Poly herbal Formulation and evaluation of herbal cough syrup

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Introduction

Herbal medicine is also known as phyto-medicine or herbalism it is a medicine that useplants or their crude products for the treatment of diseases. Since ancient era, herbal or plant-based medicines has been used for the prevention, cure & mitigation of diseases and time to time more and more herbal constituents of these natural sources are get enhanced. Herbal medicine has its origins in ancient cultures. It involves the medicinal use ofplants to treat disease and enhance general health and wellbeing. Some herbs have potent (powerful) ingredients and should be taken with the same level of caution as pharmaceutical medications.1Diseases in human life are one of the huddle to live life, which consist of chronic and acute diseases. Cough is a common respiratory symptom that can have a significant impact on the quality of life. Polyherbal formulations have been used for centuries in traditional medicine to treat coughs and other respiratory ailments. Commonly polyherbal cough syrup using a combination of medicinal plants which act as a natural ingredients, like Vasaka: *Adhatoda vasaka* (Acanthaceae), Ginger: *Zingiber officinale* (Zingiberaceae), black pepper:*Peper Nigrum Linn* (pepperaceae),Garlic: *allium sativum* (liliaceae), clove: *Syzygium aromaticum* (Myrtaceae), honey : *apis milifera* (apideae), lemmon grass: *Cymbopogon Citrate linn* (poaceae), and liquorice: *Glycyrrhiza glabra* (Legiminosae).

Herbal cough syrup is a type of natural remedy used to alleviate coughs and other respiratory symptoms. It is made from a variety of herbal ingredients such as honey, ginger, liquorice, vasaka, tulsi& turmeric which are believed to have beneficial properties for the respiratory system. The utilization of these are co- related with the Rasa of the plant material, which ultimately balances the tridosha of the body.Herbal cough syrup is typically used as an alternative to conventional cough syrup, which often contains synthetic ingredients that can have unwanted side effects. Herbal cough syrup is generally considered to be safe and effective for most people, although it is important to consult with a healthcare professional before using any new herbal remedy.

What is mean by cough?

The human being are suffered with many acute diseases, among that cough is one of them. Coughing occurs when the body's cough reflex is triggered. The cough reflex is a protective mechanism that helps to clear the airways and throat of mucus, irritants, and foreign particles. When the lining of the airways becomes irritated or inflamed, sensory receptors in the airways send signals to the brainstem, which then triggers the cough reflex. This reflex involves a series of coordinated muscle contractions in the chest, diaphragm, and throat, which create a burst of air that forcefully expels the irritant or mucus out of the airways. The cough reflex can be triggered by a wide range of factors, including respiratory infections such as the common cold, flu, and pneumonia, as well as other conditions such as allergies, asthma, and acid reflux. Certain irritants such as smoke, dust, and pollution can also trigger coughing.. Such type of diseases are possible to treat by the potential of the natural component obtained from the herbs, consisting of various phyto constituents like saponins, flavonoids and phenols.3

Herbal cough syrup

A herbal syrup is prepared by combining a concentrated decoction with either honey or sugar, and sometimes alcohol. Herbal plants and formulations are used for the many types of diseases like cough syrup

and many more other diseases. The content of herbal cough syrup include: -funnel, clove, tulsi, cinnamon, pudina, adulsa.4

Types of Herbal syrup

1. Medicated syrup
2. Non Medicated syrup
3. Flavoured syrup

Advantages of cough syrup

Herbal cough syrup offers several advantages over conventional cough syrups, including:

1. Natural ingredients: Herbal cough syrups typically contain natural ingredients such as honey, ginger, licorice, and herbs like marshmallow root or elderberry, which are gentler on the body compared to synthetic compounds.
2. Reduced side effects: Due to their natural composition, herbal cough syrups are often associated with fewer side effects than their pharmaceutical counterparts, making them suitable for individuals with sensitivities or allergies.
3. Soothing properties: Many herbal ingredients in cough syrups have soothing properties that can help alleviate cough symptoms, reduce throat irritation, and promote respiratory health.
4. Immune support: Certain herbs and botanicals used in herbal cough syrups, such as echinacea or thyme, possess immune-boosting properties, which may help the body fight off infections causing the cough.
5. Safe for children and pregnant women: Herbal cough syrups are generally considered safe for children and pregnant women, as they typically do not contain alcohol or other ingredients that may pose risks in these populations.
6. Long-term benefits: Regular use of herbal cough syrups may contribute to overall respiratory health and immune function, providing long-term benefits beyond just alleviating cough symptoms.

MATERIAL AND METHOD

❖ **Instrument :**

1. Saucepan or Pot : Used for boiling and simmering the herbal ingredients with water.
2. Stirring Utensil : A stirer, spoon or spatula for stirring the ingredients while they are being heated.
3. Fine Mesh Strainer or cloth : To strain the liquid mixture and remove the herbal solids before adding honey.
4. Clean Container : A glass jar or bottle with an airtight lid to store the finished herbal cough syrup.
5. Refrigerator: Needed for storing the syrup to maintain its freshness and potency.
6. Glass beakers and flasks: Used for mixing, heating, and measuring liquid ingredients.

Fig no: Apparatus

7. Stirring rods or magnetic stirrers: For stirring and mixing ingredients evenly.

8. Weighing balance: To accurately measure the weight of solid ingredients and ensure precise formulation.
9. Heating mantle or hot plate: For heating and dissolving ingredients as needed.
10. Funnel and filter paper: Used for filtration to remove impurities or solid particles from the syrup.
11. pH meter: To monitor and adjust the pH level of the syrup for stability and effectiveness.
12. Graduated cylinders: For precise measurement and dispensing of liquid ingredients.
13. Mortar and pestle: For grinding or crushing dried herbs or botanicals before adding them to the syrup.
14. Water bath: Used for gentle heating or maintaining the temperature of the syrup during preparation.
15. Sterile bottles or containers: To store the finished syrup safely and maintain its shelf life.

❖ **Apparatus :**

1. Extraction apparatus: Used for extracting active compounds from herbs or botanicals. This may include Soxhlet extractors, maceration equipment, or percolators.
2. Herb grinder : To grind dried herbs or botanicals into a fine powder for extraction or incorporation into the syrup.
3. Filtration apparatus: This includes filter funnels, filter papers, and vacuum filtration setups for clarifying herbal extracts or removing particulate matter.
4. Distillation apparatus: If the formulation requires the distillation of herbal extracts or the removal of solvents, distillation apparatus such as rotary evaporators may be used.
5. Viscometer: For measuring the viscosity of the syrup to ensure it meets the desired consistency and flow properties.
6. Microbiological testing equipment : This may include equipment for conducting microbial limit tests to ensure the safety and microbial stability of the syrup.
7. Packaging equipment: This includes machinery for filling bottles or containers, capping, labeling, and sealing the finished herbal cough syrup.

Drug profile

ADULSA

Synonyms:- Malabar nut, Adhatoda vasica

Biological source: The biological source of *Adhatoda Vasaka* is dried and fresh leaves of this plant.

Family:- Acanthaceae.

Fig no :Adulsa leaves

Chemical constituents:- The chemical constituent of vasaka are alkalis tannins flavonoids Serpent sugar and glucoside. The leaves of vasaka contain Vitamin C in large amount. The roots of these plant contain Vasicinolone, basil and peganine,vasicine, vasicinone, Maiontone, vasicol, kaempferol.

Uses:-

1. Expectorant properties: Adulsa helps loosen and expel mucus from the respiratory tract, making it easier to clear congestion and relieve coughing.
2. Antitussive action: It helps suppress coughing by soothing irritated throat tissues and reducing the frequency and severity of coughing spells.

3. Anti-inflammatory effects: Adulsa contains compounds that have anti-inflammatory properties, which can help reduce inflammation in the respiratory tract and alleviate symptoms of conditions like bronchitis and asthma.
4. Antimicrobial activity: Some studies suggest that Adulsa may have antimicrobial properties, helping to combat respiratory infections caused by bacteria and viruses.

BLACK PEPPER

Synonyms:- Pepper, Piper Nigurm, Maricha
Biological source:- Pepper is the dried unripe fruit of perennial climbing vine *Piper Nigrum Linn*
Family:- Piperaceae.
Chemical constituents:- Alkaloid piperine (5-9%), Volatile oil (1-2.5%), Pungent resin (6.0%), Piperidine and starch (about 30%).
Fig no :black pepper
The volatile oil which is yellowish in colour contains mainly l-phellandrene and caryophyllene.
Used:

1. Expectorant properties: Black pepper can stimulate the secretion of mucus in the respiratory tract, making it easier to expel mucus and phlegm from the lungs.
2. Antibacterial activity: Compounds found in black pepper, such as piperine, have shown antibacterial properties in some studies. This may help combat bacterial infections in the respiratory tract.
3. Anti-inflammatory effects: Black pepper contains compounds that have anti-inflammatory properties, which can help reduce inflammation in the respiratory tract and alleviate symptoms of respiratory conditions such as asthma and bronchitis.
4. Improved circulation: Piperine, the compound responsible for black pepper's spicy flavor, has been shown to improve blood circulation. Better circulation can support overall respiratory health by ensuring adequate oxygen delivery to the lungs and other respiratory tissues.
5. Antioxidant effects: Black pepper contains antioxidants that can help protect respiratory cells from damage caused by free radicals, potentially reducing the risk of respiratory diseases and supporting overall lung health.

CLOVE

Synonyms:- Caryophyllus, Clove buds, Caryophyllum; Caryophylli; Laung (Hindi).
Biological source:- Cloves are the dried flower buds of *Eugenia Caryophyllata Thumb.*
Family:- Myrtaceae
Chemical Constituents:- Clove contains 14-21% of volatile oil. The other constituents present are the
Fig no : Clove
eugenol, acetyl Eugenol, gallotannic acid, and two crystalline principles; a- and ß- caryophyllenes, methyl. Furfural, gum, resin, and fiber. Caryophylline is odorless component and appears to be a Phytosterol, whereas eugenol is a colorless liquid. Clove oil has 60-90% eugenol, which is the Cause of its anesthetic and antiseptic properties.
Uses:-
1. Antimicrobial properties: Cloves contain compounds like eugenol, which have antimicrobial properties. Consuming clove-flavored syrup may help fight respiratory infections caused by bacteria or viruses.
2. Expectorant effects: Clove syrup can help thin and loosen mucus in the respiratory tract, making it easier to expel phlegm and alleviate congestion.
3. Cough relief: Clove syrup's soothing properties can help ease coughing and throat irritation associated with respiratory conditions like bronchitis and coughs.

CINNAMON

Synonyms:- Cortex Cinnamon oil Ceylon cinnamon, Saigon cinnamon, Chinese cassia, Cinnamon oil aromaticum.
Biological source:- *Cinnamon Zeylanicum* is widely cultivated in Ceylon java Sumatra West Indies Mauritius Brazil and India.
Family:- Lauraceae.
Fig no:Cinnamon
Chemical constituents:- 10% of volatile oil, 5 to 10% eugenol, 50 to 60% cinnamon aldehyde.
Uses:-

Expectorant Properties: Cinnamon is sometimes considered an expectorant, meaning it may help loosen mucus and phlegm from the respiratory tract, making it easier to expel through coughing.
Soothing Effect: The warming and soothing properties of cinnamon may provide comfort to a sore throat or irritated airways, reducing the urge to cough.
It is used as stomachin, carminative, flavoring agent anti arithmetic.

HONEY

Synonyms:- Madhu, madh .
Biological source:- Honey is viscid and sweet secretion stored in the honey comb by various species of bees .i.e APIs florea , APIs dorsata, APIs florea, APIs indica
Family:- Apideae.
Chemical constituents:- Honey consist of sugar, heigh amount of carbohydrate, fructose , sucrose, water, maltose,enzymes ,minerals ,vitamins , glucose .
Uses:

1. Soothing throat irritation: Honey's thick consistency coats the throat, providing relief from irritation and coughing.
2. Antimicrobial activity: Honey contains enzymes that produce hydrogen peroxide, which can inhibit the growth of bacteria. This antimicrobial activity can help fight infections in the respiratory tract.
3. Cough suppression: Honey has been shown to be as effective as over-the-counter cough suppressants in reducing cough frequency and severity, especially in children.
4. Moisturizing effect: Honey can help moisturize and soothe the respiratory tract, particularly when dry or irritated due to conditions like colds or allergies.
5. Antioxidant properties: Honey contains antioxidants that can help protect respiratory tissues from oxidative damage caused by free radicals.
6. Boosting immune function: Some studies suggest that honey may help enhance the immune system, potentially reducing the risk of respiratory infections.

GARLIC :

Synonyms:- Allium ,Lahasun

Biological source:- Garlic consist of ripe bulbs of *Allium sativum* .

Family:- Liliaceae

Chemical constituents:- 29% Carbohydrates, 56% Proteins (Albumin), 0.1% Fat, Mucilage,0.06 to 0.1% volatile oil ,Volatile oil contains Allyl propyl disulphide, Diallyl-disulphade, Allin, Allicin.

Fig no : Garlic

Used :-

1. Antimicrobial activity:Garlic contains compounds like allicin, which have strong antimicrobial properties. It can help fight off bacterial, viral, and fungal infections in the respiratory tract, including colds, flu, and bronchitis.
2. Immune system support: Garlic has immune-boosting properties that can help strengthen the body's natural defenses against respiratory infections. Regular consumption of garlic may reduce the frequency and severity of respiratory illnesses.
3. Anti-inflammatory effects: Garlic contains sulfur compounds that have anti-inflammatory properties. It can help reduce inflammation in the respiratory tract, easing symptoms such as coughing, congestion, and sore throat.
4. Expectorant properties: Garlic can help loosen and expel mucus from the lungs and airways, making it easier to breathe and alleviating symptoms of respiratory congestion.
5. Cardiovascular benefits: Garlic has been shown to improve cardiovascular health by lowering blood pressure, reducing cholesterol levels, and improving circulation. Good cardiovascular health is essential for overall respiratory function.
6. Antioxidant properties: Garlic contains antioxidants that can help protect respiratory tissues from oxidative stress and damage caused by free radicals.

GINGER

Synonyms:- Zingibar , Adrak

Biological source:- Ginger consists of either the scraped or unscraped rhizomes of *Zingiber Officinale* .

Family:- Zingiberaceae
Chemical constituents:- Volatile oil, Resinous matter , Starch, Mucilage. Oil of ginger contains Monoterpenes, Sequiterpene, Sequiterpene alcohol (Zingiberol).
USED :-
1. Anti-inflammatory effects: Ginger contains compounds like gingerol and zingerone, which have potent anti-inflammatory properties. These compounds can help reduce inflammation in the respiratory tract, easing symptoms such as coughing, sore throat, and congestion.
2. Antimicrobial activity: Ginger has natural antimicrobial properties that can help fight off respiratory infections caused by bacteria, viruses, and fungi. Consuming ginger may help prevent and alleviate symptoms of respiratory illnesses like colds and flu.
3. Expectorant properties: Ginger can help loosen and expel mucus from the lungs and airways, making it easier to breathe and relieving symptoms of respiratory congestion.
4. Antioxidant effects: Ginger is rich in antioxidants that can help protect respiratory tissues from oxidative stress and damage caused by free radicals. These antioxidants may also help support overall lung health.
5. Immune system support: Ginger has immune-boosting properties that can help strengthen the body's natural defenses against respiratory infections. Regular consumption of ginger may reduce the risk of contracting respiratory illnesses and shorten the duration of symptoms.
6. Soothing throat irritation: Ginger's warming properties can help soothe and relieve irritation in the throat, providing relief from coughing and discomfort.

Fig no:Ginger

CYMBOPOGON

Synonyms:- Lemongrass , Malabar Grass , Cochin Grass
Biological source:- Lemongrass consist of essential oil obtain by steam distilation from the plant *Cympogon citrus Linn.*
Family :- Gramineae
Fig no: lemmon grass
Chemical constituents: Phytochemical present in lemongrass sterols, flavonoids, lignans, carotenoids, terpenoids, saponins, sulfides, and fiber. Lemongrass Nutrition:Minerals in lemongrass include calcium , potassium , manganese , magnesium, and iron. Also include essential oil , citronellol oil , geraniol oil ,Citral oil.
Used :-
The leaves and the oil are used to make medicine. Lemongrass is used for treating digestive tract spasms, stomachache, high blood pressure, convulsions, pain, vomiting, cough, achy joints (rheumatism), fever, the common cold, and exhaustion.
Cymbopogon citratus, commonly known as lemongrass, is often used for its citrusy flavor and aroma in cooking, particularly in Southeast Asian cuisine. It's also utilized in traditional medicine for its potential health benefits, including digestion aid, relaxation, and as an antimicrobial agent. Additionally, it's used in

the production of essential oils, perfumes, and soaps due to its pleasant fragrance. Lemongrass oil is used as flavoring agent.

METHOD:

An initially all herbal ingredients are collect from their natural source . Plants samples such as leaves bark , fruites, rhizomes, flowers, oil extract , roots etc . extract by various methods :

1) Extraction of adulsa leaves (medicated solution A):

Collect a fresh leaves of adulsa . After being plucked, fresh A. vasica leaves were carefully cleaned with tap water. Using a sterile mortar and pestle and 50 millilitres of tap water, 50 metres of leaves were macerated into a paste, which was then filtered through muslin fabric. The filtrate served as a stock solution for the investigations that followed and was stored refrigerated at 4°C. The active. Medicated extract solution are ready to taken in formulation of syrup .

2) Preparation of maceration (macerated extract solution B):

Take 50ml of honey was taken ,then weigh 25gm of ginger and 25 gm of garlic .Mixed together in beaker and packed with aluminium foil . Allow to stand for 24 hr at room tempreture . Then macerated preparation is ready to taken in formulation of syrup.

3) Preparation of decoction (extract bye decoction solution C):

The initial stage in studying medicinal plant is thePreparation of plant samples to preserve the biomolecules in the plants prior to extraction. Plants samples such asLeaves, barks, roots, fruits and flowers can be extracted From fresh or dried plant materials such as grinding and Drying also influences the preservation of phytochemicalsIn the final extracts.Licorice powder , Cinnamon powder , and Black pepper powder ,weigh and water ratio ratio maintain 1: 4 Then attach reflux condenser and materials was boil under Carefully by using water bath for 3 hrs The mixture was boiled until total volume become one Fourth of the volume. Then the decoction was cooled and filtered. Filtrate was taken to prepare final Syrup.

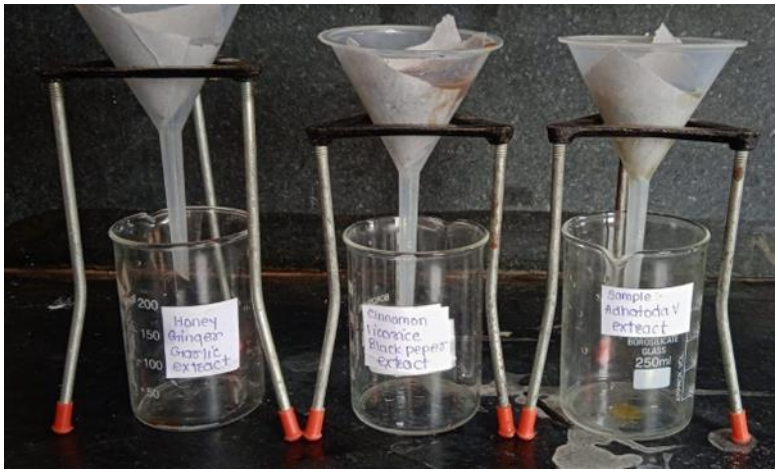

Fig no: Assembly for extract filtration

Formulation table :

Sr no	Ingredients	Active Constituents	Used
1	Adhatoda	Vasicione, vasicine	Antitussive
2	Ginger	Gingerol, sequiterpenes	Antipyretic
3	Garlic	Allin, allicin	Preservative
4	Licorice	Glycyrrhizin	Expectorant
5	Cinnamon	Eugenol, cinnamic acid	Antitussive
6	Black pepper	Peperine, terpenes	Antibacterial
7	Honey	glucose, fructose	Expectorant
8	Cymbopogon	Citral oil , citronellol oil .	Antipyretic
9	Clove oil	Eugenol, eugenyl acetate .	Flavouring agent

Formulation table :

Sr no	Ingredients	Quantity for formulation 1	Quantity for formulation 2
1	Medicated solution A	50ml	40ml
2	Macerated extract solution B	10ml	20ml
3	Extract by decoction solution C	10ml	5ml
4	Honey	5ml	5ml
5	Clove oil	5ml	5ml
6	Methyl paraben	10gm	10ml
7	Alcohol	10ml	10gm

Procedure for syrup :

- To prepared final cough syrup macerated honey, ginger, garlicwas mixed with meddicated solution of Adulsa extract.
- Add decoction solution (Cinnamon, Licorice, Black pepper, Lemongrass) slowly and continusly stired.
- Add cymbopogon extract in sufficient quantity.
- Add clove oil as flavoring agent and methyl paraben as a preservative.
- Herbal Cough Syrup was prepared.

Evaluation test :

1. Colour examination :

5ml of prepared syrup was taken on a watch glass.
Colour was observed by naked eyes.
Brown colour was observed.

2. Odour examination :

2 ml of prepared syrup was taken and smelled.
Aromatic smelled observed due to clove oil .

3. Taste examination

A pinch of final syrup was taken and examined on taste buds of the tongue.
A sweet and astringent taste is observed .

4. pH determination

10 ml of prepared syrup taken in beaker .
Take a pH paper take reading 1&2 manually
Reading 1) pH =5.0 to 6.0
Reading 2) pH 5.5 to 7.0

5. Viscosity determination

Each formulation's viscosity was measured using Ostwald's U-tube viscometer. Formulated cough syrup was taken. Place the viscometer vertically on an appropriate stand. Up to mark G, fill the dry viscometer with forlmulated cough syrup. Measure the amount of time, in seconds, needed for water to move from mark A to mark B. Step 3 should be repeated at least three times to get an accurate reading. After rinsing the viscometer with sample solution (formulated cough syrup), fill it up to mark A and record the amount of time it takes the liquid to reach mark B. The viscosity of formulated cough syrup was 0.0429.

6. Ash value determination

Total ash value of Adhatoda 12% w/w

7. Solubility determination

Take a 20 ml of sample in a 100 ml of beaker and volume make up with a water the observed by our necked eye the Solution was turbid .
Take a 20 ml of sample in a 100 ml of beaker and volume make up with alcohol then Observed by our necked eye the solution are well dissolved but remain turbid .

8. Stability testing

Take a final syrup in amber colour bottle.
Keep at accelerated tempreture at 40^0 C, room tempreture and 47^0C respectively .
Sample was tested all physiochemical parameter and turbidity at interval of 24 hours and 48 hour and 72 hour to observe any change .

Result and discussion

The result from this study , the formulation of polyherbal cough syrup was well prepared . the adhatoda gives antitussive activity, evalution parameter are calculate in following table.
Organoleptic evaluation of syrup and there reading are shown in 1.

Sr no	Organoleptic test	Readings F1	Reading F2
1	Colour	Greenish brown	Brown
2	Taste	Astringent	Astringent
3	Odour	Aromatic	aromatic

Table no1: Organleptic evaluation

Physiochemical evaluation of herbal syrup are shown in table 2

Sr no	Evaluation parameter	Reading F1	Reading F2
1	pH determination	5.0 to 6.0	5.5 to 7.0
2.	Viscocity determination	0.0429.	0.0493
3	Ash value determination	12%w/w	13%w/w
5	Solublity teting	Insoluble (turbid)	Dissolved (turbid)

Table no 2: physiochemical parameter

Time Druration	Tempreture (^{0}C)	Herbal cough syrup sample	
		Formulation 1	Formulation 2
24hour	Room temp	No change	No change
	47^0 C	No change	No change
48hour	Room temp	No change	No change
	47^0 C	Turbid	No change
72hour	Room temp	No change	No change
	47^{0}C	Turbid	No change

Table no 3: stability testing

Summary and conclusion :

Traditional medicine and complementary and alterntive medicine have become increasingly popular in both developed and developing countres over the past two decades. Due to these current global interest in traditional mededicne and hving less side effect and drawbacks the traditionally ayurvedic medicine used by people . The present study for formulation and evaluation of herbal cough syrup with main aim formulated cough syrup gives expectorant activity , antitussive activityand antipyretic activity .

References

1. Anu Kaushik Vivek, Chauhan and Dr. Sudha. Formulation and Evaluation of Herbal Cough Syrup. European Journal of Pharmaceutical and Medical Research 2016; 3(5): 517-522.
2. Meenakshi Parihar, Ankit Chouhan, M.S. Harsoliya, J. K. Pathan, S. Banerjee, N. Khan, V. M. Patel. A Review- Cough and Treatments, International Journal of Natural Products Research 2011; 5(2): 213- 218.
3. Farhat Pirjade Mujawar, Manojkumar Patil, Jyotiram Sawale. Formulation and Evaluation of Herbal Cough Syrup of Echinops echinatus Roxb. Roots, International Journal of Pharmacy and Technology, ISSN: 0975-766X; 2016.
4. G. Sandhyarani and K. Praveen Kumar. Development of herbal syrup. Asian Journal of Pharmaceutical Science and Technology 2014; 4(2): 101-103.
5. Swain Pramod Kumar, Nayak Durga Prasan. Design, Development and Evaluation of a Poly Herbal Syrup from some herbs used as Energy booster, International Journal of Ayurvedic Medicine 2013; 4(4): 374-378.
6. SeemaGairola. Vikas Gupta (2010) et al. A Review on Herbal Antitussives And Expectorents. Department of Biochemistry, PGIMER, Chandigarh, Volume 5, Issue 2 November-December 2010: Article-002.

7. Akula Nikhil Prashant. Dr. K. V. Subramanyam (2015) et al. Development and Evaluation of Herbal Cough Syrup. International Reviewed Journal For Pharmaceutical and Medical Research and Technology 2278-4357, ICV-84.87
8. Jafarzadeh M. Pourkhalili K. Bahmani M, Ahmadi B. Baharyand-Ahmadi BB Ratician-Kopaei M. Medicinal plants and secondary metabolites for cough Treatment: A systematic review. Iranian Journal of Public Health. 2015 Jun 1:44(6):685.
9. Rajaci A. Barikbin B. Moghadamnia AA. Mohammadi M. Arjomand Y. Mohammadi-Kamalabadi M, Khaksari M. Effect of a herbal syrup on cough in chronic obstructive pulmonary disease: A randomized controlled trial. Iranian Journal of Pharmaceutical Research. 2015;14(2):557.
10. AnkushGanpatPatilKaivalyaGajananMirajakar et al (6 June-2020) Formulation and evaluation of ginger macerated honey base cough syrup. International Journal of Innovative Science and Research Technology 5. 2456-2165.
11. Yogesh V. Ushi, Kundan J Tiwari (2021) et al, Design, Development and Evaluation of Anomelesindien Herbal Cough Syrup Research Journal of Pharmaceutical Dosage Forms and Technology 2021, 13(4):292-6. Doi: 10.52711/0975-4377-2021.00048
12. Anu Kaushik (2022) had done the work on, Formulation and Evaluation of Herbal Cough Syrup. An International Peer Reviewd Journal for Pharmaceuticals, Medical And Biological Science. European Journal of Pharmaceutical and Medical Research. ICV 79.57
13. Bijay Sharma, Arnab Bagchi (2022) et al. Formulation and Evaluation of Expectorent activity of Poly Herbal Cough Syrup from Traditional Medicinal Plants extracts of North East India. Department of Pharmacognosy, Himalayan Institute of Pharmacy, Department of Pharmacuetical Technology, University of North Bengal, India Vol.-15.