procedure
1	Colour examination	2ml of syrup was taken on a watch glass Watch glass was placed again stwhite background under white tube light. Colour was observed.
2	Odour examination	2ml of prepared syrup was taken and smelled by an individual. The time interval between two smelling was 2min to nullify effect of previous smelling.
3	Taste examination	A pinch of final syrup was taken &was examined on taste buds on tongue
4	Ph estimation	10ml of prepared syrup was taken in100 ml volumetric flask. Makeup volume upto100ml with distilled water. Sonicate for10min pH was measured using digital pH meter

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Evaluation parameters

Table no. 5 evaluation parameters

Pre formulation study

Table no.6 pre formulation study

Sr.no	Test	Result %
1	Moisture content	1.4
2	Ethanol soluble extract	11.9
3	Water soluble extract	13.1

Post formulation study

Formulation	Colour	Odour	Taste	PH	Viscocity
F1	Yellowish brown	Aromatic	Sweet	6.1	0.0132
F2	Yellowish brown	Aromatic	Sweet	6.2	0.0398
F3	Yellowish brown	Aromati	Sweet	6	0.0581

Table no.7 post formulation study

Colour: The colour of herbal cough syrup formulation was found to be brownish. Table 4 shows the results obtained for colour of formulat

Odour: Table 4 shows the result obtained for odour of formulated batches of cough syrup. The odour of formulation was aromatic for F1, F2 and F3 formulated batches.

Taste: Table 4 shows the results obtained for taste of formulated batches of cough syrup. The taste of formulation was sweet for F1, F2 and F3 batches.

pH: Table 4 shows the result obtained for pH of formulated batches of cough syrup. The pH of formulation is 5.89, 5.68 and 5.76 for F1, F2 and F3 formulated batches respectively.

Viscosity: Table 4 shows the result obtained for viscosity of formulated batches of cough syrup. The viscosity of formulation is 3.14cp, 3.46cp and 3.78cp for F1, F2 and F3 formulated batches.

Summary & conclusion

The present project was undertaken to formulate and evaluate a polyherbal cough syrup utilizing various medicinal herbs known for their therapeutic benefits in treating respiratory ailments. The formulation aimed to provide relief from both dry and wet cough, as well as symptoms like sore throat, bronchitis, and cold, while also boosting immunity.

A total of three formulations (F1, F2, F3) were prepared using ingredients such as Adulsa, Tulsi, Liquorice, Ginger, Clove, Peppermint, Turmeric, Cinnamon, and Honey. These were selected based on their known antitussive, expectorant, soothing, and antimicrobial properties. The evaluation was carried out through organoleptic characterization, pH determination, and viscosity testing. Among the batches, Formulation F3 was identified as the most effective due to its optimal viscosity and favorable sensory characteristics. The study demonstrated that **herbal formulations offer a safer and more natural alternative to allopathic cough syrups**, which often contain synthetic compounds and cause side effects. The developed syrup is **non-alcoholic, non-habit forming**, and easily acceptable due to its sweet and aromatic nature. This project supports the wider acceptance of herbal medicine and encourages its continued research and standardization for effective healthcare solutions.

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